Refined Economic Impact Analysis for the Greenhouse Gas Emissions Reduction Act 2012 Plan

Prepared for
Maryland Department of the Environment

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Acronyms and Abbreviations

BGE	Baltimore Gas and Electric
BWI	Baltimore/Washington International Thurgood Marshall Airport
CAP	Climate Action Plan
CAFE	Corporate Average Fuel Economy
DBED	Department of Business and Economic Development
DGS	Department of General Services
DHCD	Department of Housing and Community Development
DHMH	Department of Health and Mental Hygiene
DNR	Department of Natural Resources
EPA	U.S. Environmental Protection Agency
GGRA	Greenhouse Gas Emissions Reduction Act
GHG	Greenhouse Gas
IMPLAN	Impact Analysis for Planning
MACT	Maximum Achievable Control Technology
MARC	Maryland Area Regional Commuter
MDA	Maryland Department of Agriculture
MDOT	Maryland Department of Transportation
MDP	Maryland Department of Planning
MEA	Maryland Energy Administration
MIA	Maryland Insurance Administration
MDE	Maryland Department of the Environment
NAICS	North American Industrial Classification System
PAYD	Pay-As-You-Drive®
PEPCO	Potomac Electric Power Company
RESI	Regional Economic Studies Institute of Towson University
REMI	Regional Economic Models, Inc.
RGGI	Regional Greenhouse Gas Initiative
SAM	Social Accounting Matrix
SMECO	Southern Maryland Electric Cooperative

1.0 Executive Summary

1.1 Introduction

Climate change and mitigation strategies are important factors for many elements of the economy and society in general: the rising costs of energy and transportation, threats to the environment, and the health of the greater population (and, by extension, the labor pool). Energy, transportation, agriculture and forestry, recycling, buildings, land use, and many other areas are affected by climate change. As such, mitigating climate change is a vital concern.

Maryland State government agencies are doing their part to mitigate the negative effects of climate change by creating and implementing climate change mitigation strategies designed to reduce GHG emissions in The State. The 65 strategies under various state government agencies have been organized into eight subject areas: energy, transportation, agriculture and forestry, recycling, multi-sector, buildings, land use, and innovative initiatives.[1]

This report is a refinement of RESI's 2011 results, taking into account the short-term job creation, economic activity, and wage effects from these 65 strategies. The 2011 report was a preliminary analysis of the potential economic impacts of mitigation strategies for the 2012 GGRA report. During this refinement, RESI used a dynamic model known as the REMI model PI+ to assist in determining cumulative benefits and annual impacts to the region. This model allowed RESI to review the interactions among agencies within the region from the strategies and changes that would result from the interaction of those agencies. The results of this report are considered to be a more accurate representation of the possible outcomes from these reduction strategies and provide a potential estimation of economic activity through 2020.

1.2 Summary of Findings

RESI analyzed data collected in collaboration with state agencies and MDE in order to estimate the economic impacts of climate action strategies and their subprograms. Using data contained in strategy write-ups provided by MDE as well as external research from a variety of sources, including the implementing agencies, RESI estimated the impacts of each strategy and subprogram.

RESI coordinated with state agencies to develop a methodology. The agencies assisted in the development and finalization of all assumptions used in the economic modeling for RESI's analysis. Through this coordinated effort, RESI built upon their original design in 2011 creating an investment and operation phase. A detailed explanation of the investment and operation phases and what they entail can be found in Appendix B.1 of Appendix E of the GGRA plan.

To quantify the economic and fiscal impacts of climate action strategies and their subprograms, RESI utilized the REMI PI+ input/output model. For more information regarding REMI PI+, please refer to Appendix B.2 of Appendix E, which presents *The Refined Economic Impact Anlaysis for the Greenhouse Gas Emissions Reduction Act 2012 Plan* hereafter referred to as the full report in this Chapter.

[1] At the time the RESI analysis began there were 65 strategies in the GGRA plan. Since that time the plan has evolved to include 17 policy bundles and 60 individual programs.

A summary of RESI's findings, including the total economic impacts (employment, output, and total net benefits) of all strategies within a subject area can be found in Figure 1. Figure 2 presents the total fiscal impacts (state and local tax revenues) resulting from the investment and operation phases of the strategies. The total wage impacts can be found in Figures 3 and 4. Total net benefits can be found in Figures 5 and 6.

For more detailed impacts and further explanation, please refer to Section 3.0 and Appendix A of the full report. Information regarding the modeling assumptions and procedures used to derive impacts for each strategy within the subject areas can be found in Appendix C of the full report. Appendix D provides a discussion of the general occupations most likely to be associated with each subject area.

Figure 1: Total Annual Economic Impacts by Strategy Subject Area—Investment and Operation Phases 2010 – 2020[2]

Subject Area	Employment[3]	Output	Total Cost	Total Net Benefit
Energy	11,351.8	$12,248,168,945	$13,922,586,313	-$1,674,417,368
Transportation	17,183.7	$11,460,266,113	$11,350,209,616	$110,056,497
Agriculture and Forestry	-92.1	$2,537,384,033	$671,145,799	$1,866,238,234
Recycling	4.4	-$10,009,766	$0	-$10,009,766
Buildings	113.0	$140,348,511	$11,238,146	$129,110,365
Land Use	4,006.4	$6,130,798,340	$6,269,479,374	-$138,681,034
Innovative Initiatives	4,621.4	$1,468,488,464	$162,165,029	$1,306,323,435
Total	***37,188.6***	***$33,975,444,641***	***$32,386,824,277***	***$1,588,620,364***

Source: RESI

As shown in the figure above, during the investment and operation phases of these strategies, the total economic benefits would include approximately 37,189 jobs maintained in 2020 and $34.0 billion in output between 2010 and 2020. The total cost of all strategies in all subject areas is approximately $32.4 billion. The results in Figure 1 are point estimates. However, given that costs could vary in the future and the model is a best representation based on current economic climate, it is useful to present a range of estimated benefits. The expected net benefits range from $1.5 and $1.7 billion and the jobs maintained in 2020 would range from 35.3 to 39.0 thousand jobs. The net benefit includes public and private costs. It is important to note that employment impacts are not cumulative, and therefore annual impacts are jobs created above the baseline forecast. For more information on interpreting the results, please review the REMI PI+

[2] The *Transportation* and *Innovative Initiatives* subject areas exhibit impacts from 2020 to 2025. However, those impacts were excluded in Figure 1 and Figure 2. For the specific distribution of impacts over time, refer to Section 3.0 of the full report. In addition, summed impacts throughout the report may not add up exactly to totals due to rounding.
[3] Employment figures reflect net employment impacts in the year 2020.

model overview in Appendix B.2. All employment impacts in this report represent the number of jobs created or maintained in a given year as compared to the baseline.

Figure 2: Total Fiscal Impacts by Strategy Subject Area—Investment and Operation Phases 2010 – 2020[4]

Subject Area	Investment Phase	Operation Phase
Energy	$3,434,829,124	$105,073,632
Transportation	$182,116,251	-$525,405,327
Agriculture and Forestry	$5,227,809	$38,000,050
Recycling	$0	$5,953,398
Buildings	$574,442	$1,760,288
Land Use	$90,658,021	$53,063,002
Innovative Initiatives	$13,656,215	$86,772,986
Total	***$3,727,061,862***	***-$234,781,971***

Source: RESI

RESI also found that the strategies would generate a significant fiscal impact (state and local tax revenues). From Figure 2, the total state and local tax revenues for all subject areas, strategies, and subprograms would range from approximately $3.5 to $3.9 billion for the investment phase and decrease by $223.0 to 247.0 million for the operation phase.

A summary of the wage impacts is represented in Figure 3 and 4. The investment phase generates more jobs than the operation phase because the public and private sectors must hire workers to implement the strategies. However, once policies are in place, growth stabilizes, and maintenance and monitoring are the primary employment needs of a program.

Figure 3: Wage Impact by Strategy Subject Area—Investment Phase 2010 – 2020

Subject Area	Employment[5]	Wages
Energy	8,198.1	$6,173,507,690
Transportation	14,703.1	$6,802,734,375
Agriculture and Forestry	594.9	$131,698,608
Recycling	0.0	$0
Buildings	16.5	$14,435,425
Land Use	-5.7	$5,255,615,234
Innovative Initiatives	318.7	$193,264,618
Total	***23,825.6***	***$18,571,255,950***

Source: RESI

[4] For an explanation of negative impacts, please refer to Section B.1 of the full report.
[5] Employment figures reflect net employment impacts in the year 2020.

Figure 4: Wage Impact by Strategy Subject Area—Operation Phase 2010 – 2020

Subject Area	Employment[6]	Wages
Energy	3,153.7	$961,242,676
Transportation	2,480.6	$570,922,852
Agriculture and Forestry	-687.0	$852,920,532
Recycling	4.4	-$20,080,566
Buildings	96.5	$43,454,285
Land Use	4,012.1	$572,830,200
Innovative Initiatives	4,302.7	$673,171,997
Total	***13,363.0***	***$3,654,461,976***

Source: RESI

As shown in the figures above, these strategies result in a wage impact that ranges from of $17.6 to $19.5 billion in the investment phase and $3.5 to $3.8 billion in operation phase. The strategies generate approximately 23.0 to 25.0 thousand jobs in the investment phase and 13.0 to 14.0 thousand jobs in the operation phase.

RESI also calculated the total net benefits from these strategies. A summary of these findings can be found in Figures 5 and 6. Although some of these policies may generate negative net impacts, the programs are still generating other benefits that are not accounted for in the market. These benefits include environmental improvements to ecosystems and improvements to human health from reduced pollution and greenhouse gases. Additionally, the program as a whole has net economic benefits.

Figure 5: Total Net Benefit by Strategy Subject Area—Investment Phase 2010 – 2020

Subject Area	Output	Total Cost	Total Net Benefit
Energy	$9,481,689,453	$12,040,857,015	-$2,559,167,562
Transportation	$10,904,113,770	$11,350,209,616	-$446,095,846
Agriculture and Forestry	$181,396,484	$230,451,881	-$49,055,397
Recycling	$0	$0	$0
Buildings	$24,384,766	$11,238,146	$13,146,620
Land Use	$5,099,060,059	$6,254,479,374	-$1,155,419,315
Innovative Initiatives	$321,668,396	$161,314,529	$160,353,867
Total	***$26,012,312,928***	***$30,048,550,561***	***-$4,036,237,633***

Source: RESI

[6] Employment figures reflect net employment impacts in the year 2020.

Figure 6: Total Net Benefit by Strategy Subject Area—Operation Phase 2010 – 2020

Subject Area	Output	Total Cost	Total Net Benefit
Energy	$2,766,479,492	$1,881,729,298	$884,750,194
Transportation	$556,152,344	$0	$556,152,344
Agriculture and Forestry	$2,355,987,549	$440,693,918	$1,915,293,631
Recycling	-$10,009,766	$0	-$10,009,766
Buildings	$115,963,745	$0	$115,963,745
Land Use	$1,031,738,281	$15,000,000	$1,016,738,281
Innovative Initiatives	$1,146,820,068	$850,500	$1,145,969,568
Total	***$7,963,131,713***	***$2,338,273,716***	***$5,624,857,997***

Source: RESI

As shown in the figures above, total net benefit during the investment phase totals a negative $4.0 billion and a positive $5.6 billion during the operation phase. Total net benefit is the difference between output impact and total cost. Total net benefit is analogous to “profit” in the business sense. Positive total net benefit values recognize desireable policy outcomes for Marylanders. The total net benefit from both the investment and operation phases totals $1.6 billion, a desireable outcome.

2.0 Introduction

2.1 Overview

Climate change and mitigation strategies are important factors for many elements of the economy and society in general: the rising costs of energy and transportation, threats to the environment, and the health of the greater population (and, by extension, the labor pool). Energy, transportation, agriculture and forestry, recycling, buildings, land use, and many other areas are affected by climate change. As such, mitigating climate change is a vital concern.

Maryland state government agencies are doing their part to mitigate the negative effects of climate change by creating and implementing climate change mitigation strategies designed to reduce GHG emissions in The State. The 64 strategies under various state government agencies have been organized into eight subject areas: energy, transportation, agriculture and forestry, recycling, multi-sector, buildings, land use, and innovative initiatives.

RESI conducted a preliminary analysis of the potential economic impacts of mitigation strategies for the 2012 GGRA report. This report estimates the job creation, economic activity, and wage effects of these strategies and their subprograms in development or already enacted. The findings within the 2011 report were the preliminary analysis of these 65 strategies, providing an estimate of the economic impact these strategies would have in Maryland.

This report is a refinement of RESI's 2011 results, taking into account the short-term job creation, economic activity, and wage effects from these 64 strategies. During this refinement, RESI used a dynamic model known as the REMI model PI+ to assist in determining cumulative benefits and annual impacts to the region. This model allowed RESI to review the interactions among agencies within the region from the strategies. The results of this report are considered to be a more accurate representation (than the 2011 RESI report) of the possible outcomes from these reduction strategies and provide a potential estimation of economic activity through 2020.

2.2 Methodology

RESI analyzed data collected by state agencies and their contractors in order to quantify the economic impacts of climate action strategies and their subprograms. RESI estimated the impacts of each strategy and subprogram using data contained in strategy write-ups provided by MDE and research provided by a variety of sources.

The impacts were modeled for two phases: an investment phase and an operation phase. The investment phase refers to the entire period during which a strategy and its subprograms are being developed, invested in, and implemented. The operation phase refers to the period during which a strategy and its subprograms have already been implemented and the "end user" cost savings are being realized. A detailed explanation of the investment and operation phases and what they entail can be found in Appendix B.1.

To quantify the economic and fiscal impacts of climate action strategies and their subprograms, RESI used the REMI PI+ input/output model. This model enumerates the economic and fiscal impacts of each dollar earned and spent by the following: employees associated with the strategies, other supporting vendors (business services, retail, etc.), each dollar spent by these vendors on other firms, and each dollar spent by the households associated with the strategies' employees, other vendors' employees, and other businesses' employees. For more information regarding REMI PI+ and how to interpret the results, please refer to Appendix B.2.

The 65 strategies have been organized into seven subject areas: energy, transportation, agriculture and forestry, recycling, buildings, land use, and innovative initiatives. RESI's report is similarly organized, with each subject area separated into a different section. The economic impacts are broken down by year from 2010 through 2020, or in some cases 2025.

3.0 Findings

RESI's findings show that all strategies and subprograms will have net positive significant economic impact. The direct, spinoff, and average annual economic impacts (employment, output, and wages) for each strategy and subprogram for the investment phase and the operation phase were calculated. It is important to note that employment impacts associated for any subject area or strategy do not indicate cumulative job creation. The employment impacts are differences based on the current baseline for Maryland based on BEA historical data. Each year reflects new jobs or job loss difference from the baseline. This applies throughout the report for employment. Wages and output are cumulative and are continuously building from one year to the next. For more information on how to interpret the results please review Appendix B.2.

For more detailed economic impacts of all the programs, please refer to Appendix A. Information regarding the modeling assumptions and procedures used to derive impacts for each strategy within the subject areas can be found in Appendix C. A discussion of the general occupations most likely to be associated with each subject area is in Appendix D.

3.1 Energy

3.1.1 Regional Greenhouse Gas Initiative (RGGI)

In 2006, Maryland was required to join RGGI as part of the provisions of the Healthy Air Act. RGGI consists of nine Northeast and Mid-Atlantic States with the goal of creating a regional GHG cap-and-trade program. In creating this program, RGGI strives to reduce carbon dioxide emissions sources of power generation within the region. Through the program, pollution limits are set limited to a cap. The program aims to drive emission reductions in three ways. Regional emissions cannot exceed the cap. Auctions are held for companies to purchase enough credits to cover their emissions. These auctions help generate investment from The State for environmental programs which aim to lower GHGs on a local scale. According to the RGGI website, RGGI will move forward with future auctions next year and has raised approximately $800 million to date, of which Maryland has received approximately $180 million.

Investment Phase

The average annual economic impacts of the investment phase of the *Regional Greenhouse Gas Initiative* strategy can be found in
Figure **7**.

Figure 7: Regional Greenhouse Gas Initiative—Investment Phase[7]

Year	Employment	Output	Wages
2010	8.0	$640,869	$320,435
2011	8.6	$671,387	$320,435
2012	8.7	$671,387	$350,952
2013	8.3	$640,869	$366,211
2014	8.4	$701,904	$366,211
2015	7.8	$610,352	$396,729
2016	7.8	$671,387	$411,987
2017	8.6	$671,387	$457,764
2018	8.9	$732,422	$503,540
2019	7.7	$732,422	$442,505
2020	8.0	$732,422	$473,022
Average	***8.3***	***$679,710***	***$400,890***

Source: RESI

As shown in the figure above, during the investment phase of this strategy's implementation will generate approximately 8 jobs, $679,710 in output, and $400,890 in wages on average each year. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Sales, office, and administrative occupations*, primarily due to the expectation that sources subject to RGGI will either hire their own environmental consultants or contract with a similar agency in order to determine how to reduce emissions to meet RGGI requirements. Continued implementation of RGGI may also result in increased demand for GHG emissions reduction technologies, which would fall under this industry.

Operation Phase

The average annual economic impacts of the operation phase of the Regional Greenhouse Gas Initiative strategy can be found in Figure 8.

[7] Summed impacts throughout the report may not add up exactly to totals due to rounding.

Figure 8: Regional Greenhouse Gas Initiative—Operation Phase[8]

Year	Employment	Output	Wages
2010	298.4	$20,874,023	$11,260,986
2011	266.1	$17,211,914	$11,245,728
2012	230.4	$13,671,875	$11,016,846
2013	196.7	$10,437,012	$10,604,858
2014	167.8	$7,965,088	$10,330,200
2015	143.0	$5,798,340	$10,101,318
2016	123.1	$4,150,391	$9,811,401
2017	108.3	$2,929,688	$9,719,849
2018	96.7	$1,953,125	$9,658,813
2019	90.1	$1,403,809	$9,689,331
2020	87.7	$1,098,633	$9,872,437
Average	***164.4***	***$7,953,991***	***$10,301,070***

Source: RESI

As shown in the figure above, the strategy will support a total of 164 jobs, $8.0 million in output, and $10.3 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Protective service occupations*.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would increase by approximately $173,947 for the investment phase and $8,510,012 for the operation phase.

3.1.2 GHG Reductions from Imported Power

Through the 2008 Climate Action Plan, a generation performance standard was set for load-serving entities, including electricity providers. The promotion of energy and capacity from low-carbon or renewable sources through the policy aim to reduce the amount of energy imported annually, specifically for those states in which electricity generators primarily produce electricity using a higher concentration of coal in their fuel mixtures. The policy's goal is to enact a standard of no more than 1,125 pounds of GHGs per megawatt-hour by 2013.

Investment Phase

The total economic impacts of the investment phase of the *GHG Reductions from Imported Power* strategy can be found in Figure 9.

[8] Summed impacts throughout the report may not add up exactly to totals due to rounding.

Figure 9: GHG Reductions from Imported Power—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	-$15,259
2012	0.1	$0	$0
2013	-0.5	-$30,518	$0
2014	0.1	$61,035	$15,259
2015	-0.3	$0	$15,259
2016	0.0	$0	$0
2017	0.0	$0	$30,518
2018	-0.1	-$61,035	$0
2019	-0.5	$0	$0
2020	-1.0	-$61,035	-$15,259
Average	***-0.2***	***-$8,323***	***$2,774***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will result in a loss of $8,323 in output, and a gain of $2,774 in wages on average annually. It should be noted that the investment phase for this strategy does not have much cost associated with the policy and any loss would result in the private sector for implementation procedures. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Protective service occupations*, primarily due to the expectation that the demand for low-carbon and renewable energy technologies would increase. Therefore, companies may wish to hire additional security personnel to ensure safety during expansion periods. Companies involved in the development of such technologies are a part of this industry.

Operation Phase

The average annual economic impacts of the operation phase of the *GHG Reductions from Imported Power* strategy can be found in Figure 10.

Figure 10: GHG Reductions from Imported Power—Operation Phase

Year	Employment	Output	Wages
2010	3.8	$457,764	$106,812
2011	6.9	$732,422	$183,105
2012	9.1	$946,045	$274,658
2013	11.3	$1,159,668	$350,952
2014	12.3	$1,373,291	$396,729
2015	12.2	$1,342,773	$427,246
2016	13.5	$1,464,844	$488,281
2017	15.0	$1,647,949	$549,316
2018	15.6	$1,647,949	$610,352
2019	15.3	$1,770,020	$625,610
2020	13.7	$1,647,949	$595,093
Average	***11.7***	***$1,290,061***	***$418,923***

Source: RESI

As shown in the figure above, the strategy will support a total of 12 jobs, $1.3 million in output, and $0.4 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Construction, extraction occupations* primarily due to the expectation that utilities switching from fossil fuel-based imported electricity to renewable energy sources would experience a net fuel cost savings after they recoup the upfront cost of fuel switching.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would increase by approximately $155 for the investment phase and $261,882 for the operation phase.

3.1.3 Federal New Source Performance Standard

In accordance with a court settlement from December 2010, the EPA will use the New Source Performance Standard authority under the Clean Air Act to enforce reduction of GHG emissions from fossil fuel power plants and petroleum refineries. Companies which use fossil fuel electricity generators would be subjugated to this rule for all new or modified electricity-generating units. In accordance with the rule, companies would also need to establish set GHG emission guidelines for all existing electricity generating units involved in electricity production.

Investment Phase

The average annual economic impacts of the investment phase of the *Federal New Source Performance Standard* strategy can be found in Figure 11.

Figure 11: Federal New Source Performance Standard—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	18.2	$1,403,809	$701,904
2014	17.9	$1,434,326	$732,422
2015	17.2	$1,403,809	$808,716
2016	16.8	$1,342,773	$854,492
2017	16.4	$1,342,773	$885,010
2018	15.9	$1,342,773	$930,786
2019	15.6	$1,342,773	$961,304
2020	14.4	$1,281,738	$900,269
Average	***12.0***	***$990,434***	***$615,900***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 12 jobs, $990,434 in output, and $615,900 in wages on average annually. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Sales*, *office*, *administrative occupations*, primarily due to the expectation that sources subject to the standard will seek out cost-effective measures to reduce air pollutants. Business entities providing such services are within this industry.

Operation Phase

The average annual economic impacts of the operation phase of the *Federal New Source Performance Standard* strategy can be found in Figure 12.

Figure 12: Federal New Source Performance Standard—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	7.4	$823,975	$183,105
2012	11.9	$1,312,256	$350,952
2013	16.2	$1,739,502	$488,281
2014	18.8	$2,075,195	$579,834
2015	20.6	$2,258,301	$686,646
2016	23.4	$2,563,477	$793,457
2017	24.7	$2,746,582	$915,527
2018	26.3	$2,868,652	$1,007,080
2019	26.3	$2,929,688	$1,022,339
2020	25.9	$2,929,688	$1,037,598
Average	***18.3***	***$2,022,483***	***$642,256***

Source: RESI

As shown in the figure above, the strategy will support a total of 18 jobs, $2.0 million in output, and $0.6 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Construction, extraction occupations*, primarily due to the expectation that sources subject to the standard will switch from fossil fuel use in order to reduce air pollution and will experience cost savings from cost-effective, cleaner fuels and technologies in the long run as a result.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would increase by approximately $245,308 for the investment phase and $6,296,959 for the operation phase.

3.1.4 MACT

Over the next three years, newly developed air emissions requirements for industrial, commercial, and institutional boilers will go into effect under the authority of the EPA. Under the new requirements, thousands of boilers currently in use at various facilities will be classified as major sources of hazardous air pollutants. The official MACT boiler regulation applies to any stationary source with a boiler or group of stationary sources with boilers. According to the regulation, boilers must be operating under common pollution controls, which can emit ten tons per year of any single hazardous air pollutant. Boilers may emit 25 tons per year, but only of a combination of hazardous air pollutants. All boilers under these new provisions will be evaluated annually to verify compliance with this ruling.

Investment Phase

The average annual economic impacts of the investment phase of the *MACT* strategy can be found in Figure 13.

Figure 13: MACT—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	1.5	$122,070	$61,035
2013	1.3	$91,553	$45,776
2014	1.0	$122,070	$45,776
2015	1.0	$61,035	$45,776
2016	1.5	$122,070	$76,294
2017	1.0	$122,070	$61,035
2018	1.5	$61,035	$61,035
2019	0.6	$122,070	$61,035
2020	0.5	$61,035	$45,776
Average	***0.9***	***$80,455***	***$45,776***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately one job, $80,455 in output, and $45,776 in wages on average each year.

The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Sales, office, and administrative occupations*, primarily due to the expectation that professionals such as environmental consultants in this field would be contracted to develop and implement the technologies associated with MACT.

Operation Phase

The total economic impacts of the operation phase of the *MACT* strategy can be found in Figure 14.

Figure 14: MACT—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	256.7	$18,157,959	$10,208,130
2013	227.0	$14,801,025	$10,177,612
2014	196.7	$11,962,891	$10,040,283
2015	168.1	$9,338,379	$9,826,660
2016	143.3	$7,080,078	$9,536,743
2017	123.4	$5,432,129	$9,307,861
2018	106.3	$3,906,250	$9,094,238
2019	94.6	$2,929,688	$8,941,650
2020	88.6	$2,258,301	$8,941,650
Average	***127.7***	***$6,896,973***	***$7,824,984***

Source: RESI

As shown in the figure above, the strategy will support a total of 128 jobs, $6.9 million in output, and $7.8 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Protective services occupation.* Utilities and energy producing entities within the industry which house boilers subject to the strategy will reduce boiler fuel consumption in order to decrease pollutants. This will result in cost savings. This cost savings could result in additional expansion or investment which may require additional security personnel during these periods.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would increase by approximately $17,022 for the investment phase and $2,087,507 for the operation phase.

3.1.5 Energy Efficiency in the Residential Sector

In an effort to reduce home energy costs for Maryland residents, MEA and other state agencies introduced EMPOWER Maryland. Offering a variety of energy efficiency programs, EMPOWER Maryland strives to reduce the per-capita energy consumption in Maryland by 15 percent by 2015. Revenue received from RGGI auctions and ARRA provide financial support for EMPOWER Maryland programs. Programs to assist in reduction of energy costs to Maryland homes include EMPOWER Maryland, EMPOWER Clean Energy Loan Program, and Maryland

Home Energy Loan Program. These programs will create cost-reducing incentives to homeowners for energy efficient product replacements and residential retrofits.

Investment Phase

The average annual economic impacts of the investment phase of the *Energy Efficiency in the Residential Sector* strategy can be found in Figure 15.

Figure 15: Energy Efficiency in the Residential Sector—Investment Phase

Year	Employment	Output	Wages
2010	6,518.9	$419,799,805	$151,763,916
2011	3,512.2	$221,282,959	$90,087,891
2012	3,987.3	$246,856,689	$103,271,484
2013	3,641.8	$220,733,643	$98,907,471
2014	3,466.9	$207,427,979	$99,273,682
2015	3,007.0	$175,659,180	$91,278,076
2016	363.5	$4,150,391	$20,736,694
2017	60.0	-$16,052,246	$7,400,513
2018	-75.2	-$24,841,309	-$808,716
2019	-100.7	-$25,939,941	-$4,898,071
2020	-71.7	-$23,315,430	-$6,210,327
Average	***2,210.0***	***$127,796,520***	***$59,163,874***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 2,210 jobs, $127.8 million in output, and $59.2 million in wages on average each year. The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Sales, office, and administrative occupations,* Newly created programs to promote energy efficiency within the residential sector start with the replacement of appliances for Energy Star equivalent. Households that receive grants provided by MEA will need to purchase materials from hardware stores for weatherization, or will seek out replacement appliances with the highest energy conservation ratings.

Operation Phase

The total economic impacts of the operation phase of the *Energy Efficiency in the Residential Sector* strategy can be found in Figure 16.

Figure 16: Energy Efficiency in the Residential Sector—Operation Phase

Year	Employment	Output	Wages
2010	134.2	-$2,471,924	$1,235,962
2011	113.7	-$3,631,592	$961,304
2012	98.9	-$4,455,566	$747,681
2013	88.1	-$5,035,400	$564,575
2014	83.1	-$5,249,023	$457,764
2015	79.8	-$5,371,094	$442,505
2016	77.5	-$5,432,129	$381,470
2017	77.2	-$5,432,129	$442,505
2018	75.7	-$5,493,164	$396,729
2019	74.1	-$5,432,129	$411,987
2020	76.6	-$5,310,059	$534,058
Average	***89.0***	***-$4,846,746***	***$597,867***

Source: RESI

As shown in the figure above, the strategy will support a total of approximately 89 jobs, a loss of $4.8 million in output, and a gain of $0.6 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Sales, office, and administrative occupations*, which is driven by indirect and induced job creation in reallocation of consumer spending away from utility costs.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would increase by approximately $54,053,314 for the investment phase and $6,436,360 for the operation phase.

3.1.6 Energy Efficiency in the Commercial and Industrial Sectors

In an effort to reduce energy consumption within Maryland, MEA extended EMPOWER Maryland to the commercial and industrial sectors operating within The State. Through an offering of numerous energy savings programs, the goal is to reduce GHG emissions as well as to promote carbon footprint reduction initiatives within the single largest energy-consuming sector. Overall, this sector consumes nearly 33 percent of Maryland's total annual electricity consumption. To date, MEA has provided approximately 100 local and municipal government entities with funds totaling $9.593 million for energy audits and financing assistance for new energy projects. Four programs offered through MEA focus on energy efficiency within the commercial and industrial sector, including Maryland Save Energy Now, the Jane E. Lawton Conservation Loan Program, the Energy Efficiency and Conservation Block Grant Program, and Energy Workforce Training. Tax credits related to new buildings or retrofitting of buildings are under consideration in association with this strategy.

Investment Phase

The average annual economic impacts of the investment phase of the *Energy Efficiency in the Commercial and Industrial Sectors* strategy can be found in Figure 17.

Figure 17: Energy Efficiency in the Commercial and Industrial Sectors—Investment Phase

Year	Employment	Output	Wages
2010	3,255.3	$250,244,141	$115,112,305
2011	2,318.3	$175,872,803	$86,654,663
2012	2,916.2	$221,466,064	$111,816,406
2013	2,929.6	$220,489,502	$115,234,375
2014	3,127.8	$236,877,441	$127,502,441
2015	3,173.4	$240,844,727	$133,666,992
2016	5,666.1	$442,443,848	$244,918,823
2017	5,755.8	$448,913,574	$259,140,015
2018	5,789.3	$453,735,352	$271,255,493
2019	5,788.6	$453,735,352	$278,015,137
2020	5,807.6	$455,505,371	$284,301,758
Average	***4,229.8***	***$327,284,379***	***$184,328,946***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 4,230 jobs, $327.3 million in output, and $184.3 million in wages on average annually. The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Sales, office, and administrative occupations.* Energy efficiency technologies and improvements create additional savings for the commercial industry allowing for potential expansion.

Operation Phase
The average annual economic impacts of the operation phase of the *Energy Efficiency in the Commercial and Industrial Sectors* strategy can be found in Figure 18.

Figure 18: Energy Efficiency in the Commercial and Industrial Sectors—Operation Phase

Year	Employment	Output	Wages
2010	311.1	$24,017,334	$5,981,445
2011	755.8	$60,852,051	$15,258,789
2012	1,330.7	$111,175,537	$28,121,948
2013	2,043.9	$177,398,682	$44,662,476
2014	2,918.9	$264,007,568	$67,230,225
2015	3,894.8	$365,783,691	$94,390,869
2016	4,398.8	$436,523,438	$112,808,228
2017	4,730.0	$494,140,625	$127,365,112
2018	4,907.5	$542,053,223	$138,671,875
2019	4,933.5	$575,622,559	$143,676,758
2020	4,880.0	$601,684,570	$145,629,883
Average	***3,191.4***	***$332,114,480***	***$83,981,601***

Source: RESI

As shown in the figure above, the strategy will support a total of 3,191 jobs, $332.1 million in output, and $84.0 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Sales, office, and administrative occupations*. It is expected that businesses in the commercial and industrial sectors will benefit from energy efficiency after implementation in the form of operation cost savings, among other benefits.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would increase by approximately $3,191,579,250 for the investment phase and $67,256,829 for the operation phase.

3.1.7 Energy Efficiency—Appliances and Other Products

The encouragement of education, outreach, and incentive programs associated with the purchases of energy efficient appliances is another of EmPOWER Maryland's benefits to Maryland residents. Several types of energy efficient appliances and equipment offer rebate programs to consumers. In an effort to reduce the cost to residents for energy efficient products, MEA supports three programs: the State Energy Efficiency Appliance Rebate Program, the Maryland Home Energy Loan Program, and the Jane E. Lawton Conservation Loan Program. Programs are accessible to residential consumers and commercial industries seeking to reduce their carbon footprint. Benefits from purchases not only include the offset of some of the initial cost but also continued annual savings through the reduction of consumer electricity consumption.

Investment Phase

The average annual economic impacts of the investment phase of the *Energy Efficiency – Appliances and Other Products* strategy can be found in Figure 19.

Figure 19: Energy Efficiency – Appliances and Other Products—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	-25.4	-$1,647,949	-$595,093
2012	-60.9	-$3,875,732	-$1,464,844
2013	-94.6	-$5,950,928	-$2,380,371
2014	-124.9	-$7,812,500	-$3,372,192
2015	-158.3	-$9,887,695	-$4,486,084
2016	-185.5	-$11,535,645	-$5,584,717
2017	-183.4	-$11,230,469	-$5,874,634
2018	-165.7	-$10,070,801	-$5,706,787
2019	-140.2	-$8,361,816	-$5,096,436
2020	-114.3	-$6,713,867	-$4,348,755
Average	***-113.9***	***-$7,007,946***	***-$3,537,265***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will result in a loss of 114 jobs, $7.0 million in output, and $3.5 million in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Farm, fishing, forestry occupations*. Reducing energy consumption would decrease the demand for extraction of natural resources for energy production. This would allow certain industries such as farming to be able to use the land to the maximum use for farming, as opposed to being sold for extraction.

Operation Phase
The average annual economic impacts of the operation phase of the *Energy Efficiency – Appliances and Other Products* strategy can be found in Figure 20.

Figure 20: Energy Efficiency – Appliances and Other Products—Operation Phase

Year	Employment	Output	Wages
2010	52.1	-$946,045	$488,281
2011	45.0	-$1,373,291	$396,729
2012	38.7	-$1,739,502	$305,176
2013	35.0	-$1,922,607	$244,141
2014	32.1	-$2,075,195	$167,847
2015	29.8	-$2,197,266	$137,329
2016	29.7	-$2,136,230	$167,847
2017	29.5	-$2,136,230	$198,364
2018	29.3	-$2,136,230	$198,364
2019	29.5	-$2,014,160	$213,623
2020	29.4	-$2,075,195	$244,141
Average	***34.6***	***-$1,886,541***	***$251,076***

Source: RESI

As shown in the figure above, the strategy will support a total of 35 jobs, result in a loss of $1.9 million in output, and a gain of $0.3 million in wages annually once in operation. The industries experiencing the greatest positive economic impacts in terms of employment as a result of this strategy are those (such as *Sales, office, and administrative occupations)* providing the goods and services that will be in demand as households have more disposable income from the energy savings.

Fiscal Impacts
As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would decrease by approximately $1,609,349 for the investment phase and increase by $5,810,761 for the operation phase.

3.1.8 Energy Efficiency in the Power Sector – General
In association with the previous EmPOWER policies, MEA seeks to promote the reduction of GHG emissions from existing generating units in the power sector through energy efficiency. In particular, biomass fuels contain little to no sulfur content, therefore substituting biomass for coal will significantly reduce sulfur dioxide emissions. Nitrogen oxide is also reduced through

the use of co-firing biomass. Revenue from the sale of renewable energy credits in Maryland and the sale of these from other states will in turn economically benefit future programs for residents. Further understanding and research of the existing 16 coal-firing facilities operating machinery will be needed to achieve maximum reductions.

Investment Phase

The average annual economic impacts of the investment phase of the *Energy Efficiency in the Power Sector – General* strategy can be found in Figure 21.

Figure 21: Energy Efficiency in the Power Sector – General—Investment Phase

Year	Employment	Output	Wages
2010	-1,119.4	-$129,150,391	-$30,853,271
2011	-1,448.5	-$159,973,145	-$40,802,002
2012	-2,032.4	-$221,435,547	-$58,685,303
2013	-2,504.6	-$269,531,250	-$74,111,938
2014	-3,116.7	-$338,714,600	-$96,710,205
2015	-3,385.5	-$366,760,254	-$109,954,834
2016	-3,562.0	-$386,657,715	-$121,063,232
2017	-3,690.0	-$402,465,820	-$130,783,081
2018	-3,763.7	-$414,916,992	-$139,404,297
2019	-3,765.3	-$420,776,367	-$143,554,688
2020	-3,747.1	-$424,865,723	-$146,286,011
Average	***-2,921.4***	***-$321,386,164***	***-$99,291,715***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate a loss of approximately 2,921 jobs, $321.4 million in output, and $99.3 million in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Computer, math, architect, engineer occupations*, primarily due to the expectation that the power sector will contract with professional consultants to implement energy efficiency improvements.

Operation Phase

The average annual economic impacts of the operation phase of the *Energy Efficiency in the Power Sector – General* strategy can be found in Figure 22.

Figure 22: Energy Efficiency in the Power Sector – General—Operation Phase

Year	Employment	Output	Wages
2010	80.3	$9,246,826	$2,197,266
2011	142.3	$15,899,658	$3,967,285
2012	218.8	$23,925,781	$6,301,880
2013	340.2	$37,200,928	$10,040,283
2014	510.8	$56,365,967	$15,762,329
2015	723.2	$80,139,160	$23,376,465
2016	711.8	$77,026,367	$24,124,146
2017	723.4	$78,552,246	$25,741,577
2018	720.9	$79,223,633	$26,947,021
2019	705.7	$78,979,492	$27,221,680
2020	690.5	$78,491,211	$27,328,491
Average	***506.2***	***$25,921,831***	***$17,546,220***

Source: RESI

As shown in the figure above, the strategy will support a total of 506 jobs, $25.9 million in output, and $17.5 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Construction, extraction occupations.* Energy efficiency improvements implemented during the investment phase will result in cost savings for power generating entities within the industry, which may then expand employment or operations. Other top gaining industries reflect the increased household spending resulting from new households established due to direct and indirect job creation and wage generation in the *Construction, extraction occupations* industry.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would increase by approximately $4,494,845 for the investment phase and $18,514,443 for the operation phase.

3.1.9 Maryland Renewable Energy Portfolio Standard Subprogram

Under the RPS Subprogram, benefits associated with a variety of renewable energy sources were outlined, highlighting those which would aim to serve Maryland. Through this policy, retail suppliers of electricity would be required to meet a minimum of their energy supply needs with a mixture of renewable energy sources. Sources which must meet this requirement are those that have been classified through Tier 1 and Tier 2 of the RPS statute. Implementation of this policy includes the creation, sale, and transfer of Renewable Energy Credits. Through this policy, Maryland hopes to create a sustainable renewable energy sector. MEA hopes that the enforcement of this policy and other renewable energy source policies will help to drive down the demand for fossil fuel based energy by 2015.

Investment Phase

The average annual economic impacts of the investment phase of the *Maryland Renewable Energy Portfolio Standard Subprogram* strategy can be found in Figure 23.

Figure 23: Maryland Renewable Energy Portfolio Standard Subprogram—Investment Phase

Year	Employment	Output	Wages
2010	487.1	$28,045,654	$10,894,775
2011	7,249.2	$417,968,750	$167,144,775
2012	2,698.3	$154,144,287	$73,776,245
2013	6,441.0	$365,722,656	$166,763,306
2014	3,769.0	$210,906,982	$111,907,959
2015	10,887.4	$616,149,902	$305,389,404
2016	7,282.8	$406,311,035	$229,507,446
2017	40,462.6	$2,299,865,723	$1,203,445,435
2018	39,924.7	$2,203,369,141	$1,289,352,417
2019	17,769.5	$998,352,051	$682,495,117
2020	6,427.2	$324,462,891	$315,597,534
Average	***13,036.3***	***$729,572,643***	***$414,206,765***

Source: RESI

As shown in the previous figure, the investment phase of this strategy's implementation will generate approximately 13,036 jobs, $729.6 million in output, and $414.2 million in wages on average each year. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Sales, office, and administrative occupations*, primarily due to the expectation that those entities implementing renewable energy would seek outside contractors and purchasers to assist in acquiring the investment materials.

Operation Phase

The average annual economic impacts of the operation phase of the *Maryland Renewable Energy Portfolio Standard Subprogram* strategy can be found in Figure 24.

Figure 24: Maryland Renewable Energy Portfolio Standard Subprogram—Operation Phase

Year	Employment	Output	Wages
2010	-346.5	-$37,506,104	-$4,730,225
2011	-625.6	-$64,453,125	-$12,374,878
2012	-845.9	-$85,723,877	-$18,737,793
2013	-1,025.7	-$103,485,107	-$24,505,615
2014	-1,134.5	-$116,333,008	-$29,296,875
2015	-1,193.0	-$126,831,055	-$27,175,903
2016	-1,275.8	-$137,268,066	-$31,311,035
2017	-1,819.9	-$192,749,023	-$50,506,592
2018	-2,451.1	-$257,324,219	-$74,386,597
2019	-2,877.8	-$303,710,938	-$92,620,850
2020	-3,154.6	-$337,524,414	-$106,216,431
Average	***-1,522.8***	***-$160,264,449***	***-$42,896,618***

Source: RESI

As shown in the figure above, the strategy will result in a loss of 1,523 jobs, $160.3 million in output, and $42.9 million in wages annually once in operation. The industries experiencing the greatest positive economic impacts in terms of employment as a result of this strategy are those (such as *Farm, fishing, and forestry occupations)* which provide goods and services that households demand. New households are likely to be created due to the development of a renewable energy industry in Maryland as a result of job creation and wage generation in industries—such as *Farm, fishing, and forestry occupations*—associated with RPS.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would increase by approximately $184,296,290 for the investment phase and decrease by $23,268,807 for the operation phase.

3.1.10 Incentives and Grant Subprograms to Support Renewable Energy

Many incentives and grant programs which are administered by MEA encourage the development of more renewable energy production in Maryland. Maryland's Renewable Energy Portfolio Standard Program attempts to reduce electricity consumption in Maryland by 20 percent by 2022. To promote community outreach and involvement in obtaining this goal, MEA has awarded thousands of grants to homeowners and businesses. Grants awarded by MEA through the Commercial Clean Energy Grant Program and Residential Clean Energy Grants Program assist homeowners and businesses in covering the costs of new equipment or implementing energy reduction technologies.

Investment Phase

The average annual economic impacts of the investment phase of the *Incentives and Grant Subprograms to Support Renewable Energy* strategy can be found in Figure 25.

Figure 25: Incentives and Grant Subprograms to Support Renewable Energy—Investment Phase

Year	Employment	Output	Wages
2010	241.4	$18,615,723	$8,682,251
2011	323.8	$26,702,881	$14,129,639
2012	5.1	$4,638,672	$5,615,234
2013	-254.2	-$12,451,172	-$1,464,844
2014	-320.0	-$16,235,352	-$3,784,180
2015	-309.8	-$15,136,719	-$4,180,908
2016	-333.5	-$17,395,020	-$6,607,056
2017	-267.3	-$12,756,348	-$5,264,282
2018	-229.6	-$10,559,082	-$5,065,918
2019	-160.2	-$5,859,375	-$2,990,723
2020	-100.4	-$1,892,090	-$1,007,080
Average	***-127.7***	***-$3,847,989***	***-$176,170***

Source: RESI

As shown in the previous figure, the investment phase of this strategy's implementation will generate a loss of 128 jobs, $3.8 million in output, and $0.2 million in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment as a result of the government spending associated with this strategy is *Protective services* occupations, which results from the government spending associated with the grant program.

Operation Phase

The average annual economic impacts of the operation phase of the *Incentives and Grant Subprograms to Support Renewable Energy* strategy can be found in Figure 26.

Figure 26: Incentives and Grant Subprograms to Support Renewable Energy—Operation Phase

Year	Employment	Output	Wages
2010	-23.7	-$6,317,139	-$4,211,426
2011	25.0	-$2,014,160	-$3,524,780
2012	64.0	$1,708,984	-$2,868,652
2013	93.3	$4,882,813	-$2,319,336
2014	114.8	$7,568,359	-$1,907,349
2015	127.6	$9,643,555	-$1,556,396
2016	137.3	$11,474,609	-$1,281,738
2017	142.4	$13,000,488	-$1,098,633
2018	141.3	$14,099,121	-$1,068,115
2019	134.4	$14,770,508	-$1,220,703
2020	125.9	$15,197,754	-$1,480,103
Average	***98.4***	***$7,637,718***	***-$2,048,839***

Source: RESI

As shown in the figure above, the strategy will support a total of 98 jobs, $7.6 million in output, and a loss of $2.0 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Building, grounds, personal care, and service occupations.* A wide variety of business are expected to take advantage of the commercial grants and would therefore experience cost savings as a result. These cost savings could be used for business growth. Similar effects would be experienced by residential consumers under the residential programs, and household spending on a variety of goods and sectors would increase as a result.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would decrease by $564,654 for the investment phase and increase by $6,604,798 for the operation phase.

3.1.11 Offshore Wind Initiatives to Support Renewable Energy

The search for a reliable, renewable energy source often begins with looking towards a region's natural resources. Maryland is a prime candidate for offshore wind energy generation and could potentially offset up to 500 megawatts of consumed power over the next 5 years using this technology, according to MEA. Another positive outcome from this policy includes the decreased pollution from fossil fuel extraction within local bays and waterways. Key factors of this policy also include the potential for new jobs upon installation and upkeep of offshore windmills over the next five years and a continued decrease in the GHG emissions from energy generation.

Investment Phase

The average annual economic impacts of the investment phase of the *Offshore Wind Initiatives to Support Renewable Energy* strategy can be found in Figure 27.

Figure 27: Offshore Wind Initiatives to Support Renewable Energy—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.0	$0	$0
2014	0.0	$0	$0
2015	0.0	$0	$0
2016	0.0	$0	$0
2017	2,167.9	$88,134,766	$56,182,861
2018	25.9	$1,159,668	$3,005,981
2019	-7.7	-$1,037,598	$1,098,633
2020	-25.1	-$2,258,301	-$137,329
Average	***540.2***	***$21,499,634***	***$15,037,537***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 540 jobs, $21.5 million in output, and $15.0 million in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Sales, office, and administrative occupations*, primarily due to the expectation that the expertise of environmental consultants and engineers would be in demand as offshore wind is established and in need of proper development and management.

Operation Phase

The average annual economic impacts of the operation phase of the *Offshore Wind Initiatives to Support Renewable Energy* strategy can be found in Figure 28.

Figure 28: Offshore Wind Initiatives to Support Renewable Energy—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.0	$0	$0
2014	0.0	$0	$0
2015	0.0	$0	$0
2016	0.0	$0	$0
2017	0.0	$0	$0
2018	281.8	$16,662,598	$37,902,832
2019	291.2	$17,333,984	$39,627,075
2020	290.2	$17,333,984	$40,908,813
Average	***287.7***	***$17,110,189***	***$39,479,574***

Source: RESI

As shown in the figure above, the strategy will support a total of 288 jobs, $17.1 million in output, and $39.5 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Sales, office, and administrative occupations.* A wide variety of businesses will benefit positively from the need for management and maintenance of offshore wind once implemented, and may hire additional employees.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would increase by $2,388,305 for the investment phase and $10,175,236 for the operation phase.

3.2 Transportation

3.2.1 Maryland Clean Cars Subprogram

For new vehicles to be sold in the United States, manufacturers must first submit to a certification process. Vehicles can either be certified under the Tier 2 federal program or the California Clean Cars Program. In an effort to regulate GHG emissions from motor vehicles, the California Clean Cars program was the first program in the nation to establish a fleet-wide average GHG emissions standard. Through the Maryland Clean Cars Program Act of 2007, MDE was authorized to adopt regulations similar to those of the California Clean Cars Program. Implementation of the program began in 2011, and to date 13 other states have joined in the clean cars initiative to lower GHG emissions from motor vehicles. A federal mandate as of 2009 established new GHG and fuel economy standards for passenger vehicles and light-duty trucks. Vehicles produced in model year 2012 through 2016 should attain the standards previously outlined by the California Clean Cars Program.

Investment Phase

The average annual economic impacts of the investment phase of the *Maryland Clean Cars Subprogram* strategy can be found in Figure 29.

Figure 29: Maryland Clean Cars Subprogram—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	1,898.7	$105,682,373	$37,429,810
2013	1,755.3	$99,243,164	$38,345,337
2014	2,329.2	$133,483,887	$53,527,832
2015	2,312.2	$134,216,309	$57,250,977
2016	2,282.2	$133,911,133	$59,982,300
2017	2,245.8	$133,239,746	$62,011,719
2018	2,196.5	$132,507,324	$63,644,409
2019	2,115.0	$129,638,672	$63,278,198
2020	2,052.6	$127,441,406	$62,942,505
Average	***1,744.3***	***$102,669,456***	***$45,310,281***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 1,744 jobs, approximately $102.7 million in output, and $45.3 million in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Farm, fishing, and forestry occupations.* It is expected that the demand for fuel would decrease which would allow industries pursuing alternative fuels to expand and grow.

Operation Phase

The average annual economic impacts of the operation phase of the *Maryland Clean Cars Subprogram* strategy can be found in Figure 30.

Figure 30: Maryland Clean Cars Subprogram—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	-1,007.1	-$53,771,973	-$19,668,579
2013	-992.6	-$53,894,043	-$21,148,682
2014	-958.3	-$53,100,586	-$22,308,350
2015	-917.6	-$51,879,883	-$22,811,890
2016	-873.9	-$50,231,934	-$22,979,736
2017	-831.1	-$48,583,984	-$22,888,184
2018	-788.8	-$47,241,211	-$22,689,819
2019	-759.9	-$46,203,613	-$22,415,161
2020	-740.8	-$45,593,262	-$22,293,091
Average	***-715.5***	***-$40,954,590***	***-$18,109,408***

Source: RESI

As shown in the figure above, the strategy will result in a loss of 716 jobs, $41.0 million in output, and $18.1 million in wages annually once in operation. The industries experiencing the greatest positive economic impacts in terms of employment as a result of this strategy are *Health care and social assistance* and *Retail trade*. As new car sales associates are hired to meet increased demand for new and efficient vehicles, these new employees and households will likely increase demand for healthcare and other services.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would decrease by approximately $91,367,736 for the investment phase and increase by $905,009 for the operation phase.

3.2.2 Federal Medium- and Heavy-Duty GHG Standards

Currently, medium- and heavy-duty vehicles are the second largest contributor to oil consumption and GHG emissions. In an effort to minimize GHG emissions and improve fuel efficiency, the National Fuel Efficiency & Emission Standards for Medium- and Heavy-Duty Trucks Program aims to enforce a nationwide mandate upon medium- and heavy-duty vehicles. A joint effort between the EPA and the National Highway Traffic Safety Administration attempts to reduce the GHG emissions associated with medium- and heavy-duty vehicles through collaborative policies and programs. This program will be federally enforced jointly by the EPA and the National Highway Transportation Safety Administration. Implementation and enforcement of this program will reflect that of the light-duty National GHG Emissions Standards.

Investment Phase

The average annual economic impacts of the investment phase of the *Federal Medium- and Heavy-Duty GHG Standards* strategy can be found in Figure 31.

Figure 31: Federal Medium- and Heavy-Duty GHG Standards—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	-1,978.8	-$147,979,736	-$44,738,770
2013	-2,749.3	-$230,346,680	-$66,619,873
2014	-3,431.1	-$304,626,465	-$88,729,858
2015	-4,002.3	-$369,018,555	-$109,069,824
2016	-4,527.4	-$429,016,113	-$129,318,237
2017	-2,584.4	-$295,532,227	-$82,031,250
2018	-1,955.4	-$240,234,375	-$63,446,045
2019	-1,515.0	-$200,805,664	-$48,477,173
2020	-1,211.9	-$171,752,930	-$37,231,445
Average	***-2,177.8***	***-$217,210,249***	***-$60,878,407***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate a loss of 2,178 jobs, $217.2 million in output, and $60.9 million in wages on average. The industries experiencing the greatest positive economic impacts in terms of employment as a result of this strategy are *Farming, fishing, and forestry occupations*. Implementation of this policy will cause higher demand for development of fuel-saving technologies for medium- and heavy-duty vehicles.

Operation Phase

The average annual economic impacts of the operation phase of the *Federal Medium and Heavy-Duty GHG Standards* strategy can be found in Figure 32.

Figure 32: Federal Medium- and Heavy-Duty GHG Standards—Operation Phase

Year	Employment	Output	Wages
2020	296.6	$28,076,172	$10,025,024
2021	317.4	$29,602,051	$11,627,197
2022	323.1	$30,090,332	$12,573,242
2023	320.4	$30,029,297	$13,183,594
2024	313.6	$29,785,156	$13,549,805
2025	306.9	$29,541,016	$13,763,428
Average	***117.4***	***$11,070,251***	***$4,670,143***

Source: RESI

As shown in the figure above, the strategy will support a total of 117 jobs, $11.1 million in output, and $4.7 million in wages annually once in operation. The industries experiencing the greatest positive economic impacts in terms of employment as a result of this strategy are *Sales, office, and administrative occupations*, primarily due to the expectation that more efficient medium- and heavy-duty vehicles are being purchased and new sales associates are likely to receive healthcare benefits. The increased efficiency and fuel cost savings of these purchased commercial medium- and heavy-duty vehicles may even allow for employers to provide increased healthcare options to drivers.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would decrease by approximately $52,925,393 for the investment phase and increase by $7,043,362 for the operation phase.

3.2.3 Clean Fuel Standard

In accordance with the Clean Fuel Standard program, regional fuel suppliers are required to reduce the average carbon intensity of fuels used in the region over time. Opportunities proposed to control costs include a credit trading system, which would allow suppliers to purchase credits from low-carbon fuel producers. These credits could then be averaged with higher carbon fuels which are delivered to consumers. As opposed to restrictions on specific fuel types, this approach allows suppliers the opportunity to choose among different fuels, based on cost effectiveness and environmental impact while meeting the carbon intensity reduction target outlined by the program. The Clean Fuel Standard is designed to ultimately reduce the carbon intensity from fuels used in transportation in the region by about 5 percent and 15 percent over the next 10 and 15 years, respectively.

Investment Phase

The average annual economic impacts of the investment phase of the *Clean Fuel Standard* strategy can be found in Figure 33.

Figure 33: Clean Fuel Standard—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	-390.8	-$29,052,734	-$8,834,839
2013	-540.1	-$45,013,428	-$13,076,782
2014	-676.4	-$59,875,488	-$17,486,572
2015	-795.6	-$73,364,258	-$21,652,222
2016	-909.6	-$86,303,711	-$25,985,718
2017	-450.0	-$53,833,008	-$14,572,144
2018	-303.5	-$40,710,449	-$10,040,283
2019	-201.5	-$31,250,000	-$6,454,468
2020	-132.6	-$24,475,098	-$3,799,438
Average	***-400.0***	***-$40,352,561***	***-$11,082,042***

Source: RESI

As shown in the figure above, the investment phase of this strategy’s implementation will generate a loss of approximately 400 jobs, $40.4 million in output, and $11.1 million in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Farm, fishing, and forestry occupations*, primarily due to the expectation that such services will be in increased demand as this policy drives the need for cleaner fuel technologies to meet the standard.

Operation Phase

The average annual economic impacts of the operation phase of the *Clean Energy Fuel Standard* strategy can be found in Figure 34.

Figure 34: Clean Fuel Standard—Operation Phase

Year	Employment	Output	Wages
2020	35.8	-$915,527	$595,093
2021	31.3	-$1,159,668	$610,352
2022	28.2	-$1,403,809	$518,799
2023	25.6	-$1,525,879	$457,764
2024	23.7	-$1,647,949	$396,729
2025	22.7	-$1,586,914	$427,246
Average	***27.9***	***-$1,373,291***	***$500,997***

Source: RESI

As shown in the figure above, the strategy will support a total of 28 jobs, a loss of $1.4 million in output, and a gain of $0.5 million in wages annually once in operation. The industries experiencing the greatest positive economic impacts in terms of employment as a result of this strategy are *Sales, office, and administrative occupations*, primarily due to the expectation that after the initial implementation, cleaner fuel vehicles will be the market norm and consumers who withheld their purchases during the investment phase will purchase these vehicles to replace less efficient vehicles.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would increase by approximately $9,710,572 for the investment phase and $160,218 for the operation phase.

3.2.4 Transportation and Climate Initiative

Recognizing that the transportation sector currently accounts for approximately 30 percent of GHG emissions in the Mid-Atlantic and Northeastern U.S., a regional effort between Maryland and 10 other Northeast and Mid-Atlantic states (including the District of Columbia) in the form of a collaborative committee sets GHG reduction standards within this sector. These initiatives include minimizing the sector’s reliance on high-carbon fuels, promote sustainable growth to address the challenges of VMTs, and help build the clean energy economy across the region. The collaborative committee is also expected to advance current individual states’ efforts including a reduction of traffic congestion; job growth and the flow of goods and services; the establishment of state and local land use strategies which increase commercial and residential housing density and encourage transit-friendly design; improved performance of existing highway, transit and other transportation modes while enhancing neighborhoods and urban centers; and the promotion of mixed-use development which supports viable alternatives to driving.

Investment Phase

The average annual economic impacts of the investment phase of the *Transportation and Climate Initiative* strategy can be found in **Error! Reference source not found.**.

Figure 35: Transportation and Climate Initiative—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.5	$30,518	$30,518
2014	0.6	$61,035	$15,259
2015	0.3	$0	$15,259
2016	0.9	$61,035	$45,776
2017	0.6	$61,035	$61,035
2018	0.2	$0	$15,259
2019	0.3	$61,035	$30,518
2020	0.2	$0	$30,518
Average	***0.3***	***$24,969***	***$22,195***

Source: RESI

As shown in the figure above, the strategy will support less than one job, $24,969 in output, and $22,195 in wages annually during investment phase. The industries experiencing the greatest positive economic impacts in terms of employment as a result of this strategy are those with goods and services demanded by new employees and households directly related to the strategic efforts of TCI to reduce GHGs in the transportation sector.

Operation Phase

The average annual economic impacts of the operation phase of the *Transportation and Climate Initiative* strategy can be found in Figure 36.

Figure 36: Transportation and Climate Initiative—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.0	$0	$0
2014	0.0	$0	$0
2015	0.0	$0	$0
2016	0.0	$0	$0
2017	0.0	$0	$0
2018	0.0	$0	$0
2019	0.0	$0	$0
2020	0.0	$0	$0
Average	***0.0***	***$0***	***$0***

Source: RESI

As shown in the figure above, the operation phase of this strategy's implementation will not have an impacts on jobs, output or wages. To date, there has been no operation phase costs or benefits associated with this strategy.

Fiscal Impacts
As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would not be impacted during the operation phase and increase by $5,867,295 for the investment phase.

3.2.5 Public Transportation Initiatives

Increasing public transit in Maryland with the goal of reducing GHG emissions related to individual transportation is a key initiative within MDOT. Increased access and travel options from newly created or existing public transportation will become a key driver of these reductions. Programs associated with this strategy attempt to identify initiatives focused on land use planning and policy, pricing disincentives towards personal automobile use, and bike and pedestrian access improvements. Programs currently and potentially associated with this policy include the purchase of hybrid buses, free downtown route services seven days a week in Baltimore, funding of local transit systems within rural Maryland, and smart card fare technology which will increase ease for commuter fare collection. Other programs currently in place include carpooling initiatives through "Commuter Connections" and a "Guaranteed Ride Home" program, both of which are intended as a collaborative effort between states and employers for employees who utilize public transportation. A tax credit for employers who promote public transit programs is also offered by The State of Maryland. To date, the tax credit allows employers to claim an approximate $52 credit per employee registered with public transit programs through their employer.

Investment Phase
The average annual economic impacts of the investment phase of the *Public Transportation Initiatives* strategy can be found in Figure 37.

Figure 37: Public Transportation Initiatives—Investment Phase

Year	Employment	Output	Wages
2010	1,048.9	$80,627,441	$37,048,340
2011	1,958.1	$150,085,449	$71,624,756
2012	2,002.5	$152,526,855	$76,339,722
2013	2,015.1	$152,099,609	$78,994,751
2014	2,007.5	$152,008,057	$81,832,886
2015	2,000.1	$151,672,363	$84,152,222
2016	1,998.8	$151,489,258	$86,257,935
2017	1,122.9	$79,711,914	$48,812,866
2018	1,104.4	$78,552,246	$47,286,987
2019	1,115.3	$79,101,563	$46,966,553
2020	1,140.1	$80,688,477	$47,714,233
Average	***1,592.1***	***$118,960,294***	***$64,275,568***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 1,592 jobs, $119.0 million in output, and $64.3 million in wages on average. The industries experiencing the greatest positive economic impacts in terms of employment as a result of this strategy are *Sales, office, and administrative occupations*, primarily due to the expectation that development of new public transit technologies will be in demand as will the management of these services.

Operation Phase

The average annual economic impacts of the operation phase of the *Public Transportation Initiatives* strategy can be found in Figure 38.

Figure 38: Public Transportation Initiatives—Operation Phase

Year	Employment	Output	Wages
2010	752.6	$47,149,658	$19,622,803
2011	794.6	$49,346,924	$22,415,161
2012	802.6	$49,102,783	$24,032,593
2013	796.7	$47,760,010	$25,024,414
2014	788.6	$46,722,412	$26,245,117
2015	778.8	$45,410,156	$27,359,009
2016	772.2	$44,311,523	$28,350,830
2017	747.2	$41,564,941	$28,518,677
2018	742.6	$40,710,449	$29,571,533
2019	728.3	$39,672,852	$30,029,297
2020	722.2	$39,245,605	$30,609,131
Average	***766.0***	***$44,636,119***	***$26,525,324***

Source: RESI

As shown in the figure above, the strategy will support a total of 766 jobs, $44.6 million in output, and $26.5 million in wages annually once in operation. The industries experiencing the greatest positive economic impacts in terms of employment as a result of this strategy are *Protective services occupations*. Additional security to ensure the safety of passengers may be required as ridership on public transit increases and expands.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would increase by $35,504,959 for the investment phase and decrease by $59,968,890 for the operation phase.

3.2.6 Initiatives to Double Transit Ridership by 2020

To enhance GHG emissions reductions associated with the transportation sector in Maryland, MDOT created this initiative. This strategy is designed to ensure that Maryland meets the goal to double transit ridership by 2020, as designated by the O'Malley-Brown administration. Programs associated with this strategy include funding for new MARC stations, expansions of current transit routes, and investment in existing MARC infrastructure. Successful implementation of accessible public transit within the Maryland region through MARC has already resulted in ridership of nearly 30,000 commuters a day for travel between Washington's Union Station and most regions of Maryland. Continued funding and encouragement of public transit initiatives through this strategy should result in an annual reduction of GHG emissions from congestion associated with daily public commuting in the Maryland region and provide Maryland households with an annual savings from reduction of carbon-based fuel consumption.

Investment Phase

The average annual economic impacts of the investment phase of the *Initiatives to Double Transit Ridership by 2020* strategy can be found in Figure 39.

Figure 39: Initiatives to Double Transit Ridership by 2020—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	8,526.5	$658,111,572	$308,334,351
2012	11,199.2	$861,114,502	$424,880,981
2013	11,329.9	$863,983,154	$447,235,107
2014	11,291.8	$865,081,787	$468,719,482
2015	11,559.3	$889,831,543	$499,633,789
2016	11,480.6	$886,047,363	$514,450,073
2017	11,420.9	$882,873,535	$527,435,303
2018	11,385.1	$885,742,188	$542,541,504
2019	11,370.1	$884,887,695	$552,062,988
2020	11,423.6	$890,075,684	$563,400,269
Average	***10,089.7***	***$778,886,275***	***$440,790,350***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 10,090 jobs, $778.9 million in output, and $440.8 million in wages on average. The industries experiencing the greatest positive economic impacts in terms of employment as a result of this strategy are *Sales, office, and administrative occupations*, primarily due to the expectation that increases in ridership will likely require the development and installation of new high-tech public transit technologies as well as administration of these services.

Operation Phase

The average annual economic impacts of the operation phase of the *Initiatives to Double Transit Ridership by 2020* strategy can be found in Figure 40.

Figure 40: Initiatives to Double Transit Ridership by 2020—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	1,739.2	$72,570,801	$28,900,146
2012	1,767.8	$73,516,846	$32,745,361
2013	1,744.2	$71,014,404	$34,698,486
2014	1,710.4	$68,695,068	$36,834,717
2015	1,664.2	$65,368,652	$38,330,078
2016	1,619.4	$62,011,719	$39,505,005
2017	1,575.1	$58,654,785	$40,420,532
2018	1,528.0	$55,664,063	$41,305,542
2019	1,486.5	$53,283,691	$41,305,542
2020	1,856.0	$67,749,023	$50,384,521
2021	176.2	$1,098,633	$8,575,439
2022	144.3	-$1,220,703	$4,730,225
2023	147.5	-$1,098,633	$2,899,170
2024	169.3	$244,141	$2,380,371
2025	202.5	$2,502,441	$2,868,652
Average	***1,095.7***	***$40,628,433***	***$25,367,737***

Source: RESI

As shown in the figure above, the strategy will result in a gain of 1,096 jobs, $40.6 million in output, and $25.4 million in wages annually once in operation. The industries experiencing the greatest positive economic impacts in terms of employment as a result of this strategy are those (such as *Farm, fishing, and forestry and Community, social service occupations)* providing goods and services most likely to be in demand from transit riders experiencing increased access to these goods and services, and by extension, the potential new households associated with smart growth occurring around enhanced public transportation.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would increase by approximately $222,123,132 for the investment phase and decrease by $20,670,255 for the operation phase.

3.2.7 Intercity Transportation Initiatives

Higher volumes of interstate commuters continue to increase congestion along the Interstate 95 corridor, resulting in greater emissions of GHGs associated with idling traffic. MDOT, in response to increased emissions from congestion along this major roadway, is implementing strategies which seek to reduce vehicle emissions through viable alternatives. Many of these alternatives are directed toward single-occupant vehicle use as well as improvements to the transportation system. To date, MDOT has sponsored programs which continue to develop and enhance Maryland’s commuter and intercity rail systems through increased access and availability. Programs such as parking enhancements at regional MARC stations and updates to rail lines traveling through BWI have been outlined and have begun generating funding to move forward with implementation.

Investment Phase

The average annual economic impacts of the investment phase of the *Intercity Transportation Initiatives* strategy can be found in Figure 41.

Figure 41: Intercity Transportation Initiatives—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	513.3	$39,581,299	$18,569,946
2012	544.6	$41,839,600	$20,797,729
2013	550.5	$41,931,152	$21,820,068
2014	451.3	$34,362,793	$18,936,157
2015	425.8	$32,470,703	$18,630,981
2016	420.7	$32,104,492	$18,890,381
2017	-1.9	-$2,380,371	$320,435
2018	-13.7	-$3,295,898	-$1,205,444
2019	-12.5	-$3,234,863	-$1,892,090
2020	-6.4	-$2,868,652	-$2,151,489
Average	***261.0***	***$19,137,296***	***$10,246,970***

Source: RESI

As shown in the previous figure, the investment phase of this strategy's implementation will generate approximately 261 jobs, $19.1 million in output, and $10.2 million in wages on average. The industries experiencing the greatest positive economic impacts in terms of employment as a result of this strategy are *Sales, office, and administrative occupations*, primarily due to the expectation that implementation of this policy will require the development and purchasing of new public transportation technologies.

Operation Phase

The average annual economic impacts of the operation phase of the *Intercity Transportation Initiatives* strategy can be found in Figure 42.

Figure 42: Intercity Transportation Initiatives—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	297.8	$11,627,197	$4,302,979
2012	301.4	$11,749,268	$4,898,071
2013	301.3	$11,566,162	$5,294,800
2014	297.5	$11,322,021	$5,599,976
2015	522.9	$20,385,742	$10,192,871
2016	522.2	$20,202,637	$11,016,846
2017	388.0	$14,770,508	$9,246,826
2018	378.0	$14,160,156	$9,323,120
2019	367.5	$13,610,840	$9,216,309
2020	360.4	$13,244,629	$9,170,532
Average	***339.7***	***$12,967,196***	***$7,114,757***

Source: RESI

As shown in the figure above, the strategy will result in a gain of 340 jobs, $13.0 million in output, and $7.1 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Transportation, material and moving occupations*, primarily due to the expectation that this strategy will encourage increased ridership. Publicly managed transportation providers such as MARC will likely require increased staff to manage increased demand for these transit systems.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would increase by approximately $5,980,384 for the investment phase and $14,225,373 for the operation phase.

3.2.8 Bike and Pedestrian Initiatives

Efforts to reduce GHG emissions from passenger vehicles are the key focus of many MDOT policies. Through the Bike and Pedestrian Initiatives stragegy, MDOT hopes to reduce GHG emissions from passenger vehicles by encouraging commutrs to chose non-automobile modes of travel and connect to local transit hubs. Through the construction and extension of previously existing pedestrian and bicycle facilities, MDOT hopes to encourage those who may consider public transportation but find that the commute to the local hub is almost as time consuming as the commute to their destination. The increased use of bicycles and sidewalks can help achieve GHG reduction goals by cutting down the number of short trips taken in motor vehicles. MDOT has considered and developed current and potential initiatives which seek to assist Maryland's bicyclists and pedestrians through updating facilities, increasing miles of trails and sidewalks, and installing fixtures which will ease a bicyclist's commute using public transportation.

Investment Phase

The average annual economic impacts of the investment phase of the *Bike and Pedestrian Initiatives* strategy can be found in Figure 43.

Figure 43: Bike and Pedestrian Initiatives—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	2,811.8	$218,200,684	$103,897,095
2012	2,951.8	$228,485,107	$116,455,078
2013	2,940.3	$226,928,711	$122,375,488
2014	2,707.1	$210,937,500	$120,925,903
2015	2,503.3	$196,960,449	$118,988,037
2016	2,196.5	$174,133,301	$110,916,138
2017	1,409.6	$111,572,266	$79,391,479
2018	1,351.0	$108,947,754	$78,308,105
2019	1,326.2	$107,971,191	$77,850,342
2020	1,330.4	$109,069,824	$78,842,163
Average	***1,957.1***	***$153,927,890***	***$91,631,803***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 1,957 jobs, $153.9 million in output, and $91.6 million in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Sales, office, and administrative occupations*. The development and creation of bike and pedestrian paths will likely require engineers, planners, and construction workers within this industry.

Operation Phase

The average annual economic impacts of the operation phase of the *Bike and Pedestrian Initiatives* strategy can be found in Figure 44.

Figure 44: Bike and Pedestrian Initiatives—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	-0.1	$0	-$15,259
2012	0.5	$30,518	$0
2013	-0.3	-$30,518	$0
2014	-0.1	$0	$0
2015	-0.1	$0	$0
2016	0.5	$0	$0
2017	0.0	$0	$30,518
2018	-0.1	-$61,035	-$15,259
2019	0.1	$61,035	$0
2020	0.0	$0	$0
2021	0.0	$0	$0
2022	0.0	$0	$0
2023	0.0	$0	$0
2024	0.0	$0	$0
2025	0.0	$0	$0
Average	***0.0***	***$0***	***$0***

Source: RESI

As shown in the figure above, the strategy will generate no new jobs, output, or wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Legal occupations*, primarily due to the expectation that one of the reasons households will increase use of bike and pedestrian paths is transportation cost savings. This may require parcels of land to be purchased or leased under agreements through the legal system.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would increase by approximately $41,179,756 for the investment phase and decrease by $85,645 for the operation phase.

3.2.9 Pricing Initiatives

Travel demand for work and leisure throughout Maryland contributes to the daily congestion of Maryland roadways. This strategy attempts to minimize the GHG emissions associated with travel, specifically through focused initiatives addressing pricing and travel demand. Programs which are currently in existence or in development include electronic toll collection, development of high occupancy toll (HOT) lanes, congestion pricing, parking fees, and employer commuter incentives. Each program seeks to reduce the emissions from a single-occupant vehicle through public transportation, or if one must use a passenger vehicle for work, through carpooling or shared commuting alternatives.

Investment Phase

The average annual economic impacts of the investment phase of the *Pricing Initiatives* strategy can be found in Figure 45.

Figure 45: Pricing Initiatives—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	2,639.2	$203,674,316	$95,397,949
2012	2,729.0	$209,045,410	$103,546,143
2013	2,760.7	$209,564,209	$108,169,556
2014	2,756.1	$209,869,385	$112,716,675
2015	86.3	-$2,990,723	$6,210,327
2016	-6.7	-$9,948,730	-$1,754,761
2017	-30.9	-$12,145,996	-$6,378,174
2018	-12.1	-$11,291,504	-$8,529,663
2019	29.4	-$8,666,992	-$8,728,027
2020	70.5	-$5,920,410	-$8,010,864
Average	***1,002.0***	***$71,017,179***	***$35,694,469***

Source: RESI

As shown in the figure above, the investment of strategy implementation will generate approximately 1,002 jobs, $71.0 million in output, and $35.7 million in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Sales, office, and administrative occupations*. New technologies associated with electronic toll collection, high occupancy toll lanes, and other subprograms of the strategy will need to be developed by engineers and other similar professionals associated with transportation technology development in these industries.

Operation Phase

The average annual economic impacts of the operation phase of the *Pricing Initiatives* strategy can be found in Figure 46.

Figure 46: Pricing Initiatives—Operation Phase

Year	Employment	Output	Wages
2010	252.6	$16,113,281	$7,141,113
2011	267.1	$15,869,141	$7,965,088
2012	278.9	$15,411,377	$8,743,286
2013	282.6	$14,404,297	$9,246,826
2014	289.7	$13,671,875	$9,979,248
2015	294.2	$12,695,313	$10,726,929
2016	301.4	$11,840,820	$11,535,645
2017	309.8	$11,108,398	$12,390,137
2018	316.2	$10,253,906	$13,229,370
2019	303.3	$8,850,098	$13,320,923
2020	295.1	$8,117,676	$13,504,028
Average	***290.1***	***$12,576,017***	***$10,707,508***

Source: RESI

As shown in the figure above, the strategy will support 290 jobs, $12.6 million in output, and $10.7 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Life, physical and social service occupations*, primarily due to the expectation that the operation and maintenance of these programs may result in some household savings through reallocation of gas purchases. These savings may in turn result in consumers pursing other activities that are not related to transportation but are considered leisurely activities.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would increase by approximately $23,659,044 for the investment phase and decrease by $126,552,754 for the operation phase.

3.2.10 Transportation Technology Initiatives

Highway construction, traffic flow, and freight transportation are large contributors to the increased emissions from motor vehicles. In an effort to combat these emissions, MDOT has reviewed a set of programs under this strategy which seek to reduce emissions from these areas by 2020. As part of a joint effort, MDOT will work with other agencies to help reduce the amount of carbon emissions generated annually. Reduced idling time for vehicles is a main goal for many of these policies. Idling in a car not only costs the consumer in terms of wasted fuel but also expends large amounts of GHGs during a single commute. MDOT also hopes to reduce the emissions from larger vehicles during periods of idling while not on roadways through the creation of welcome stations and truck stop electrification.

Investment Phase
The average annual economic impacts of the investment phase of the *Transportation Technology Initiatives* strategy can be found in Figure 47.

Figure 47: Transportation Technology Initiatives—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	7.6	$579,834	$259,399
2012	115.9	$9,002,686	$4,409,790
2013	8.8	$579,834	$534,058
2014	6.0	$488,281	$427,246
2015	-3.5	-$305,176	$61,035
2016	-4.7	-$366,211	-$30,518
2017	-4.0	-$305,176	-$61,035
2018	-4.2	-$366,211	-$106,812
2019	-3.4	-$183,105	-$76,294
2020	-3.3	-$183,105	-$91,553
Average	***10.5***	***$812,877***	***$484,120***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 10.5 jobs, $0.8 million in output, and $0.5 million in wages on average each year. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Sales, office, and administrative occupations*, primarily due to the expectation that the transportation technologies associated with this strategy will need to be developed by engineers and other similar professionals.

Operation Phase
The average annual economic impacts of the operation phase of the *Transportation Technology Initiatives* strategy can be found in Figure 48.

Figure 48: Transportation Technology Initiatives—Operation Phase

Year	Employment	Output	Wages
2010	-971.6	-$39,764,404	-$14,968,872
2011	-895.1	-$38,909,912	-$15,029,907
2012	-813.9	-$37,780,762	-$14,465,332
2013	-745.8	-$36,712,646	-$13,641,357
2014	-662.3	-$35,034,180	-$12,435,913
2015	-587.9	-$33,874,512	-$10,940,552
2016	-517.3	-$32,714,844	-$9,353,638
2017	-454.3	-$31,860,352	-$7,629,395
2018	-393.4	-$31,188,965	-$5,950,928
2019	-379.3	-$31,982,422	-$5,371,094
2020	-360.9	-$32,043,457	-$4,669,189
Average	***-616.5***	***-$34,715,132***	***-$10,405,107***

Source: RESI

As shown in the figure above, the strategy will result in a loss of 617 jobs, $34.7 million in output, and $10.4 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Farming, fishing, and forestry occupations.* Once implemented, the strategy will encourage increased and efficient use of various modes of transportation. Households can then reallocate spending to areas such as food and beverage consumption.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would increase by approximately $222,331 for the investment phase and decrease by $316,815,522 for the operation phase.

3.2.11 Electric Vehicle Initiatives

Electric vehicle use by consumers can help reduce mobile emissions throughout The State. In an effort to support drivers of electric vehicles, programs which encourage infrastructure improvements will be implemented by MDOT under this strategy. Electric vehicles reduce GHG emissions through the use of battery power for propulsion rather than an internal combustion engine. Electric vehicle use may also benefit local jurisdictions which seek to offset operations-related electricity consumption. Through vehicle-to-grid technology, commuters can plug into a battery charging station offered in local parking areas. While in charging mode, the local energy grid can offset area energy needs using the reserved power stored in the parked vehicle. The cycle effect helps to reduce GHG emissions from passenger vehicles and overall energy consumption within the region.

Investment Phase

The average annual economic impacts of the investment phase of the *Electric Vehicle Initiatives* strategy can be found in Figure 49.

Figure 49: Electric Vehicle Initiatives—Investment Phase

Year	Employment	Output	Wages
2010	27.7	$2,105,713	$961,304
2011	28.3	$2,136,230	$1,022,339
2012	29.1	$2,197,266	$1,113,892
2013	29.3	$2,197,266	$1,144,409
2014	28.3	$2,197,266	$1,144,409
2015	28.4	$2,136,230	$1,205,444
2016	27.7	$2,075,195	$1,205,444
2017	29.0	$2,197,266	$1,281,738
2018	29.6	$2,258,301	$1,327,515
2019	29.0	$2,319,336	$1,373,291
2020	29.8	$2,258,301	$1,403,809
Average	***28.7***	***$2,188,943***	***$1,198,509***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 29 jobs, $2.2 million in output, and $1.2 million in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Sales, office, and administrative occupations*. The development and enhancement of electric vehicles and related technologies such as charging stations will be produced by transportation technology engineers and other similar experts within the industry.

Operation Phase

The average annual economic impacts of the operation phase of the *Electric Vehicle Initiatives* strategy can be found in Figure 50.

Figure 50: Electric Vehicle Initiatives—Operation Phase

Year	Employment	Output	Wages
2010	-19.7	-$762,939	-$289,917
2011	-17.4	-$701,904	-$274,658
2012	-14.6	-$610,352	-$228,882
2013	-13.1	-$579,834	-$198,364
2014	-11.6	-$518,799	-$198,364
2015	-10.9	-$549,316	-$152,588
2016	-8.6	-$549,316	-$122,070
2017	-7.4	-$427,246	-$61,035
2018	-5.8	-$427,246	-$15,259
2019	-5.4	-$366,211	$30,518
2020	-5.9	-$488,281	$15,259
Average	***-10.9***	***-$543,768***	***-$135,942***

Source: RESI

As shown in the previous figure, the strategy will result in a loss of 11 jobs, $0.5 million in output, and $0.1 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Farm, fishing, and forestry occupations*, primarily due to the fact that consumers will reallocate their spending from gas purchases to other areas of recreational spending such as visiting local parks or increased food and beverage consumption.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $307,374 for the investment phase, and decrease by $3,323,804 for the operation phase.

3.2.12 Low-Emitting Vehicles Initiatives

Through the encouragement of low emitting vehicles, MDOT and other state agencies hope to reduce air emissions, including the emissions of GHGs attributed to internal combustion engines. For example, the use of hybrid vehicles for car-sharing can reduce the number of personal cars on the road. The addition of rental facilities at commuter rail stations will further encourage such behaviors. Cars rented from such facilities are often used for a few hours to a day at the most and are returned either to the station of arrival or a partner location. Encouragement of programs such as car-sharing entices those who may wish to use public transportation but have distances to travel which may not be practical through these means. Public transit officials are also considering the replacement of heavy diesel vehicles with hybrid alternatives.

Investment Phase

The average annual economic impacts of the investment phase of the *Low-Emitting Vehicles Initiatives* strategy can be found in Figure 51.

Figure 51: Low-Emitting Vehicles Initiatives—Investment Phase

Year	Employment	Output	Wages
2010	45.4	$3,509,521	$1,647,949
2011	12.6	$915,527	$518,799
2012	11.7	$854,492	$518,799
2013	11.0	$823,975	$518,799
2014	10.5	$854,492	$503,540
2015	9.1	$732,422	$518,799
2016	8.8	$671,387	$534,058
2017	9.4	$793,457	$549,316
2018	9.3	$793,457	$595,093
2019	9.3	$854,492	$579,834
2020	8.7	$732,422	$579,834
Average	***13.3***	***$1,048,695***	***$642,256***

Source: RESI

As shown in the previous figure, investment phase of this strategy's implementation will generate approximately 13 jobs, $1.0 million in output, and $0.6 million in wages on average.

The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Sales, office, and administrative occupations* primarily due to the expectation that low-emitting vehicles with diesel oxidation catalysts, closed crankcase ventilation filtration systems, or similar technologies will be produced for purchase.

Operation Phase

The average annual economic impacts of the operation phase of the *Low-Emitting Vehicles Initiatives* strategy can be found in Figure 52.

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Figure 52: Low-Emitting Vehicles Initiatives—Operation Phase

Year	Employment	Output	Wages
2010	-11.1	-$457,764	-$167,847
2011	-9.6	-$427,246	-$167,847
2012	-8.0	-$366,211	-$137,329
2013	-7.5	-$366,211	-$122,070
2014	-7.1	-$335,693	-$137,329
2015	-6.6	-$366,211	-$106,812
2016	-5.2	-$366,211	-$91,553
2017	-3.7	-$305,176	-$30,518
2018	-3.9	-$366,211	-$30,518
2019	-4.1	-$305,176	-$30,518
2020	-4.3	-$366,211	-$45,776
Average	***-6.5***	***-$366,211***	***-$97,101***

Source: RESI

As shown in the figure above, the strategy will result in a loss of 7 jobs, $0.4 million in output, and $0.1 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Farm, fishing, and forestry occupations*, primarily due to the expectation that consumers will reallocate their spending to other areas of consumption. Households may begin to dine out more, or extended trips to scenic areas for vacations with their savings from this strategy.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $622,556 for the investment phase and decrease by $6,434,806 for the operation phase.

3.2.13 Evaluating the GHG Emissions Impacts from Major Projects and Plans

In accordance with the Governor's GHG reduction commitment, this strategy established evaluation of GHG emissions for all state and local major projects. Through this policy, MDOT will develop guidance for state and other major project sponsors to use for future projects and emissions of GHGs. Three strategies which are currently under consideration include active participation in framing National GHG Emissions Evaluation Policies, Evaluation of GHG Emissions through the National Environmental Policy Act Process, and Evaluation of GHG Emissions through Statewide/Regional Planning. MDOT is considering a formal program which could provide future incentives for different regions of Maryland if those regions develop a sustainability plan which aims to meet future GHG targets within the transportation sector. A process for addressing GHGs is currently being considered along with other options on a national level. MDOT believes that before The State establishes a formal evaluation process for transportation GHGs, it should wait and see what is proposed on a national level.

At this time, RESI has not been asked to quantify this strategy as the current ruling is still under review. The impacts of this strategy are likely to be estimated in future refinement of the current analysis.

3.2.14 Airport Initiatives

Through the support of the Maryland Aviation Administration, BWI initiatives to reduce GHG emissions and associated mixed pollutants are included in this strategy. To evaluate the potential reduction in energy consumption and fleet vehicle fuel use, the Maryland Aviation Administration conducted an energy audit in 2011 will help design a more energy efficient framework and provide fuel conservation concepts for BWI. Programs which are currently being considered include the use of compressed natural gas buses, the use of alternative fuels for fleet vehicles, and periodic air quality assessments to gauge the success of these programs. Other programs being considered include reduction in fuel loss associated with flight and increased accessibility to BWI through public transportation.

Investment Phase

The average annual economic impacts of the investment phase of the *Airport Initiatives* strategy can be found in Figure 53**.**

Figure 53: Airport Initiatives—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.0	$0	$0
2014	0.0	$0	$0
2015	0.0	$0	$0
2016	0.0	$0	$0
2017	0.0	$0	$0
2018	0.0	$0	$0
2019	0.0	$0	$0
2020	0.0	$0	$0
Average	***0.0***	***$0***	***$0***

Source: RESI

As shown in the previous figure, the investment phase of this strategy’s implementation will not impact jobs, output or wages.

Operation Phase

The average annual economic impacts of the operation phase of the *Airport Initiatives* strategy can be found in Figure 54.

Figure 54: Airport Initiatives—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.0	$0	$0
2014	0.0	$0	$0
2015	0.0	$0	$0
2016	0.0	$0	$0
2017	0.0	$0	$0
2018	0.0	$0	$0
2019	0.0	$0	$0
2020	0.0	$0	$0
Average	***0.0***	***$0***	***$0***

Source: RESI

As shown in the figure above, the operation phase of this strategy's implementation will not impact jobs, output or wages.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would not be impacted during the investment or operation phase.

3.2.15 Port Initiatives

Initiatives through the Maryland Port Administration's Environmental Management System aim to reduce the GHG emissions and environmental footprint associated with Maryland's deep-water seaports. Emission reduction initiatives coinciding with MDOT's goal to reduce harmful pollutant emissions (including GHGs) are supported under this strategy. Reduction efforts for Maryland seaports include the use of cleaner diesel fuel for port fleet vehicles, the use of diesel-operated equipment retrofitted to reduce the emission of GHGs, and the use of clean diesel port fleet vehicles. Initiatives to reduce truck emissions through turn time and idle reductions are currently being planned to help decrease harmful air pollutants associated with Maryland port projects.

Investment Phase

The average annual economic impacts of the investment phase of the *Port Initiatives* strategy can be found in Figure 55.

Figure 55: Port Initiatives—Investment Phase

Year	Employment	Output	Wages
2010	0.7	$30,518	$0
2011	0.0	$0	-$15,259
2012	-0.1	$0	$0
2013	-0.4	$0	$0
2014	0.1	$30,518	$0
2015	-0.3	$0	$0
2016	0.4	$0	$0
2017	-0.2	$0	$0
2018	0.0	$0	$0
2019	-0.3	$0	$15,259
2020	-0.5	$0	$0
Average	***-0.1***	***$5,549***	***$0***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will result in a loss of approximately less than one job, a gain of $5,549 in output, and $0 in wages on average.

Operation Phase

The average annual economic impacts of the operation phase of the *Port Initiatives* strategy can be found in Figure 56.

Figure 56: Port Initiatives—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.0	$0	$0
2014	0.0	$0	$0
2015	0.0	$0	$0
2016	0.0	$0	$0
2017	0.0	$0	$0
2018	0.0	$0	$0
2019	0.0	$0	$0
2020	0.0	$0	$0
Average	***0.0***	***$0***	***$0***

Source: RESI

As shown in the figure above, the operation phase of this strategy's implementation will not impact jobs, output or wages.

Fiscal Impacts
As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would decrease by approximately $860 for the investment phase, and no impact for the operation phase.

3.2.16 Freight and Freight Rail Strategies

Through a collaborative effort between freight transportation and MDOT, initiatives are underway to reduce the GHG emissions associated with the freight and rail transportation sector. Improvements to infrastructure and technology, including the expansion of bottleneck truck and rail corridors to cut down on idling time, are highlighted within this strategy. Under this strategy, initiatives regarding the replacement of locomotives and installations of auxiliary power units for those locomotives currently in use within the freight transportation industry are supported by funding. Auxiliary power units will lower overall costs to suppliers through the eliminated fuel loss during periods of idling by shutting down the main engine. Other programs associated with this strategy support the replacement of shipyard locomotives with new hybrid locomotives to cut down on GHG emissions resulting from older models.

Investment Phase
The average annual economic impacts of the investment phase of the *Freight and Freight Rail Strategies* strategy can be found in Figure 57.

Figure 57: Freight and Freight Rail Strategies—Investment Phase

Year	Employment	Output	Wages
2010	0.9	$30,518	$0
2011	0.0	$0	-$15,259
2012	-0.1	$0	$0
2013	-0.4	$0	$0
2014	0.1	$30,518	$0
2015	-0.3	$0	$0
2016	0.3	$0	$0
2017	-0.2	$0	$0
2018	-0.1	$0	$0
2019	-0.3	$0	$15,259
2020	-0.6	$0	$0
Average	***0.0***	***$5,549***	***$0***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will not impact jobs, or wages but will result in a gain of $5,549 in ouput.

Operation Phase
The average annual economic impacts of the operation phase of the *Freight and Freight Rail Strategies* strategy can be found in Figure 58.
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Figure 58: Freight and Freight Rail Strategies—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	-2.4	-$91,553	-$30,518
2013	-5.1	-$244,141	-$61,035
2014	-6.9	-$335,693	-$106,812
2015	-7.9	-$488,281	-$106,812
2016	-8.9	-$549,316	-$106,812
2017	-9.0	-$610,352	-$106,812
2018	-9.0	-$671,387	-$91,553
2019	-10.0	-$732,422	-$91,553
2020	-10.4	-$854,492	-$91,553
Average	***-6.3***	***-$416,149***	***-$72,132***

Source: RESI

As shown in the figure above, the strategy will result in a loss of 6 jobs, $0.4 million in output, and $72,132 in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Computer, math, architect, and engineer occupations*. Typically, transportation by freight train has been more cost-effective than trucking for companies with larger inventories. New hybrid locomotives are able to use less fuel per ton-mile, allowing for savings to be potentially passed on to companies in the form of reduction of price per ton-mile. Increased distribution and availability of goods and services in other industries due to enhanced rail transportation is likely to produce further positive impacts.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would result in a decrease by $2,062 during the investment phase and an additional loss of $4,062,569 in the operation phase.

3.2.17 Renewable Fuels Standard

Regulated by EPA, the Renewable Fuel Standard establishes the first renewable fuel volume mandate in the U.S. The mandate requires that 7.5 billion gallons of renewable fuel are to be blended into gasoline by 2012, but has been expanded by new legislation to include diesel fuel. Under this new legislation diesel fuel may act as a medium, and the share of renewable fuel in the mix is to increase from 7.5 billion to 36 billion gallons by 2012. The Renewable Fuels Standard aims to reduce the nation's need of foreign oil and simultaneously reduce the emissions of GHGs. By 2022, the estimated decrease in gasoline pricing associated with the increase in renewable fuels will be as high as $0.121 per gallon of unleaded gasoline. Potential national savings associated with this strategy could amount to approximately $12 billion annually.

Investment Phase

The average annual economic impacts of the investment phase of the *Renewable Fuels Standard* strategy can be found in Figure 59.

Figure 59: Renewable Fuels Standard—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.0	$0	$0
2014	0.0	$0	$0
2015	0.0	$0	$0
2016	0.0	$0	$0
2017	0.0	$0	$0
2018	0.0	$0	$0
2019	0.0	$0	$0
2020	0.0	$0	$0
Average	***0.0***	***$0***	***$0***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will not impact jobs, output, or wages.

Operation Phase
The average annual economic impacts of the operation phase of the *Renewable Fuel Standard* strategy can be found in Figure 60.

Figure 60: Renewable Fuels Standard—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	-31.1	-$1,556,396	-$404,358
2014	-28.4	-$1,495,361	-$396,729
2015	-26.1	-$1,525,879	-$381,470
2016	-22.7	-$1,464,844	-$305,176
2017	-19.0	-$1,281,738	-$244,141
2018	-16.3	-$1,281,738	-$183,105
2019	-15.0	-$1,220,703	-$137,329
2020	-14.2	-$1,220,703	-$122,070
Average	***-15.7***	***-$1,004,306***	***-$197,671***

Source: RESI

As shown in the figure above, the strategy will result in a loss of 16 jobs, $1.0 million in output, and $0.2 million in wages annually once in operation. The industries experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy are *Farming, fishing, and forestry occupations* and *Community, and social services occupations*. The availability of renewable and efficient fuels drives down costs for both commercial and residential consumers. This leads to increased discretionary income for households, which then spend more on goods and services in such industries. Other service-based industries will also benefit from the same effects.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues will not be impacted in the investment phase, and decrease by $9,996,155 during the operation phase.

3.2.18 CAFE Standards: Model Years 2008-2011

CAFE is the fuel economy standard relating to the sales-weighted fuel economy average for a vehicle manufacturer for the current model year. Vehicles which are subject to CAFE standards include those with a gross vehicle weight rating of 8,500 pounds or less as well as passenger vehicles and light-duty trucks. Depending on the vehicle type, CAFE standards have increased at different rates. Despite these standards increasing over the years, CAFE standards needs to continue until the fuel efficiency miles per gallon reaches the 2007 mandate of 35 miles per gallon.

Investment Phase

The average annual economic impacts of the investment phase of the *CAFE Standards: Model Years 2008-2011* strategy can be found in Figure 61.

Figure 61: CAFE Standards: Model Years 2008-2011—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.0	$0	$0
2014	0.0	$0	$0
2015	0.0	$0	$0
2016	0.0	$0	$0
2017	0.0	$0	$0
2018	0.0	$0	$0
2019	0.0	$0	$0
2020	0.0	$0	$0
Average	***0.0***	***$0***	***$0***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will not impact jobs, output, or wages.

Operation Phase

The average annual economic impacts of the operation phase of the *CAFE Standards: Model Years 2008-2011* strategy can be found in Figure 62.

Figure 62: CAFE Standards: Model Years 2008-2011—Operation Phase

Year	Employment	Output	Wages
2010	-20.2	-$854,492	-$274,658
2011	-17.7	-$762,939	-$259,399
2012	-15.6	-$701,904	-$228,882
2013	-14.1	-$701,904	-$205,994
2014	-12.4	-$610,352	-$183,105
2015	-11.1	-$671,387	-$167,847
2016	-9.5	-$610,352	-$106,812
2017	-8.3	-$610,352	-$91,553
2018	-7.3	-$610,352	-$61,035
2019	-7.2	-$549,316	-$45,776
2020	-6.9	-$549,316	-$45,776
Average	***-11.9***	***-$657,515***	***-$151,894***

Source: RESI

As shown in the figure above, the strategy will result in a loss of 12 jobs, $0.7 million in output, and $0.2 million in wages annually once in operation. The industries experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy are *Farming, fishing, and forestry occupations* and *Community, and social service occupations*. It is expected that households will save on transportation fuel costs and will therefore spend discretionary funds elsewhere in the economy.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues will not be impacted during the investment phase, and will decrease by $6,111,827 for the operation phase.

3.2.19 Promoting Hybrid and Electric Vehicles

The promotion of hybrid and electric vehicles will have many environmental and economic benefits. To meet Maryland’s air quality and Chesapeake Bay conservation initiatives, transportation initiatives include replacing petroleum-based mobile fuels with alternative fuels. This effort will reduce the emissions generated from various vehicles’ exhaust systems. The incorporation of hybrid and electric vehicles will provide many jobs for Maryland. Jobs include those in the research and manufacturing sector as well as the actual sale, installation, and maintenance of plug-in vehicles and charging stations.

Investment Phase

The average annual economic impacts of the investment phase of the *Promoting Hybrid and Electric Vehicles* strategy can be found in Figure 63**.**

Figure 63: Promoting Hybrid and Electric Vehicles—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	2.7	$213,623	$122,070
2014	3.6	$305,176	$137,329
2015	2.8	$244,141	$152,588
2016	2.7	$183,105	$152,588
2017	3.4	$305,176	$213,623
2018	3.3	$244,141	$152,588
2019	3.3	$305,176	$167,847
2020	2.7	$244,141	$183,105
Average	***2.2***	***$185,880***	***$116,522***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate less than approximately 2 jobs, $0.2 million in output, and $0.1 million in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Sales, office, and administrative occupations.* The investment phase of promoting hybrid and electric vehicles will involve car manufacturers purchasing parts wholesale and car dealerships purchasing hybrid and electric cars wholesale as well.

Operation Phase

The average annual economic impacts of the operation phase of the *Promoting Hybrid and Electric Vehicles* strategy can be found in Figure 64.

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Figure 64: Promoting Hybrid and Electric Vehicles—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	100.3	-$1,983,643	$1,327,515
2014	89.0	-$2,532,959	$1,251,221
2015	80.2	-$3,051,758	$1,190,186
2016	73.1	-$3,417,969	$1,098,633
2017	68.5	-$3,601,074	$1,052,856
2018	63.1	-$3,845,215	$961,304
2019	59.2	-$3,967,285	$885,010
2020	57.2	-$4,028,320	$869,751
Average	***53.7***	***-$2,402,566***	***$785,134***

Source: RESI

As shown in the figure above, the strategy will support a total of 54 jobs, result in a loss of $2.4 million in output, and an economic gain of $0.8 million in wages annually once in operation. The industries experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy are those industries (such as *Sales, office, and administrative occupations* and *Healthcare occupations)* offering goods and services which will be in demand by households experiencing increased fuel cost savings (and discretionary income) associated with driving hybrid and electric vehicles. Increased household spending resulting from job creation in both phases will also contribute to positive impacts in these industries.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues will accumulate to approximately $41,416 for the investment phase, and $5,283,287 for the operation phase.

3.2.20 PAYD Insurance in Maryland

MIA has led the effort to promote PAYD insurance as a voluntary program which ties consumer insurance costs to actual motor-vehicle travel. In previous studies, PAYD insurance has often resulted in more efficient driving patterns induced by potential cost savings. In addition, participating vehicles report an annual reduction in average mileage resulting in GHG emissions reduction. Main beneficiaries of this strategy include those who tend to drive shorter distances annually, including those within metropolitan areas who may only use personal vehicles for occasional trips. Indirect benefits of this strategy also include decreases in traffic fatalities and increases in mass transit since policyholders have an incentive to maintain a low-cost policy and a lower total mileage on an annual basis.

Investment Phase

The average annual economic impacts of the investment phase of the *PAYD Insurance in Maryland* strategy can be found in Figure 65.

Figure 65: PAYD Insurance in Maryland—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.0	$0	$0
2014	0.0	$0	$0
2015	0.0	$0	$0
2016	0.0	$0	$0
2017	0.0	$0	$0
2018	0.0	$0	$0
2019	0.0	$0	$0
2020	0.0	$0	$0
Average	***0.0***	***$0***	***$0***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will not impact jobs, output, or wages.

Operation Phase

The average annual economic impacts of the operation phase of the *PAYD* strategy can be found in Figure 66.

Figure 66: PAYD Insurance in Maryland—Operation Phase

Year	Employment	Output	Wages
2010	-0.5	-$30,518	-$15,259
2011	-0.1	-$30,518	-$15,259
2012	-0.5	-$61,035	-$15,259
2013	-0.7	-$61,035	$0
2014	0.3	$0	$15,259
2015	-0.1	-$61,035	$0
2016	0.6	$0	$15,259
2017	-0.2	$0	$15,259
2018	0.0	$0	$0
2019	0.1	$61,035	$15,259
2020	0.6	$61,035	$15,259
2021	0.2	$0	$30,518
2022	0.2	$0	$61,035
2023	-0.2	$0	$30,518
2024	-0.6	-$61,035	$30,518
2025	0.1	$0	$0
Average	***0.0***	***-$11,444***	***$11,444***

Source: RESI

As shown in the figure above, the strategy will result in a loss of $11,444 in output, and an economic gain of $11,444 in wages annually once in operation. The industries experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy are those (such as *Management, business, and financial occupations)* associated with the spending patterns of households experiencing increased income. This is due to those households taking advantage of PAYD as the policyholders tend to drive less than the average Maryland resident.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would not be impacted during the investment phase, and would decrease by $19,002 for the operation phase.

3.3 Agriculture and Forestry

3.3.1 Managing Forests to Capture Carbon

Enhanced productivity from enrolling forests into a forestry management system has the potential to yield increased rates of carbon dioxide sequestration in forest biomass. Durable wood products can be harvested to provide a renewable biomass for energy production within

The State. DNR, in association with various state and local government agencies, will implement this strategy with the goal of managing 30,000 acres of privately owned land annually by 2020. In an effort to continue support for the Forestry for the Bay program, best management guidelines for forest harvests associated with biomass markets are being developed.

Investment Phase

From 2010 to 2020 a total of $37.7 million was allocated to the *Managing Forests to Capture Carbon* strategy. The average annual economic impacts of the investment phase of the strategy can be found in Figure 67.

Figure 67: Managing Forests to Capture Carbon—Investment Phase

Year	Employment	Output	Wages
2010	387.8	$2,227,783	$1,617,432
2011	383.4	$2,258,301	$1,892,090
2012	377.5	$2,136,230	$2,059,937
2013	371.4	$1,953,125	$2,182,007
2014	362.7	$1,739,502	$2,227,783
2015	353.4	$1,464,844	$2,258,301
2016	346.3	$1,220,703	$2,304,077
2017	339.5	$1,098,633	$2,273,560
2018	331.9	$976,563	$2,319,336
2019	328.1	$915,527	$2,258,301
2020	324.3	$732,422	$2,212,524
Average	***355.1***	***$1,520,330***	***$2,145,941***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 355 jobs, $1.5 million in output, and $2.1 million in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Sales, office, and administrative occupations*. Sustainable forest management will be carried out by professionals in this industry. To a lesser extent, environmental consultants or management firms within the industry will likely be needed to determine and advise on best practices in sustainable forest management.

Operation Phase

The average annual economic impacts of the operation phase of the *Managing Forests to Capture Carbon* strategy can be found in Figure 68.

Figure 68: Managing Forests to Capture Carbon—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	47.8	$1,403,809	$350,952
2013	48.7	$1,403,809	$427,246
2014	48.5	$1,464,844	$457,764
2015	47.6	$1,342,773	$518,799
2016	47.0	$1,281,738	$534,058
2017	46.9	$1,281,738	$564,575
2018	46.1	$1,220,703	$564,575
2019	45.0	$1,281,738	$579,834
2020	43.9	$1,159,668	$534,058
Average	***38.3***	***$1,076,438***	***$411,987***

Source: RESI

As shown in the figure above, the strategy will support a total of 38 jobs, $1.1 million in output, and $0.4 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Farming, fishing, and forestry.* It is expected that the implementation of sustainable forest management is likely to have ripple effects for a wide variety of businesses which may be contracted to facilitate management.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $1,005,298 for the investment phase, and $208,681 for the operation phase.

3.3.2 Creating Ecosystem Markets to Encourage GHG Emissions Reductions

Benefits and cost efficiencies associated with ecosystem markets have captured the focus of various state government agencies in regard to GHG emissions reductions. Maryland's Forest Conservation Act and Critical Area Act mandates mitigation of for impacts to natural resource which result from land development. Mitigation banking is an option to address these requirements. Benefits would fall into two categories: avoidance/minimization benefits and net environmental enhancements. The following is a list of ecosystem markets currently being considered or have already been implemented under this policy: Wetlands, Streams and Waterways, Forests, Critical Areas, Species and Habitats, Carbon: RGGI and Maryland CO2 Budget Trading Program Offsets, Carbon: GHG Emissions Reduction Act of 2009 – Offsets and Early Reductions, Carbon: GHG Emissions Reduction Act of 2009 – Nutrient Trading with Carbon Co-Benefits, and Biomass. Any possible state revenues from implementation of these markets could be used to fund future state initiatives relating to emissions reduction. Additionally, the markets provide an incentive for private firms to achieve emissions reduction and provide funds for adopting more environmentally-friendly practices.

Investment Phase

The average annual economic impacts of the investment phase of the *Creating Ecosystem Markets to Encourage GHG Emissions Reductions* strategy can be found in Figure 69.

Figure 69: Creating Ecosystem Markets to Encourage GHG Emissions Reductions—Investment Phase

Year	Employment	Output	Wages
2010	1.6	$122,070	$61,035
2011	2.1	$122,070	$45,776
2012	1.7	$122,070	$76,294
2013	1.8	$122,070	$91,553
2014	1.6	$183,105	$76,294
2015	1.6	$122,070	$76,294
2016	1.6	$122,070	$76,294
2017	1.5	$122,070	$122,070
2018	1.6	$122,070	$91,553
2019	1.3	$122,070	$76,294
2020	0.6	$61,035	$76,294
Average	***1.5***	***$122,070***	***$79,068***

Source: RESI

As shown in the previous figure, the investment phase of this strategy's implementation will generate approximately 2 jobs, $122,070 in output, and $79,068 in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment resulting from this phase of the strategy is *Sales, office, and administrative occupations*, primarily due to the expectation that trained experts in the financial services industry will implement and manage the various ecosystem markets.

Operation Phase

The average annual economic impacts of the operation phase of the *Creating Ecosystem Markets to Encourage GHG Emissions Reductions* strategy can be found in Figure 70.

Figure 70: Creating Ecosystem Markets to Encourage GHG Emissions Reductions—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	420.6	$85,632,324	$49,926,758
2014	-284.6	$68,695,068	$49,041,748
2015	-822.1	$55,847,168	$47,042,847
2016	-1,237.8	$46,325,684	$44,494,629
2017	-1,489.9	$41,748,047	$42,602,539
2018	-1,581.2	$42,114,258	$42,053,223
2019	-1,691.6	$40,893,555	$41,198,730
2020	-1,758.1	$40,832,520	$40,939,331
Average	***-767.7***	***$38,371,693***	***$32,481,800***

Source: RESI

As shown in the figure above, the strategy will result in a loss of 768 jobs, and an economic gain of $38.4 million in output, and $32.5 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Protective service occupations*. A wide variety of business types will be motivated by market compliance to engage in best practices which benefit both the environment and their bottom line. As companies seek enter the market or expand, an increase in protective workforce may be necessary to ensure employee safety during expansionary periods.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $28,821 for the investment phase, and $10,557,326 for the operation phase.

3.3.3 Increasing Urban Trees to Capture Carbon

In an effort to maintain and improve the health and longevity of trees in urban areas, DNR is working with state and local agencies to increase the urban tree canopy cover throughout Maryland. Trees in urban areas assist in GHG emissions reductions for power production, vehicles, and the operation and maintenance of the surrounding environment. Reduced heat due to urban tree cover ultimately slows the formation of ground-level ozone as well as the evaporation of fuel from motor vehicles. Urban communities, lacking in tree cover, will become the main focus of this program to achieve the highest reduction of potential GHG emissions.

Investment Phase

The average annual economic impacts of the investment phase of the *Increasing Urban Trees to Capture Carbon* strategy can be found in Figure 71.

Figure 71: Increasing Urban Trees to Capture Carbon—Investment Phase

Year	Employment	Output	Wages
2010	5.5	$91,553	$61,035
2011	5.6	$91,553	$45,776
2012	5.3	$91,553	$45,776
2013	5.7	$122,070	$76,294
2014	5.4	$152,588	$76,294
2015	4.7	$61,035	$45,776
2016	4.9	$122,070	$45,776
2017	4.4	$61,035	$61,035
2018	5.1	$61,035	$61,035
2019	4.8	$122,070	$61,035
2020	3.8	$61,035	$61,035
Average	***5.0***	***$94,327***	***$58,261***

Source: RESI

As shown in the previous figure, the investment phase of this strategy's implementation will generate approximately 5 jobs, $94,327 in output, and $58,261 in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Sales, office, and administrative occupations*. This strategy will require cooperation between local community organizers and governments in planning and implementation, and funds will be passed through to this industry for administration purposes.

Operation Phase

The average annual economic impacts of the operation phase of the *Increasing Urban Trees to Capture Carbon* strategy can be found in Figure 72.

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Figure 72: Increasing Urban Trees to Capture Carbon—Operation Phase

Year	Employment	Output	Wages
2010	234.2	$10,406,494	$3,814,697
2011	292.2	$15,594,482	$5,294,800
2012	336.0	$19,866,943	$6,561,279
2013	363.7	$23,132,324	$7,476,807
2014	381.2	$26,031,494	$8,346,558
2015	390.5	$28,259,277	$9,124,756
2016	396.9	$30,273,438	$9,704,590
2017	396.9	$31,799,316	$10,208,130
2018	394.1	$33,203,125	$10,620,117
2019	383.2	$33,996,582	$10,635,376
2020	371.5	$34,545,898	$10,589,600
Average	***358.2***	***$26,100,852***	***$8,397,883***

Source: RESI

As shown in the figure above, the strategy will support a total of 358 jobs, $26.1 million in output, and $8.4 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Sales, office, and administrative occupations,* primarily due to the expectation that a wide variety of businesses in the urban areas where trees are being planted will experience benefits in terms of building operation costs as carbon capture lowers ambient temperature.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $33,062 for the investment phase, and $5,328,250 for the operation phase.

3.3.4 Creating and Protecting Wetlands and Waterway Borders to Capture Carbon

Prevention of property damage from natural disasters and maintenance of healthy environments is a constant challenge for Maryland. Wetlands and marshlands are key resources which will allow The State to achieve these goals for coastal regions. As the sea level rises, current wetlands need to be able to migrate inland if wetland buffers are to be ensured for future generations. If inland areas did not exist for migration, the Chesapeake Bay watershed would suffer the harmful effects caused by rising waters.[9] Another benefit of wetland protection is the resulting storage of carbon during long periods of rain. Highly saturated wetlands are capable of holding large amounts of carbon in peat. Working closely with the General Assembly and other state agencies, DNR will set a goal to establish or restore 16,678 acres of wetlands in Maryland by 2020.

Investment Phase

The average annual economic impacts of the investment phase of the *Creating and Protecting Wetlands and Waterway Borders to Capture Carbon* strategy can be found in Figure 73.

Figure 73: Creating and Protecting Wetlands and Waterway Borders to Capture Carbon—Investment Phase

Year	Employment	Output	Wages
2010	2.1	$61,035	$15,259
2011	2.1	$61,035	$15,259
2012	2.2	$30,518	$15,259
2013	18.2	$396,729	$183,105
2014	18.3	$457,764	$183,105
2015	18.1	$366,211	$213,623
2016	18.7	$366,211	$213,623
2017	18.9	$427,246	$259,399
2018	18.9	$366,211	$244,141
2019	18.9	$427,246	$259,399
2020	17.7	$366,211	$228,882
Average	***14.0***	***$302,401***	***$166,460***

Source: RESI

[9] RESI economic impact estimates do not include the damage valule mitigated by the wetland buffer.

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 14 jobs, $0.3 million in output, and $0.2 million in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment due to this strategy is *Sales, office, and administrative occupations.* It is expected that creating and protecting wetland and waterway borders will require planning and supervision from experts knowledgeable in land management.

Operation Phase

The average annual economic impacts of the operation phase of the *Creating and Protecting Wetlands and Waterway Borders to Capture Carbon* strategy can be found in Figure 74.

Figure 74: Creating and Protecting Wetlands and Waterway Borders to Capture Carbon—Operation Phase

Year	Employment	Output	Wages
2010	152.9	$4,119,873	$1,632,690
2011	151.8	$4,150,391	$1,770,020
2012	149.8	$4,119,873	$1,922,607
2013	200.9	$5,462,646	$2,593,994
2014	52.2	$1,373,291	$976,563
2015	47.6	$1,098,633	$823,975
2016	45.1	$915,527	$701,904
2017	44.9	$976,563	$717,163
2018	44.3	$976,563	$686,646
2019	44.7	$1,098,633	$701,904
2020	44.4	$1,098,633	$686,646
Average	***89.0***	***$2,308,239***	***$1,201,283***

Source: RESI

As shown in the previous figure, the strategy will support a total of 89 jobs, $2.3 million in output, and $1.2 million in wages annually once in operation. The industries experiencing the greatest positive economic impacts in terms of employment due to this strategy are mostly service-based sectors such as *Food preparation, serving related occupations* and *Sales, office, and administrative occupations*, primarily due to the expectation that the expanded wetlands resulting from implementation of this strategy will create tourism opportunities and increase overall household spending on a variety of both necessary and desired services (healthcare, retail, food, etc.) as a result.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $75,431 for the investment phase, and $556,621 for the operation phase.

3.3.5 Geological Opportunities to Store Carbon

In the past, naturally occurring geologic reservoirs have held oil, natural gas, water, and even carbon dioxide for millions of years with minimal or no leakage. Utilizing these same natural geologic systems, the short- and long-term opportunities for future injection and storage of man-made carbon dioxide emissions are significant. Areas under consideration for implementation of this policy include old gas fields, unmineable coal seams, and deep saline aquifers. The Midwest Regional Carbon Sequestration Partnership is analyzing potential geological carbon sequestration. Over time, the group will examine and measure the initial injection of gas into geologic formations. Before proceeding forward, lawmakers will need to consider regulations regarding subsurface injections of carbon dioxide. A noted benefit would be the potential use of this strategy in regard to enhanced oil and gas recovery, particularly shale gas.

Investment Phase

From 2010 to 2020 a total of four state employees were allocated to the *Geological Opportunities to Store Carbon* strategy. The average annual economic impacts of the investment phase of the strategy can be found in
Figure 75.

Figure 75: Geological Opportunities to Store Carbon—Investment Phase

Year	Employment	Output	Wages
2010	0.4	$30,518	$0
2011	0.4	$0	-$15,259
2012	0.0	$0	$0
2013	0.1	$0	$15,259
2014	0.4	$61,035	$0
2015	0.0	$0	$0
2016	0.5	$0	$15,259
2017	0.0	$61,035	$15,259
2018	0.5	$0	$0
2019	0.5	$61,035	$30,518
2020	0.5	$61,035	$15,259
Average	***0.3***	***$24,969***	***$6,936***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately less than one job, $24,969 in output, and $6,936 in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment due to this strategy is *Sales, office, and administrative occupations*, mainly from the expectation that environmental and geological consultants within this industry will be needed to help with development, planning, and implementation of carbon sequestration associated with this strategy.

Operation Phase

The average annual economic impacts of the operation phase of the *Geological Opportunities to Store Carbon* strategy can be found in Figure 76.

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Figure 76: Geological Opportunities to Store Carbon—Operation Phase

Year	Employment	Output	Wages
2010	138.6	$12,237,549	$2,761,841
2011	193.4	$18,524,170	$4,089,355
2012	226.6	$23,132,324	$5,081,177
2013	243.0	$26,397,705	$5,661,011
2014	250.4	$28,930,664	$6,072,998
2015	251.0	$30,822,754	$6,378,174
2016	248.2	$32,287,598	$6,484,985
2017	244.6	$33,630,371	$6,607,056
2018	236.0	$34,606,934	$6,546,021
2019	225.7	$35,278,320	$6,347,656
2020	217.2	$35,888,672	$6,088,257
Average	***225.0***	***$28,339,733***	***$5,647,139***

Source: RESI

As shown in the figure above, the strategy will support a total of 225 jobs, $28.3 million in output, and $5.6 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Sales, office, and administrative occupations*. Companies will attempt to harness carbon sequestration associated with natural geologic reservoirs because carbon dioxide injections into these reservoirs and the resulting creation, extraction, and consumption of shale and natural gas could potentially offset higher costs associated with energy generation. Savings resulting from decreased energy costs should be passed on to consumers, who will then have more disposable income to spend on a variety of goods and services in many other industries.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $9,101 for the investment phase, and $4,576,841 for the operation phase.

3.3.6 Planting Forests in Maryland

This strategy promotes the implementation and practice of planting forests for carbon sequestration. Initiatives which will be included within this strategy include soil preparation, erosion control, and supplemental planting to ensure optimum conditions to support forest growth. Included in this strategy is the identification of prime areas, including wetlands, in need of physical intervention to return forest habitats to peak conditions. Additional areas for policy initiatives include linking islands of fragmented forests in an effort to restore optimal function, recovering severely disrupted lands, and working toward reversing the effects of continued toxicity to disturbed lands. In a partnership with the General Assembly and other state agencies, DNR will work to achieve a goal of afforestation of 43,030 acres by 2020.

Investment Phase
From 2010 to 2020 a total of $7.7 million was allocated to the *Planting Forests in Maryland* strategy. The average annual economic impacts of the investment phase of the strategy can be found in Figure 77.

Figure 77: Planting Forests in Maryland—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	190.3	$2,258,301	$1,632,690
2012	190.3	$2,380,371	$1,983,643
2013	99.8	$1,190,186	$1,373,291
2014	107.8	$1,190,186	$1,419,067
2015	103.4	$915,527	$1,419,067
2016	100.7	$793,457	$1,419,067
2017	97.2	$671,387	$1,388,550
2018	95.4	$610,352	$1,419,067
2019	93.7	$610,352	$1,373,291
2020	91.9	$488,281	$1,358,032
Average	***106.4***	***$1,009,854***	***$1,344,161***

Source: RESI

As shown in the previous figure, the investment phase of this strategy's implementation will generate approximately 106 jobs, $1.0 million in output, and $1.3 million in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment due to this strategy is *Farming, fishing, and forestry occupations*, primarily due to the expectation that the implementation of this strategy will require planning from experts in forestry-related areas such as soil preparation, erosion control, and supplemental planting.

Operation Phase
The average annual economic impacts of the operation phase of the *Planting Forests in Maryland* strategy can be found in Figure 78.

Figure 78: Planting Forests in Maryland—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.8	$0	$0
2012	0.9	$0	$15,259
2013	0.3	-$30,518	$0
2014	0.3	$0	$0
2015	0.0	$0	$0
2016	0.7	$0	$15,259
2017	0.5	$0	$30,518
2018	0.4	$0	$0
2019	0.0	$0	$15,259
2020	0.0	$0	$0
Average	***0.4***	***-$2,774***	***$6,936***

Source: RESI

As shown in the figure above, the strategy will support a total of less than one job, result in a $2,774 loss in output, and generate $6,936 in wages annually once in operation. The industries experiencing the greatest positive economic impacts in terms of employment due to this strategy are those (such as *Sales, office, and administrative occupations* and *Healthcare occupations)* providing goods and services in demand by households. It is likely that private landowners will experience economic benefits from effective management and operation of this strategy, which will encourage increased household spending as a result.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $673,447 for the investment phase, and $2,689 for the operation phase.

3.3.7 Biomass for Energy Production

In an effort to promote the use of locally produced woody biomass, Maryland will review initiatives using woody biomass in the generation of thermal energy and electricity. Energy derived from forestry by-products can be used to offset fossil fuel-based energy production and associated GHG emissions. Many end users could potentially benefit from this program, such as those consumers who tend to heat or cool large areas over an extended period of time. A feedstock, woody biomass can be used in numerous energy applications. For example, wood chips, forest thinning remnants, and urban wood waste are all included within the category of woody biomass. All of these products can be used to generate thermal power (heat and cooling), electric power, or liquid fuels. Various representatives of state agencies, universities, nonprofits, and businesses comprise the Maryland Wood Energy Coalition. The group’s main goal is to increase adoption of high efficiency and low emission yielding wood energy technologies.

Investment Phase
From 2010 to 2020 a total of $100.0 million was allocated to the *Biomass for Energy Production* strategy. The average annual economic impacts of the investment phase of the strategy can be found in Figure 79.

Figure 79: Biomass for Energy Production—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	38.1	$1,708,984	$869,751
2014	57.0	$2,502,441	$1,358,032
2015	56.3	$2,380,371	$1,449,585
2016	37.1	$1,464,844	$1,022,339
2017	36.1	$1,403,809	$1,037,598
2018	36.0	$1,342,773	$1,052,856
2019	36.2	$1,403,809	$1,098,633
2020	35.8	$1,342,773	$1,098,633
Average	***30.3***	***$1,231,800***	***$817,039***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 30 jobs, $1.2 million in output, and $0.8 million in wages on average each year. The industry experiencing the greatest positive economic impacts in terms of employment resulting from this strategy is *Sales, office, and administrative occupations*, primarily due to the expectation that the creation of woody biomass will be carried out by professionals in this industry. Environmental consultants and experts within the industry will also likely be contracted to provide guidance in the implementation and organization of sustainable woody biomass production.

Operation Phase
The average annual economic impacts of the operation phase of the *Biomass for Energy Production* strategy can be found in Figure 80.

Figure 80: Biomass for Energy Production—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	5.3	$579,834	$152,588
2014	8.9	$976,563	$259,399
2015	11.1	$1,159,668	$381,470
2016	13.0	$1,403,809	$473,022
2017	15.2	$1,647,949	$564,575
2018	16.2	$1,770,020	$610,352
2019	16.3	$1,892,090	$671,387
2020	15.6	$1,892,090	$656,128
Average	***9.2***	***$1,029,275***	***$342,629***

Source: RESI

As shown in the figure above, the strategy will support a total of 9 jobs, $1.0 million in output, and $0.3 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment due to this strategy is *Construction,* primarily from the expectation that the use of woody biomass which was produced during implementation of this strategy will benefit energy-producing entities which switch to this type of fuel as it is more energy efficient. Other industries will experience slight gains from the energy cost savings passed on by utilities, and residential consumers also experiencing these energy cost savings will spend more on other goods and services.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $368,176 for the investment phase, and $210,694 for the operation phase.

3.3.8 Conservation of Agricultural Land for GHG Benefits

MDA is working toward the preservation of agricultural lands and wetlands to promote pollutant emissions reductions. The benefits associated with the creation of protected lands and open space encourage the growth of natural wildlife habitats and reduce sediment and nutrient loss. With over 2,000,000 acres registered as farm land, the agricultural sector remains one of The State’s largest industries. To continue preservation and working toward GHG emissions reduction goals, MDA will work with various agencies to establish a network of conservation practices, strategies, and programs.

Investment Phase

The average annual economic impacts of the investment phase of the *Conservation of Agricultural Land for GHG Benefits* strategy can be found in Figure 81.

Figure 81: Conservation of Agricultural Land for GHG Benefits—Investment Phase

Year	Employment	Output	Wages
2010	148.8	$11,474,609	$5,371,094
2011	151.6	$11,627,197	$5,828,857
2012	150.9	$11,596,680	$6,179,810
2013	111.6	$8,544,922	$4,989,624
2014	107.4	$8,392,334	$5,081,177
2015	102.1	$8,056,641	$5,157,471
2016	99.4	$7,995,605	$5,279,541
2017	97.9	$7,995,605	$5,386,353
2018	97.0	$7,995,605	$5,569,458
2019	96.1	$8,056,641	$5,676,270
2020	94.6	$7,995,605	$5,752,563
Average	***114.3***	***$9,066,495***	***$5,479,292***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 114 jobs, $9.1 million in output, and $5.5 million in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment due to this strategy is *Sales, office, and administrative occupations.* It is expected that new employees will be hired to manage and track the conservation of agricultural lands.

Operation Phase

The total economic impacts of the operation phase of the *Conservation of Agricultural Land for GHG Benefits* strategy can be found in Figure 82.

Figure 82: Conservation of Agricultural Land for GHG Benefits—Operation Phase

Year	Employment	Output	Wages
2010	571.5	$134,063,721	$23,452,759
2011	579.4	$134,246,826	$26,809,692
2012	563.9	$132,812,500	$28,808,594
2013	402.3	$98,693,848	$23,818,970
2014	365.4	$96,160,889	$23,483,276
2015	334.5	$93,872,070	$23,162,842
2016	313.5	$92,285,156	$22,811,890
2017	299.6	$91,186,523	$22,644,043
2018	288.0	$90,332,031	$22,506,714
2019	284.3	$89,904,785	$22,308,350
2020	283.3	$89,599,609	$22,186,279
Average	***389.6***	***$103,923,451***	***$23,817,583***

Source: RESI

As shown in the figure above, the strategy will support a total of 390 jobs, $103.9 million in output, and $23.8 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment resulting from this strategy is *Farm, fishing, and forestry occupations*, primarily due to the increased demand for individuals familiar with agricultural land and productive uses.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $204,733 for the investment phase, and $14,106,601 for the operation phase.

3.3.9 Buy Local for GHG Benefits

Local agriculture is one of the largest sectors of Maryland's economy. Through a "Buy Local" program created by MDA, local farms within The State receive support promoting them as preferred food sources for Marylanders. This program assists agricultural producers who are native to Maryland in marketing their products directly to supermarkets, food service, institutional buyers, and other wholesale buyers within The State. The sale and consumption of locally grown products can provide a variety of environmental and health benefits. MDA will work alongside other agencies to continue encouraging Maryland residential and commercial customers to buy locally.

Investment Phase

The total economic impacts of the investment phase of the *Buy Local for GHG Benefits* strategy can be found in Figure 83.

Figure 83: Buy Local for GHG Benefits—Investment Phase

Year	Employment	Output	Wages
2010	61.4	$4,730,225	$2,197,266
2011	62.4	$4,791,260	$2,380,371
2012	62.3	$4,821,777	$2,548,218
2013	21.5	$1,617,432	$1,113,892
2014	19.5	$1,525,879	$1,022,339
2015	17.6	$1,403,809	$1,007,080
2016	16.6	$1,342,773	$1,007,080
2017	17.2	$1,403,809	$1,022,339
2018	16.6	$1,342,773	$1,068,115
2019	16.8	$1,464,844	$1,052,856
2020	16.4	$1,403,809	$1,068,115
Average	***29.9***	***$2,349,854***	***$1,407,970***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 30 jobs, $2.3 million in output, and $1.4 million in wages on average each year. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Professional, scientific, and technical services*, primarily due to the expectation that as popularity for buying local continues, Maryland may need to increase assistance to farmers in expanding their local farms to accommodate demand.

Operation Phase

The average annual economic impacts of the operation phase of the *Buy Local for GHG Benefits* strategy can be found in Figure 84.

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Figure 84: Buy Local for GHG Benefits—Operation Phase

Year	Employment	Output	Wages
2010	30.5	$7,141,113	$1,235,962
2011	30.9	$7,141,113	$1,403,809
2012	30.8	$7,141,113	$1,556,396
2013	28.7	$6,988,525	$1,602,173
2014	27.2	$6,866,455	$1,647,949
2015	24.1	$6,652,832	$1,663,208
2016	23.7	$6,591,797	$1,663,208
2017	22.4	$6,591,797	$1,647,949
2018	21.5	$6,408,691	$1,678,467
2019	20.1	$6,408,691	$1,647,949
2020	19.4	$6,347,656	$1,602,173
Average	***25.4***	***$6,752,708***	***$1,577,204***

Source: RESI

As shown in the figure above, the strategy will support a total of 25 jobs, $6.8 million in output, and $1.6 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Farming, fishing, and forestry occupations*. As buying locally continues to be encouraged, more retailers will begin to purchase Maryland-sourced goods to meet increased demand.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate approximately $580,299 for the investment phase, and $905,009 for the operation phase.

3.3.10 Nutrient Trading for GHG Benefits

Carbon credits and enhanced nutrient credits could potentially be stacked as tradable commodities within the Maryland Nutrient Trading Program. Through the sale of credits, MDA seeks to reduce GHG emissions, improve water quality, reduce fertilizer runoff and emissions, reduce soil erosion, restore wetlands and wildlife habitats, and provide supplemental income to farmers and foresters. Other strategy goals include promoting Smart Growth initiatives which preserve agricultural and forested lands. The development of a marketplace for nutrient and carbon trading will create new employment opportunities for individuals and companies seeking to gain a competitive advantage in a newly defined industry.

Investment Phase

The average annual economic impacts of the investment phase of the *Nutrient Trading for GHG Benefits* strategy can be found in Figure 85.

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Figure 85: Nutrient Trading for GHG Benefits—Investment Phase

Year	Employment	Output	Wages
2010	6.4	$488,281	$244,141
2011	6.7	$488,281	$228,882
2012	7.0	$518,799	$274,658
2013	12.3	$915,527	$503,540
2014	12.0	$976,563	$503,540
2015	11.1	$854,492	$518,799
2016	10.8	$854,492	$564,575
2017	10.9	$854,492	$579,834
2018	10.7	$854,492	$595,093
2019	10.2	$854,492	$579,834
2020	9.2	$793,457	$549,316
Average	***9.7***	***$768,488***	***$467,474***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 10 jobs, $768,488 in output, and $467,474 in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment due to this strategy is *Agriculture, forestry, fishing, and hunting*. Nutrient trading program will provide incremental revenues to farmers and landowners allowing them to expand their business. The strategy will also generate employment opportunities in industries facilitating the credit-trading market, such as in *Management, business, and financial occupations* and *Professional, scientific, and technical services*.

Operation Phase

The average annual economic impacts of the operation phase of the *Nutrient Trading for GHG Benefits* strategy can be found in Figure 86**.**

Figure 86: Nutrient Trading for GHG Benefits—Operation Phase

Year	Employment	Output	Wages
2010	95.5	$6,744,385	$2,960,205
2011	97.0	$6,805,420	$3,219,604
2012	95.7	$6,744,385	$3,402,710
2013	93.3	$6,561,279	$3,524,780
2014	90.7	$6,469,727	$3,616,333
2015	86.5	$6,225,586	$3,723,145
2016	84.1	$6,042,480	$3,784,180
2017	82.6	$5,981,445	$3,921,509
2018	80.2	$5,859,375	$3,982,544
2019	77.7	$5,859,375	$4,013,062
2020	75.8	$5,798,340	$4,043,579
Average	***87.2***	***$6,281,072***	***$3,653,786***

Source: RESI

As shown in the figure above, the strategy will support a total of 87 jobs, $6.3 million in output, and $3.6 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Sales, office, and administrative occupations*. It is expected that, as nutrient markets continue to grow in popularity, many participants will seek to hire their own managers for these markets.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $202,118 for the investment phase, and $1,547,337 for the operation phase.

3.4 Recycling

3.4.1 Recycling and Source Reduction

In an effort to save energy, reduce GHGs and other pollutants generated in the manufacturing process and landfills, save natural resources, and reduce the amount of waste disposed annually, Maryland is seeking goals which promote waste diversion through this strategy. Continued promotion and encouragement of waste diversion will require the collaborative efforts of Maryland's jurisdictions and the public and private sectors. Through cooperation among various state agencies within Maryland, efforts to oversee the creation of a developed market for recyclable materials to increase diversion of waste from landfills will be undertaken. The main waste generation goal supported by MDE through this strategy is to maintain a maximum 1.36 tons per person per year of waste generation by increasing the source reduction credit rate achieved from 3.55 percent in 2006 to 3.98 percent in 2012, 4.20 percent in 2015, and 4.56 percent in 2020.

Investment Phase

The average annual economic impacts of the investment phase of the *Recycling and Source Reduction* strategy can be found in Figure 87.

Figure 87: Recycling and Source Reduction—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.0	$0	$0
2014	0.0	$0	$0
2015	0.0	$0	$0
2016	0.0	$0	$0
2017	0.0	$0	$0
2018	0.0	$0	$0
2019	0.0	$0	$0
2020	0.0	$0	$0
Average	***0.0***	***$0***	***$0***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will not impact jobs, output, or wages.

Operation Phase
The average annual economic impacts of the operation phase of the *Recycling and Source Reduction* strategy can be found in Figure 88..

Figure 88: Recycling and Source Reduction—Operation Phase

Year	Employment	Output	Wages
2010	-58.6	-$4,455,566	-$2,441,406
2011	-47.0	-$3,479,004	-$2,319,336
2012	-36.0	-$2,471,924	-$2,182,007
2013	-26.2	-$1,678,467	-$2,014,160
2014	-16.4	-$854,492	-$1,892,090
2015	-10.7	-$366,211	-$1,754,761
2016	-4.2	$122,070	-$1,647,949
2017	0.8	$549,316	-$1,495,361
2018	3.9	$793,457	-$1,434,326
2019	4.5	$915,527	-$1,434,326
2020	4.4	$915,527	-$1,464,844
Average	***-16.9***	***-$909,979***	***-$1,825,506***

Source: RESI

As shown in the figure above, the strategy will result in a loss of 17 jobs, $0.9 million in output, and $1.8 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment due to this strategy is *Transportation, and material moving occupations*, primarily due to the expectation that successful recycling and source reduction will increase reuse of materials, which will then result in increased need for curbside pickup and recycling facility maintenance.

Fiscal Impacts
As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues will not be impacted for the investment phase, and will increase by $5,278,091 for the operation phase.

3.5 Buildings

3.5.1 Building Codes

The adoption of statewide building codes for Maryland Building Performance Standards is the responsibility of DHCD. DHCD amends and proposes state and/or local building codes to include minimum energy efficiency requirements and updates energy efficiency codes which provide long-term GHG savings. Maryland's core building codes are based on two International Code Council publications per mandatory statue. These publications are the International Business Code and the International Residential Code. In an effort to promote energy efficiency, the adoption of the latest statewide building codes will apply to new and renovated buildings.

Through the most recent adoption of standards, energy efficiency improvements are estimated to achieve a 15 percent consumption reduction over previous 2006 standards.

Investment Phase

The average annual economic impacts of the investment phase of the *Building Codes* strategy can be found in Figure 89.

Figure 89: Building Codes—Investment Phase

Year	Employment	Output	Wages
2010	19.5	$1,495,361	$671,387
2011	23.1	$1,739,502	$839,233
2012	21.7	$1,647,949	$869,751
2013	21.4	$1,617,432	$915,527
2014	20.5	$1,647,949	$915,527
2015	18.9	$1,525,879	$930,786
2016	19.3	$1,525,879	$976,563
2017	18.8	$1,525,879	$976,563
2018	19.2	$1,525,879	$1,052,856
2019	18.3	$1,586,914	$1,068,115
2020	18.6	$1,525,879	$1,068,115
Average	***19.9***	***$1,578,591***	***$934,948***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 20 jobs, $1.6 million in output, and $0.9 million in wages on average. The industries experiencing the greatest positive economic impacts in terms of employment due to this strategy are *Sales, office, and administrative occupations*, primarily due to the expectation that implementation of new building codes will result in the need for new training associated with repair and maintenance and new construction projects which will require building code inspectors, construction workers, site managers, architects, engineers, and other building professionals in these two industries.

Operation Phase

Operational impacts were reviewed as the marginal impact from the increased code changes for green initiatives. Impacts reflect a three percent marginal change the construction industry would need to make to adhere to new codes and speciality contractors. The average annual economic impacts of the operation phase of the *Building Codes* strategy can be found in Figure 90.

Figure 90: Building Codes—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	99.3	$10,649,414	$3,336,639
2012	102.7	$11,028,442	$3,648,376
2013	103.4	$11,213,379	$3,855,286
2014	103.1	$11,423,950	$4,099,731
2015	102.1	$11,585,083	$4,309,387
2016	100.9	$11,729,736	$4,498,444
2017	99.7	$11,878,052	$4,676,056
2018	98.8	$12,117,920	$4,877,472
2019	97.3	$12,218,628	$4,986,877
2020	96.6	$12,363,281	$5,104,980
Average	***91.3***	***$10,564,353***	***$3,944,841***

Source: RESI

As shown in the figure above, the strategy will support a total of 91 jobs, $10.6 million in output, and $3.9 million in wages annually once in operation. The industries experiencing the greatest positive economic impacts in terms of employment due to this strategy are those (such as *Sales, office, and administrative occupations* and *Management, business, and financial occupations*) associated with goods and services which will be in demand by existing households which have increased their income due to the new job training required during implementation of this strategy as well as new households associated with job creation during implementation.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $398,903 for the investment phase, and $58,574,839 for the operation phase.

3.5.2 BeSMART

Reduction in energy consumption can begin at the local level in most cases, and the use of energy represents about 70 percent of GHG emissions. Specifically, buildings represent approximately 48 percent of the total energy consumed. Through a collaborative effort, the DHCD works with other state government agencies to support a variety of energy reduction initiatives. These programs include energy audits and energy efficiency retrofits for residential and commercial buildings, development and implementation of advanced building codes and inspections, and creation of financial incentive programs for energy efficiency. Funding for many of these initiatives is provided to local government agencies in the form of grants administered by DHCD, and combined state and federal initiatives. Overall goals strive to achieve energy consumption reductions on the local level and set a primary example for future Maryland residents and business leaders.

Investment Phase

Investment impacts were reviewed as the marginal impact from the increased changes in costs for green initiatives. Impacts reflect a three percent marginal change required to adhere to new green project costs. The average annual economic impacts of the investment phase of the *BeSMART* strategy can be found in Figure 91.

Figure 91: BeSMART—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	3.0	$235,291	$111,237
2012	1.3	$101,624	$55,389
2013	0.0	-$2,747	$6,409
2014	0.0	-$3,662	$2,289
2015	-0.1	-$9,155	-$458
2016	-0.1	-$9,155	-$1,373
2017	-0.1	-$9,155	-$1,831
2018	-0.1	-$9,155	-$3,204
2019	-0.1	-$5,493	-$2,747
2020	-0.1	-$5,493	-$3,204
Average	***0.3***	***$25,718***	***$14,773***

Source: RESI

As shown in the figure above, investment phase of this strategy's implementation will generate approximately less than one job, $25,718 in output, and $14,773 in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Sales, office, and administrative occupations*, primarily due to the expectation that buildings in need of energy audits and energy efficiency retrofits will be audited and retrofitted by energy and environmental consultants within this industry.

Operation Phase

The average annual economic impacts of the operation phase of the *BeSMART* strategy can be found in Figure 92.

Figure 92: BeSMART—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.1	$0	$0
2014	0.3	$30,518	$0
2015	0.1	$0	$0
2016	-0.1	$0	$0
2017	0.0	$0	$15,259
2018	0.1	$0	-$15,259
2019	-0.4	$0	$15,259
2020	-0.5	$0	$15,259
Average	***0.0***	***$2,774***	***$2,774***

Source: RESI

As shown in the figure above, the strategy will generate $2,774 in output, and $2,774 in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Management of companies and enterprises*, primarily due to the expectation that operation of this strategy will likely require management of funds distributed through the Energy Efficiency and Conservation Block Program. Another top-gaining industry is *Health care and social assistance*, which is driven by indirect and induced job creation in healthcare associated with the relatively high job creation from *Management of companies and enterprises* and other industries. The new employees and households directly associated with this policy as well as the indirect beneficiaries of the grant program will increase demand for healthcare.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $236,564 for the investment phase, and $1,339 for the operation phase.

3.5.3 Weatherization and Energy Efficiency for Low-Income Houses

Energy reduction at the residential level includes the purchase of energy efficiency upgrades and modifications to existing features such as weatherization of buildings. The benefits from these initiatives usually result in lower utility bills, typically offsetting previously incurred costs during investment. For some households, implementation of these features can be costly when considered as a percentage of average weekly wages. In an effort to make energy efficiency upgrades and modifications more accessible, the DHCD works with other government agencies to incorporate energy efficiency into affordable rental housing developments and eligible low-income households. DHCD also provides education and training on the benefits of energy efficiency in affordable rental housing and assists eligible low-income households with energy audits and the installation of energy conservation materials in their dwelling units. Other collaborative projects include working with other state and federal agencies to support energy audits and retrofits within residential and commercial buildings.

Investment Phase

Investment impacts were reviewed as the marginal impact from the increased changes in costs for green initiatives. Impacts reflect a three percent marginal change required to adhere to new green project costs. The average annual economic impacts of the investment phase of the *Weatherization and Energy Efficiency for Low-Income Houses* strategy can be found in Figure 93.

Figure 93: Weatherization and Energy Efficiency for Low-Income Houses—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	33.3	$2,596,436	$1,263,428
2013	33.7	$2,615,662	$1,368,713
2014	33.4	$2,616,577	$1,461,639
2015	-0.8	-$95,215	$122,223
2016	-2.1	-$181,274	$31,128
2017	-2.7	-$217,896	-$27,924
2018	-2.7	-$223,389	-$65,002
2019	-2.4	-$199,585	-$80,566
2020	-2.0	-$173,950	-$85,144
Average	***8.0***	***$612,488***	***$362,590***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 8 jobs, $0.6 million in output, and $0.4 million in wages on average each year. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Sales, office, and administrative occupations,* primarily due to the expectation that the policy will drive increased demand for energy auditing services, which are contained within this industry. Another top-gaining industry is *Construction*, which includes repair and maintenance associated with weatherization.

Operation Phase

The average annual economic impacts of the operation phase of the *Weatherization and Energy Efficiency for Low-Income Houses* strategy can be found in Figure 94.

Figure 94: Weatherization and Energy Efficiency for Low-Income Houses—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	1.6	-$91,553	$30,518
2013	0.6	-$122,070	$15,259
2014	1.5	-$61,035	$15,259
2015	-0.9	-$61,035	-$15,259
2016	-0.5	-$61,035	-$15,259
2017	0.3	$0	$0
2018	0.6	$0	$0
2019	0.1	$61,035	$0
2020	0.4	$61,035	$0
Average	***0.3***	***-$24,969***	***$2,774***

Source: RESI

As shown in the figure above, the strategy will support less than one job, result in a loss of $24,969 in output, and generate $2,774 in wages annually once in operation. The industries experiencing the greatest positive economic impacts in terms of employment as a result of this strategy are *Health care occupations* and *Building, grounds, personal care, and service occupations*). It is expected that households receiving weatherization services as a result of this policy will save on energy costs and experience an increase in disposable income, which will be spent on a wide variety of goods and services in such industries.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $5,614,756 during the investment phase, and $1,704 during the operation phase.

3.6 Land Use

3.6.1 Reducing Transportation Issues through Smart Growth

Through a collaborative effort of MDP, other state agencies, and the Sustainable Growth Commission, strategies and suggestions are being developed to reduce Marylanders' dependence on motor vehicle travel. Specifically, the development of incentives and requirements for future development projects and regional land use patterns with an overall goal to achieve transportation-related land use and location efficiency will help reduce single-occupant travel. The combination of development projects and land use patterns will result in shorter trip lengths; reduced reliance on automobile and truck travel; and increased use of alternative transportation modes to reach employment, shopping, recreation, education, and religious and commercial destinations. This strategy's goal is to reduce VMTs and consumption of fossil fuels, thus reducing GHG emissions.

Investment Phase
The average annual economic impacts of the investment phase of the *Reducing Transportation Issues through Smart Growth* strategy can be found in Figure 95.

Figure 95: Reducing Transportation Issues through Smart Growth—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.0	$0	$0
2014	0.0	$0	$0
2015	0.0	$0	$0
2016	0.0	$0	$0
2017	0.0	$0	$0
2018	0.0	$0	$0
2019	0.0	$0	$0
2020	0.0	$0	$0
Average	***0.0***	***$0***	***$0***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will not impact jobs, output, or wages.

Operation Phase
The average annual economic impacts of the operation phase of the *Reducing Transportation Issues through Smart Growth* strategy can be found in Figure 96..

Figure 96: Reducing Transportation Issues through Smart Growth—Operation Phase

Year	Employment	Output	Wages
2010	78.2	$4,608,154	$1,800,537
2011	229.6	$13,458,252	$5,416,870
2012	-2.3	-$366,211	$305,176
2013	-6.9	-$701,904	$61,035
2014	-7.8	-$732,422	-$61,035
2015	-9.6	-$854,492	-$183,105
2016	-8.8	-$793,457	-$228,882
2017	-7.3	-$671,387	-$213,623
2018	-6.3	-$610,352	-$198,364
2019	-4.6	-$427,246	-$167,847
2020	-3.8	-$427,246	-$152,588
Average	***22.8***	***$1,134,699***	***$579,834***

Source: RESI

As shown in the figure above, the strategy will support a total of 22.8 jobs, $1.1 million in output, and $0.6 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment from this strategy is *Sales, office, and administrative occupations,* primarily due to the expectation that as programs continue through year one, localities will move into new phases of design and further integration of other initiatives associated with Smart Growth.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $789,139 during the investment phase, and $8,984,315 during the operation phase.

3.6.2 GHG Targets for Local Government’s Transportation and Land Use Planning

Local governments within Maryland are seeking to implement land use policies which will support compact, transit-oriented development in suburban cores. These policies will reduce VMTs, preserve natural areas which serve to sequester carbon, and create more compact, energy-efficient buildings. This strategy aims for dense, transit-oriented, and sustainable development in local and municipal core growth areas. Overall, job growth under this policy will primarily result from the construction sector and transit vehicle manufacturing sector.

Investment Phase

The average annual economic impacts of the investment phase of the *GHG Targets for Local Government’s Transportation and Land Use Planning* strategy can be found in Figure 97.

Figure 97: GHG Targets for Local Government’s Transportation and Land Use Planning—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.0	$0	$0
2014	0.0	$0	$0
2015	0.0	$0	$0
2016	0.0	$0	$0
2017	0.0	$0	$0
2018	0.0	$0	$0
2019	0.0	$0	$0
2020	0.0	$0	$0
Average	***0.0***	***$0***	***$0***

Source: RESI

As shown in the figure above, the investment phase of this strategy’s implementation will not impact jobs, output, or wages.

Operation Phase

The average annual economic impacts of the operation phase of the *GHG Targets for Local Government's Transportation and Land Use Planning* strategy can be found in Figure 98.

Figure 98: GHG Targets for Local Government's Transportation and Land Use Planning—Operation Phase

Year	Employment	Output	Wages
2010	67.9	-$1,129,150	$854,492
2011	62.4	-$1,403,809	$823,975
2012	56.7	-$1,708,984	$808,716
2013	52.3	-$1,953,125	$747,681
2014	48.2	-$2,105,713	$686,646
2015	44.1	-$2,319,336	$656,128
2016	41.9	-$2,441,406	$610,352
2017	40.4	-$2,502,441	$595,093
2018	37.8	-$2,624,512	$579,834
2019	36.0	-$2,624,512	$534,058
2020	34.0	-$2,685,547	$503,540
Average	***47.4***	***-$2,136,230***	***$672,774***

Source: RESI

As shown in the figure above, the strategy will support a total of 47 jobs, decrease output by $2.1 million, and and increase in wages by $0.7 million annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment from this strategy is *Construction, extraction occupations,* primarily due to the expectation that construction employees will be needed as transit-oriented developments continue to be planned and maintained. Other industries benefitting from operation of this strategy are those positively impacted by spending from households within the residential portions of new transit-oriented developments.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues will not be impacted during the investment phase, and will increase by $6,061,311 during the operation phase.

3.6.3 Land Use Planning GHG Benefits

Population growth continues to produce traffic congestion, greater demand on resources, loss of green spaces, and other undesirable consequences throughout The State of Maryland. Through properly managed growth, communities can work towards mitigation of the negative effects associated with expansion in order to reduce GHG emissions. MDP's Smart Growth outlines four goals: support for existing communities by targeting resources for support of development in areas of existing infrastructure; conservation of the most valuable and scare natural resources; taxpayer cost savings associated with enhanced building infrastructure intended to serve development which has spread out of regional hubs; and providing Marylanders with a high quality of life, no matter their place of residence within The State's borders. Benefits from these

Smart Growth principles include minimizing air and water pollution, encouraging brownfields clean-up and reuse, and preserving natural lands.

Investment Phase

The average annual economic impacts of the investment phase of the *Land Use Planning GHG Benefits* strategy can be found in Figure 99.

Figure 99: Land Use Planning GHG Benefits—Investment Phase

Year	Employment	Output	Wages
2010	162.5	$12,542,725	$5,844,116
2011	378.3	$29,205,322	$14,190,674
2012	1.2	-$152,588	$930,786
2013	-7.5	-$732,422	$411,987
2014	-12.5	-$1,007,080	$30,518
2015	-14.4	-$1,159,668	-$198,364
2016	-14.2	-$1,159,668	-$335,693
2017	-12.3	-$1,037,598	-$381,470
2018	-10.6	-$976,563	-$427,246
2019	-8.0	-$732,422	-$381,470
2020	-5.7	-$549,316	-$335,693
Average	***41.5***	***$3,112,793***	***$1,758,922***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 42 jobs, $3.1 million in output, and $1.8 million in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment due to this strategy is *Sales, office, and administrative occupations.* Planning of land management should require skilled engineers as well as transportation consultants in order to complete projects associated with this strategy through the proper allocation of scarce natural resources and most efficient plans for newly constructed areas.

Operation Phase

The average annual economic impacts of the operation phase of the *Land Use Planning GHG Benefits* strategy can be found in Figure 100.

Figure 100: Land Use Planning GHG Benefits—Operation Phase

Year	Employment	Output	Wages
2010	492.2	$28,961,182	$11,260,986
2011	487.1	$28,350,830	$11,947,632
2012	473.0	$27,130,127	$12,359,619
2013	458.8	$25,726,318	$12,588,501
2014	444.1	$24,505,615	$12,893,677
2015	-46.9	-$5,004,883	$228,882
2016	-57.5	-$5,737,305	-$823,975
2017	-57.8	-$5,737,305	-$1,449,585
2018	-52.1	-$5,432,129	-$1,754,761
2019	-42.9	-$4,638,672	-$1,739,502
2020	-32.4	-$3,906,250	-$1,571,655
Average	***187.8***	***$9,474,321***	***$4,903,620***

Source: RESI

As shown in the figure above, the strategy will support a total of 188 jobs, $9.5 million in output, and $4.9 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment from this strategy is *Construction and extraction occupations*, primarily due to the expectation that positions at the Maryland Department of Planning (and any other participating government agencies) will be created or retained in order to manage land use planning efforts under this strategy.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $789,139 during the investment phase $8,94,315 during the operation phase.

3.6.4 Growth Boundary GHG Benefits

To preserve existing communities, Maryland established Priority Funding Areas, targeting State resources to build on past investments, and reduced development pressure on critical farmland and natural resource areas. Through encouragement of projects in already developed areas, Priority Funding Areas will reduce the GHG emissions associated with continued urban and suburban sprawl in Maryland. By definition, Priority Funding Areas refer to areas of geographic growth defined under State law and designated by local jurisdictions. They provide a map for targeting State investment for infrastructure. This strategy will also provide environmental and economic benefits. The conservation and creation of green space in the rural, suburban, and urban communities will improve the quality of life by providing places where neighbors can congregate and recreate. Savings resulting from reduced spending on transportation fuels and vehicles can then be directed to spending on in-state produced goods and services. In turn, this increase in household spending should produce benefits to Maryland's economy.

Investment Phase

The average annual economic impacts of the investment phase of the *Growth Boundary GHG Benefits* strategy can be found in Figure 101.

Figure 101: Growth Boundary GHG Benefits—Investment Phase

Year	Employment	Output	Wages
2010	14,094.4	$1,207,275,391	$687,026,978
2011	10,512.8	$951,354,980	$676,895,142
2012	7,867.0	$757,720,947	$665,084,839
2013	5,687.6	$597,778,320	$647,598,267
2014	4,208.0	$489,471,436	$642,471,313
2015	3,070.5	$407,043,457	$638,839,722
2016	2,222.7	$346,984,863	$637,832,642
2017	1,641.3	$307,189,941	$640,518,188
2018	0.0	$0	$0
2019	0.0	$0	$0
2020	0.0	$0	$0
Average	***6,163.0***	***$633,102,417***	***$654,533,386***

Source: RESI

As shown in the previous figure, the investment phase of this strategy's implementation will generate approximately 6,163 jobs, $633.1 million in output, and $654.5 million in wages on average[10]. The industry experiencing the greatest positive economic impacts in terms of employment due to this strategy is *Protective service occupations*, resulting from the expectation that companies may seek to expand. During that period companies will need additional security to ensure personnel safety.

Operation Phase

The average annual economic impacts of the operation phase of the *Growth Boundary GHG Benefits* strategy can be found in Figure 102.

Figure 102: Growth Boundary GHG Benefits—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.0	$0	$0
2014	0.0	$0	$0
2015	0.0	$0	$0
2016	0.0	$0	$0
2017	2,843.1	$187,011,719	$88,821,411
2018	3,583.4	$233,337,402	$121,719,360
2019	3,907.4	$254,943,848	$141,357,422
2020	4,014.3	$263,244,629	$153,213,501
Average	***3,587.1***	***$234,634,399***	***$126,277,924***

Source: RESI

[10] This strategy does not have economic impacts in the years that have zero values, therefore the average is taken for only the years when the strategy is active. This applies throughout the report.

As shown in the figure above, the strategy will support a total of 3,587 jobs, $234.6 million in output, and $126.3 million in wages annually once in operation. The industries experiencing the greatest positive economic impacts in terms of employment due to this strategy are those (such as *Construction)* which would benefit from the increase in spending attributed to the continued maintenance and operation of the growth boundaries.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $89,079,743 during the investment phase and $29,033,061 during the operation phase.

3.7 Innovative Initiatives

3.7.1 Leadership-by-Example – Local Government

This strategy seeks not only to fulfill a set of tasks, but also to provide direction for others. As Maryland strives to achieve a 20 percent reduction of GHG emissions by 2020 (from the 2006 baseline), leadership by example will emerge as an essential element and become increasingly important as more businesses and households look toward The State for guidance in regards to GHG emissions reductions. In partnership with Maryland state agencies, county and municipal governments are initiating the adoption of policies and practices to obtain high performance and energy-efficient buildings, facilities, and vehicle fleets. An additional step includes reducing the carbon footprint in purchasing, procurement, and other government operations. Some areas within Maryland have conducted GHG inventories on a jurisdictional level, adopted climate action plans and targets, and implemented tracking protocols, such as those provided by the International Council for Local Environmental Initiatives. Where local government protocols for the tracking of quantifiable reductions exist, MDE conducted a survey to track actual and projected success in GHG emissions reductions. Through MDE's statewide survey data results, a snapshot of 2010 actual local government GHG reduction was obtained.

Investment Phase

The average annual economic impacts of the investment phase of the *Leadership-by-Example – Local Government* strategy can be found in Figure 103.

Figure 103: Leadership-by-Example – Local Government—Investment Phase

Year	Employment	Output	Wages
2010	168.6	$13,031,006	$6,072,998
2011	172.5	$13,244,629	$6,637,573
2012	170.4	$13,153,076	$6,988,525
2013	167.2	$12,908,936	$7,217,407
2014	162.4	$12,725,830	$7,492,065
2015	157.2	$12,512,207	$7,720,947
2016	153.6	$12,329,102	$7,934,570
2017	151.0	$12,268,066	$8,148,193
2018	148.4	$12,207,031	$8,377,075
2019	145.7	$12,207,031	$8,544,922
2020	144.5	$12,207,031	$8,682,251
Average	***158.3***	***$12,617,631***	***$7,619,684***

Source: RESI

As shown in the previous figure, the investment phase of this strategy's implementation will generate approximately 158 jobs, $12.6 million in output, and $7.6 million in wages on average. The industries experiencing the greatest positive economic impacts in terms of employment due to this strategy are *Sales, office, and administrative occupations*, primarily due to the expectation that state government must lead by example by obtaining high performance and energy-efficient buildings, among other measures. Environmental consultants will also likely be contracted to assist in the creation of GHG inventories, climate action plans and targets, and inventory and emissions tracking protocols.

Operation Phase

The average annual economic impacts of the operation phase of the *Leadership-by-example – Local Government* strategy can be found in Figure 104.

Figure 104: Leadership-by-Example – Local Government—Operation Phase

Year	Employment	Output	Wages
2020	1,837.4	$109,313,965	$103,195,190
2021	1,706.1	$100,830,078	$107,574,463
2022	1,620.1	$94,909,668	$111,572,266
2023	1,558.5	$90,759,277	$115,295,410
2024	1,514.9	$87,707,520	$118,865,967
2025	1,484.2	$85,571,289	$122,528,076
Average	***1,620.2***	***$94,848,633***	***$113,171,895***

Source: RESI

As shown in the figure above, the strategy will support a total of 1,620 jobs, $94.8 million in output, and $113.2 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment due to this strategy is *Sales, office, and administrative occupations*. Leading by example will result in higher efficiency and subsequent cost savings for local governments, which will in turn be able to support additional employment. Other industry sectors will benefit from the ongoing sustainable procurement activities of local governments. It is important to note that some strategies have operation phase impacts after 2020. This was done to capture the full effect of the strategy in cases where at least five years of operation could not be quantified prior to 2020. In any case, operation phase impacts were not quantified for years after 2025. This applies throughout the report.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would increase by approximately $3,140,436 during the investment phase, and $20,478,272 for the operation phase.

3.7.2 Leadership-by-Example – Federal Government

Under this strategy, federal agencies with installations located in Maryland would be required to implement a comprehensive collection of lead-by-example programs which aim to improve efficiency, reduce waste, and integrate renewable energy and sustainable practices into facility operations. An established tool used to measure for a benchmark and track energy use along with GHG emissions would be necessary to achieve lead-by-example standards. Other goals of the federal government installations' lead-by-example programs include transparency, progress reports, targets, and defined objectives. Program examples include energy reduction in public buildings, facilities, and lands; improved fuel efficiency for fleet vehicles; water conservation, waste reduction, and recycling; the purchasing of products and services with lower life-cycle impacts; and the increased use of renewable energy.

Investment Phase

The average annual economic impacts of the investment phase of the *Leadership-by-Example – Federal Government* strategy can be found in Figure 105.

Figure 105: Leadership-by-Example – Federal Government—Investment Phase

Year	Employment	Output	Wages
2010	105.9	$8,178,711	$3,814,697
2011	108.0	$8,300,781	$4,135,132
2012	106.8	$8,239,746	$4,394,531
2013	105.2	$8,117,676	$4,547,119
2014	102.5	$8,056,641	$4,745,483
2015	98.2	$7,812,500	$4,837,036
2016	96.6	$7,751,465	$4,989,624
2017	94.1	$7,690,430	$5,142,212
2018	91.9	$7,629,395	$5,279,541
2019	90.3	$7,629,395	$5,355,835
2020	88.5	$7,507,324	$5,416,870
Average	***98.9***	***$7,901,278***	***$4,787,098***

Source: RESI

As shown in the previous figure, the investment phase of this strategy's implementation will generate approximately 99 jobs, $7.9 million in output, and $4.8 million in wages on average. The industries experiencing the greatest positive economic impacts in terms of employment from to this strategy are *Sale, office, and administrative occupations,* primarily due to the expectation that federal government must lead by example by obtaining high performance and energy-efficient buildings, among other measures. Environmental consultants will also likely be contracted to assist and advise in the planning and implementation of efficiency improvements, waste reduction, water conservation, renewable energy use, and other measures.

Operation Phase

The average annual economic impacts of the operation phase of the *Leadership-by-Example – Federal Government* strategy can be found in Figure 106.

Figure 106: Leadership-by-Example – Federal Government—Operation Phase

Year	Employment	Output	Wages
2020	1,258.4	$92,102,051	$68,771,362
2021	1,220.6	$89,782,715	$73,303,223
2022	1,185.2	$87,463,379	$76,843,262
2023	1,149.1	$85,144,043	$79,620,361
2024	1,117.4	$83,068,848	$82,061,768
2025	1,091.1	$81,359,863	$84,289,551
Average	***1,170.3***	***$86,486,816***	***$77,481,588***

Source: RESI

As shown in the figure above, the strategy will support a total of 1,170 jobs, $86.5 million in output, and $77.5 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment due to this strategy is *Sales, office, and administrative occupations*, primarily due to the expectation that leading by example will result in higher efficiency and subsequent cost savings for federal governments, which will in turn be able to hire additional employees. Other industry sectors will benefit from the ongoing sustainable procurement activities of federal governments which are continuing implementation and operation of this strategy.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $1,957,467 for the investment phase, and $14,969,077 for the operation phase.

3.7.3 Leadership-by-Example – Maryland University Lead-by-Example Initiatives

Throughout Maryland, the presidents of 22 public universities and colleges have signed the American College and University Presidents Climate Commitment. This commitment requires that each school complete a GHG inventory, develop a climate action plan, and work toward strategy implementation to reduce GHG emissions and achieve a predefined set target. Commitment by schools to become climate-neutral by a certain date is encouraged. To achieve climate neutrality, schools are required to reduce or mitigate GHG emissions sourced from the school from a baseline year, with any remaining emissions to be offset by the purchase of carbon credits.

Investment Phase

The average annual economic impacts of the investment phase of the *Leadership-by-Example – Maryland University Lead-by-Example Initiatives* strategy can be found in Figure 107.

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Figure 107: Leadership-by-Example – Maryland University Lead-by-Example Initiatives—Investment Phase

Year	Employment	Output	Wages
2010	101.9	$7,843,018	$3,677,368
2011	104.3	$8,026,123	$3,967,285
2012	102.9	$7,934,570	$4,226,685
2013	101.9	$7,843,018	$4,409,790
2014	99.1	$7,781,982	$4,562,378
2015	95.0	$7,568,359	$4,684,448
2016	93.0	$7,446,289	$4,791,260
2017	91.0	$7,385,254	$4,943,848
2018	89.4	$7,385,254	$5,096,436
2019	86.5	$7,324,219	$5,157,471
2020	85.8	$7,263,184	$5,249,023
Average	***95.5***	***$7,618,297***	***$4,615,090***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 96 jobs, $7.6 million in output, and $4.6 million in wages on average. The industries experiencing the greatest positive economic impacts in terms of employment due to this strategy are *Sales, office, and administrative occupations*. Universities must lead by example by obtaining high performance and energy-efficient buildings, and fleet vehicles among other measures. Environmental consultants will likely be contracted to assist and advise in the planning and implementation of building efficiency, efficient appliance purchasing, optimized operations, waste minimization, and other measures.

Operation Phase

The average annual economic impacts of the operation phase of the *Leadership-by-Example – Maryland University Lead-by-Example Initiatives* strategy can be found in Figure 108.

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Figure 108: Leadership-by-Example – Maryland University Lead-by-Example Initiatives—Operation Phase

Year	Employment	Output	Wages
2020	96.0	$5,615,234	$5,386,353
2021	88.8	$5,126,953	$5,676,270
2022	83.9	$4,699,707	$5,859,375
2023	80.3	$4,516,602	$6,072,998
2024	78.4	$4,394,531	$6,225,586
2025	77.7	$4,333,496	$6,469,727
Average	***84.2***	***$4,781,087***	***$5,948,385***

Source: RESI

As shown in the figure above, the strategy will support a total of 84 jobs, $4.8 million in output, and $5.9 million in wages annually once in operation. The industries experiencing the greatest positive economic impacts in terms of employment due to this strategy are *Sales, office, and administrative occupations* and *Construction and extraction occupations*. Leading by example will result in higher efficiency and subsequent cost savings for universities within Maryland's higher education system, which will in turn be able to support additional employment. Other industry sectors will benefit from the ongoing sustainable purchasing by universities which are continuing implementation and operation of this strategy.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $1,886,382 during the investment phase, and $1,064,665 during the operation phase.

3.7.4 Voluntary Stationary Source Reductions

The GGRA provides the manufacturing sector with two paths to follow to potentially receive credit for any voluntary programs that they are implementing. The first option states that companies may simply take only voluntary action and provide a good faith estimate of potential emission reductions. Efforts will be acknowledged, and, if appropriate, included in the plan as a reduction. The uncertainty of emissions reduction calculations will remain a key factor in determining whether or not such reductions are included in the plan. The second option and more formal mechanism included in the GGRA allows companies to implement an early voluntary GHG emissions reduction plan and secure a formal "credit" for those actions. Early reductions must be approved by MDE prior to January 1, 2012. A source which implements an approved voluntary reduction plan under the provisions of the GGRA "may be eligible to receive voluntary early action credits under any future state law requiring GHG emissions reductions from the manufacturing sector," according to MDE.

Investment Phase

The average annual economic impacts of the investment phase of the *Voluntary Stationary Source Reductions* strategy can be found in Figure 109.

Figure 109: Voluntary Stationary Source Reductions—Investment Phase

Year	Employment	Output	Wages
2010	0.8	$61,035	$15,259
2011	0.7	$30,518	$15,259
2012	0.4	$30,518	$0
2013	0.3	$30,518	$15,259
2014	0.6	$61,035	$15,259
2015	0.3	$0	$15,259
2016	1.0	$61,035	$30,518
2017	0.4	$0	$30,518
2018	0.0	$0	$15,259
2019	0.7	$61,035	$30,518
2020	-0.3	$0	$30,518
Average	***0.4***	***$30,518***	***$19,420***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately less than one job, $30,518 in output, and $19,420 in wages on average each year. The industries experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy are *Sales, office, and administrative occupations*. Some sources are likely to take advantage of voluntary early reductions and develop plans to retrofit or construct new, energy-efficient facilities. These actions will require engineers, planners, and construction workers within these two industries.

Operation Phase

The average annual economic impacts of the operation phase of the *Voluntary Stationary Source Reductions* strategy can be found in Figure 110..

Figure 110: Voluntary Stationary Source Reductions—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	2.0	$183,105	$45,776
2012	2.7	$305,176	$76,294
2013	3.4	$366,211	$122,070
2014	4.9	$518,799	$137,329
2015	4.2	$488,281	$152,588
2016	5.4	$549,316	$183,105
2017	5.2	$549,316	$213,623
2018	5.3	$610,352	$183,105
2019	5.4	$671,387	$228,882
2020	4.3	$549,316	$228,882
Average	***3.9***	***$435,569***	***$142,878***

Source: RESI

As shown in the figure above, the strategy will support a total of 4 jobs, $0.4 million in output, and $0.1 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment from this phase of the strategy is *Construction and extraction occupations*, primarily due to the expectation that sources which pursue voluntary early reductions have successfully implemented retrofitting or construct new, energy-efficient facilities. These facilities generate operating cost savings which are passed on to a wide variety of companies and enterprises. Positive impacts occur in other industries as these cost savings allow companies and enterprises to hire additional workers (who then spend in the economy) or increase spending with other vendors.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $5,776 during the investment phase, and $6,622,774 during the operation phase.

3.7.5 State of Maryland Initiatives to Lead by Example

Through lead-by-example programs, state government in Maryland aims to improve efficiency, reduce waste, and undergo renewable energy practices in all of its agencies' operations and facilities, as well as in their purchasing practices. DGS currently oversees four 'lead-by-example' programs, the Maryland Green Building Council, Maryland Green Purchasing Committee, EmPOWER Maryland and the Renewable Energy Portfolio.

The Maryland Green Building Council makes recommendations about the State High Performance Building Program, which requires all new or substantially renovated State owned or funded buildings 7,500 gross square feet or larger to achieve USGBC LEED Silver certification. Authorized in 2007 by the Maryland Green Building Council, this strategy involves the design and evaluation of current high performance building technologies. DGS implemented Maryland's green building policy to upgrade existing state government buildings. Implementation of these policies will result in increased energy efficiency and reduced energy consumption. Commercial and public buildings are heavy consumers of various resources, including energy. As a result, reduction of their GHG emissions will result in a variety of environmental benefits. In addition to reducing Maryland's regional GHG emissions through the promotion and construction of green buildings, the state as a whole will experience reduced waste output and water usage over time.

The Maryland Green Purchasing Committee provides assistance to State units in developing strategies and best practices for implementing environmentally preferable purchasing practices, maintains a Best Practices Purchasing Manual, and maintains Purchasing Guidelines.

EmPOWER Maryland reduces the energy consumption of the State by 15 percent by 2015. DGS is working to track and implement this reduction in State owned facilities through the State Energy Database and the Energy Performance Contract program.

Maryland's Renewable Energy Portofolio requires 20 percent of the State's electricity to be generated from renewable sources by 2022. DGS is working to secure 20 percent of the energy the State uses internally from renewable sources.

Investment Phase[11]

The investments to comply with this program were reviewed on the marginal cost experienced to adhere to LEED certification. According to the U.S. Department of Energy, this cost is roughly an additional three percent of the total cost of the project. Economic impacts were scaled to reflect these changes. The average annual economic impacts of the investment phase of the *State of Maryland Initiatives to Lead by Example* strategy can be found in Figure 111.

Figure 111: State of Maryland Initiatives to Lead by Example—Investment Phase

Year	Employment	Output	Wages
2010	24.7	$1,785,278	$788,727
2011	31.6	$2,219,238	$1,013,489
2012	25.3	$1,737,671	$836,792
2013	0.2	$12,817	$81,482
2014	-1.7	-$110,779	-$5,493
2015	-2.7	-$179,443	-$63,629
2016	-3.0	-$194,092	-$97,046
2017	-2.8	-$179,443	-$109,863
2018	-2.3	-$151,978	-$111,237
2019	-1.8	-$113,525	-$99,792
2020	-1.3	-$82,397	-$85,144
Average	***6.0***	***$431,213***	***$195,299***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 6 jobs, $0.4 million in output, and $0.2 million in wages on average. The industries experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy are *Sales, office, and administrative occupations*, resulting from the expectation that The State will need construction, architectural, and engineering services to implement its High Performance Building program.

Operation Phase

The average annual economic impacts of the operation phase of the *State of Maryland Initiatives to Lead by Example* strategy can be found in Figure 112.

[11] Due to data limitations, impacts from *Green Buildings Initiatives*, section 3.5.1, have been included in Figure 111 and Figure 112.

Figure 112: State of Maryland Initiatives to Lead by Example—Operation Phase

Year	Employment	Output	Wages
2010	156.8	$9,674,072	$3,952,026
2011	306.8	$19,500,732	$7,659,912
2012	389.2	$26,153,564	$10,208,130
2013	438.7	$31,250,000	$11,978,149
2014	458.6	$35,247,803	$13,290,405
2015	460.0	$38,208,008	$14,083,862
2016	449.1	$40,405,273	$14,404,297
2017	428.4	$42,175,293	$14,419,556
2018	398.2	$43,518,066	$14,022,827
2019	355.8	$44,250,488	$12,954,712
2020	311.7	$44,433,594	$11,627,197
Average	***377.6***	***$34,074,263***	***$11,691,007***

Source: RESI

As shown in the figure above, the strategy will support a total of 378 jobs, $34.1 million in output, and $11.7 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Sales, office, and administrative occupations.* Once the state government implements this strategy and recoups any upfront costs associated with implementation, it will experience cost savings from reduced building operation costs and reduced paper waste under the two programs included in this strategy.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $4,041,300 during the investment phase, and $6,970,330 during the operation phase.

3.7.6 State of Maryland Carbon and Footprint Initiatives

Launched by Governor O'Malley in 2009, the Maryland Environmental Footprint initiative works to calculate, reduce, track, and report the environmental footprint of State agencies and universities in five areas: electricity and building energy, water consumption, vehicle fuel reductions in fleet vehicles, waste/recycling, and aggregate GHG emissions. State government has established goals in these areas in conjunction with The State's suite of lead-by-example programs.

Investment Phase

The average annual economic impacts of the investment phase of the *State of Maryland Carbon Footprint Initiatives* strategy can be found in Figure 113.

Figure 113: State of Maryland Carbon and Footprint Initiatives—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.0	$0	$0
2014	0.0	$0	$0
2015	0.0	$0	$0
2016	0.0	$0	$0
2017	0.0	$0	$0
2018	0.0	$0	$0
2019	0.0	$0	$0
2020	0.0	$0	$0
Average	***0.0***	***$0***	***$0***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 0 jobs, $0 in output, and $0 in wages on average.

Operation Phase

The average annual economic impacts of the operation phase of the *State of Maryland Carbon Footprint Initiatives* strategy can be found in Figure 114.

Figure 114: State of Maryland Carbon and Footprint Initiatives—Operation Phase

Year	Employment	Output	Wages
2010	1,146.0	$96,923,828	$38,681,030
2011	752.0	$47,454,834	$29,556,274
2012	708.0	$44,525,146	$29,510,498
2013	683.4	$42,480,469	$29,327,393
2014	671.9	$41,809,082	$29,678,345
2015	672.0	$41,809,082	$30,242,920
2016	680.2	$42,236,328	$30,853,271
2017	694.2	$43,029,785	$31,692,505
2018	711.6	$44,372,559	$32,836,914
2019	730.6	$45,410,156	$33,859,253
2020	753.0	$46,752,930	$35,110,474
Average	***745.7***	***$48,800,382***	***$31,940,807***

Source: RESI

As shown in the figure above, the strategy will support a total of 746 jobs, $48.8 million in output, and $31.9 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Sales, office, and administrative occupations*, primarily due to the expectation that once state government implements this strategy and recoups any upfront costs associated with implementation, it will experience cost savings from waste reduction, reuse, recycling, and efficient water usage, among other changes associated with these carbon and footprint initiatives. Cost savings then allow for increased spending elsewhere, which produces a ripple effect through the economy in terms of indirect and induced impacts.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $4,270,476 during the investment phase, and $16,650,354 during the operation phase.

3.7.7 Job Creation and Economic Development Initiatives Related to Climate Change

Promotion of economic development opportunities associated with reducing GHG emissions in Maryland is the key focus for this strategy managed by DBED. Based on Governor O'Malley's aggressive goal of creating, retraining, or placing 100,000 green jobs by 2015, this program will also create a task force managed by DBED. The Green Jobs & Industry Task Force aims to help Maryland create green jobs and move toward a more environmentally conscious economy. To remain on task with Governor O'Malley's job creation goal, the task force was charged with developing recommendations for green jobs creation and retention, scarce and finite natural resource utilization, environmental protection and restoration, and clean and efficient energy use in Maryland.

This program would have an impact on preparing Maryland's workforce for renewable energy initiatives. However, the impacts from this program are already accounted for in other programs throughout this report. Including those same benefits here would result in an overstatement of the benefits from the GGRA plan. Jobs associated with the GGRA will require a specific skill set of employees, and DBED's role will help to facilitate the change in employee skills in preparation for these jobs. This program will help to grow a domestic workforce in renewable energy, allowing employers to draw from a local base of employment as opposed to paying additional costs for relocation or hiring employees outside the region.

Investment Phase

The average annual economic impacts of the investment phase of the *Job Creation and Economic Development Initiatives Related to Climate Change* strategy can be found in Figure 115.

Figure 115: Job Creation and Economic Development Initiatives Related to Climate Change—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.0	$0	$0
2014	0.0	$0	$0
2015	0.0	$0	$0
2016	0.0	$0	$0
2017	0.0	$0	$0
2018	0.0	$0	$0
2019	0.0	$0	$0
2020	0.0	$0	$0
Average	***0.0***	***$0***	***$0***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will not generate an additional impact when accounting for the other programs in the plan.

Operation Phase

The average annual economic impacts of the operation phase of the *Job Creation and Economic Development Initiatives Related to Climate Change* strategy can be found in Figure 116.

Figure 116: Job Creation and Economic Development Initiatives Related to Climate Change—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.0	$0	$0
2014	0.0	$0	$0
2015	0.0	$0	$0
2016	0.0	$0	$0
2017	0.0	$0	$0
2018	0.0	$0	$0
2019	0.0	$0	$0
2020	0.0	$0	$0
Average	***0.0***	***$0***	***$0***

Source: RESI

As shown in the figure above, the strategy will not generate an additional impact when accounting for the other programs in the plan.

Fiscal Impacts
As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues will not be impacted during the investment phase, and increase by $176,711,605 during the operation phase.

3.7.8 Public Health Initiatives Related to Climate Change

Over time, climate change within Maryland has resulted in increased negative health effects for Maryland residents. Climate change increases the prevalence of infectious diseases and other threats to human health. The response to these negative effects is often costly for state governments, private businesses, and individuals. Through the collaborative effort of DHMH and other state agencies, steps to minimize the public health risks of climate change have been taken. These steps include policies directed toward GHG emissions reductions and air quality improvements. In support of the initiative, DHMH has been working with MDE to improve and effectively implement the capabilities of its Environmental Public Health Tracking infrastructure.

Investment Phase
The average annual economic impacts of the investment phase of the *Public Health Initiatives Related to Climate Change* strategy can be found in Figure 117.

Figure 117: Public Health Initiatives Related to Climate Change—Investment Phase

Year	Employment	Output	Wages
2010	36.5	$2,807,617	$1,281,738
2011	37.9	$2,838,135	$1,373,291
2012	1.4	$61,035	$91,553
2013	0.0	-$61,035	$76,294
2014	-0.2	-$30,518	-$15,259
2015	-1.0	-$122,070	-$15,259
2016	-0.6	-$122,070	-$61,035
2017	-0.1	-$61,035	-$15,259
2018	0.3	-$61,035	-$30,518
2019	0.6	$61,035	-$30,518
2020	0.6	$0	$0
Average	***6.8***	***$482,733***	***$241,366***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will support approximately 7 jobs, $0.5 million in output, and $0.2 million in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Sales, office, and administrative occupations*, primarily due to the expectation that hospitals, doctor's offices, and private practices will need to adhere to this new strategy. In an effort to maintain the most recent technology, health care professionals will need to hire employees with an information systems background.

Operation Phase
The average annual economic impacts of the operation phase of the *Public Health Initiatives Related to Climate Change* strategy can be found in Figure 118.

Figure 118: Public Health Initiatives Related to Climate Change—Operation Phase

Year	Employment	Output	Wages
2010	-9.3	-$976,563	-$289,917
2011	49.5	$2,258,301	$869,751
2012	50.3	$2,349,854	$1,022,339
2013	49.8	$2,319,336	$1,068,115
2014	48.5	$2,288,818	$1,098,633
2015	46.0	$2,136,230	$1,129,150
2016	44.4	$2,075,195	$1,144,409
2017	43.6	$2,014,160	$1,174,927
2018	42.5	$1,953,125	$1,190,186
2019	41.3	$2,014,160	$1,190,186
2020	40.0	$1,892,090	$1,190,186
Average	***40.6***	***$1,847,701***	***$980,724***

Source: RESI

As shown in the figure above, the strategy will support a total of 41 jobs, $1.9 million in output, and $1.0 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Sales, office, and administrative occupations* and *Healthcare occupations*. The new regulations will cause employers in the health care industry recruit individuals with a diversified background in health care.

Fiscal Impacts
As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $1,811,802 for the investment phase, and $333,649 for the operation phase.

3.7.9 Title V Permits for GHG Sources
The Title V operating permits program was established through the Clean Air Act amendments of 1990. Before 1990, states were required to issue air pollution permits to businesses which created new pollution sources or modified existing pollution sources. Title V of the amendments required all states to develop and implement permit programs for sources already in operation. The program is achieving enhanced compliance with industrial and commercial air pollution requirements. The Title V Program does not establish any new emissions limitations, standards, or work practices on an affected facility. However, there may be additional recordkeeping, monitoring, or reporting requirements. EPA granted Maryland final full approval for its Title V permit program in February 2003.

Investment Phase
The average annual economic impacts of the investment phase of the *Title V Permits for GHG Sources* strategy can be found in Figure 119.

Figure 119: Title V Permits for GHG Sources—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	1.5	$122,070	$61,035
2013	1.3	$91,553	$45,776
2014	1.0	$122,070	$45,776
2015	1.0	$61,035	$45,776
2016	1.5	$122,070	$76,294
2017	1.0	$122,070	$61,035
2018	1.5	$61,035	$61,035
2019	0.6	$122,070	$61,035
2020	0.5	$61,035	$45,776
Average	***0.9***	***$80,455***	***$45,776***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately one job, $80,455 in output, and $45,776 in wages on average. The industry experiencing the greatest positive economic impacts in terms of employment due to this phase of the strategy is *Sales, office, and administrative occupations.* The companies and enterprises required to purchase Title V permits are likely to demand services in this industry relating to energy efficiency and emissions reductions to lower the amount of permits they need to purchase through auctions. This industry will also benefit from auction proceeds being invested into various energy efficiency programs relating to the services provided within this industry.

Operation Phase
The average annual economic impacts of the operation phase of the *Title V Permits for GHG Sources* strategy can be found in Figure 120. .

Figure 120: Title V Permits for GHG Sources—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	8.2	$549,316	$289,917
2012	7.1	$457,764	$305,176
2013	6.2	$335,693	$305,176
2014	5.4	$335,693	$289,917
2015	3.4	$122,070	$259,399
2016	3.2	$122,070	$244,141
2017	3.0	$122,070	$274,658
2018	2.9	$122,070	$274,658
2019	2.1	$122,070	$228,882
2020	2.0	$61,035	$259,399
Average	***4.0***	***$213,623***	***$248,302***

Source: RESI

As shown in the figure above, the strategy will support a total of 4 jobs, $0.2 million in output, and $0.3 million in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment from this phase of the strategy is *Protective service occupations* and *Sales, office, and administrative occupations*, primarily due to the expectation that the ongoing permit auctions and the resulting proceeds will need to be administered and monitored by individuals employed by the state government.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $17,022 for the investment phase, and $6,597,563 for the operation phase.

3.7.10 Outreach and Public Education

Outreach and educational initiatives undertaken by state-sponsored forums create the essential foundation for behavioral and lifestyle changes necessary to reduce GHG emissions. This strategy is designed to encourage existing efforts and facilitate new actions throughout The State of Maryland. A combination of efforts from various agencies will insure that scientifically based factual information is made available to the general public through education and outreach efforts. Many of these activities are already underway to reach goals predetermined by state agencies to promote GHG reduction initiatives.

Investment Phase

The average annual economic impacts of the investment phase of the *Outreach and Public Education* strategy can be found in Figure 121.

Figure 121: Outreach and Public Education—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.0	$0	$0
2013	0.0	$0	$0
2014	0.0	$0	$0
2015	0.0	$0	$0
2016	0.0	$0	$0
2017	0.0	$0	$0
2018	0.0	$0	$0
2019	0.0	$0	$0
2020	0.0	$0	$0
Average	***0.0***	***$0***	***$0***

Source: RESI

As shown in the figure above, the investment phase of this strategy's implementation will generate approximately 0 jobs, $0 in output, and $0 in wages on average.

Operation Phase

The average annual economic impacts of the operation phase of the *Outreach and Public Education* strategy can be found in Figure 122.

Figure 122: Outreach and Public Education—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	0.1	$0	$0
2013	0.0	$0	$0
2014	0.0	$30,518	$0
2015	0.0	$0	$0
2016	-0.1	$0	$0
2017	0.4	$0	$15,259
2018	0.4	$0	$0
2019	0.3	$61,035	$30,518
2020	0.1	$61,035	$15,259
Average	***0.1***	***$13,872***	***$5,549***

Source: RESI

As shown in the figure above, the strategy will support a total of less than one job, $13,872 in output, and $5,549 in wages annually once in operation. The industries experiencing the greatest positive economic impacts in terms of employment due to this strategy are primarily those industries (such as *Sales, office, and administrative occupations* and *Management, business, and financial occupations)* which will experience increased consumption of goods and services as successful outreach and education create some change in consumption behavior and spending patterns for both businesses and consumers.

Fiscal Impacts
As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues not be impacted during the investment phase, and would increase by $6,541,298 during the operation phase.

3.7.11 GHG Prevention of Significant Deterioration Permitting Program

Under the Prevention of Significant Deterioration Permitting Program, all new major stationary sources and major modifications to existing major stationary sources will be subject to a preconstruction and review analysis. As a principal requirement of the program, new major sources or preexisting source modifications must apply Best Available Control Technology. The application is determined on a per-case basis in regard to cost effectiveness and environmental impact. Analysis on the approach of Best Available Control Technology will rely on two key factors: (1) assessed existing air quality and (2) predictions of the applicants' resulting ambient concentrations associated with the project using dispersion modeling.

Investment Phase
The average annual economic impacts of the investment phase of the *Prevention of Significant Deterioration* strategy can be found in Figure 123.

Figure 123: Prevention of Significant Deterioration—Investment Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	1.5	$122,070	$61,035
2013	1.3	$91,553	$45,776
2014	1.0	$122,070	$45,776
2015	1.0	$61,035	$45,776
2016	1.5	$122,070	$76,294
2017	1.0	$122,070	$61,035
2018	1.5	$61,035	$61,035
2019	0.6	$122,070	$61,035
2020	0.5	$61,035	$45,776
Average	***0.9***	***$80,455***	***$45,776***

Source: RESI

As shown in the previous figure, the investment phase of this strategy's implementation will generate approximately one job, $80,455 in output, and $45,776 in wages on average each year. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Sales, office, and administrative occupations*, primarily due to the expectation that processing and management will be required for tracking stationary sources subject to preconstruction reviews.

Operation Phase

The total economic impacts of the operation phase of the *Prevention of Significant Deterioration* strategy can be found in Figure 124.

Figure 124: Prevention of Significant Deterioration—Operation Phase

Year	Employment	Output	Wages
2010	0.0	$0	$0
2011	0.0	$0	$0
2012	2.7	$183,105	$106,812
2013	2.4	$152,588	$106,812
2014	2.1	$152,588	$76,294
2015	0.6	$0	$76,294
2016	0.5	$0	$76,294
2017	0.4	$0	$61,035
2018	0.5	$0	$76,294
2019	0.0	$61,035	$76,294
2020	-0.1	$0	$61,035
Average	***0.8***	***$49,938***	***$65,197***

Source: RESI

As shown in the previous figure, the strategy will support an average increase of one job, $49,938 in output, and $65,197 in wages annually once in operation. The industry experiencing the greatest positive economic impacts in terms of employment as a result of this strategy is *Sales, office, and administrative occupations,* primarily due to the expectation that public administration will conduct the preconstruction reviews during operation of the strategy.

Fiscal Impacts

As a result of the previously discussed activities contributing to the economic impacts of the strategy, the total state and local tax revenues would accumulate to approximately $17,022 for the investment phase, and $6,545,005 for the operation phase.

3.8 Unquantified Policies

3.8.1 Greenhouse Gas Emissions Inventory Development

To create a starting point for GHG emissions reductions, Maryland needs to establish a system which identifies the overall GHG emissions in The State. Maryland will also benefit from identifying emissions levels and their sources. The identification of all sources which emit GHGs within The State and the total annual amount of GHG emissions will be greatly beneficial for future reduction strategies. MDE is respondsible for reviewing and publishing annual statewide GHG emissions inventories. Beginning in 2011 and every three calendar years thereafter, MDE is required to publish an inventory. Recorded impacts of GHG reduction programs implemented after the 2006 baseline will appear in the 2011 calendar year inventory.

3.8.2 Subprogram Analysis, Goals, and Overall Implementation

The continued growth of The State's carbon footprint relative to Maryland's size is an ongoing concern among leading officials. The growth of total and per capita GHG emissions in Maryland has outpaced that for the U.S. As a result, there is a need for statewide goals and targets to address emissions growth. Through a scientific-based, consensus-building stakeholder process, statewide goals and targets were developed for consideration by the Maryland Commission on Climate Change. The Maryland Commission on Climate Change suggested the following goals in regard to GHG emissions for Maryland: 25 percent to 50 percent below 2006 levels by 2020; 90 percent below 2006 levels by 2050, a non-regulatory goal to drive climate neutral technology innovations; interim targets of 10 percent by 2012 and 15 percent by 2015 to spur early action; and science-based review of the goals every four years. Further analysis of this strategy has not been scheduled at this time.

Refined Economic Impact Analysis for the Greenhouse Gas Emissions Reduction Act 2012 Plan – Appendices A through B

Prepared for
Maryland Department of the Environment

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Regional Economic Studies Institute

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Appendix A—Detailed Impacts

A.1 Energy

Figure 1: Regional Greenhouse Gas Initiative—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	6.1	1.9	8.0
2011	6.3	2.2	8.6
2012	6.4	2.3	8.7
2013	6.1	2.2	8.3
2014	6.4	2.0	8.4
2015	5.9	1.9	7.8
2016	6.1	1.7	7.8
2017	6.4	2.2	8.6
2018	6.6	2.3	8.9
2019	5.9	1.8	7.7
2020	6.2	1.9	8.0
Average	***6.2***	***2.0***	***8.3***

Source: RESI

Figure 2: Regional Greenhouse Gas Initiative—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$483,305	$157,564	$640,869
2011	$506,319	$165,067	$671,387
2012	$506,319	$165,067	$671,387
2013	$483,305	$157,564	$640,869
2014	$529,334	$172,570	$701,904
2015	$460,290	$150,061	$610,352
2016	$506,319	$165,067	$671,387
2017	$506,319	$165,067	$671,387
2018	$552,348	$180,073	$732,422
2019	$552,348	$180,073	$732,422
2020	$552,348	$180,073	$732,422
Average	***$512,596***	***$167,114***	***$679,710***

Source: RESI

Figure 3: Regional Greenhouse Gas Initiative—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$241,652	$78,782	$320,435
2011	$241,652	$78,782	$320,435
2012	$264,667	$86,285	$350,952
2013	$276,174	$90,037	$366,211
2014	$276,174	$90,037	$366,211
2015	$299,189	$97,540	$396,729
2016	$310,696	$101,291	$411,987
2017	$345,218	$112,546	$457,764
2018	$379,740	$123,801	$503,540
2019	$333,710	$108,794	$442,505
2020	$356,725	$116,297	$473,022
Average	***$302,327***	***$98,563***	***$400,890***

Source: RESI

Figure 4: Regional Greenhouse Initiative—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	228.6	69.8	298.4
2011	211.5	54.7	266.1
2012	192.7	37.7	230.4
2013	174.8	21.8	196.7
2014	158.9	8.9	167.8
2015	145.1	-2.0	143.0
2016	133.6	-10.5	123.1
2017	125.2	-16.9	108.3
2018	118.2	-21.5	96.7
2019	114.4	-24.3	90.1
2020	113.1	-25.4	87.7
Average	***156.0***	***8.4***	***164.4***

Source: RESI

Figure 5: Regional Greenhouse Initiative—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$19,808,280	$1,065,743	$20,874,023
2011	$16,333,143	$878,771	$17,211,914
2012	$12,973,844	$698,031	$13,671,875
2013	$9,904,140	$532,872	$10,437,012
2014	$7,558,423	$406,665	$7,965,088
2015	$5,502,300	$296,040	$5,798,340
2016	$3,938,488	$211,902	$4,150,391
2017	$2,780,109	$149,578	$2,929,688
2018	$1,853,406	$99,719	$1,953,125
2019	$1,332,136	$71,673	$1,403,809
2020	$1,042,541	$56,092	$1,098,633
Average	***$7,547,892***	***$406,099***	***$7,953,991***

Source: RESI

Figure 6: Regional Greenhouse Initiative—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$10,686,046	$574,941	$11,260,986
2011	$10,671,566	$574,161	$11,245,728
2012	$10,454,370	$562,476	$11,016,846
2013	$10,063,417	$541,441	$10,604,858
2014	$9,802,782	$527,418	$10,330,200
2015	$9,585,586	$515,733	$10,101,318
2016	$9,310,471	$500,931	$9,811,401
2017	$9,223,592	$496,256	$9,719,849
2018	$9,165,673	$493,140	$9,658,813
2019	$9,194,633	$494,698	$9,689,331
2020	$9,368,390	$504,047	$9,872,437
Average	***$9,775,139***	***$525,931***	***$10,301,070***

Source: RESI

Figure 7: GHG Reductions from Imported Power—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.1	0.0	0.1
2013	-0.2	-0.3	-0.5
2014	0.1	0.1	0.1
2015	-0.2	-0.1	-0.3
2016	0.0	0.0	0.0
2017	0.0	-0.1	0.0
2018	0.0	-0.1	-0.1
2019	-0.2	-0.3	-0.5
2020	-0.5	-0.5	-1.0
Average	***-0.1***	***-0.1***	***-0.2***

Source: RESI

Figure 8: GHG Reductions from Imported Power—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	-$11,813	-$18,704	-$30,518
2014	$23,627	$37,409	$61,035
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	-$23,627	-$37,409	-$61,035
2019	$0	$0	$0
2020	-$23,627	-$37,409	-$61,035
Average	***-$3,222***	***-$5,101***	***-$8,323***

Source: RESI

Figure 9: GHG Reductions from Imported Power—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	-$5,907	-$9,352	-$15,259
2012	$0	$0	$0
2013	$0	$0	$0
2014	$5,907	$9,352	$15,259
2015	$5,907	$9,352	$15,259
2016	$0	$0	$0
2017	$11,813	$18,704	$30,518
2018	$0	$0	$0
2019	$0	$0	$0
2020	-$5,907	-$9,352	-$15,259
Average	***$1,074***	***$1,700***	***$2,774***

Source: RESI

Figure 10: GHG Reductions from Imported Power—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	2.1	1.7	3.8
2011	3.7	3.2	6.9
2012	4.9	4.3	9.1
2013	5.9	5.4	11.3
2014	6.7	5.6	12.3
2015	6.5	5.7	12.2
2016	7.2	6.3	13.5
2017	8.1	6.9	15.0
2018	8.3	7.3	15.6
2019	8.2	7.1	15.3
2020	7.4	6.3	13.7
Average	***6.3***	***5.4***	***11.7***

Source: RESI

Figure 11: GHG Reductions from Imported Power—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$245,803	$211,961	$457,764
2011	$393,285	$339,137	$732,422
2012	$507,993	$438,052	$946,045
2013	$622,701	$536,967	$1,159,668
2014	$737,409	$635,882	$1,373,291
2015	$721,023	$621,751	$1,342,773
2016	$786,570	$678,274	$1,464,844
2017	$884,891	$763,058	$1,647,949
2018	$884,891	$763,058	$1,647,949
2019	$950,439	$819,581	$1,770,020
2020	$884,891	$763,058	$1,647,949
Average	***$692,718***	***$597,343***	***$1,290,061***

Source: RESI

Figure 12: GHG Reductions from Imported Power—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$57,354	$49,457	$106,812
2011	$98,321	$84,784	$183,105
2012	$147,482	$127,176	$274,658
2013	$188,449	$162,503	$350,952
2014	$213,029	$183,699	$396,729
2015	$229,416	$197,830	$427,246
2016	$262,190	$226,091	$488,281
2017	$294,964	$254,353	$549,316
2018	$327,738	$282,614	$610,352
2019	$335,931	$289,679	$625,610
2020	$319,544	$275,549	$595,093
Average	***$224,947***	***$193,976***	***$418,923***

Source: RESI

Figure 13: Federal New Source Performance Standard—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	12.9	5.2	18.2
2014	13.1	4.8	17.9
2015	12.5	4.7	17.2
2016	12.3	4.5	16.8
2017	12.1	4.3	16.4
2018	11.8	4.1	15.9
2019	11.5	4.1	15.6
2020	11.0	3.4	14.4
Average	***8.8***	***3.2***	***12.0***

Source: RESI

Figure 14: Federal New Source Performance Standard—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$1,031,574	$372,234	$1,403,809
2014	$1,054,000	$380,326	$1,434,326
2015	$1,031,574	$372,234	$1,403,809
2016	$986,723	$356,050	$1,342,773
2017	$986,723	$356,050	$1,342,773
2018	$986,723	$356,050	$1,342,773
2019	$986,723	$356,050	$1,342,773
2020	$941,872	$339,866	$1,281,738
Average	***$727,810***	***$262,624***	***$990,434***

Source: RESI

Figure 15: Federal New Source Performance Standard—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$515,787	$186,117	$701,904
2014	$538,213	$194,209	$732,422
2015	$594,277	$214,439	$808,716
2016	$627,915	$226,577	$854,492
2017	$650,340	$234,669	$885,010
2018	$683,979	$246,807	$930,786
2019	$706,404	$254,900	$961,304
2020	$661,553	$238,715	$900,269
Average	***$452,588***	***$163,312***	***$615,900***

Source: RESI

Figure 16: Federal New Source Performance Standard—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	4.0	3.4	7.4
2012	6.3	5.5	11.9
2013	8.5	7.7	16.2
2014	10.1	8.6	18.8
2015	11.0	9.6	20.6
2016	12.5	10.9	23.4
2017	13.3	11.4	24.7
2018	14.1	12.2	26.3
2019	14.1	12.2	26.3
2020	13.9	12.0	25.9
Average	***9.8***	***8.5***	***18.3***

Source: RESI

Figure 17: Federal New Source Performance Standard—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$441,510	$382,465	$823,975
2012	$703,145	$609,111	$1,312,256
2013	$932,076	$807,426	$1,739,502
2014	$1,111,950	$963,245	$2,075,195
2015	$1,210,064	$1,048,237	$2,258,301
2016	$1,373,586	$1,189,891	$2,563,477
2017	$1,471,699	$1,274,883	$2,746,582
2018	$1,537,108	$1,331,544	$2,868,652
2019	$1,569,812	$1,359,875	$2,929,688
2020	$1,569,812	$1,359,875	$2,929,688
Average	***$1,083,706***	***$938,777***	***$2,022,483***

Source: RESI

Figure 18: Federal New Source Performance Standard—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$98,113	$84,992	$183,105
2012	$188,050	$162,902	$350,952
2013	$261,635	$226,646	$488,281
2014	$310,692	$269,142	$579,834
2015	$367,925	$318,721	$686,646
2016	$425,158	$368,299	$793,457
2017	$490,566	$424,961	$915,527
2018	$539,623	$467,457	$1,007,080
2019	$547,799	$474,540	$1,022,339
2020	$555,975	$481,622	$1,037,598
Average	***$344,140***	***$298,117***	***$642,256***

Source: RESI

Figure 19: MACT—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	1.0	0.4	1.5
2013	0.8	0.4	1.3
2014	0.8	0.2	1.0
2015	0.8	0.3	1.0
2016	1.0	0.5	1.5
2017	0.8	0.2	1.0
2018	1.0	0.5	1.5
2019	0.5	0.1	0.6
2020	0.5	0.0	0.5
Average	***0.7***	***0.2***	***0.9***

Source: RESI

Figure 20: MACT—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$88,984	$33,086	$122,070
2013	$66,738	$24,815	$91,553
2014	$88,984	$33,086	$122,070
2015	$44,492	$16,543	$61,035
2016	$88,984	$33,086	$122,070
2017	$88,984	$33,086	$122,070
2018	$44,492	$16,543	$61,035
2019	$88,984	$33,086	$122,070
2020	$44,492	$16,543	$61,035
Average	***$58,649***	***$21,807***	***$80,455***

Source: RESI

Figure 21: MACT—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$44,492	$16,543	$61,035
2013	$33,369	$12,407	$45,776
2014	$33,369	$12,407	$45,776
2015	$33,369	$12,407	$45,776
2016	$55,615	$20,679	$76,294
2017	$44,492	$16,543	$61,035
2018	$44,492	$16,543	$61,035
2019	$44,492	$16,543	$61,035
2020	$33,369	$12,407	$45,776
Average	***$33,369***	***$12,407***	***$45,776***

Source: RESI

Figure 22: MACT—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	196.4	60.4	256.7
2013	180.3	46.7	227.0
2014	163.8	32.9	196.7
2015	148.0	20.1	168.1
2016	134.2	9.1	143.3
2017	123.2	0.2	123.4
2018	113.4	-7.1	106.3
2019	107.1	-12.5	94.6
2020	103.9	-15.4	88.6
Average	***115.5***	***12.2***	***127.7***

Source: RESI

Figure 23: MACT—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$16,420,106	$1,737,853	$18,157,959
2013	$13,384,456	$1,416,570	$14,801,025
2014	$10,817,952	$1,144,939	$11,962,891
2015	$8,444,626	$893,753	$9,338,379
2016	$6,402,461	$677,617	$7,080,078
2017	$4,912,233	$519,896	$5,432,129
2018	$3,532,392	$373,858	$3,906,250
2019	$2,649,294	$280,393	$2,929,688
2020	$2,042,164	$216,136	$2,258,301
Average	***$6,236,880***	***$660,092***	***$6,896,973***

Source: RESI

Figure 24: MACT—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$9,231,135	$976,995	$10,208,130
2013	$9,203,538	$974,074	$10,177,612
2014	$9,079,353	$960,931	$10,040,283
2015	$8,886,175	$940,485	$9,826,660
2016	$8,624,005	$912,738	$9,536,743
2017	$8,417,029	$890,832	$9,307,861
2018	$8,223,851	$870,387	$9,094,238
2019	$8,085,867	$855,783	$8,941,650
2020	$8,085,867	$855,783	$8,941,650
Average	***$7,076,075***	***$748,910***	***$7,824,984***

Source: RESI

Figure 25: Energy Efficiency in the Residential Sector—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	3,483.3	3,035.6	6,518.9
2011	1,854.8	1,657.3	3,512.2
2012	2,071.4	1,916.0	3,987.3
2013	1,889.8	1,752.0	3,641.8
2014	1,799.8	1,667.1	3,466.9
2015	1,561.6	1,445.4	3,007.0
2016	190.3	173.2	363.5
2017	32.2	27.8	60.0
2018	-38.7	-36.5	-75.2
2019	-52.4	-48.3	-100.7
2020	-37.6	-34.1	-71.7
Average	***1,159.5***	***1,050.5***	***2,210.0***

Source: RESI

Figure 26: Energy Efficiency in the Residential Sector—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$220,251,963	$199,547,842	$419,799,805
2011	$116,098,210	$105,184,749	$221,282,959
2012	$129,515,711	$117,340,978	$246,856,689
2013	$115,810,006	$104,923,636	$220,733,643
2014	$108,829,063	$98,598,915	$207,427,979
2015	$92,161,260	$83,497,919	$175,659,180
2016	$2,177,542	$1,972,849	$4,150,391
2017	-$8,421,964	-$7,630,282	-$16,052,246
2018	-$13,033,229	-$11,808,080	-$24,841,309
2019	-$13,609,637	-$12,330,304	-$25,939,941
2020	-$12,232,662	-$11,082,768	-$23,315,430
Average	***$67,049,660***	***$60,746,859***	***$127,796,520***

Source: RESI

Figure 27: Energy Efficiency in the Residential Sector—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$79,624,383	$72,139,533	$151,763,916
2011	$47,265,469	$42,822,421	$90,087,891
2012	$54,182,367	$49,089,117	$103,271,484
2013	$51,892,746	$47,014,725	$98,907,471
2014	$52,084,882	$47,188,800	$99,273,682
2015	$47,889,911	$43,388,165	$91,278,076
2016	$10,879,704	$9,856,990	$20,736,694
2017	$3,882,749	$3,517,763	$7,400,513
2018	-$424,300	-$384,415	-$808,716
2019	-$2,569,820	-$2,328,252	-$4,898,071
2020	-$3,258,307	-$2,952,020	-$6,210,327
Average	***$31,040,889***	***$28,122,984***	***$59,163,874***

Source: RESI

Figure 28: Energy Efficiency in the Residential Sector—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	66.3	67.9	134.2
2011	55.8	57.9	113.7
2012	48.3	50.6	98.9
2013	42.7	45.4	88.1
2014	40.3	42.8	83.1
2015	38.6	41.2	79.8
2016	37.4	40.1	77.5
2017	37.5	39.7	77.2
2018	36.7	39.0	75.7
2019	35.8	38.2	74.1
2020	37.3	39.3	76.6
Average	***43.3***	***45.6***	***89.0***

Source: RESI

Figure 29: Energy Efficiency in the Residential Sector—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$1,203,874	-$1,268,050	-$2,471,924
2011	-$1,768,654	-$1,862,938	-$3,631,592
2012	-$2,169,945	-$2,285,621	-$4,455,566
2013	-$2,452,335	-$2,583,065	-$5,035,400
2014	-$2,556,374	-$2,692,650	-$5,249,023
2015	-$2,615,824	-$2,755,270	-$5,371,094
2016	-$2,645,549	-$2,786,580	-$5,432,129
2017	-$2,645,549	-$2,786,580	-$5,432,129
2018	-$2,675,275	-$2,817,889	-$5,493,164
2019	-$2,645,549	-$2,786,580	-$5,432,129
2020	-$2,586,099	-$2,723,960	-$5,310,059
Average	***-$2,360,457***	***-$2,486,289***	***-$4,846,746***

Source: RESI

Figure 30: Energy Efficiency in the Residential Sector—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$601,937	$634,025	$1,235,962
2011	$468,173	$493,131	$961,304
2012	$364,135	$383,546	$747,681
2013	$274,959	$289,616	$564,575
2014	$222,940	$234,824	$457,764
2015	$215,508	$226,997	$442,505
2016	$185,783	$195,687	$381,470
2017	$215,508	$226,997	$442,505
2018	$193,214	$203,514	$396,729
2019	$200,646	$211,342	$411,987
2020	$260,096	$273,961	$534,058
Average	***$291,173***	***$306,695***	***$597,867***

Source: RESI

Figure 31: Energy Efficiency in the Commercial and Industrial Sectors—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	2,362.8	892.4	3,255.3
2011	1,666.3	652.0	2,318.3
2012	2,099.2	817.0	2,916.2
2013	2,107.1	822.5	2,929.6
2014	2,248.7	879.1	3,127.8
2015	2,277.2	896.2	3,173.4
2016	4,058.1	1,608.0	5,666.1
2017	4,097.4	1,658.4	5,755.8
2018	4,107.6	1,681.7	5,789.3
2019	4,106.2	1,682.4	5,788.6
2020	4,117.3	1,690.3	5,807.6
Average	***3,022.5***	***1,207.3***	***4,229.8***

Source: RESI

Figure 32: Energy Efficiency in the Commercial and Industrial Sectors—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$178,819,309	$71,424,832	$250,244,141
2011	$125,675,082	$50,197,720	$175,872,803
2012	$158,255,088	$63,210,976	$221,466,064
2013	$157,557,257	$62,932,245	$220,489,502
2014	$169,267,741	$67,609,701	$236,877,441
2015	$172,102,681	$68,742,045	$240,844,727
2016	$316,161,261	$126,282,587	$442,443,848
2017	$320,784,394	$128,129,180	$448,913,574
2018	$324,229,937	$129,505,415	$453,735,352
2019	$324,229,937	$129,505,415	$453,735,352
2020	$325,494,756	$130,010,615	$455,505,371
Average	***$233,870,677***	***$93,413,703***	***$327,284,379***

Source: RESI

Figure 33: Energy Efficiency in the Commercial and Industrial Sectors—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$82,256,882	$32,855,423	$115,112,305
2011	$61,921,637	$24,733,026	$86,654,663
2012	$79,901,701	$31,914,705	$111,816,406
2013	$82,344,111	$32,890,264	$115,234,375
2014	$91,110,619	$36,391,823	$127,502,441
2015	$95,515,680	$38,151,313	$133,666,992
2016	$175,013,947	$69,904,877	$244,918,823
2017	$185,176,117	$73,963,898	$259,140,015
2018	$193,833,589	$77,421,905	$271,255,493
2019	$198,663,891	$79,351,246	$278,015,137
2020	$203,156,181	$81,145,577	$284,301,758
Average	***$131,717,668***	***$52,611,278***	***$184,328,946***

Source: RESI

Figure 34: Energy Efficiency in the Commercial and Industrial Sectors—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	164.4	146.7	311.1
2011	399.4	356.4	755.8
2012	703.3	627.4	1,330.7
2013	1,080.7	963.3	2,043.9
2014	1,547.3	1,371.6	2,918.9
2015	2,069.8	1,825.0	3,894.8
2016	2,346.7	2,052.1	4,398.8
2017	2,533.1	2,197.0	4,730.0
2018	2,639.2	2,268.3	4,907.5
2019	2,663.4	2,270.1	4,933.5
2020	2,645.3	2,234.7	4,880.0
Average	***1,708.4***	***1,483.0***	***3,191.4***

Source: RESI

Figure 35: Energy Efficiency in the Commercial and Industrial Sectors—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$12,856,996	$11,160,338	$24,017,334
2011	$32,575,413	$28,276,638	$60,852,051
2012	$59,514,658	$51,660,879	$111,175,537
2013	$94,965,333	$82,433,349	$177,398,682
2014	$141,328,934	$122,678,634	$264,007,568
2015	$195,811,883	$169,971,808	$365,783,691
2016	$233,680,392	$202,843,046	$436,523,438
2017	$264,524,113	$229,616,512	$494,140,625
2018	$290,172,757	$251,880,465	$542,053,223
2019	$308,143,145	$267,479,413	$575,622,559
2020	$322,094,701	$279,589,869	$601,684,570
Average	***$177,788,030***	***$154,326,450***	***$332,114,480***

Source: RESI

Figure 36: Energy Efficiency in the Commercial and Industrial Sectors—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$3,201,996	$2,779,449	$5,981,445
2011	$8,168,358	$7,090,431	$15,258,789
2012	$15,054,284	$13,067,664	$28,121,948
2013	$23,908,785	$20,753,691	$44,662,476
2014	$35,989,786	$31,240,438	$67,230,225
2015	$50,529,464	$43,861,405	$94,390,869
2016	$60,388,672	$52,419,555	$112,808,228
2017	$68,181,286	$59,183,826	$127,365,112
2018	$74,234,039	$64,437,836	$138,671,875
2019	$76,913,261	$66,763,497	$143,676,758
2020	$77,958,811	$67,671,072	$145,629,883
Average	***$44,957,158***	***$39,024,442***	***$83,981,601***

Source: RESI

Figure 37: Energy Efficiency – Appliances and Other Products—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	-13.2	-12.2	-25.4
2012	-31.6	-29.3	-60.9
2013	-49.1	-45.4	-94.6
2014	-64.7	-60.2	-124.9
2015	-82.1	-76.2	-158.3
2016	-96.3	-89.2	-185.5
2017	-95.2	-88.3	-183.4
2018	-86.0	-79.7	-165.7
2019	-72.9	-67.4	-140.2
2020	-59.4	-55.0	-114.3
Average	***-59.1***	***-54.8***	***-113.9***

Source: RESI

Figure 38: Energy Efficiency – Appliances and Other Products—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	-$855,257	-$792,692	-$1,647,949
2012	-$2,011,438	-$1,864,294	-$3,875,732
2013	-$3,088,429	-$2,862,499	-$5,950,928
2014	-$4,054,553	-$3,757,947	-$7,812,500
2015	-$5,131,543	-$4,756,152	-$9,887,695
2016	-$5,986,801	-$5,548,844	-$11,535,645
2017	-$5,828,420	-$5,402,049	-$11,230,469
2018	-$5,226,572	-$4,844,229	-$10,070,801
2019	-$4,339,639	-$4,022,178	-$8,361,816
2020	-$3,484,381	-$3,229,486	-$6,713,867
Average	***-$3,637,003***	***-$3,370,943***	***-$7,007,946***

Source: RESI

Figure 39: Energy Efficiency – Appliances and Other Products—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	-$308,843	-$286,250	-$595,093
2012	-$760,229	-$704,615	-$1,464,844
2013	-$1,235,372	-$1,145,000	-$2,380,371
2014	-$1,750,110	-$1,622,083	-$3,372,192
2015	-$2,328,200	-$2,157,884	-$4,486,084
2016	-$2,898,372	-$2,686,345	-$5,584,717
2017	-$3,048,834	-$2,825,800	-$5,874,634
2018	-$2,961,724	-$2,745,063	-$5,706,787
2019	-$2,644,962	-$2,451,473	-$5,096,436
2020	-$2,256,929	-$2,091,826	-$4,348,755
Average	***-$1,835,779***	***-$1,701,485***	***-$3,537,265***

Source: RESI

Figure 40: Energy Efficiency – Appliances and Other Products—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	25.8	26.4	52.1
2011	22.2	22.8	45.0
2012	19.0	19.8	38.7
2013	17.0	18.0	35.0
2014	15.6	16.5	32.1
2015	14.5	15.4	29.8
2016	14.4	15.3	29.7
2017	14.3	15.2	29.5
2018	14.2	15.1	29.3
2019	14.3	15.3	29.5
2020	14.3	15.0	29.4
Average	***16.9***	***17.7***	***34.6***

Source: RESI

Figure 41: Energy Efficiency – Appliances and Other Products—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$461,593	-$484,452	-$946,045
2011	-$670,054	-$703,237	-$1,373,291
2012	-$848,735	-$890,767	-$1,739,502
2013	-$938,076	-$984,532	-$1,922,607
2014	-$1,012,526	-$1,062,669	-$2,075,195
2015	-$1,072,086	-$1,125,179	-$2,197,266
2016	-$1,042,306	-$1,093,924	-$2,136,230
2017	-$1,042,306	-$1,093,924	-$2,136,230
2018	-$1,042,306	-$1,093,924	-$2,136,230
2019	-$982,746	-$1,031,414	-$2,014,160
2020	-$1,012,526	-$1,062,669	-$2,075,195
Average	***-$920,478***	***-$966,063***	***-$1,886,541***

Source: RESI

Figure 42: Energy Efficiency – Appliances and Other Products—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$238,241	$250,040	$488,281
2011	$193,571	$203,157	$396,729
2012	$148,901	$156,275	$305,176
2013	$119,121	$125,020	$244,141
2014	$81,895	$85,951	$167,847
2015	$67,005	$70,324	$137,329
2016	$81,895	$85,951	$167,847
2017	$96,786	$101,579	$198,364
2018	$96,786	$101,579	$198,364
2019	$104,231	$109,392	$213,623
2020	$119,121	$125,020	$244,141
Average	***$122,505***	***$128,572***	***$251,076***

Source: RESI

Figure 43: Energy Efficiency in the Power Sector – General—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-606.5	-512.9	-1,119.4
2011	-780.2	-668.3	-1,448.5
2012	-1,090.6	-941.9	-2,032.4
2013	-1,340.2	-1,164.3	-2,504.6
2014	-1,668.9	-1,447.7	-3,116.7
2015	-1,813.4	-1,572.1	-3,385.5
2016	-1,909.2	-1,652.8	-3,562.0
2017	-1,979.0	-1,711.0	-3,690.0
2018	-2,020.8	-1,742.9	-3,763.7
2019	-2,023.2	-1,742.1	-3,765.3
2020	-2,014.9	-1,732.2	-3,747.1
Average	***-1,567.9***	***-1,353.5***	***-2,921.4***

Source: RESI

Figure 44: Energy Efficiency in the Power Sector – General—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$69,315,368	-$59,835,023	-$129,150,391
2011	-$85,858,024	-$74,115,120	-$159,973,145
2012	-$118,845,064	-$102,590,483	-$221,435,547
2013	-$144,658,159	-$124,873,091	-$269,531,250
2014	-$181,789,052	-$156,925,547	-$338,714,600
2015	-$196,841,232	-$169,919,022	-$366,760,254
2016	-$207,520,253	-$179,137,461	-$386,657,715
2017	-$216,004,507	-$186,461,313	-$402,465,820
2018	-$222,687,085	-$192,229,907	-$414,916,992
2019	-$225,831,828	-$194,944,540	-$420,776,367
2020	-$228,026,596	-$196,839,127	-$424,865,723
Average	***-$172,488,833***	***-$148,897,330***	***-$321,386,164***

Source: RESI

Figure 45: Energy Efficiency in the Power Sector – General—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$16,559,035	-$14,294,236	-$30,853,271
2011	-$21,898,546	-$18,903,456	-$40,802,002
2012	-$31,496,563	-$27,188,740	-$58,685,303
2013	-$39,776,080	-$34,335,858	-$74,111,938
2014	-$51,904,632	-$44,805,573	-$96,710,205
2015	-$59,013,060	-$50,941,774	-$109,954,834
2016	-$64,974,968	-$56,088,264	-$121,063,232
2017	-$70,191,637	-$60,591,444	-$130,783,081
2018	-$74,818,668	-$64,585,629	-$139,404,297
2019	-$77,046,194	-$66,508,494	-$143,554,688
2020	-$78,512,102	-$67,773,909	-$146,286,011
Average	***-$53,290,135***	***-$46,001,580***	***-$99,291,715***

Source: RESI

Figure 46: Energy Efficiency in the Power Sector – General—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	43.5	36.8	80.3
2011	76.8	65.6	142.3
2012	117.4	101.4	218.8
2013	182.0	158.2	340.2
2014	273.7	237.2	510.8
2015	387.5	335.7	723.2
2016	381.1	330.7	711.8
2017	387.6	335.7	723.4
2018	386.8	334.1	720.9
2019	378.9	326.8	705.7
2020	371.3	319.2	690.5
Average	***271.5***	***234.7***	***506.2***

Source: RESI

Figure 47: Energy Efficiency in the Power Sector – General—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$4,959,962	$4,286,864	$9,246,826
2011	$8,528,515	$7,371,143	$15,899,658
2012	$12,833,697	$11,092,085	$23,925,781
2013	$19,954,434	$17,246,494	$37,200,928
2014	$30,234,487	$26,131,480	$56,365,967
2015	$42,986,336	$37,152,824	$80,139,160
2016	$41,316,646	$35,709,721	$77,026,367
2017	$42,135,121	$36,417,125	$78,552,246
2018	$42,495,251	$36,728,382	$79,223,633
2019	$42,364,294	$36,615,198	$78,979,492
2020	$42,102,382	$36,388,829	$78,491,211
Average	***$29,991,920***	***$25,921,831***	***$55,913,752***

Source: RESI

Figure 48: Energy Efficiency in the Power Sector – General—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$1,178,605	$1,018,661	$2,197,266
2011	$2,128,036	$1,839,249	$3,967,285
2012	$3,380,304	$2,921,576	$6,301,880
2013	$5,385,569	$4,654,714	$10,040,283
2014	$8,454,852	$7,307,477	$15,762,329
2015	$12,539,045	$10,837,419	$23,376,465
2016	$12,940,098	$11,184,047	$24,124,146
2017	$13,807,683	$11,933,895	$25,741,577
2018	$14,454,278	$12,492,743	$26,947,021
2019	$14,601,604	$12,620,076	$27,221,680
2020	$14,658,897	$12,669,594	$27,328,491
Average	***$9,411,725***	***$8,134,496***	***$17,546,220***

Source: RESI

Figure 49: Maryland Renewable Energy Portfolio Standard Program—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	239.4	247.6	487.1
2011	3,563.5	3,685.7	7,249.2
2012	1,329.9	1,368.5	2,698.3
2013	3,160.6	3,280.4	6,441.0
2014	1,848.7	1,920.4	3,769.0
2015	5,333.8	5,553.6	10,887.4
2016	3,565.3	3,717.6	7,282.8
2017	19,821.4	20,641.3	40,462.6
2018	18,972.4	20,952.2	39,924.7
2019	8,713.6	9,055.9	17,769.5
2020	3,108.6	3,318.6	6,427.2
Average	***6,332.5***	***6,703.8***	***13,036.3***

Source: RESI

Figure 50: Maryland Renewable Energy Portfolio Standard Program—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$13,623,408	$14,422,246	$28,045,654
2011	$203,031,768	$214,936,982	$417,968,750
2012	$74,876,859	$79,267,428	$154,144,287
2013	$177,652,797	$188,069,859	$365,722,656
2014	$102,449,806	$108,457,176	$210,906,982
2015	$299,299,898	$316,850,005	$616,149,902
2016	$197,368,937	$208,942,098	$406,311,035
2017	$1,117,178,746	$1,182,686,977	$2,299,865,723
2018	$1,070,304,735	$1,133,064,405	$2,203,369,141
2019	$484,957,744	$513,394,307	$998,352,051
2020	$157,610,526	$166,852,365	$324,462,891
Average	***$354,395,929***	***$375,176,714***	***$729,572,643***

Source: RESI

Figure 51: Maryland Renewable Energy Portfolio Standard Program—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$5,292,227	$5,602,548	$10,894,775
2011	$81,191,953	$85,952,822	$167,144,775
2012	$35,837,420	$37,938,825	$73,776,245
2013	$81,006,651	$85,756,654	$166,763,306
2014	$54,360,214	$57,547,745	$111,907,959
2015	$148,345,422	$157,043,982	$305,389,404
2016	$111,485,135	$118,022,311	$229,507,446
2017	$584,583,547	$618,861,888	$1,203,445,435
2018	$626,313,572	$663,038,845	$1,289,352,417
2019	$331,527,633	$350,967,484	$682,495,117
2020	$153,304,106	$162,293,429	$315,597,534
Average	***$201,204,353***	***$213,002,412***	***$414,206,765***

Source: RESI

Figure 52: Maryland Renewable Energy Portfolio Standard Program—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-186.6	-159.9	-346.5
2011	-334.9	-290.7	-625.6
2012	-451.3	-394.6	-845.9
2013	-546.3	-479.4	-1,025.7
2014	-604.9	-529.6	-1,134.5
2015	-638.0	-555.0	-1,193.0
2016	-683.3	-592.5	-1,275.8
2017	-972.7	-847.3	-1,819.9
2018	-1,309.0	-1,142.1	-2,451.1
2019	-1,536.6	-1,341.2	-2,877.8
2020	-1,685.3	-1,469.3	-3,154.6
Average	***-813.5***	***-709.2***	***-1,522.8***

Source: RESI

Figure 53: Maryland Renewable Energy Portfolio Standard Program—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$20,037,125	-$17,468,978	-$37,506,104
2011	-$34,433,205	-$30,019,920	-$64,453,125
2012	-$45,796,815	-$39,927,062	-$85,723,877
2013	-$55,285,510	-$48,199,597	-$103,485,107
2014	-$62,149,326	-$54,183,682	-$116,333,008
2015	-$67,757,765	-$59,073,290	-$126,831,055
2016	-$73,333,596	-$63,934,470	-$137,268,066
2017	-$102,973,542	-$89,775,481	-$192,749,023
2018	-$137,471,962	-$119,852,257	-$257,324,219
2019	-$162,253,435	-$141,457,503	-$303,710,938
2020	-$180,317,824	-$157,206,590	-$337,524,414
Average	***-$85,619,100***	***-$74,645,348***	***-$160,264,449***

Source: RESI

Figure 54: Maryland Renewable Energy Portfolio Standard Program—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$2,527,058	-$2,203,166	-$4,730,225
2011	-$6,611,110	-$5,763,768	-$12,374,878
2012	-$10,010,411	-$8,727,382	-$18,737,793
2013	-$13,091,791	-$11,413,824	-$24,505,615
2014	-$15,651,457	-$13,645,418	-$29,296,875
2015	-$14,518,356	-$12,657,547	-$27,175,903
2016	-$16,727,494	-$14,583,541	-$31,311,035
2017	-$26,982,459	-$23,524,133	-$50,506,592
2018	-$39,740,027	-$34,646,570	-$74,386,597
2019	-$49,481,428	-$43,139,421	-$92,620,850
2020	-$56,744,682	-$49,471,748	-$106,216,431
Average	***-$22,916,934***	***-$19,979,683***	***-$42,896,618***

Source: RESI

Figure 55: Incentives and Grant Programs to Support Renewable Energy—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	176.1	65.3	241.4
2011	262.4	61.4	323.8
2012	68.5	-63.3	5.1
2013	-77.6	-176.6	-254.2
2014	-112.2	-207.7	-320.0
2015	-107.7	-202.1	-309.8
2016	-135.5	-198.0	-333.5
2017	-101.5	-165.9	-267.3
2018	-88.8	-140.8	-229.6
2019	-52.9	-107.2	-160.2
2020	-21.9	-78.5	-100.4
Average	***-17.4***	***-110.3***	***-127.7***

Source: RESI

Figure 56: Incentives and Grant Programs to Support Renewable Energy—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$2,532,324	$16,083,399	$18,615,723
2011	$3,632,431	$23,070,450	$26,702,881
2012	$631,005	$4,007,667	$4,638,672
2013	-$1,693,751	-$10,757,421	-$12,451,172
2014	-$2,208,518	-$14,026,833	-$16,235,352
2015	-$2,059,070	-$13,077,649	-$15,136,719
2016	-$2,366,270	-$15,028,750	-$17,395,020
2017	-$1,735,264	-$11,021,083	-$12,756,348
2018	-$1,436,367	-$9,122,715	-$10,559,082
2019	-$797,059	-$5,062,316	-$5,859,375
2020	-$257,384	-$1,634,706	-$1,892,090
Average	***-$523,448***	***-$3,324,542***	***-$3,847,989***

Source: RESI

Figure 57: Incentives and Grant Programs to Support Renewable Energy—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$1,181,059	$7,501,192	$8,682,251
2011	$1,922,075	$12,207,564	$14,129,639
2012	$763,848	$4,851,386	$5,615,234
2013	-$199,265	-$1,265,579	-$1,464,844
2014	-$514,767	-$3,269,412	-$3,784,180
2015	-$568,735	-$3,612,173	-$4,180,908
2016	-$898,767	-$5,708,288	-$6,607,056
2017	-$716,108	-$4,548,174	-$5,264,282
2018	-$689,124	-$4,376,794	-$5,065,918
2019	-$406,832	-$2,583,890	-$2,990,723
2020	-$136,995	-$870,086	-$1,007,080
Average	***-$23,965***	***-$152,205***	***-$176,170***

Source: RESI

Figure 58: Incentives and Grant Programs to Support Renewable Energy—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-54.2	30.5	-23.7
2011	-28.5	53.5	25.0
2012	-7.9	72.0	64.0
2013	7.6	85.7	93.3
2014	19.9	94.9	114.8
2015	27.5	100.1	127.6
2016	33.6	103.8	137.3
2017	37.2	105.3	142.4
2018	37.2	104.1	141.3
2019	34.0	100.4	134.4
2020	30.2	95.7	125.9
Average	***12.4***	***86.0***	***98.4***

Source: RESI

Figure 59: Incentives and Grant Programs to Support Renewable Energy—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$796,737	-$5,520,402	-$6,317,139
2011	-$254,032	-$1,760,128	-$2,014,160
2012	$215,542	$1,493,442	$1,708,984
2013	$615,835	$4,266,977	$4,882,813
2014	$954,544	$6,613,815	$7,568,359
2015	$1,216,274	$8,427,281	$9,643,555
2016	$1,447,212	$10,027,397	$11,474,609
2017	$1,639,661	$11,360,828	$13,000,488
2018	$1,778,224	$12,320,897	$14,099,121
2019	$1,862,901	$12,907,607	$14,770,508
2020	$1,916,787	$13,280,967	$15,197,754
Average	***$963,292***	***$6,674,426***	***$7,637,718***

Source: RESI

Figure 60: Incentives and Grant Programs to Support Renewable Energy—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$531,158	-$3,680,268	-$4,211,426
2011	-$444,556	-$3,080,224	-$3,524,780
2012	-$361,803	-$2,506,849	-$2,868,652
2013	-$292,522	-$2,026,814	-$2,319,336
2014	-$240,561	-$1,666,788	-$1,907,349
2015	-$196,297	-$1,360,099	-$1,556,396
2016	-$161,657	-$1,120,082	-$1,281,738
2017	-$138,563	-$960,070	-$1,098,633
2018	-$134,714	-$933,401	-$1,068,115
2019	-$153,959	-$1,066,744	-$1,220,703
2020	-$186,675	-$1,293,428	-$1,480,103
Average	***-$258,406***	***-$1,790,433***	***-$2,048,839***

Source: RESI

Figure 61: Offshore Wind Initiatives to Support Renewable Energy—Investment Phase, Employment Impacts[1]

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	751.8	1,416.1	2,167.9
2018	14.0	11.9	25.9
2019	-3.6	-4.1	-7.7
2020	-12.6	-12.6	-25.1
Average	***187.4***	***352.8***	***540.2***

Source: RESI

Figure 62: Offshore Wind Initiatives to Support Renewable Energy—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$30,574,595	$57,560,171	$88,134,766
2018	$402,297	$757,371	$1,159,668
2019	-$359,950	-$677,647	-$1,037,598
2020	-$783,421	-$1,474,880	-$2,258,301
Average	***$7,458,380***	***$14,041,254***	***$21,499,634***

Source: RESI

[1] Offshore Wind according to MEA data is scheduled for the first investment in 2017. This program is therefore defined as having a lifespan from 2017-2020. Averages are done over this period of time.

Figure 63: Offshore Wind Initiatives to Support Renewable Energy—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$19,490,246	$36,692,616	$56,182,861
2018	$1,042,797	$1,963,184	$3,005,981
2019	$381,124	$717,509	$1,098,633
2020	-$47,640	-$89,689	-$137,329
Average	***$5,216,631***	***$9,820,905***	***$15,037,537***

Source: RESI

Figure 64: Offshore Wind Initiatives to Support Renewable Energy—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	0.0	0.0	0.0
2018	146.1	135.7	281.8
2019	150.8	140.3	291.2
2020	150.6	139.6	290.2
Average	***149.2***	***138.5***	***287.7***

Source: RESI

Figure 65: Offshore Wind Initiatives to Support Renewable Energy—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$8,639,369	$8,023,229	$16,662,598
2019	$8,987,476	$8,346,509	$17,333,984
2020	$8,987,476	$8,346,509	$17,333,984
Average	***$8,871,440***	***$8,238,749***	***$17,110,189***

Source: RESI

Figure 66: Offshore Wind Initiatives to Support Renewable Energy—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$19,652,191	$18,250,641	$37,902,832
2019	$20,546,192	$19,080,883	$39,627,075
2020	$21,210,759	$19,698,055	$40,908,813
Average	***$20,469,714***	***$19,009,860***	***$39,479,574***

Source: RESI

A.2 Transportation

Figure 67: Maryland Clean Cars Program—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	985.6	913.1	1,898.7
2013	915.4	839.9	1,755.3
2014	1,214.1	1,115.1	2,329.2
2015	1,206.7	1,105.5	2,312.2
2016	1,192.5	1,089.7	2,282.2
2017	1,174.9	1,070.8	2,245.8
2018	1,150.6	1,045.9	2,196.5
2019	1,109.0	1,006.0	2,115.0
2020	1,077.2	975.4	2,052.6
Average	***911.5***	***832.9***	***1,744.3***

Source: RESI

Figure 68: Maryland Clean Cars Program—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$55,222,000	$50,460,373	$105,682,373
2013	$51,857,333	$47,385,831	$99,243,164
2014	$69,749,070	$63,734,817	$133,483,887
2015	$70,131,781	$64,084,528	$134,216,309
2016	$69,972,318	$63,938,815	$133,911,133
2017	$69,621,499	$63,618,247	$133,239,746
2018	$69,238,788	$63,268,536	$132,507,324
2019	$67,739,837	$61,898,835	$129,638,672
2020	$66,591,704	$60,849,702	$127,441,406
Average	***$53,647,666***	***$49,021,789***	***$102,669,456***

Source: RESI

Figure 69: Maryland Clean Cars Program—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$19,558,124	$17,871,686	$37,429,810
2013	$20,036,513	$18,308,824	$38,345,337
2014	$27,969,792	$25,558,040	$53,527,832
2015	$29,915,239	$27,335,738	$57,250,977
2016	$31,342,432	$28,639,868	$59,982,300
2017	$32,402,860	$29,608,859	$62,011,719
2018	$33,255,987	$30,388,423	$63,644,409
2019	$33,064,631	$30,213,567	$63,278,198
2020	$32,889,222	$30,053,283	$62,942,505
Average	***$23,675,891***	***$21,634,390***	***$45,310,281***

Source: RESI

Figure 70: Maryland Clean Cars Program—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	-521.4	-485.7	-1,007.1
2013	-514.0	-478.6	-992.6
2014	-496.7	-461.5	-958.3
2015	-476.4	-441.2	-917.6
2016	-454.3	-419.6	-873.9
2017	-432.7	-398.5	-831.1
2018	-411.3	-377.5	-788.8
2019	-396.5	-363.4	-759.9
2020	-386.7	-354.1	-740.8
Average	***-371.8***	***-343.6***	***-715.5***

Source: RESI

Figure 71: Maryland Clean Cars Program—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	-$27,945,502	-$25,826,471	-$53,771,973
2013	-$28,008,942	-$25,885,101	-$53,894,043
2014	-$27,596,580	-$25,504,006	-$53,100,586
2015	-$26,962,176	-$24,917,707	-$51,879,883
2016	-$26,105,730	-$24,126,204	-$50,231,934
2017	-$25,249,284	-$23,334,700	-$48,583,984
2018	-$24,551,440	-$22,689,771	-$47,241,211
2019	-$24,012,196	-$22,191,417	-$46,203,613
2020	-$23,694,994	-$21,898,267	-$45,593,262
Average	***-$21,284,259***	***-$19,670,331***	***-$40,954,590***

Source: RESI

Figure 72: Maryland Clean Cars Program—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	-$10,221,837	-$9,446,743	-$19,668,579
2013	-$10,991,052	-$10,157,630	-$21,148,682
2014	-$11,593,735	-$10,714,614	-$22,308,350
2015	-$11,855,427	-$10,956,462	-$22,811,890
2016	-$11,942,658	-$11,037,079	-$22,979,736
2017	-$11,895,077	-$10,993,106	-$22,888,184
2018	-$11,791,987	-$10,897,833	-$22,689,819
2019	-$11,649,246	-$10,765,915	-$22,415,161
2020	-$11,585,805	-$10,707,285	-$22,293,091
Average	***-$9,411,529***	***-$8,697,879***	***-$18,109,408***

Source: RESI

Figure 73: Federal Medium- and Heavy-Duty GHG Standards—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	-1,037.2	-941.5	-1,978.8
2013	-1,445.4	-1,303.9	-2,749.3
2014	-1,808.9	-1,622.1	-3,431.1
2015	-2,114.9	-1,887.4	-4,002.3
2016	-2,397.1	-2,130.2	-4,527.4
2017	-1,385.2	-1,199.2	-2,584.4
2018	-1,055.9	-899.5	-1,955.4
2019	-824.2	-690.9	-1,515.0
2020	-663.9	-547.9	-1,211.9
Average	***-1,157.5***	***-1,020.2***	***-2,177.8***

Source: RESI

Figure 74: Federal Medium- and Heavy-Duty GHG Standards—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	-$78,654,457	-$69,325,280	-$147,979,736
2013	-$122,434,283	-$107,912,397	-$230,346,680
2014	-$161,915,608	-$142,710,856	-$304,626,465
2015	-$196,141,408	-$172,877,146	-$369,018,555
2016	-$228,031,419	-$200,984,694	-$429,016,113
2017	-$157,081,822	-$138,450,404	-$295,532,227
2018	-$127,689,809	-$112,544,566	-$240,234,375
2019	-$106,732,589	-$94,073,075	-$200,805,664
2020	-$91,290,427	-$80,462,503	-$171,752,930
Average	***-$115,451,984***	***-$101,758,266***	***-$217,210,249***

Source: RESI

Figure 75: Federal Medium- and Heavy-Duty GHG Standards—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	-$23,779,632	-$20,959,138	-$44,738,770
2013	-$35,409,915	-$31,209,958	-$66,619,873
2014	-$47,161,854	-$41,568,004	-$88,729,858
2015	-$57,972,990	-$51,096,834	-$109,069,824
2016	-$68,735,463	-$60,582,774	-$129,318,237
2017	-$43,601,398	-$38,429,852	-$82,031,250
2018	-$33,722,956	-$29,723,089	-$63,446,045
2019	-$25,766,674	-$22,710,498	-$48,477,173
2020	-$19,789,325	-$17,442,120	-$37,231,445
Average	***-$32,358,201***	***-$28,520,206***	***-$60,878,407***

Source: RESI

Figure 76: Federal Medium- and Heavy-Duty GHG Standards—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	0.0	0.0	0.0
2018	0.0	0.0	0.0
2019	0.0	0.0	0.0
2020	155.1	141.4	296.6
2021	151.4	166.1	317.4
2022	168.9	154.1	323.1
2023	167.8	152.7	320.4
2024	164.2	149.4	313.6
2025	160.8	146.1	306.9
Average	***60.5***	***56.9***	***117.4***

Source: RESI

Figure 77: Federal Medium- and Heavy-Duty GHG Standards—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$14,473,649	$13,602,523	$28,076,172
2021	$15,260,261	$14,341,790	$29,602,051
2022	$15,511,976	$14,578,356	$30,090,332
2023	$15,480,512	$14,548,785	$30,029,297
2024	$15,354,654	$14,430,502	$29,785,156
2025	$15,228,796	$14,312,219	$29,541,016
Average	***$5,706,866***	***$5,363,386***	***$11,070,251***

Source: RESI

Figure 78: Federal Medium- and Heavy-Duty GHG Standards—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$5,168,037	$4,856,988	$10,025,024
2021	$5,993,979	$5,633,219	$11,627,197
2022	$6,481,678	$6,091,564	$12,573,242
2023	$6,796,322	$6,387,271	$13,183,594
2024	$6,985,109	$6,564,696	$13,549,805
2025	$7,095,235	$6,668,193	$13,763,428
Average	***$2,407,522***	***$2,262,621***	***$4,670,143***

Source: RESI

Figure 79: Clean Fuel Standard—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	-204.7	-186.0	-390.8
2013	-283.9	-256.1	-540.1
2014	-356.5	-319.8	-676.4
2015	-420.4	-375.1	-795.6
2016	-481.5	-428.1	-909.6
2017	-241.9	-208.1	-450.0
2018	-165.1	-138.4	-303.5
2019	-111.4	-90.2	-201.5
2020	-74.6	-58.0	-132.6
Average	***-212.7***	***-187.3***	***-400.0***

Source: RESI

Figure 80: Clean Fuel Standard—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	-$15,451,308	-$13,601,426	-$29,052,734
2013	-$23,939,790	-$21,073,638	-$45,013,428
2014	-$31,843,978	-$28,031,510	-$59,875,488
2015	-$39,017,800	-$34,346,458	-$73,364,258
2016	-$45,899,475	-$40,404,236	-$86,303,711
2017	-$28,630,365	-$25,202,642	-$53,833,008
2018	-$21,651,308	-$19,059,141	-$40,710,449
2019	-$16,619,895	-$14,630,105	-$31,250,000
2020	-$13,016,753	-$11,458,344	-$24,475,098
Average	***-$21,460,970***	***-$18,891,591***	***-$40,352,561***

Source: RESI

Figure 81: Clean Fuel Standard—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	-$4,698,691	-$4,136,148	-$8,834,839
2013	-$6,954,712	-$6,122,070	-$13,076,782
2014	-$9,300,000	-$8,186,573	-$17,486,572
2015	-$11,515,445	-$10,136,777	-$21,652,222
2016	-$13,820,157	-$12,165,561	-$25,985,718
2017	-$7,750,000	-$6,822,144	-$14,572,144
2018	-$5,339,790	-$4,700,493	-$10,040,283
2019	-$3,432,722	-$3,021,745	-$6,454,468
2020	-$2,020,681	-$1,778,758	-$3,799,438
Average	***-$5,893,836***	***-$5,188,206***	***-$11,082,042***

Source: RESI

Figure 82: Clean Fuel Standard—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	0.0	0.0	0.0
2018	0.0	0.0	0.0
2019	0.0	0.0	0.0
2020	18.3	17.5	35.8
2021	15.4	15.9	31.3
2022	14.2	13.9	28.2
2023	13.0	12.6	25.6
2024	12.0	11.8	23.7
2025	11.4	11.3	22.7
Average	***5.3***	***5.2***	***10.5***

Source: RESI

Figure 83: Clean Fuel Standard—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	-$461,260	-$454,267	-$915,527
2021	-$584,263	-$575,405	-$1,159,668
2022	-$707,266	-$696,543	-$1,403,809
2023	-$768,767	-$757,112	-$1,525,879
2024	-$830,269	-$817,681	-$1,647,949
2025	-$799,518	-$787,396	-$1,586,914
Average	***-$259,459***	***-$255,525***	***-$514,984***

Source: RESI

Figure 84: Clean Fuel Standard—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$299,819	$295,274	$595,093
2021	$307,507	$302,845	$610,352
2022	$261,381	$257,418	$518,799
2023	$230,630	$227,134	$457,764
2024	$199,879	$196,849	$396,729
2025	$215,255	$211,991	$427,246
Average	***$94,654***	***$93,219***	***$187,874***

Source: RESI

Figure 85: Transportation Climate Initiative—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	0.0	0.0	0.0
2018	0.0	0.0	0.0
2019	0.0	0.0	0.0
2020	0.0	0.0	0.0
Average	0.0	0.0	0.0

Source: RESI

Figure 86: Transportation Climate Initiative—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 87: Transportation Climate Initiative—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 88: Transportation Climate Initiative—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.2	0.2	0.5
2014	0.5	0.1	0.6
2015	0.2	0.1	0.3
2016	0.7	0.3	0.9
2017	0.5	0.2	0.6
2018	0.2	0.0	0.2
2019	0.2	0.0	0.3
2020	0.2	0.0	0.2
Average	***0.2***	***0.1***	***0.3***

Source: RESI

Figure 89: Transportation Climate Initiative—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$22,386	$8,131	$30,518
2014	$44,772	$16,263	$61,035
2015	$0	$0	$0
2016	$44,772	$16,263	$61,035
2017	$44,772	$16,263	$61,035
2018	$0	$0	$0
2019	$44,772	$16,263	$61,035
2020	$0	$0	$0
Average	***$18,316***	***$6,653***	***$24,969***

Source: RESI

Figure 90: Transportation Climate Initiative—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$22,386	$8,131	$30,518
2014	$11,193	$4,066	$15,259
2015	$11,193	$4,066	$15,259
2016	$33,579	$12,197	$45,776
2017	$44,772	$16,263	$61,035
2018	$11,193	$4,066	$15,259
2019	$22,386	$8,131	$30,518
2020	$22,386	$8,131	$30,518
Average	***$16,281***	***$5,914***	***$22,195***

Source: RESI

Figure 91: Public Transportation Initiatives—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	761.2	287.7	1,048.9
2011	1,414.1	544.0	1,958.1
2012	1,439.3	563.2	2,002.5
2013	1,446.2	568.9	2,015.1
2014	1,439.8	567.7	2,007.5
2015	1,433.1	567.0	2,000.1
2016	1,429.5	569.3	1,998.8
2017	799.9	323.0	1,122.9
2018	787.8	316.5	1,104.4
2019	792.6	322.7	1,115.3
2020	805.1	334.9	1,140.1
Average	***1,140.8***	***451.4***	***1,592.1***

Source: RESI

Figure 92: Public Transportation Initiatives—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$57,769,773	$22,857,669	$80,627,441
2011	$107,536,617	$42,548,832	$150,085,449
2012	$109,285,891	$43,240,964	$152,526,855
2013	$108,979,768	$43,119,841	$152,099,609
2014	$108,914,170	$43,093,886	$152,008,057
2015	$108,673,645	$42,998,718	$151,672,363
2016	$108,542,450	$42,946,808	$151,489,258
2017	$57,113,795	$22,598,119	$79,711,914
2018	$56,282,890	$22,269,356	$78,552,246
2019	$56,676,477	$22,425,086	$79,101,563
2020	$57,813,505	$22,874,972	$80,688,477
Average	***$85,235,362***	***$33,724,932***	***$118,960,294***

Source: RESI

Figure 93: Public Transportation Initiatives—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$26,545,232	$10,503,107	$37,048,340
2011	$51,319,325	$20,305,431	$71,624,756
2012	$54,697,610	$21,642,111	$76,339,722
2013	$56,599,946	$22,394,805	$78,994,751
2014	$58,633,477	$23,199,409	$81,832,886
2015	$60,295,287	$23,856,935	$84,152,222
2016	$61,804,036	$24,453,899	$86,257,935
2017	$34,974,546	$13,838,320	$48,812,866
2018	$33,881,250	$13,405,737	$47,286,987
2019	$33,651,658	$13,314,895	$46,966,553
2020	$34,187,373	$13,526,860	$47,714,233
Average	***$46,053,613***	***$18,221,955***	***$64,275,568***

Source: RESI

Figure 94: Public Transportation Initiatives—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	459.1	293.5	752.6
2011	485.1	309.5	794.6
2012	489.1	313.5	802.6
2013	485.5	311.2	796.7
2014	480.7	307.8	788.6
2015	474.7	304.1	778.8
2016	470.5	301.7	772.2
2017	452.6	294.5	747.2
2018	449.2	293.3	742.6
2019	441.6	286.7	728.3
2020	438.4	283.7	722.2
Average	***466.1***	***300.0***	***766.0***

Source: RESI

Figure 95: Public Transportation Initiatives—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$28,686,380	$18,463,278	$47,149,658
2011	$30,023,221	$19,323,703	$49,346,924
2012	$29,874,683	$19,228,100	$49,102,783
2013	$29,057,724	$18,702,285	$47,760,010
2014	$28,426,438	$18,295,974	$46,722,412
2015	$27,628,047	$17,782,109	$45,410,156
2016	$26,959,627	$17,351,897	$44,311,523
2017	$25,288,576	$16,276,366	$41,564,941
2018	$24,768,693	$15,941,756	$40,710,449
2019	$24,137,407	$15,535,445	$39,672,852
2020	$23,877,466	$15,368,140	$39,245,605
Average	***$27,157,115***	***$17,479,005***	***$44,636,119***

Source: RESI

Figure 96: Public Transportation Initiatives—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$11,938,733	$7,684,070	$19,622,803
2011	$13,637,635	$8,777,526	$22,415,161
2012	$14,621,698	$9,410,894	$24,032,593
2013	$15,225,134	$9,799,280	$25,024,414
2014	$15,967,823	$10,277,294	$26,245,117
2015	$16,645,527	$10,713,482	$27,359,009
2016	$17,248,962	$11,101,868	$28,350,830
2017	$17,351,082	$11,167,595	$28,518,677
2018	$17,991,652	$11,579,881	$29,571,533
2019	$18,270,160	$11,759,137	$30,029,297
2020	$18,622,938	$11,986,193	$30,609,131
Average	***$16,138,304***	***$10,387,020***	***$26,525,324***

Source: RESI

Figure 97: Initiatives to Double Transit Ridership by 2020—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	6,178.2	2,348.3	8,526.5
2012	8,073.0	3,126.2	11,199.2
2013	8,143.2	3,186.7	11,329.9
2014	8,109.0	3,182.8	11,291.8
2015	8,302.4	3,257.0	11,559.3
2016	8,244.1	3,236.5	11,480.6
2017	8,195.0	3,225.9	11,420.9
2018	8,158.6	3,226.4	11,385.1
2019	8,146.5	3,223.6	11,370.1
2020	8,172.9	3,250.8	11,423.6
Average	***7,247.5***	***2,842.2***	***10,089.7***

Source: RESI

Figure 98: Initiatives to Double Transit Ridership by 2020—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$472,727,370	$185,384,202	$658,111,572
2012	$618,546,172	$242,568,329	$861,114,502
2013	$620,606,751	$243,376,403	$863,983,154
2014	$621,395,909	$243,685,879	$865,081,787
2015	$639,173,877	$250,657,666	$889,831,543
2016	$636,455,668	$249,591,696	$886,047,363
2017	$634,175,879	$248,697,656	$882,873,535
2018	$636,236,457	$249,505,730	$885,742,188
2019	$635,622,668	$249,265,028	$884,887,695
2020	$639,349,246	$250,726,438	$890,075,684
Average	***$559,480,909***	***$219,405,366***	***$778,886,275***

Source: RESI

Figure 99: Initiatives to Double Transit Ridership by 2020—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$221,479,295	$86,855,056	$308,334,351
2012	$305,195,772	$119,685,210	$424,880,981
2013	$321,252,938	$125,982,169	$447,235,107
2014	$336,685,355	$132,034,127	$468,719,482
2015	$358,891,375	$140,742,414	$499,633,789
2016	$369,534,043	$144,916,030	$514,450,073
2017	$378,861,449	$148,573,854	$527,435,303
2018	$389,712,367	$152,829,137	$542,541,504
2019	$396,551,733	$155,511,255	$552,062,988
2020	$404,695,402	$158,704,866	$563,400,269
Average	***$316,623,612***	***$124,166,738***	***$440,790,350***

Source: RESI

Figure 100: Initiatives to Double Transit Ridership by 2020—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	895.1	844.1	1,739.2
2012	909.2	858.6	1,767.8
2013	896.3	847.9	1,744.2
2014	879.2	831.2	1,710.4
2015	855.4	808.8	1,664.2
2016	832.4	787.0	1,619.4
2017	809.6	765.5	1,575.1
2018	785.2	742.8	1,528.0
2019	763.8	722.7	1,486.5
2020	952.9	903.0	1,856.0
2021	84.0	92.2	176.2
2022	75.1	69.2	144.3
2023	76.5	71.0	147.5
2024	87.5	81.8	169.3
2025	104.5	98.1	202.5
Average	***562.9***	***532.7***	***1,095.7***

Source: RESI

Figure 101: Initiatives to Double Transit Ridership by 2020—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$37,162,099	$35,408,701	$72,570,801
2012	$37,646,551	$35,870,295	$73,516,846
2013	$36,365,099	$34,649,305	$71,014,404
2014	$35,177,412	$33,517,656	$68,695,068
2015	$33,474,019	$31,894,633	$65,368,652
2016	$31,754,998	$30,256,720	$62,011,719
2017	$30,035,978	$28,618,807	$58,654,785
2018	$28,504,487	$27,159,576	$55,664,063
2019	$27,285,545	$25,998,147	$53,283,691
2020	$34,692,961	$33,056,063	$67,749,023
2021	$562,589	$536,044	$1,098,633
2022	-$625,098	-$595,605	-$1,220,703
2023	-$562,589	-$536,044	-$1,098,633
2024	$125,020	$119,121	$244,141
2025	$1,281,452	$1,220,990	$2,502,441
Average	***$20,805,033***	***$19,823,401***	***$40,628,433***

Source: RESI

Figure 102: Initiatives to Double Transit Ridership by 2020—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$14,799,204	$14,100,942	$28,900,146
2012	$16,768,264	$15,977,097	$32,745,361
2013	$17,768,422	$16,930,065	$34,698,486
2014	$18,862,344	$17,972,373	$36,834,717
2015	$19,628,090	$18,701,989	$38,330,078
2016	$20,229,747	$19,275,258	$39,505,005
2017	$20,698,571	$19,721,962	$40,420,532
2018	$21,151,767	$20,153,775	$41,305,542
2019	$21,151,767	$20,153,775	$41,305,542
2020	$25,800,936	$24,583,585	$50,384,521
2021	$4,391,316	$4,184,123	$8,575,439
2022	$2,422,256	$2,307,968	$4,730,225
2023	$1,484,609	$1,414,561	$2,899,170
2024	$1,218,942	$1,161,429	$2,380,371
2025	$1,468,981	$1,399,671	$2,868,652
Average	***$12,990,326***	***$12,377,411***	***$25,367,737***

Source: RESI

Figure 103: Intercity Transportation Initiatives—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	372.0	141.2	513.3
2012	392.2	152.3	544.6
2013	395.4	155.1	550.5
2014	324.0	127.2	451.3
2015	306.7	119.1	425.8
2016	303.2	117.5	420.7
2017	0.9	-2.7	-1.9
2018	-5.6	-8.1	-13.7
2019	-5.2	-7.3	-12.5
2020	-2.2	-4.2	-6.4
Average	***189.2***	***71.8***	***261.0***

Source: RESI

Figure 104: Intercity Transportation Initiatives—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$28,689,610	$10,891,689	$39,581,299
2012	$30,326,488	$11,513,111	$41,839,600
2013	$30,392,848	$11,538,304	$41,931,152
2014	$24,907,094	$9,455,699	$34,362,793
2015	$23,535,655	$8,935,048	$32,470,703
2016	$23,270,216	$8,834,277	$32,104,492
2017	-$1,725,358	-$655,013	-$2,380,371
2018	-$2,388,957	-$906,941	-$3,295,898
2019	-$2,344,718	-$890,146	-$3,234,863
2020	-$2,079,278	-$789,375	-$2,868,652
Average	***$13,871,236***	***$5,266,059***	***$19,137,296***

Source: RESI

Figure 105: Intercity Transportation Initiatives—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$13,460,006	$5,109,940	$18,569,946
2012	$15,074,764	$5,722,965	$20,797,729
2013	$15,815,783	$6,004,285	$21,820,068
2014	$13,725,446	$5,210,712	$18,936,157
2015	$13,504,246	$5,126,736	$18,630,981
2016	$13,692,266	$5,198,115	$18,890,381
2017	$232,260	$88,175	$320,435
2018	-$873,739	-$331,705	-$1,205,444
2019	-$1,371,439	-$520,651	-$1,892,090
2020	-$1,559,458	-$592,031	-$2,151,489
Average	***$7,427,285***	***$2,819,685***	***$10,246,970***

Source: RESI

Figure 106: Intercity Transportation Initiatives—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	152.5	145.3	297.8
2012	154.3	147.1	301.4
2013	154.1	147.2	301.3
2014	152.4	145.1	297.5
2015	267.9	255.0	522.9
2016	267.6	254.6	522.2
2017	199.2	188.9	388.0
2018	193.9	184.1	378.0
2019	188.6	178.9	367.5
2020	185.1	175.4	360.4
Average	***174.1***	***165.6***	***339.7***

Source: RESI

Figure 107: Intercity Transportation Initiatives—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$5,960,009	$5,667,188	$11,627,197
2012	$6,022,581	$5,726,686	$11,749,268
2013	$5,928,723	$5,637,439	$11,566,162
2014	$5,803,578	$5,518,443	$11,322,021
2015	$10,449,570	$9,936,172	$20,385,742
2016	$10,355,711	$9,846,925	$20,202,637
2017	$7,571,245	$7,199,263	$14,770,508
2018	$7,258,384	$6,901,772	$14,160,156
2019	$6,976,809	$6,634,031	$13,610,840
2020	$6,789,092	$6,455,537	$13,244,629
Average	***$6,646,882***	***$6,320,314***	***$12,967,196***

Source: RESI

Figure 108: Intercity Transportation Initiatives—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$2,205,673	$2,097,306	$4,302,979
2012	$2,510,713	$2,387,359	$4,898,071
2013	$2,714,072	$2,580,727	$5,294,800
2014	$2,870,503	$2,729,472	$5,599,976
2015	$5,224,785	$4,968,086	$10,192,871
2016	$5,647,148	$5,369,698	$11,016,846
2017	$4,739,850	$4,506,976	$9,246,826
2018	$4,778,957	$4,544,163	$9,323,120
2019	$4,724,207	$4,492,102	$9,216,309
2020	$4,700,742	$4,469,790	$9,170,532
Average	***$3,646,968***	***$3,467,789***	***$7,114,757***

Source: RESI

Figure 109: Bike and Pedestrian Initiatives—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	2,050.8	761.0	2,811.8
2012	2,143.2	808.6	2,951.8
2013	2,136.8	803.5	2,940.3
2014	1,973.8	733.3	2,707.1
2015	1,835.4	667.9	2,503.3
2016	1,622.3	574.2	2,196.5
2017	1,066.2	343.4	1,409.6
2018	1,032.0	319.0	1,351.0
2019	1,017.8	308.4	1,326.2
2020	1,019.5	310.8	1,330.4
Average	***1,445.3***	***511.8***	***1,957.1***

Source: RESI

Figure 110: Bike and Pedestrian Initiatives—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$161,136,001	$57,064,683	$218,200,684
2012	$168,730,803	$59,754,305	$228,485,107
2013	$167,581,441	$59,347,270	$226,928,711
2014	$155,772,313	$55,165,187	$210,937,500
2015	$145,450,594	$51,509,855	$196,960,449
2016	$128,593,290	$45,540,011	$174,133,301
2017	$82,393,457	$29,178,808	$111,572,266
2018	$80,455,318	$28,492,436	$108,947,754
2019	$79,734,150	$28,237,042	$107,971,191
2020	$80,545,464	$28,524,360	$109,069,824
Average	***$113,672,075***	***$40,255,814***	***$153,927,890***

Source: RESI

Figure 111: Bike and Pedestrian Initiatives—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$76,725,527	$27,171,568	$103,897,095
2012	$85,999,298	$30,455,780	$116,455,078
2013	$90,371,379	$32,004,109	$122,375,488
2014	$89,300,896	$31,625,008	$120,925,903
2015	$87,869,828	$31,118,210	$118,988,037
2016	$81,908,922	$29,007,215	$110,916,138
2017	$58,628,714	$20,762,765	$79,391,479
2018	$57,828,668	$20,479,437	$78,308,105
2019	$57,490,621	$20,359,721	$77,850,342
2020	$58,223,057	$20,619,106	$78,842,163
Average	***$67,667,901***	***$23,963,902***	***$91,631,803***

Source: RESI

Figure 112: Bike and Pedestrian Initiatives—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	-0.1	-0.1
2012	0.2	0.3	0.5
2013	-0.2	-0.1	-0.3
2014	0.0	-0.1	-0.1
2015	0.0	-0.1	-0.1
2016	0.2	0.2	0.5
2017	0.0	0.0	0.0
2018	0.0	-0.1	-0.1
2019	0.0	0.1	0.1
2020	0.0	0.0	0.0
2021	0.0	0.0	0.0
2022	0.0	0.0	0.0
2023	0.0	0.0	0.0
2024	0.0	0.0	0.0
2025	0.0	0.0	0.0
Average	***0.0***	***0.0***	***0.0***

Source: RESI

Figure 113: Bike and Pedestrian Initiatives—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$20,158	$10,359	$30,518
2013	-$20,158	-$10,359	-$30,518
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	-$40,317	-$20,718	-$61,035
2019	$40,317	$20,718	$61,035
2020	$0	$0	$0
2021	$0	$0	$0
2022	$0	$0	$0
2023	$0	$0	$0
2024	$0	$0	$0
2025	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 114: Bike and Pedestrian Initiatives—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	-$10,079	-$5,180	-$15,259
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$20,158	$10,359	$30,518
2018	-$10,079	-$5,180	-$15,259
2019	$0	$0	$0
2020	$0	$0	$0
2021	$0	$0	$0
2022	$0	$0	$0
2023	$0	$0	$0
2024	$0	$0	$0
2025	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 115: Pricing Initiatives—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	1,912.3	727.0	2,639.2
2012	1,962.2	766.9	2,729.0
2013	1,979.5	781.2	2,760.7
2014	1,974.0	782.1	2,756.1
2015	54.2	32.1	86.3
2016	4.3	-11.0	-6.7
2017	-9.2	-21.7	-30.9
2018	-0.5	-11.6	-12.1
2019	20.1	9.3	29.4
2020	40.9	29.5	70.5
Average	***721.6***	***280.3***	***1,002.0***

Source: RESI

Figure 116: Pricing Initiatives—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$146,687,985	$56,986,332	$203,674,316
2012	$150,556,292	$58,489,118	$209,045,410
2013	$150,929,936	$58,634,273	$209,564,209
2014	$151,149,726	$58,719,659	$209,869,385
2015	-$2,153,944	-$836,779	-$2,990,723
2016	-$7,165,161	-$2,783,570	-$9,948,730
2017	-$8,747,650	-$3,398,346	-$12,145,996
2018	-$8,132,238	-$3,159,266	-$11,291,504
2019	-$6,242,042	-$2,424,950	-$8,666,992
2020	-$4,263,930	-$1,656,480	-$5,920,410
Average	***$51,147,179***	***$19,869,999***	***$71,017,179***

Source: RESI

Figure 117: Pricing Initiatives—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$68,706,419	$26,691,530	$95,397,949
2012	$74,574,817	$28,971,325	$103,546,143
2013	$77,904,639	$30,264,917	$108,169,556
2014	$81,179,513	$31,537,162	$112,716,675
2015	$4,472,731	$1,737,596	$6,210,327
2016	-$1,263,794	-$490,967	-$1,754,761
2017	-$4,593,615	-$1,784,558	-$6,378,174
2018	-$6,143,136	-$2,386,527	-$8,529,663
2019	-$6,286,000	-$2,442,027	-$8,728,027
2020	-$5,769,493	-$2,241,371	-$8,010,864
Average	***$25,707,462***	***$9,987,007***	***$35,694,469***

Source: RESI

Figure 118: Pricing Initiatives—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	130.8	121.9	252.6
2011	137.8	129.4	267.1
2012	143.3	135.6	278.9
2013	144.7	137.9	282.6
2014	148.1	141.6	289.7
2015	150.2	144.0	294.2
2016	153.5	147.9	301.4
2017	157.7	152.1	309.8
2018	160.6	155.7	316.2
2019	153.7	149.7	303.3
2020	149.4	145.8	295.1
Average	***148.2***	***141.9***	***290.1***

Source: RESI

Figure 119: Pricing Initiatives—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$8,228,911	$7,884,370	$16,113,281
2011	$8,104,230	$7,764,910	$15,869,141
2012	$7,870,455	$7,540,922	$15,411,377
2013	$7,356,148	$7,048,149	$14,404,297
2014	$6,982,106	$6,689,769	$13,671,875
2015	$6,483,384	$6,211,928	$12,695,313
2016	$6,047,003	$5,793,818	$11,840,820
2017	$5,672,961	$5,435,437	$11,108,398
2018	$5,236,580	$5,017,327	$10,253,906
2019	$4,519,667	$4,330,431	$8,850,098
2020	$4,145,626	$3,972,050	$8,117,676
Average	***$6,422,461***	***$6,153,556***	***$12,576,017***

Source: RESI

Figure 120: Pricing Initiatives—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$3,646,904	$3,494,210	$7,141,113
2011	$4,067,700	$3,897,388	$7,965,088
2012	$4,465,119	$4,278,167	$8,743,286
2013	$4,722,273	$4,524,553	$9,246,826
2014	$5,096,314	$4,882,934	$9,979,248
2015	$5,478,148	$5,248,781	$10,726,929
2016	$5,891,152	$5,644,492	$11,535,645
2017	$6,327,534	$6,062,603	$12,390,137
2018	$6,756,123	$6,473,247	$13,229,370
2019	$6,802,878	$6,518,045	$13,320,923
2020	$6,896,388	$6,607,640	$13,504,028
Average	***$5,468,230***	***$5,239,278***	***$10,707,508***

Source: RESI

Figure 121: Transportation Technology Initiatives—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	5.5	2.2	7.6
2012	84.1	31.8	115.9
2013	6.1	2.7	8.8
2014	4.7	1.3	6.0
2015	-1.8	-1.7	-3.5
2016	-2.3	-2.3	-4.7
2017	-2.0	-1.9	-4.0
2018	-2.2	-2.0	-4.2
2019	-1.8	-1.6	-3.4
2020	-1.6	-1.6	-3.3
Average	***8.1***	***2.4***	***10.5***

Source: RESI

Figure 122: Transportation Technology Initiatives—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$445,487	$134,347	$579,834
2012	$6,916,766	$2,085,919	$9,002,686
2013	$445,487	$134,347	$579,834
2014	$375,147	$113,135	$488,281
2015	-$234,467	-$70,709	-$305,176
2016	-$281,360	-$84,851	-$366,211
2017	-$234,467	-$70,709	-$305,176
2018	-$281,360	-$84,851	-$366,211
2019	-$140,680	-$42,425	-$183,105
2020	-$140,680	-$42,425	-$183,105
Average	***$624,534***	***$188,343***	***$812,877***

Source: RESI

Figure 123: Transportation Technology Initiatives—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$199,297	$60,103	$259,399
2012	$3,388,043	$1,021,747	$4,409,790
2013	$410,317	$123,741	$534,058
2014	$328,253	$98,993	$427,246
2015	$46,893	$14,142	$61,035
2016	-$23,447	-$7,071	-$30,518
2017	-$46,893	-$14,142	-$61,035
2018	-$82,063	-$24,748	-$106,812
2019	-$58,617	-$17,677	-$76,294
2020	-$70,340	-$21,213	-$91,553
Average	***$371,949***	***$112,170***	***$484,120***

Source: RESI

Figure 124: Transportation Technology Initiatives—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-500.8	-470.8	-971.6
2011	-462.0	-433.0	-895.1
2012	-420.8	-393.1	-813.9
2013	-386.4	-359.5	-745.8
2014	-344.1	-318.2	-662.3
2015	-306.7	-281.2	-587.9
2016	-271.2	-246.0	-517.3
2017	-239.3	-215.0	-454.3
2018	-209.0	-184.5	-393.4
2019	-202.1	-177.2	-379.3
2020	-192.7	-168.2	-360.9
Average	***-321.4***	***-295.2***	***-616.5***

Source: RESI

Figure 125: Transportation Technology Initiatives—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$20,727,686	-$19,036,718	-$39,764,404
2011	-$20,282,272	-$18,627,640	-$38,909,912
2012	-$19,693,688	-$18,087,074	-$37,780,762
2013	-$19,136,920	-$17,575,727	-$36,712,646
2014	-$18,261,998	-$16,772,181	-$35,034,180
2015	-$17,657,507	-$16,217,005	-$33,874,512
2016	-$17,053,016	-$15,661,828	-$32,714,844
2017	-$16,607,601	-$15,252,750	-$31,860,352
2018	-$16,257,633	-$14,931,332	-$31,188,965
2019	-$16,671,232	-$15,311,190	-$31,982,422
2020	-$16,703,047	-$15,340,410	-$32,043,457
Average	***-$18,095,691***	***-$16,619,441***	***-$34,715,132***

Source: RESI

Figure 126: Transportation Technology Initiatives—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$7,802,709	-$7,166,163	-$14,968,872
2011	-$7,834,525	-$7,195,383	-$15,029,907
2012	-$7,540,233	-$6,925,099	-$14,465,332
2013	-$7,110,726	-$6,530,632	-$13,641,357
2014	-$6,482,373	-$5,953,540	-$12,435,913
2015	-$5,702,898	-$5,237,654	-$10,940,552
2016	-$4,875,699	-$4,477,939	-$9,353,638
2017	-$3,976,916	-$3,652,479	-$7,629,395
2018	-$3,101,995	-$2,848,933	-$5,950,928
2019	-$2,799,749	-$2,571,345	-$5,371,094
2020	-$2,433,873	-$2,235,317	-$4,669,189
Average	***-$5,423,790***	***-$4,981,317***	***-$10,405,107***

Source: RESI

Figure 127: Electric Vehicle Initiatives—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	19.9	7.7	27.7
2011	20.4	8.0	28.3
2012	20.7	8.4	29.1
2013	20.6	8.6	29.3
2014	20.3	8.0	28.3
2015	20.2	8.2	28.4
2016	19.8	7.9	27.7
2017	20.6	8.4	29.0
2018	20.7	8.9	29.6
2019	20.4	8.6	29.0
2020	20.9	8.9	29.8
Average	***20.4***	***8.3***	***28.7***

Source: RESI

Figure 128: Electric Vehicle Initiatives—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$1,495,837	$609,876	$2,105,713
2011	$1,517,515	$618,715	$2,136,230
2012	$1,560,873	$636,393	$2,197,266
2013	$1,560,873	$636,393	$2,197,266
2014	$1,560,873	$636,393	$2,197,266
2015	$1,517,515	$618,715	$2,136,230
2016	$1,474,158	$601,037	$2,075,195
2017	$1,560,873	$636,393	$2,197,266
2018	$1,604,231	$654,070	$2,258,301
2019	$1,647,588	$671,748	$2,319,336
2020	$1,604,231	$654,070	$2,258,301
Average	***$1,554,961***	***$633,982***	***$2,188,943***

Source: RESI

Figure 129: Electric Vehicle Initiatives—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$682,882	$278,422	$961,304
2011	$726,240	$296,099	$1,022,339
2012	$791,276	$322,616	$1,113,892
2013	$812,955	$331,454	$1,144,409
2014	$812,955	$331,454	$1,144,409
2015	$856,312	$349,132	$1,205,444
2016	$856,312	$349,132	$1,205,444
2017	$910,509	$371,229	$1,281,738
2018	$943,027	$384,487	$1,327,515
2019	$975,546	$397,745	$1,373,291
2020	$997,224	$406,584	$1,403,809
Average	***$851,385***	***$347,123***	***$1,198,509***

Source: RESI

Figure 130: Electric Vehicle Initiatives—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-9.9	-9.7	-19.7
2011	-8.9	-8.5	-17.4
2012	-7.4	-7.2	-14.6
2013	-6.7	-6.4	-13.1
2014	-5.8	-5.7	-11.6
2015	-5.4	-5.4	-10.9
2016	-4.4	-4.3	-8.6
2017	-3.7	-3.7	-7.4
2018	-3.0	-2.9	-5.8
2019	-2.8	-2.6	-5.4
2020	-3.0	-2.9	-5.9
Average	***-5.5***	***-5.4***	***-10.9***

Source: RESI

Figure 131: Electric Vehicle Initiatives—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$386,134	-$376,805	-$762,939
2011	-$355,244	-$346,661	-$701,904
2012	-$308,908	-$301,444	-$610,352
2013	-$293,462	-$286,372	-$579,834
2014	-$262,571	-$256,227	-$518,799
2015	-$278,017	-$271,300	-$549,316
2016	-$278,017	-$271,300	-$549,316
2017	-$216,235	-$211,011	-$427,246
2018	-$216,235	-$211,011	-$427,246
2019	-$185,345	-$180,866	-$366,211
2020	-$247,126	-$241,155	-$488,281
Average	***-$275,209***	***-$268,559***	***-$543,768***

Source: RESI

Figure 132: Electric Vehicle Initiatives—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$146,731	-$143,186	-$289,917
2011	-$139,008	-$135,650	-$274,658
2012	-$115,840	-$113,041	-$228,882
2013	-$100,395	-$97,969	-$198,364
2014	-$100,395	-$97,969	-$198,364
2015	-$77,227	-$75,361	-$152,588
2016	-$61,782	-$60,289	-$122,070
2017	-$30,891	-$30,144	-$61,035
2018	-$7,723	-$7,536	-$15,259
2019	$15,445	$15,072	$30,518
2020	$7,723	$7,536	$15,259
Average	***-$68,802***	***-$67,140***	***-$135,942***

Source: RESI

Figure 133: Low-Emitting Vehicles Initiatives—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	33.1	12.3	45.4
2011	8.9	3.7	12.6
2012	8.5	3.2	11.7
2013	8.0	3.0	11.0
2014	7.9	2.6	10.5
2015	7.0	2.1	9.1
2016	6.9	1.9	8.8
2017	7.2	2.2	9.4
2018	7.1	2.2	9.3
2019	7.1	2.1	9.3
2020	6.9	1.9	8.7
Average	***9.9***	***3.4***	***13.3***

Source: RESI

Figure 134: Low-Emitting Vehicles Initiatives—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$2,615,204	$894,318	$3,509,521
2011	$682,227	$233,300	$915,527
2012	$636,745	$217,747	$854,492
2013	$614,004	$209,970	$823,975
2014	$636,745	$217,747	$854,492
2015	$545,782	$186,640	$732,422
2016	$500,300	$171,087	$671,387
2017	$591,264	$202,194	$793,457
2018	$591,264	$202,194	$793,457
2019	$636,745	$217,747	$854,492
2020	$545,782	$186,640	$732,422
Average	***$781,460***	***$267,235***	***$1,048,695***

Source: RESI

Figure 135: Low-Emitting Vehicles Initiatives—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$1,228,009	$419,940	$1,647,949
2011	$386,595	$132,203	$518,799
2012	$386,595	$132,203	$518,799
2013	$386,595	$132,203	$518,799
2014	$375,225	$128,315	$503,540
2015	$386,595	$132,203	$518,799
2016	$397,966	$136,092	$534,058
2017	$409,336	$139,980	$549,316
2018	$443,448	$151,645	$595,093
2019	$432,077	$147,757	$579,834
2020	$432,077	$147,757	$579,834
Average	***$478,593***	***$163,664***	***$642,256***

Source: RESI

Figure 136: Low-Emitting Vehicles Initiatives—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-5.7	-5.4	-11.1
2011	-4.9	-4.7	-9.6
2012	-4.2	-3.9	-8.0
2013	-3.9	-3.6	-7.5
2014	-3.7	-3.5	-7.1
2015	-3.4	-3.2	-6.6
2016	-2.8	-2.4	-5.2
2017	-1.9	-1.9	-3.7
2018	-2.0	-1.8	-3.9
2019	-2.2	-1.9	-4.1
2020	-2.2	-2.0	-4.3
Average	***-3.3***	***-3.1***	***-6.5***

Source: RESI

Figure 137: Low-Emitting Vehicles Initiatives—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$237,357	-$220,407	-$457,764
2011	-$221,533	-$205,713	-$427,246
2012	-$189,886	-$176,325	-$366,211
2013	-$189,886	-$176,325	-$366,211
2014	-$174,062	-$161,631	-$335,693
2015	-$189,886	-$176,325	-$366,211
2016	-$189,886	-$176,325	-$366,211
2017	-$158,238	-$146,938	-$305,176
2018	-$189,886	-$176,325	-$366,211
2019	-$158,238	-$146,938	-$305,176
2020	-$189,886	-$176,325	-$366,211
Average	***-$189,886***	***-$176,325***	***-$366,211***

Source: RESI

Figure 138: Low-Emitting Vehicles Initiatives—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$87,031	-$80,816	-$167,847
2011	-$87,031	-$80,816	-$167,847
2012	-$71,207	-$66,122	-$137,329
2013	-$63,295	-$58,775	-$122,070
2014	-$71,207	-$66,122	-$137,329
2015	-$55,383	-$51,428	-$106,812
2016	-$47,471	-$44,081	-$91,553
2017	-$15,824	-$14,694	-$30,518
2018	-$15,824	-$14,694	-$30,518
2019	-$15,824	-$14,694	-$30,518
2020	-$23,736	-$22,041	-$45,776
Average	***-$50,348***	***-$46,753***	***-$97,101***

Source: RESI

Figure 139: Airport Initiatives—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	0.0	0.0	0.0
2018	0.0	0.0	0.0
2019	0.0	0.0	0.0
2020	0.0	0.0	0.0
Average	***0.0***	***0.0***	***0.0***

Source: RESI

Figure 140: Airport Initiatives—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 141: Airport Initiatives—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 142: Airport Initiatives—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	0.0	0.0	0.0
2018	0.0	0.0	0.0
2019	0.0	0.0	0.0
2020	0.0	0.0	0.0
Average	***0.0***	***0.0***	***0.0***

Source: RESI

Figure 143: Airport Initiatives—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 144: Airport Initiatives—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 145: Port Initiatives—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.5	0.3	0.7
2011	0.0	0.0	0.0
2012	0.0	-0.1	-0.1
2013	-0.2	-0.1	-0.4
2014	0.0	0.1	0.1
2015	-0.2	-0.1	-0.3
2016	0.2	0.1	0.4
2017	0.0	-0.2	-0.2
2018	0.0	0.0	0.0
2019	-0.2	-0.1	-0.3
2020	-0.3	-0.3	-0.5
Average	***0.0***	***0.0***	***-0.1***

Source: RESI

Figure 146: Port Initiatives—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$13,488	$17,029	$30,518
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$13,488	$17,029	$30,518
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$2,452***	***$3,096***	***$5,549***

Source: RESI

Figure 147: Port Initiatives—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	-$6,744	-$8,515	-$15,259
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$6,744	$8,515	$15,259
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 148: Port Initiatives—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	0.0	0.0	0.0
2018	0.0	0.0	0.0
2019	0.0	0.0	0.0
2020	0.0	0.0	0.0
Average	***0.0***	***0.0***	***0.0***

Source: RESI

Figure 149: Port Initiatives—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 150: Port Initiatives—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 151: Freight and Freight Rail Strategies—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.5	0.5	0.9
2011	0.0	0.0	0.0
2012	0.0	-0.1	-0.1
2013	-0.2	-0.1	-0.4
2014	0.0	0.1	0.1
2015	-0.2	-0.1	-0.3
2016	0.2	0.1	0.3
2017	0.0	-0.2	-0.2
2018	0.0	0.0	-0.1
2019	-0.2	-0.1	-0.3
2020	-0.3	-0.3	-0.6
Average	***0.0***	***0.0***	***0.0***

Source: RESI

Figure 152: Freight and Freight Rail Strategies—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$18,356	$12,161	$30,518
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$18,356	$12,161	$30,518
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$3,338***	***$2,211***	***$5,549***

Source: RESI

Figure 153: Freight and Freight Rail Strategies—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	-$9,178	-$6,081	-$15,259
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$9,178	$6,081	$15,259
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 154: Freight and Freight Rail Strategies—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	-1.2	-1.2	-2.4
2013	-2.6	-2.5	-5.1
2014	-3.4	-3.5	-6.9
2015	-4.0	-3.9	-7.9
2016	-4.4	-4.5	-8.9
2017	-4.5	-4.5	-9.0
2018	-4.5	-4.5	-9.0
2019	-5.0	-5.0	-10.0
2020	-5.2	-5.3	-10.4
Average	***-3.2***	***-3.2***	***-6.3***

Source: RESI

Figure 155: Freight and Freight Rail Strategies—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	-$45,804	-$45,749	-$91,553
2013	-$122,144	-$121,997	-$244,141
2014	-$167,948	-$167,745	-$335,693
2015	-$244,288	-$243,993	-$488,281
2016	-$274,824	-$274,492	-$549,316
2017	-$305,360	-$304,992	-$610,352
2018	-$335,896	-$335,491	-$671,387
2019	-$366,432	-$365,990	-$732,422
2020	-$427,504	-$426,988	-$854,492
Average	***-$208,200***	***-$207,949***	***-$416,149***

Source: RESI

Figure 156: Freight and Freight Rail Strategies—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	-$15,268	-$15,250	-$30,518
2013	-$30,536	-$30,499	-$61,035
2014	-$53,438	-$53,374	-$106,812
2015	-$53,438	-$53,374	-$106,812
2016	-$53,438	-$53,374	-$106,812
2017	-$53,438	-$53,374	-$106,812
2018	-$45,804	-$45,749	-$91,553
2019	-$45,804	-$45,749	-$91,553
2020	-$45,804	-$45,749	-$91,553
Average	***-$36,088***	***-$36,044***	***-$72,132***

Source: RESI

Figure 157: Renewable Fuels Standard—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	0.0	0.0	0.0
2018	0.0	0.0	0.0
2019	0.0	0.0	0.0
2020	0.0	0.0	0.0
Average	***0.0***	***0.0***	***0.0***

Source: RESI

Figure 158: Renewable Fuels Standard—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 159: Renewable Fuels Standard—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 160: Renewable Fuels Standard—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	-16.1	-15.0	-31.1
2014	-14.7	-13.7	-28.4
2015	-13.4	-12.6	-26.1
2016	-11.9	-10.7	-22.7
2017	-9.9	-9.1	-19.0
2018	-8.7	-7.6	-16.3
2019	-8.0	-7.1	-15.0
2020	-7.5	-6.7	-14.2
Average	***-8.2***	***-7.5***	***-15.7***

Source: RESI

Figure 161: Renewable Fuels Standard—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	-$812,744	-$743,653	-$1,556,396
2014	-$780,872	-$714,490	-$1,495,361
2015	-$796,808	-$729,071	-$1,525,879
2016	-$764,936	-$699,908	-$1,464,844
2017	-$669,319	-$612,420	-$1,281,738
2018	-$669,319	-$612,420	-$1,281,738
2019	-$637,446	-$583,257	-$1,220,703
2020	-$637,446	-$583,257	-$1,220,703
Average	***-$524,444***	***-$479,861***	***-$1,004,306***

Source: RESI

Figure 162: Renewable Fuels Standard—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	-$211,154	-$193,204	-$404,358
2014	-$207,170	-$189,558	-$396,729
2015	-$199,202	-$182,268	-$381,470
2016	-$159,362	-$145,814	-$305,176
2017	-$127,489	-$116,651	-$244,141
2018	-$95,617	-$87,489	-$183,105
2019	-$71,713	-$65,616	-$137,329
2020	-$63,745	-$58,326	-$122,070
Average	***-$103,223***	***-$94,448***	***-$197,671***

Source: RESI

Figure 163: CAFÉ Standards: Model Years 2008-2011—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	0.0	0.0	0.0
2018	0.0	0.0	0.0
2019	0.0	0.0	0.0
2020	0.0	0.0	0.0
Average	***0.0***	***0.0***	***0.0***

Source: RESI

Figure 164: CAFÉ Standards: Model Years 2008-2011—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 165: CAFÉ Standards: Model Years 2008-2011—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 166: CAFÉ Standards: Model Years 2008-2011—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-10.3	-9.9	-20.2
2011	-9.1	-8.6	-17.7
2012	-8.1	-7.5	-15.6
2013	-7.4	-6.8	-14.1
2014	-6.4	-6.0	-12.4
2015	-5.7	-5.3	-11.1
2016	-5.0	-4.6	-9.5
2017	-4.3	-4.0	-8.3
2018	-3.9	-3.4	-7.3
2019	-3.9	-3.3	-7.2
2020	-3.6	-3.2	-6.9
Average	***-6.2***	***-5.7***	***-11.9***

Source: RESI

Figure 167: CAFÉ Standards: Model Years 2008-2011—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$444,001	-$410,491	-$854,492
2011	-$396,430	-$366,510	-$762,939
2012	-$364,715	-$337,189	-$701,904
2013	-$364,715	-$337,189	-$701,904
2014	-$317,144	-$293,208	-$610,352
2015	-$348,858	-$322,529	-$671,387
2016	-$317,144	-$293,208	-$610,352
2017	-$317,144	-$293,208	-$610,352
2018	-$317,144	-$293,208	-$610,352
2019	-$285,429	-$263,887	-$549,316
2020	-$285,429	-$263,887	-$549,316
Average	***-$341,650***	***-$315,865***	***-$657,515***

Source: RESI

Figure 168: CAFÉ Standards: Model Years 2008-2011—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$142,715	-$131,944	-$274,658
2011	-$134,786	-$124,613	-$259,399
2012	-$118,929	-$109,953	-$228,882
2013	-$107,036	-$98,958	-$205,994
2014	-$95,143	-$87,962	-$183,105
2015	-$87,214	-$80,632	-$167,847
2016	-$55,500	-$51,311	-$106,812
2017	-$47,572	-$43,981	-$91,553
2018	-$31,714	-$29,321	-$61,035
2019	-$23,786	-$21,991	-$45,776
2020	-$23,786	-$21,991	-$45,776
Average	***-$78,926***	***-$72,969***	***-$151,894***

Source: RESI

Figure 169: Promoting Hybrid and Electric Vehicles—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	2.0	0.7	2.7
2014	2.7	0.9	3.6
2015	2.2	0.7	2.8
2016	2.1	0.6	2.7
2017	2.4	1.0	3.4
2018	2.3	1.0	3.3
2019	2.3	1.0	3.3
2020	2.1	0.6	2.7
Average	***1.6***	***0.6***	***2.2***

Source: RESI

Figure 170: Promoting Hybrid and Electric Vehicles—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$156,756	$56,867	$213,623
2014	$223,937	$81,239	$305,176
2015	$179,150	$64,991	$244,141
2016	$134,362	$48,743	$183,105
2017	$223,937	$81,239	$305,176
2018	$179,150	$64,991	$244,141
2019	$223,937	$81,239	$305,176
2020	$179,150	$64,991	$244,141
Average	***$136,398***	***$49,482***	***$185,880***

Source: RESI

Figure 171: Promoting Hybrid and Electric Vehicles—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$89,575	$32,495	$122,070
2014	$100,772	$36,557	$137,329
2015	$111,969	$40,619	$152,588
2016	$111,969	$40,619	$152,588
2017	$156,756	$56,867	$213,623
2018	$111,969	$40,619	$152,588
2019	$123,165	$44,681	$167,847
2020	$134,362	$48,743	$183,105
Average	***$85,503***	***$31,018***	***$116,522***

Source: RESI

Figure 172: Promoting Hybrid and Electric Vehicles—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	50.8	49.5	100.3
2014	45.1	43.9	89.0
2015	40.7	39.5	80.2
2016	36.9	36.2	73.1
2017	34.7	33.8	68.5
2018	31.8	31.3	63.1
2019	29.8	29.5	59.2
2020	28.9	28.3	57.2
Average	***27.2***	***26.5***	***53.7***

Source: RESI

Figure 173: Promoting Hybrid and Electric Vehicles—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	-$1,003,083	-$980,560	-$1,983,643
2014	-$1,280,859	-$1,252,100	-$2,532,959
2015	-$1,543,204	-$1,508,554	-$3,051,758
2016	-$1,728,388	-$1,689,580	-$3,417,969
2017	-$1,820,981	-$1,780,094	-$3,601,074
2018	-$1,944,437	-$1,900,778	-$3,845,215
2019	-$2,006,165	-$1,961,120	-$3,967,285
2020	-$2,037,029	-$1,991,291	-$4,028,320
Average	***-$1,214,922***	***-$1,187,643***	***-$2,402,566***

Source: RESI

Figure 174: Promoting Hybrid and Electric Vehicles—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$671,294	$656,221	$1,327,515
2014	$632,714	$618,507	$1,251,221
2015	$601,850	$588,336	$1,190,186
2016	$555,553	$543,079	$1,098,633
2017	$532,405	$520,451	$1,052,856
2018	$486,109	$475,194	$961,304
2019	$447,529	$437,481	$885,010
2020	$439,813	$429,938	$869,751
Average	***$397,024***	***$388,110***	***$785,134***

Source: RESI

Figure 175: PAYD Insurance in Maryland—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	0.0	0.0	0.0
2018	0.0	0.0	0.0
2019	0.0	0.0	0.0
2020	0.0	0.0	0.0
Average	***0.0***	***0.0***	***0.0***

Source: RESI

Figure 176: PAYD Insurance in Maryland—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 177: PAYD Insurance in Maryland—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 178: PAYD Insurance in Maryland—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-0.2	-0.2	-0.5
2011	0.0	-0.1	-0.1
2012	-0.2	-0.3	-0.5
2013	-0.5	-0.3	-0.7
2014	0.2	0.1	0.3
2015	0.0	-0.1	-0.1
2016	0.2	0.3	0.6
2017	0.0	-0.2	-0.2
2018	0.0	0.0	0.0
2019	0.0	0.1	0.1
2020	0.3	0.3	0.6
2021	0.0	0.2	0.2
2022	0.0	0.2	0.2
2023	-0.1	-0.1	-0.2
2024	-0.4	-0.2	-0.6
2025	0.0	0.1	0.1
Average	***0.0***	***0.0***	***0.0***

Source: RESI

Figure 179: PAYD Insurance in Maryland—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$27,271	-$3,247	-$30,518
2011	-$27,271	-$3,247	-$30,518
2012	-$54,542	-$6,493	-$61,035
2013	-$54,542	-$6,493	-$61,035
2014	$0	$0	$0
2015	-$54,542	-$6,493	-$61,035
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$54,542	$6,493	$61,035
2020	$54,542	$6,493	$61,035
2021	$0	$0	$0
2022	$0	$0	$0
2023	$0	$0	$0
2024	-$54,542	-$6,493	-$61,035
2025	$0	$0	$0
Average	***-$10,227***	***-$1,217***	***-$11,444***

Source: RESI

Figure 180: PAYD Insurance in Maryland—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$13,636	-$1,623	-$15,259
2011	-$13,636	-$1,623	-$15,259
2012	-$13,636	-$1,623	-$15,259
2013	$0	$0	$0
2014	$13,636	$1,623	$15,259
2015	$0	$0	$0
2016	$13,636	$1,623	$15,259
2017	$13,636	$1,623	$15,259
2018	$0	$0	$0
2019	$13,636	$1,623	$15,259
2020	$13,636	$1,623	$15,259
2021	$27,271	$3,247	$30,518
2022	$54,542	$6,493	$61,035
2023	$27,271	$3,247	$30,518
2024	$27,271	$3,247	$30,518
2025	$0	$0	$0
Average	***$10,227***	***$1,217***	***$11,444***

Source: RESI

A.3 Agriculture and Forestry

Figure 181: Managing Forests to Capture Carbon—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	96.1	291.7	387.8
2011	95.3	288.0	383.4
2012	93.4	284.1	377.5
2013	91.1	280.3	371.4
2014	88.3	274.4	362.7
2015	84.7	268.7	353.4
2016	82.4	263.9	346.3
2017	80.0	259.4	339.5
2018	77.8	254.1	331.9
2019	76.0	252.1	328.1
2020	74.9	249.4	324.3
Average	***85.5***	***269.6***	***355.1***

Source: RESI

Figure 182: Managing Forests to Capture Carbon—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$536,144	$1,691,639	$2,227,783
2011	$543,488	$1,714,812	$2,258,301
2012	$514,111	$1,622,120	$2,136,230
2013	$470,044	$1,483,081	$1,953,125
2014	$418,633	$1,320,869	$1,739,502
2015	$352,533	$1,112,311	$1,464,844
2016	$293,778	$926,926	$1,220,703
2017	$264,400	$834,233	$1,098,633
2018	$235,022	$741,540	$976,563
2019	$220,333	$695,194	$915,527
2020	$176,267	$556,155	$732,422
Average	***$365,887***	***$1,154,444***	***$1,520,330***

Source: RESI

Figure 183: Managing Forests to Capture Carbon—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$389,255	$1,228,176	$1,617,432
2011	$455,355	$1,436,735	$1,892,090
2012	$495,750	$1,564,187	$2,059,937
2013	$525,127	$1,656,879	$2,182,007
2014	$536,144	$1,691,639	$2,227,783
2015	$543,488	$1,714,812	$2,258,301
2016	$554,505	$1,749,572	$2,304,077
2017	$547,161	$1,726,399	$2,273,560
2018	$558,177	$1,761,159	$2,319,336
2019	$543,488	$1,714,812	$2,258,301
2020	$532,472	$1,680,053	$2,212,524
Average	***$516,448***	***$1,629,493***	***$2,145,941***

Source: RESI

Figure 184: Managing Forests to Capture Carbon—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	24.2	23.6	47.8
2013	24.7	24.0	48.7
2014	24.6	23.9	48.5
2015	24.2	23.4	47.6
2016	23.8	23.2	47.0
2017	23.9	23.0	46.9
2018	23.3	22.8	46.1
2019	22.9	22.2	45.0
2020	22.3	21.6	43.9
Average	***19.4***	***18.9***	***38.3***

Source: RESI

Figure 185: Managing Forests to Capture Carbon—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$712,505	$691,304	$1,403,809
2013	$712,505	$691,304	$1,403,809
2014	$743,484	$721,360	$1,464,844
2015	$681,527	$661,247	$1,342,773
2016	$650,548	$631,190	$1,281,738
2017	$650,548	$631,190	$1,281,738
2018	$619,570	$601,134	$1,220,703
2019	$650,548	$631,190	$1,281,738
2020	$588,591	$571,077	$1,159,668
Average	***$546,348***	***$530,090***	***$1,076,438***

Source: RESI

Figure 186: Managing Forests to Capture Carbon—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$178,126	$172,826	$350,952
2013	$216,849	$210,397	$427,246
2014	$232,339	$225,425	$457,764
2015	$263,317	$255,482	$518,799
2016	$271,062	$262,996	$534,058
2017	$286,551	$278,024	$564,575
2018	$286,551	$278,024	$564,575
2019	$294,296	$285,538	$579,834
2020	$271,062	$262,996	$534,058
Average	***$209,105***	***$202,883***	***$411,987***

Source: RESI

Figure 187: Creating Ecosystem Markets to Encourage GHG Emissions Reductions—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	1.2	0.4	1.6
2011	1.5	0.6	2.1
2012	1.2	0.5	1.7
2013	1.2	0.6	1.8
2014	1.2	0.4	1.6
2015	1.2	0.4	1.6
2016	1.1	0.4	1.6
2017	1.2	0.3	1.5
2018	1.1	0.5	1.6
2019	0.9	0.4	1.3
2020	0.6	0.0	0.6
Average	***1.1***	***0.4***	***1.5***

Source: RESI

Figure 188: Creating Ecosystem Markets to Encourage GHG Emissions Reductions—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$88,819	$33,252	$122,070
2011	$88,819	$33,252	$122,070
2012	$88,819	$33,252	$122,070
2013	$88,819	$33,252	$122,070
2014	$133,228	$49,877	$183,105
2015	$88,819	$33,252	$122,070
2016	$88,819	$33,252	$122,070
2017	$88,819	$33,252	$122,070
2018	$88,819	$33,252	$122,070
2019	$88,819	$33,252	$122,070
2020	$44,409	$16,626	$61,035
Average	***$88,819***	***$33,252***	***$122,070***

Source: RESI

Figure 189: Creating Ecosystem Markets to Encourage GHG Emissions Reductions—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$44,409	$16,626	$61,035
2011	$33,307	$12,469	$45,776
2012	$55,512	$20,782	$76,294
2013	$66,614	$24,939	$91,553
2014	$55,512	$20,782	$76,294
2015	$55,512	$20,782	$76,294
2016	$55,512	$20,782	$76,294
2017	$88,819	$33,252	$122,070
2018	$66,614	$24,939	$91,553
2019	$55,512	$20,782	$76,294
2020	$55,512	$20,782	$76,294
Average	***$57,530***	***$21,538***	***$79,068***

Source: RESI

Figure 190: Creating Ecosystem Markets to Encourage GHG Emissions Reductions—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	534.1	-113.5	420.6
2014	175.1	-459.7	-284.6
2015	-99.4	-722.7	-822.1
2016	-312.5	-925.3	-1,237.8
2017	-442.5	-1,047.4	-1,489.9
2018	-491.2	-1,090.0	-1,581.2
2019	-547.8	-1,143.8	-1,691.6
2020	-581.1	-1,177.0	-1,758.1
Average	***-160.5***	***-607.2***	***-767.7***

Source: RESI

Figure 191: Creating Ecosystem Markets to Encourage GHG Emissions Reductions—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$17,899,855	$67,732,469	$85,632,324
2014	$14,359,434	$54,335,634	$68,695,068
2015	$11,673,818	$44,173,350	$55,847,168
2016	$9,683,528	$36,642,156	$46,325,684
2017	$8,726,658	$33,021,389	$41,748,047
2018	$8,803,207	$33,311,051	$42,114,258
2019	$8,548,042	$32,345,513	$40,893,555
2020	$8,535,284	$32,297,236	$40,832,520
Average	$8,020,893	$30,350,800	$38,371,693

Source: RESI

Figure 192: Creating Ecosystem Markets to Encourage GHG Emissions Reductions—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$10,436,266	$39,490,492	$49,926,758
2014	$10,251,271	$38,790,477	$49,041,748
2015	$9,833,438	$37,209,409	$47,042,847
2016	$9,300,780	$35,193,849	$44,494,629
2017	$8,905,273	$33,697,266	$42,602,539
2018	$8,790,449	$33,262,774	$42,053,223
2019	$8,611,833	$32,586,897	$41,198,730
2020	$8,557,611	$32,381,720	$40,939,331
Average	***$6,789,720***	***$25,692,080***	***$32,481,800***

Source: RESI

Figure 193: Increasing Urban Trees to Capture Carbon—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	1.8	3.7	5.5
2011	1.8	3.8	5.6
2012	1.5	3.7	5.3
2013	1.8	3.8	5.7
2014	1.8	3.6	5.4
2015	1.5	3.1	4.7
2016	1.5	3.4	4.9
2017	1.3	3.1	4.4
2018	1.7	3.4	5.1
2019	1.6	3.3	4.8
2020	1.0	2.8	3.8
Average	***1.6***	***3.4***	***5.0***

Source: RESI

Figure 194: Increasing Urban Trees to Capture Carbon—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$28,874	$62,679	$91,553
2011	$28,874	$62,679	$91,553
2012	$28,874	$62,679	$91,553
2013	$38,498	$83,572	$122,070
2014	$48,123	$104,465	$152,588
2015	$19,249	$41,786	$61,035
2016	$38,498	$83,572	$122,070
2017	$19,249	$41,786	$61,035
2018	$19,249	$41,786	$61,035
2019	$38,498	$83,572	$122,070
2020	$19,249	$41,786	$61,035
Average	***$29,749***	***$64,578***	***$94,327***

Source: RESI

Figure 195: Increasing Urban Trees to Capture Carbon—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$19,249	$41,786	$61,035
2011	$14,437	$31,340	$45,776
2012	$14,437	$31,340	$45,776
2013	$24,061	$52,233	$76,294
2014	$24,061	$52,233	$76,294
2015	$14,437	$31,340	$45,776
2016	$14,437	$31,340	$45,776
2017	$19,249	$41,786	$61,035
2018	$19,249	$41,786	$61,035
2019	$19,249	$41,786	$61,035
2020	$19,249	$41,786	$61,035
Average	***$18,374***	***$39,887***	***$58,261***

Source: RESI

Figure 196: Increasing Urban Trees to Capture Carbon—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	121.0	113.2	234.2
2011	151.8	140.4	292.2
2012	175.0	161.0	336.0
2013	189.8	173.9	363.7
2014	199.9	181.3	381.2
2015	205.2	185.3	390.5
2016	209.3	187.6	396.9
2017	210.0	186.9	396.9
2018	208.9	185.1	394.1
2019	203.9	179.3	383.2
2020	198.2	173.3	371.5
Average	***188.4***	***169.8***	***358.2***

Source: RESI

Figure 197: Increasing Urban Trees to Capture Carbon—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$5,474,632	$4,931,862	$10,406,494
2011	$8,203,921	$7,390,561	$15,594,482
2012	$10,451,571	$9,415,373	$19,866,943
2013	$12,169,417	$10,962,907	$23,132,324
2014	$13,694,608	$12,336,886	$26,031,494
2015	$14,866,597	$13,392,681	$28,259,277
2016	$15,926,203	$14,347,234	$30,273,438
2017	$16,728,935	$15,070,381	$31,799,316
2018	$17,467,449	$15,735,676	$33,203,125
2019	$17,884,869	$16,111,713	$33,996,582
2020	$18,173,853	$16,372,046	$34,545,898
Average	***$13,731,096***	***$12,369,756***	***$26,100,852***

Source: RESI

Figure 198: Increasing Urban Trees to Capture Carbon—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$2,006,830	$1,807,867	$3,814,697
2011	$2,785,480	$2,509,320	$5,294,800
2012	$3,451,748	$3,109,532	$6,561,279
2013	$3,933,387	$3,543,420	$7,476,807
2014	$4,390,944	$3,955,614	$8,346,558
2015	$4,800,337	$4,324,418	$9,124,756
2016	$5,105,376	$4,599,214	$9,704,590
2017	$5,370,277	$4,837,853	$10,208,130
2018	$5,587,015	$5,033,102	$10,620,117
2019	$5,595,042	$5,040,334	$10,635,376
2020	$5,570,960	$5,018,639	$10,589,600
Average	***$4,417,945***	***$3,979,938***	***$8,397,883***

Source: RESI

Figure 199: Creating and Protecting Wetlands and Waterway Borders to Capture Carbon—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.5	1.6	2.1
2011	0.6	1.6	2.1
2012	0.5	1.6	2.2
2013	3.8	14.4	18.2
2014	4.0	14.3	18.3
2015	3.7	14.4	18.1
2016	3.9	14.8	18.7
2017	4.0	14.8	18.9
2018	3.9	15.0	18.9
2019	4.0	14.9	18.9
2020	3.5	14.3	17.7
Average	***3.0***	***11.1***	***14.0***

Source: RESI

Figure 200: Creating and Protecting Wetlands and Waterway Borders to Capture Carbon—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$12,868	$48,167	$61,035
2011	$12,868	$48,167	$61,035
2012	$6,434	$24,084	$30,518
2013	$83,643	$313,086	$396,729
2014	$96,511	$361,253	$457,764
2015	$77,209	$289,002	$366,211
2016	$77,209	$289,002	$366,211
2017	$90,077	$337,169	$427,246
2018	$77,209	$289,002	$366,211
2019	$90,077	$337,169	$427,246
2020	$77,209	$289,002	$366,211
Average	***$63,756***	***$238,646***	***$302,401***

Source: RESI

Figure 201: Creating and Protecting Wetlands and Waterway Borders to Capture Carbon—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$3,217	$12,042	$15,259
2011	$3,217	$12,042	$15,259
2012	$3,217	$12,042	$15,259
2013	$38,604	$144,501	$183,105
2014	$38,604	$144,501	$183,105
2015	$45,038	$168,585	$213,623
2016	$45,038	$168,585	$213,623
2017	$54,689	$204,710	$259,399
2018	$51,472	$192,668	$244,141
2019	$54,689	$204,710	$259,399
2020	$48,255	$180,626	$228,882
Average	***$35,095***	***$131,365***	***$166,460***

Source: RESI

Figure 202: Creating and Protecting Wetlands and Waterway Borders to Capture Carbon—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	58.2	94.7	152.9
2011	57.9	93.9	151.8
2012	57.0	92.8	149.8
2013	76.1	124.7	200.9
2014	19.7	32.5	52.2
2015	17.3	30.3	47.6
2016	16.0	29.1	45.1
2017	16.0	28.9	44.9
2018	15.7	28.6	44.3
2019	16.0	28.7	44.7
2020	16.1	28.4	44.4
Average	***33.3***	***55.7***	***89.0***

Source: RESI

Figure 203: Creating and Protecting Wetlands and Waterway Borders to Capture Carbon—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$1,540,927	$2,578,946	$4,119,873
2011	$1,552,341	$2,598,049	$4,150,391
2012	$1,540,927	$2,578,946	$4,119,873
2013	$2,043,155	$3,419,491	$5,462,646
2014	$513,642	$859,649	$1,373,291
2015	$410,914	$687,719	$1,098,633
2016	$342,428	$573,099	$915,527
2017	$365,257	$611,306	$976,563
2018	$365,257	$611,306	$976,563
2019	$410,914	$687,719	$1,098,633
2020	$410,914	$687,719	$1,098,633
Average	***$863,334***	***$1,444,904***	***$2,308,239***

Source: RESI

Figure 204: Creating and Protecting Wetlands and Waterway Borders to Capture Carbon—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$610,664	$1,022,027	$1,632,690
2011	$662,028	$1,107,992	$1,770,020
2012	$719,099	$1,203,508	$1,922,607
2013	$970,213	$1,623,781	$2,593,994
2014	$365,257	$611,306	$976,563
2015	$308,185	$515,789	$823,975
2016	$262,528	$439,376	$701,904
2017	$268,235	$448,928	$717,163
2018	$256,821	$429,824	$686,646
2019	$262,528	$439,376	$701,904
2020	$256,821	$429,824	$686,646
Average	***$449,307***	***$751,976***	***$1,201,283***

Source: RESI

Figure 205: Geological Opportunities to Store Carbon—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.2	0.1	0.4
2011	0.3	0.1	0.4
2012	0.0	0.0	0.0
2013	0.0	0.1	0.1
2014	0.3	0.1	0.4
2015	0.0	0.0	0.0
2016	0.2	0.3	0.5
2017	0.1	0.0	0.0
2018	0.2	0.3	0.5
2019	0.3	0.2	0.5
2020	0.3	0.2	0.5
Average	***0.2***	***0.1***	***0.3***

Source: RESI

Figure 206: Geological Opportunities to Store Carbon—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$17,386	$13,131	$30,518
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$34,772	$26,263	$61,035
2015	$0	$0	$0
2016	$0	$0	$0
2017	$34,772	$26,263	$61,035
2018	$0	$0	$0
2019	$34,772	$26,263	$61,035
2020	$34,772	$26,263	$61,035
Average	***$14,225***	***$10,744***	***$24,969***

Source: RESI

Figure 207: Geological Opportunities to Store Carbon—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	-$8,693	-$6,566	-$15,259
2012	$0	$0	$0
2013	$8,693	$6,566	$15,259
2014	$0	$0	$0
2015	$0	$0	$0
2016	$8,693	$6,566	$15,259
2017	$8,693	$6,566	$15,259
2018	$0	$0	$0
2019	$17,386	$13,131	$30,518
2020	$8,693	$6,566	$15,259
Average	***$3,951***	***$2,984***	***$6,936***

Source: RESI

Figure 208: Geological Opportunities to Store Carbon—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	73.7	64.9	138.6
2011	103.2	90.3	193.4
2012	121.0	105.5	226.6
2013	130.1	113.0	243.0
2014	134.9	115.5	250.4
2015	135.8	115.1	251.0
2016	134.9	113.3	248.2
2017	133.7	110.9	244.6
2018	129.8	106.2	236.0
2019	124.8	101.0	225.7
2020	120.8	96.5	217.2
Average	***122.1***	***102.9***	***225.0***

Source: RESI

Figure 209: Geological Opportunities to Store Carbon—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$6,639,031	$5,598,518	$12,237,549
2011	$10,049,605	$8,474,565	$18,524,170
2012	$12,549,590	$10,582,735	$23,132,324
2013	$14,321,102	$12,076,603	$26,397,705
2014	$15,695,265	$13,235,399	$28,930,664
2015	$16,721,749	$14,101,005	$30,822,754
2016	$17,516,446	$14,771,152	$32,287,598
2017	$18,244,918	$15,385,453	$33,630,371
2018	$18,774,716	$15,832,218	$34,606,934
2019	$19,138,952	$16,139,368	$35,278,320
2020	$19,470,076	$16,418,596	$35,888,672
Average	***$15,374,677***	***$12,965,056***	***$28,339,733***

Source: RESI

Figure 210: Geological Opportunities to Store Carbon—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$1,498,335	$1,263,506	$2,761,841
2011	$2,218,529	$1,870,826	$4,089,355
2012	$2,756,605	$2,324,572	$5,081,177
2013	$3,071,173	$2,589,838	$5,661,011
2014	$3,294,681	$2,778,317	$6,072,998
2015	$3,460,243	$2,917,931	$6,378,174
2016	$3,518,190	$2,966,796	$6,484,985
2017	$3,584,414	$3,022,641	$6,607,056
2018	$3,551,302	$2,994,718	$6,546,021
2019	$3,443,687	$2,903,969	$6,347,656
2020	$3,302,959	$2,785,298	$6,088,257
Average	***$3,063,647***	***$2,583,492***	***$5,647,139***

Source: RESI

Figure 211: Planting Forests in Maryland—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	96.0	94.4	190.3
2012	95.9	94.4	190.3
2013	50.3	49.5	99.8
2014	54.4	53.4	107.8
2015	52.1	51.2	103.4
2016	50.8	49.9	100.7
2017	49.1	48.1	97.2
2018	48.0	47.3	95.4
2019	47.1	46.6	93.7
2020	46.4	45.5	91.9
Average	***53.6***	***52.8***	***106.4***

Source: RESI

Figure 212: Planting Forests in Maryland—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$1,138,546	$1,119,755	$2,258,301
2012	$1,200,089	$1,180,282	$2,380,371
2013	$600,044	$590,141	$1,190,186
2014	$600,044	$590,141	$1,190,186
2015	$461,573	$453,955	$915,527
2016	$400,030	$393,427	$793,457
2017	$338,487	$332,900	$671,387
2018	$307,715	$302,636	$610,352
2019	$307,715	$302,636	$610,352
2020	$246,172	$242,109	$488,281
Average	***$509,129***	***$500,726***	***$1,009,854***

Source: RESI

Figure 213: Planting Forests in Maryland—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$823,138	$809,553	$1,632,690
2012	$1,000,074	$983,569	$1,983,643
2013	$692,359	$680,932	$1,373,291
2014	$715,438	$703,630	$1,419,067
2015	$715,438	$703,630	$1,419,067
2016	$715,438	$703,630	$1,419,067
2017	$700,052	$688,498	$1,388,550
2018	$715,438	$703,630	$1,419,067
2019	$692,359	$680,932	$1,373,291
2020	$684,666	$673,366	$1,358,032
Average	***$677,673***	***$666,488***	***$1,344,161***

Source: RESI

Figure 214: Planting Forests in Maryland—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.5	0.3	0.8
2012	0.5	0.4	0.9
2013	0.0	0.2	0.3
2014	0.2	0.1	0.3
2015	0.0	0.0	0.0
2016	0.5	0.3	0.7
2017	0.2	0.2	0.5
2018	0.2	0.2	0.4
2019	0.0	0.0	0.0
2020	0.0	0.0	0.0
Average	***0.2***	***0.2***	***0.4***

Source: RESI

Figure 215: Planting Forests in Maryland—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	-$16,613	-$13,904	-$30,518
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***-$1,510***	***-$1,264***	***-$2,774***

Source: RESI

Figure 216: Planting Forests in Maryland—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$8,307	$6,952	$15,259
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$8,307	$6,952	$15,259
2017	$16,613	$13,904	$30,518
2018	$0	$0	$0
2019	$8,307	$6,952	$15,259
2020	$0	$0	$0
Average	***$3,776***	***$3,160***	***$6,936***

Source: RESI

Figure 217: Expanded Use of Forests and Feedstocks for Energy Production—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	13.4	24.7	38.1
2014	20.2	36.8	57.0
2015	19.7	36.6	56.3
2016	12.8	24.3	37.1
2017	12.5	23.7	36.1
2018	12.3	23.7	36.0
2019	12.4	23.8	36.2
2020	12.4	23.5	35.8
Average	***10.5***	***19.7***	***30.3***

Source: RESI

Figure 218: Expanded Use of Forests and Feedstocks for Energy Production—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$594,315	$1,114,669	$1,708,984
2014	$870,247	$1,632,194	$2,502,441
2015	$827,796	$1,552,575	$2,380,371
2016	$509,413	$955,431	$1,464,844
2017	$488,187	$915,621	$1,403,809
2018	$466,962	$875,812	$1,342,773
2019	$488,187	$915,621	$1,403,809
2020	$466,962	$875,812	$1,342,773
Average	***$428,370***	***$803,430***	***$1,231,800***

Source: RESI

Figure 219: Expanded Use of Forests and Feedstocks for Energy Production—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$302,464	$567,287	$869,751
2014	$472,268	$885,764	$1,358,032
2015	$504,107	$945,478	$1,449,585
2016	$355,528	$666,811	$1,022,339
2017	$360,834	$676,763	$1,037,598
2018	$366,141	$686,716	$1,052,856
2019	$382,060	$716,573	$1,098,633
2020	$382,060	$716,573	$1,098,633
Average	***$284,133***	***$532,906***	***$817,039***

Source: RESI

Figure 220: Expanded Use of Forests and Feedstocks for Energy Production—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	2.9	2.5	5.3
2014	4.8	4.1	8.9
2015	5.9	5.2	11.1
2016	6.9	6.1	13.0
2017	8.2	7.1	15.2
2018	8.6	7.6	16.2
2019	8.7	7.5	16.3
2020	8.4	7.1	15.6
Average	***4.9***	***4.3***	***9.2***

Source: RESI

Figure 221: Expanded Use of Forests and Feedstocks for Energy Production—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$310,231	$269,603	$579,834
2014	$522,494	$454,069	$976,563
2015	$620,462	$539,206	$1,159,668
2016	$751,085	$652,724	$1,403,809
2017	$881,708	$766,241	$1,647,949
2018	$947,020	$822,999	$1,770,020
2019	$1,012,332	$879,758	$1,892,090
2020	$1,012,332	$879,758	$1,892,090
Average	***$550,697***	***$478,578***	***$1,029,275***

Source: RESI

Figure 222: Expanded Use of Forests and Feedstocks for Energy Production—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$81,640	$70,948	$152,588
2014	$138,787	$120,612	$259,399
2015	$204,099	$177,371	$381,470
2016	$253,083	$219,939	$473,022
2017	$302,067	$262,508	$564,575
2018	$326,559	$283,793	$610,352
2019	$359,215	$312,172	$671,387
2020	$351,051	$305,077	$656,128
Average	***$183,318***	***$159,311***	***$342,629***

Source: RESI

Figure 223: Conservation of Agricultural Land for GHG Benefits—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	108.7	40.1	148.8
2011	110.2	41.3	151.6
2012	109.9	41.0	150.9
2013	81.9	29.7	111.6
2014	79.6	27.8	107.4
2015	76.5	25.6	102.1
2016	75.0	24.4	99.4
2017	74.1	23.8	97.9
2018	73.2	23.8	97.0
2019	72.8	23.3	96.1
2020	72.0	22.6	94.6
Average	***84.9***	***29.4***	***114.3***

Source: RESI

Figure 224: Conservation of Agricultural Land for GHG Benefits—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$8,523,880	$2,950,729	$11,474,609
2011	$8,637,230	$2,989,968	$11,627,197
2012	$8,614,560	$2,982,120	$11,596,680
2013	$6,347,570	$2,197,352	$8,544,922
2014	$6,234,221	$2,158,113	$8,392,334
2015	$5,984,852	$2,071,789	$8,056,641
2016	$5,939,512	$2,056,093	$7,995,605
2017	$5,939,512	$2,056,093	$7,995,605
2018	$5,939,512	$2,056,093	$7,995,605
2019	$5,984,852	$2,071,789	$8,056,641
2020	$5,939,512	$2,056,093	$7,995,605
Average	***$6,735,019***	***$2,331,476***	***$9,066,495***

Source: RESI

Figure 225: Conservation of Agricultural Land for GHG Benefits—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$3,989,901	$1,381,192	$5,371,094
2011	$4,329,950	$1,498,908	$5,828,857
2012	$4,590,654	$1,589,156	$6,179,810
2013	$3,706,528	$1,283,096	$4,989,624
2014	$3,774,537	$1,306,639	$5,081,177
2015	$3,831,212	$1,326,259	$5,157,471
2016	$3,921,892	$1,357,649	$5,279,541
2017	$4,001,236	$1,385,116	$5,386,353
2018	$4,137,256	$1,432,202	$5,569,458
2019	$4,216,600	$1,459,669	$5,676,270
2020	$4,273,275	$1,479,288	$5,752,563
Average	***$4,070,276***	***$1,409,016***	***$5,479,292***

Source: RESI

Figure 226: Conservation of Agricultural Land for GHG Benefits—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	316.4	255.1	571.5
2011	320.1	259.3	579.4
2012	311.5	252.4	563.9
2013	223.2	179.1	402.3
2014	204.5	160.9	365.4
2015	188.6	145.9	334.5
2016	177.7	135.8	313.5
2017	170.8	128.8	299.6
2018	164.8	123.2	288.0
2019	162.7	121.7	284.3
2020	162.1	121.2	283.3
Average	***218.4***	***171.2***	***389.6***

Source: RESI

Figure 227: Conservation of Agricultural Land for GHG Benefits—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$75,151,950	$58,911,771	$134,063,721
2011	$75,254,593	$58,992,233	$134,246,826
2012	$74,450,554	$58,361,946	$132,812,500
2013	$55,324,700	$43,369,148	$98,693,848
2014	$53,904,802	$42,256,087	$96,160,889
2015	$52,621,761	$41,250,309	$93,872,070
2016	$51,732,187	$40,552,970	$92,285,156
2017	$51,116,327	$40,070,196	$91,186,523
2018	$50,637,325	$39,694,706	$90,332,031
2019	$50,397,825	$39,506,961	$89,904,785
2020	$50,226,753	$39,372,857	$89,599,609
Average	***$58,256,252***	***$45,667,199***	***$103,923,451***

Source: RESI

Figure 228: Conservation of Agricultural Land for GHG Benefits—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$13,146,887	$10,305,872	$23,452,759
2011	$15,028,679	$11,781,013	$26,809,692
2012	$16,149,201	$12,659,393	$28,808,594
2013	$13,352,173	$10,466,797	$23,818,970
2014	$13,163,994	$10,319,282	$23,483,276
2015	$12,984,368	$10,178,474	$23,162,842
2016	$12,787,635	$10,024,254	$22,811,890
2017	$12,693,546	$9,950,497	$22,644,043
2018	$12,616,563	$9,890,151	$22,506,714
2019	$12,505,367	$9,802,983	$22,308,350
2020	$12,436,938	$9,749,342	$22,186,279
Average	***$13,351,396***	***$10,466,187***	***$23,817,583***

Source: RESI

Figure 229: Buy Local for GHG Benefits—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	44.9	16.5	61.4
2011	45.4	17.0	62.4
2012	45.3	16.9	62.3
2013	15.9	5.6	21.5
2014	15.0	4.5	19.5
2015	13.8	3.8	17.6
2016	13.4	3.2	16.6
2017	13.7	3.5	17.2
2018	13.2	3.4	16.6
2019	13.2	3.6	16.8
2020	13.2	3.2	16.4
Average	***22.5***	***7.4***	***29.9***

Source: RESI

Figure 230: Buy Local for GHG Benefits—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$3,558,850	$1,171,374	$4,730,225
2011	$3,604,771	$1,186,489	$4,791,260
2012	$3,627,731	$1,194,046	$4,821,777
2013	$1,216,897	$400,534	$1,617,432
2014	$1,148,016	$377,863	$1,525,879
2015	$1,056,175	$347,634	$1,403,809
2016	$1,010,254	$332,519	$1,342,773
2017	$1,056,175	$347,634	$1,403,809
2018	$1,010,254	$332,519	$1,342,773
2019	$1,102,096	$362,748	$1,464,844
2020	$1,056,175	$347,634	$1,403,809
Average	***$1,767,945***	***$581,909***	***$2,349,854***

Source: RESI

Figure 231: Buy Local for GHG Benefits—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$1,653,143	$544,122	$2,197,266
2011	$1,790,905	$589,466	$2,380,371
2012	$1,917,187	$631,031	$2,548,218
2013	$838,052	$275,840	$1,113,892
2014	$769,171	$253,168	$1,022,339
2015	$757,691	$249,389	$1,007,080
2016	$757,691	$249,389	$1,007,080
2017	$769,171	$253,168	$1,022,339
2018	$803,611	$264,504	$1,068,115
2019	$792,131	$260,725	$1,052,856
2020	$803,611	$264,504	$1,068,115
Average	***$1,059,306***	***$348,664***	***$1,407,970***

Source: RESI

Figure 232: Buy Local for GHG Benefits—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	17.0	13.6	30.5
2011	17.2	13.8	30.9
2012	17.0	13.8	30.8
2013	15.7	12.9	28.7
2014	15.2	12.0	27.2
2015	13.5	10.6	24.1
2016	13.4	10.3	23.7
2017	12.8	9.7	22.4
2018	12.2	9.3	21.5
2019	11.4	8.6	20.1
2020	11.1	8.3	19.4
Average	14.2	11.2	25.4

Source: RESI

Figure 233: Buy Local for GHG Benefits—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$3,999,562	$3,141,552	$7,141,113
2011	$3,999,562	$3,141,552	$7,141,113
2012	$3,999,562	$3,141,552	$7,141,113
2013	$3,914,101	$3,074,424	$6,988,525
2014	$3,845,732	$3,020,723	$6,866,455
2015	$3,726,087	$2,926,745	$6,652,832
2016	$3,691,903	$2,899,894	$6,591,797
2017	$3,691,903	$2,899,894	$6,591,797
2018	$3,589,350	$2,819,341	$6,408,691
2019	$3,589,350	$2,819,341	$6,408,691
2020	$3,555,166	$2,792,490	$6,347,656
Average	***$3,782,025***	***$2,970,682***	***$6,752,708***

Source: RESI

Figure 234: Buy Local for GHG Benefits—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$692,232	$543,730	$1,235,962
2011	$786,239	$617,570	$1,403,809
2012	$871,699	$684,697	$1,556,396
2013	$897,338	$704,835	$1,602,173
2014	$922,976	$724,973	$1,647,949
2015	$931,522	$731,686	$1,663,208
2016	$931,522	$731,686	$1,663,208
2017	$922,976	$724,973	$1,647,949
2018	$940,068	$738,399	$1,678,467
2019	$922,976	$724,973	$1,647,949
2020	$897,338	$704,835	$1,602,173
Average	***$883,353***	***$693,851***	***$1,577,204***

Source: RESI

Figure 235: Nutrient Trading for GHG Benefits—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	4.6	1.8	6.4
2011	4.8	1.9	6.7
2012	4.9	2.1	7.0
2013	8.7	3.6	12.3
2014	8.7	3.4	12.0
2015	8.1	3.0	11.1
2016	7.9	2.9	10.8
2017	8.0	2.9	10.9
2018	7.8	2.8	10.7
2019	7.6	2.6	10.2
2020	7.1	2.1	9.2
Average	***7.1***	***2.6***	***9.7***

Source: RESI

Figure 236: Nutrient Trading for GHG Benefits—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$356,213	$132,068	$488,281
2011	$356,213	$132,068	$488,281
2012	$378,476	$140,323	$518,799
2013	$667,899	$247,628	$915,527
2014	$712,426	$264,137	$976,563
2015	$623,373	$231,120	$854,492
2016	$623,373	$231,120	$854,492
2017	$623,373	$231,120	$854,492
2018	$623,373	$231,120	$854,492
2019	$623,373	$231,120	$854,492
2020	$578,846	$214,611	$793,457
Average	***$560,630***	***$207,858***	***$768,488***

Source: RESI

Figure 237: Nutrient Trading for GHG Benefits—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$178,106	$66,034	$244,141
2011	$166,975	$61,907	$228,882
2012	$200,370	$74,288	$274,658
2013	$367,345	$136,196	$503,540
2014	$367,345	$136,196	$503,540
2015	$378,476	$140,323	$518,799
2016	$411,871	$152,704	$564,575
2017	$423,003	$156,831	$579,834
2018	$434,134	$160,958	$595,093
2019	$423,003	$156,831	$579,834
2020	$400,739	$148,577	$549,316
Average	***$341,033***	***$126,440***	***$467,474***

Source: RESI

Figure 238: Nutrient Trading for GHG Benefits—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	62.0	33.4	95.5
2011	63.0	34.0	97.0
2012	62.3	33.4	95.7
2013	60.9	32.5	93.3
2014	59.6	31.2	90.7
2015	57.3	29.2	86.5
2016	55.8	28.3	84.1
2017	55.1	27.5	82.6
2018	53.5	26.7	80.2
2019	52.2	25.5	77.7
2020	51.3	24.5	75.8
Average	***57.5***	***29.6***	***87.2***

Source: RESI

Figure 239: Nutrient Trading for GHG Benefits—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$4,451,328	$2,293,056	$6,744,385
2011	$4,491,612	$2,313,808	$6,805,420
2012	$4,451,328	$2,293,056	$6,744,385
2013	$4,330,478	$2,230,802	$6,561,279
2014	$4,270,052	$2,199,674	$6,469,727
2015	$4,108,918	$2,116,668	$6,225,586
2016	$3,988,068	$2,054,413	$6,042,480
2017	$3,947,784	$2,033,661	$5,981,445
2018	$3,867,217	$1,992,158	$5,859,375
2019	$3,867,217	$1,992,158	$5,859,375
2020	$3,826,934	$1,971,406	$5,798,340
Average	***$4,145,540***	***$2,135,533***	***$6,281,072***

Source: RESI

Figure 240: Nutrient Trading for GHG Benefits—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$1,953,750	$1,006,455	$2,960,205
2011	$2,124,955	$1,094,649	$3,219,604
2012	$2,245,806	$1,156,904	$3,402,710
2013	$2,326,373	$1,198,407	$3,524,780
2014	$2,386,798	$1,229,535	$3,616,333
2015	$2,457,294	$1,265,850	$3,723,145
2016	$2,497,578	$1,286,602	$3,784,180
2017	$2,588,216	$1,333,293	$3,921,509
2018	$2,628,499	$1,354,045	$3,982,544
2019	$2,648,641	$1,364,420	$4,013,062
2020	$2,668,783	$1,374,796	$4,043,579
Average	***$2,411,518***	***$1,242,269***	***$3,653,786***

Source: RESI

A.4 Recycling

Figure 241: Recycling and Source Reduction—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	0.0	0.0	0.0
2018	0.0	0.0	0.0
2019	0.0	0.0	0.0
2020	0.0	0.0	0.0
Average	***0.0***	***0.0***	***0.0***

Source: RESI

Figure 242: Recycling and Source Reduction—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 243: Recycling and Source Reduction—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 244: Recycling and Source Reduction—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-46.8	-11.8	-58.6
2011	-40.7	-6.3	-47.0
2012	-35.1	-0.9	-36.0
2013	-30.0	3.8	-26.2
2014	-24.6	8.2	-16.4
2015	-21.5	10.8	-10.7
2016	-17.9	13.7	-4.2
2017	-14.9	15.7	0.8
2018	-13.3	17.2	3.9
2019	-12.8	17.3	4.5
2020	-12.8	17.2	4.4
Average	***-24.6***	***7.7***	***-16.9***

Source: RESI

Figure 245: Recycling and Source Reduction—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$6,497,957	$2,042,391	-$4,455,566
2011	-$5,073,747	$1,594,743	-$3,479,004
2012	-$3,605,031	$1,133,107	-$2,471,924
2013	-$2,447,860	$769,394	-$1,678,467
2014	-$1,246,184	$391,691	-$854,492
2015	-$534,079	$167,868	-$366,211
2016	$178,026	-$55,956	$122,070
2017	$801,118	-$251,802	$549,316
2018	$1,157,170	-$363,713	$793,457
2019	$1,335,197	-$419,669	$915,527
2020	$1,335,197	-$419,669	$915,527
Average	***-$1,327,105***	***$417,126***	***-$909,979***

Source: RESI

Figure 246: Recycling and Source Reduction—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$3,560,524	$1,119,118	-$2,441,406
2011	-$3,382,498	$1,063,162	-$2,319,336
2012	-$3,182,219	$1,000,212	-$2,182,007
2013	-$2,937,433	$923,272	-$2,014,160
2014	-$2,759,406	$867,317	-$1,892,090
2015	-$2,559,127	$804,366	-$1,754,761
2016	-$2,403,354	$755,405	-$1,647,949
2017	-$2,180,821	$685,460	-$1,495,361
2018	-$2,091,808	$657,482	-$1,434,326
2019	-$2,091,808	$657,482	-$1,434,326
2020	-$2,136,315	$671,471	-$1,464,844
Average	-$2,662,301	$836,795	-$1,825,506

Source: RESI

A.5 Buildings

Figure 247: Building Codes—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	14.1	5.4	19.5
2011	16.5	6.6	23.1
2012	15.6	6.1	21.7
2013	15.3	6.1	21.4
2014	14.9	5.6	20.5
2015	14.0	4.9	18.9
2016	14.2	5.1	19.3
2017	14.0	4.9	18.8
2018	14.0	5.2	19.2
2019	13.7	4.6	18.3
2020	13.8	4.8	18.6
Average	***14.6***	***5.4***	***19.9***

Source: RESI

Figure 248: Building Codes—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$1,092,207	$403,154	$1,495,361
2011	$1,270,526	$468,976	$1,739,502
2012	$1,203,657	$444,293	$1,647,949
2013	$1,181,367	$436,065	$1,617,432
2014	$1,203,657	$444,293	$1,647,949
2015	$1,114,497	$411,382	$1,525,879
2016	$1,114,497	$411,382	$1,525,879
2017	$1,114,497	$411,382	$1,525,879
2018	$1,114,497	$411,382	$1,525,879
2019	$1,159,077	$427,837	$1,586,914
2020	$1,114,497	$411,382	$1,525,879
Average	***$1,152,998***	***$425,593***	***$1,578,591***

Source: RESI

Figure 249: Building Codes—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$490,379	$181,008	$671,387
2011	$612,973	$226,260	$839,233
2012	$635,263	$234,488	$869,751
2013	$668,698	$246,829	$915,527
2014	$668,698	$246,829	$915,527
2015	$679,843	$250,943	$930,786
2016	$713,278	$263,284	$976,563
2017	$713,278	$263,284	$976,563
2018	$769,003	$283,854	$1,052,856
2019	$780,148	$287,967	$1,068,115
2020	$780,148	$287,967	$1,068,115
Average	***$682,883***	***$252,065***	***$934,948***

Source: RESI

Figure 250: Building Codes—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	52.8	46.4	99.3
2012	54.5	48.1	102.7
2013	54.9	48.5	103.4
2014	54.8	48.3	103.1
2015	54.4	47.8	102.1
2016	53.8	47.1	100.9
2017	53.3	46.5	99.7
2018	52.9	45.9	98.8
2019	52.1	45.2	97.3
2020	51.8	44.8	96.6
Average	***48.7***	***42.6***	***91.3***

Source: RESI

Figure 251: Building Codes—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$5,677,864	$4,971,550	$10,649,414
2012	$5,879,947	$5,148,495	$11,028,442
2013	$5,978,548	$5,234,831	$11,213,379
2014	$6,090,817	$5,333,133	$11,423,950
2015	$6,176,727	$5,408,356	$11,585,083
2016	$6,253,851	$5,475,886	$11,729,736
2017	$6,332,927	$5,545,125	$11,878,052
2018	$6,460,815	$5,657,105	$12,117,920
2019	$6,514,509	$5,704,119	$12,218,628
2020	$6,591,633	$5,771,649	$12,363,281
Average	***$5,632,512***	***$4,931,841***	***$10,564,353***

Source: RESI

Figure 252: Building Codes—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$1,778,970	$1,557,670	$3,336,639
2012	$1,945,176	$1,703,201	$3,648,376
2013	$2,055,492	$1,799,794	$3,855,286
2014	$2,185,821	$1,913,910	$4,099,731
2015	$2,297,602	$2,011,785	$4,309,387
2016	$2,398,400	$2,100,044	$4,498,444
2017	$2,493,096	$2,182,960	$4,676,056
2018	$2,600,483	$2,276,989	$4,877,472
2019	$2,658,814	$2,328,064	$4,986,877
2020	$2,721,782	$2,383,199	$5,104,980
Average	***$2,103,240***	***$1,841,601***	***$3,944,841***

Source: RESI

Figure 253: BeSMART—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	2.2	0.8	3.0
2012	1.0	0.4	1.3
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	-0.1	-0.1	-0.1
2016	-0.1	-0.1	-0.1
2017	-0.1	0.0	-0.1
2018	-0.1	-0.1	-0.1
2019	0.0	0.0	-0.1
2020	0.0	0.0	-0.1
Average	***0.3***	***0.1***	***0.3***

Source: RESI

Figure 254: BeSMART—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$179,261	$56,030	$235,291
2012	$77,424	$24,200	$101,624
2013	-$2,093	-$654	-$2,747
2014	-$2,790	-$872	-$3,662
2015	-$6,975	-$2,180	-$9,155
2016	-$6,975	-$2,180	-$9,155
2017	-$6,975	-$2,180	-$9,155
2018	-$6,975	-$2,180	-$9,155
2019	-$4,185	-$1,308	-$5,493
2020	-$4,185	-$1,308	-$5,493
Average	***$19,594***	***$6,124***	***$25,718***

Source: RESI

Figure 255: BeSMART—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$84,748	$26,489	$111,237
2012	$42,200	$13,190	$55,389
2013	$4,883	$1,526	$6,409
2014	$1,744	$545	$2,289
2015	-$349	-$109	-$458
2016	-$1,046	-$327	-$1,373
2017	-$1,395	-$436	-$1,831
2018	-$2,441	-$763	-$3,204
2019	-$2,093	-$654	-$2,747
2020	-$2,441	-$763	-$3,204
Average	***$11,255***	***$3,518***	***$14,773***

Source: RESI

Figure 256: BeSMART—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.1	0.1
2014	0.2	0.1	0.3
2015	0.0	0.1	0.1
2016	0.0	-0.1	-0.1
2017	0.0	0.0	0.0
2018	0.0	0.1	0.1
2019	-0.2	-0.2	-0.4
2020	-0.2	-0.2	-0.5
Average	***0.0***	***0.0***	***0.0***

Source: RESI

Figure 257: BeSMART—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$15,679	$14,839	$30,518
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$1,425***	***$1,349***	***$2,774***

Source: RESI

Figure 258: Main Street—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$7,839	$7,419	$15,259
2018	-$7,839	-$7,419	-$15,259
2019	$7,839	$7,419	$15,259
2020	$7,839	$7,419	$15,259
Average	***$1,425***	***$1,349***	***$2,774***

Source: RESI

Figure 259: Weatherization and Energy Efficiency for Low-Income Houses—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	24.2	9.1	33.3
2013	24.4	9.3	33.7
2014	24.2	9.2	33.4
2015	-0.4	-0.4	-0.8
2016	-1.0	-1.0	-2.1
2017	-1.4	-1.3	-2.7
2018	-1.4	-1.3	-2.7
2019	-1.2	-1.2	-2.4
2020	-1.0	-1.0	-2.0
Average	***6.0***	***1.9***	***8.0***

Source: RESI

Figure 260: Weatherization and Energy Efficiency for Low-Income Houses—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$1,966,457	$629,978	$2,596,436
2013	$1,981,018	$634,643	$2,615,662
2014	$1,981,712	$634,865	$2,616,577
2015	-$72,113	-$23,102	-$95,215
2016	-$137,291	-$43,983	-$181,274
2017	-$165,027	-$52,868	-$217,896
2018	-$169,187	-$54,201	-$223,389
2019	-$151,159	-$48,426	-$199,585
2020	-$131,744	-$42,206	-$173,950
Average	***$463,879***	***$148,609***	***$612,488***

Source: RESI

Figure 261: Weatherization and Energy Efficiency for Low-Income Houses—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$956,880	$306,548	$1,263,428
2013	$1,036,620	$332,094	$1,368,713
2014	$1,106,999	$354,640	$1,461,639
2015	$92,568	$29,655	$122,223
2016	$23,575	$7,553	$31,128
2017	-$21,148	-$6,775	-$27,924
2018	-$49,231	-$15,772	-$65,002
2019	-$61,018	-$19,548	-$80,566
2020	-$64,485	-$20,659	-$85,144
Average	***$274,614***	***$87,976***	***$362,590***

Source: RESI

Figure 262: Weatherization and Energy Efficiency for Low-Income Houses—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.8	0.8	1.6
2013	0.2	0.4	0.6
2014	0.7	0.7	1.5
2015	-0.5	-0.5	-0.9
2016	-0.3	-0.2	-0.5
2017	0.3	0.0	0.3
2018	0.3	0.3	0.6
2019	0.1	0.0	0.1
2020	0.4	0.0	0.4
Average	***0.2***	***0.1***	***0.3***

Source: RESI

Figure 263: Weatherization and Energy Efficiency for Low-Income Houses—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	-$51,756	-$39,797	-$91,553
2013	-$69,008	-$53,063	-$122,070
2014	-$34,504	-$26,531	-$61,035
2015	-$34,504	-$26,531	-$61,035
2016	-$34,504	-$26,531	-$61,035
2017	$0	$0	$0
2018	$0	$0	$0
2019	$34,504	$26,531	$61,035
2020	$34,504	$26,531	$61,035
Average	***-$14,115***	***-$10,854***	***-$24,969***

Source: RESI

Figure 264: Weatherization and Energy Efficiency for Low-Income Houses—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$17,252	$13,266	$30,518
2013	$8,626	$6,633	$15,259
2014	$8,626	$6,633	$15,259
2015	-$8,626	-$6,633	-$15,259
2016	-$8,626	-$6,633	-$15,259
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$1,568***	***$1,206***	***$2,774***

Source: RESI

A.6 Land Use

Figure 265: Reducing GHG Emissions from the Transportation Sector through Land Use and Location Efficiency—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	0.0	0.0	0.0
2018	0.0	0.0	0.0
2019	0.0	0.0	0.0
2020	0.0	0.0	0.0
Average	***0.0***	***0.0***	***0.0***

Source: RESI

Figure 266: Reducing GHG Emissions from the Transportation Sector through Land Use and Location Efficiency—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 267: Reducing GHG Emissions from the Transportation Sector through Land Use and Location Efficiency—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 268: Reducing GHG Emissions from the Transportation Sector through Land Use and Location Efficiency—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	40.5	37.6	78.2
2011	118.9	110.7	229.6
2012	-1.1	-1.2	-2.3
2013	-3.6	-3.3	-6.9
2014	-4.0	-3.8	-7.8
2015	-4.9	-4.7	-9.6
2016	-4.6	-4.1	-8.8
2017	-3.8	-3.6	-7.3
2018	-3.3	-3.1	-6.3
2019	-2.4	-2.1	-4.6
2020	-2.0	-1.9	-3.8
Average	***11.8***	***11.0***	***22.8***

Source: RESI

Figure 269: Reducing GHG Emissions from the Transportation Sector through Land Use and Location Efficiency—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$2,387,047	$2,221,107	$4,608,154
2011	$6,971,442	$6,486,810	$13,458,252
2012	-$189,699	-$176,512	-$366,211
2013	-$363,590	-$338,314	-$701,904
2014	-$379,398	-$353,024	-$732,422
2015	-$442,631	-$411,861	-$854,492
2016	-$411,015	-$382,442	-$793,457
2017	-$347,782	-$323,605	-$671,387
2018	-$316,165	-$294,186	-$610,352
2019	-$221,316	-$205,930	-$427,246
2020	-$221,316	-$205,930	-$427,246
Average	***$587,780***	***$546,919***	***$1,134,699***

Source: RESI

Figure 270: Reducing GHG Emissions from the Transportation Sector through Land Use and Location Efficiency—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$932,687	$867,850	$1,800,537
2011	$2,805,966	$2,610,904	$5,416,870
2012	$158,083	$147,093	$305,176
2013	$31,617	$29,419	$61,035
2014	-$31,617	-$29,419	-$61,035
2015	-$94,850	-$88,256	-$183,105
2016	-$118,562	-$110,320	-$228,882
2017	-$110,658	-$102,965	-$213,623
2018	-$102,754	-$95,611	-$198,364
2019	-$86,945	-$80,901	-$167,847
2020	-$79,041	-$73,547	-$152,588
Average	***$300,357***	***$279,477***	***$579,834***

Source: RESI

Figure 271: Transportation GHG Targets for Local Governments and Metropolitan Planning Organizations—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	0.0	0.0	0.0
2018	0.0	0.0	0.0
2019	0.0	0.0	0.0
2020	0.0	0.0	0.0
Average	***0.0***	***0.0***	***0.0***

Source: RESI

Figure 272: Transportation GHG Targets for Local Governments and Metropolitan Planning Organizations—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 273: Transportation GHG Targets for Local Governments and Metropolitan Planning Organizations—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 274: Transportation GHG Targets for Local Governments and Metropolitan Planning Organizations—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	34.5	33.4	67.9
2011	31.7	30.7	62.4
2012	28.6	28.1	56.7
2013	26.4	25.9	52.3
2014	24.5	23.7	48.2
2015	22.3	21.8	44.1
2016	21.1	20.8	41.9
2017	20.5	19.9	40.4
2018	19.0	18.8	37.8
2019	18.1	18.0	36.0
2020	17.2	16.9	34.0
Average	***24.0***	***23.4***	***47.4***

Source: RESI

Figure 275: Transportation GHG Targets for Local Governments and Metropolitan Planning Organizations—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$570,994	-$558,156	-$1,129,150
2011	-$709,885	-$693,924	-$1,403,809
2012	-$864,208	-$844,777	-$1,708,984
2013	-$987,666	-$965,459	-$1,953,125
2014	-$1,064,827	-$1,040,886	-$2,105,713
2015	-$1,172,853	-$1,146,483	-$2,319,336
2016	-$1,234,582	-$1,206,824	-$2,441,406
2017	-$1,265,447	-$1,236,994	-$2,502,441
2018	-$1,327,176	-$1,297,336	-$2,624,512
2019	-$1,327,176	-$1,297,336	-$2,624,512
2020	-$1,358,041	-$1,327,506	-$2,685,547
Average	***-$1,080,260***	***-$1,055,971***	***-$2,136,230***

Source: RESI

Figure 276: Transportation GHG Targets for Local Governments and Metropolitan Planning Organizations—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$432,104	$422,388	$854,492
2011	$416,672	$407,303	$823,975
2012	$408,955	$399,760	$808,716
2013	$378,091	$369,590	$747,681
2014	$347,226	$339,419	$686,646
2015	$331,794	$324,334	$656,128
2016	$308,646	$301,706	$610,352
2017	$300,929	$294,163	$595,093
2018	$293,213	$286,621	$579,834
2019	$270,065	$263,993	$534,058
2020	$254,633	$248,907	$503,540
Average	***$340,212***	***$332,562***	***$672,774***

Source: RESI

Figure 277: Land Use Planning GHG Benefits—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	118.7	43.8	162.5
2011	275.4	102.9	378.3
2012	0.8	0.4	1.2
2013	-3.8	-3.7	-7.5
2014	-6.3	-6.2	-12.5
2015	-7.3	-7.1	-14.4
2016	-7.4	-6.9	-14.2
2017	-6.1	-6.1	-12.3
2018	-5.4	-5.2	-10.6
2019	-4.2	-3.8	-8.0
2020	-2.8	-2.8	-5.7
Average	***32.0***	***9.6***	***41.5***

Source: RESI

Figure 278: Land Use Planning GHG Benefits —Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$9,649,523	$2,893,202	$12,542,725
2011	$22,468,596	$6,736,726	$29,205,322
2012	-$117,391	-$35,197	-$152,588
2013	-$563,476	-$168,946	-$732,422
2014	-$774,779	-$232,301	-$1,007,080
2015	-$892,170	-$267,498	-$1,159,668
2016	-$892,170	-$267,498	-$1,159,668
2017	-$798,257	-$239,340	-$1,037,598
2018	-$751,301	-$225,261	-$976,563
2019	-$563,476	-$168,946	-$732,422
2020	-$422,607	-$126,710	-$549,316
Average	***$2,394,772***	***$718,021***	***$3,112,793***

Source: RESI

Figure 279: Land Use Planning GHG Benefits —Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$4,496,067	$1,348,049	$5,844,116
2011	$10,917,343	$3,273,331	$14,190,674
2012	$716,084	$214,702	$930,786
2013	$316,955	$95,032	$411,987
2014	$23,478	$7,039	$30,518
2015	-$152,608	-$45,756	-$198,364
2016	-$258,260	-$77,434	-$335,693
2017	-$293,477	-$87,993	-$381,470
2018	-$328,694	-$98,552	-$427,246
2019	-$293,477	-$87,993	-$381,470
2020	-$258,260	-$77,434	-$335,693
Average	***$1,353,196***	***$405,727***	***$1,758,922***

Source: RESI

Figure 280: Land Use Planning GHG Benefits —Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	255.2	237.0	492.2
2011	252.3	234.7	487.1
2012	244.8	228.2	473.0
2013	237.2	221.7	458.8
2014	229.6	214.6	444.1
2015	-24.2	-22.7	-46.9
2016	-29.8	-27.7	-57.5
2017	-29.9	-27.9	-57.8
2018	-27.2	-24.9	-52.1
2019	-22.5	-20.4	-42.9
2020	-17.0	-15.4	-32.4
Average	***97.1***	***90.7***	***187.8***

Source: RESI

Figure 281: Land Use Planning GHG Benefits —Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$14,977,974	$13,983,208	$28,961,182
2011	$14,662,316	$13,688,514	$28,350,830
2012	$14,031,000	$13,099,127	$27,130,127
2013	$13,304,986	$12,421,332	$25,726,318
2014	$12,673,670	$11,831,945	$24,505,615
2015	-$2,588,396	-$2,416,487	-$5,004,883
2016	-$2,967,186	-$2,770,119	-$5,737,305
2017	-$2,967,186	-$2,770,119	-$5,737,305
2018	-$2,809,357	-$2,622,772	-$5,432,129
2019	-$2,399,001	-$2,239,671	-$4,638,672
2020	-$2,020,211	-$1,886,039	-$3,906,250
Average	***$4,899,874***	***$4,574,447***	***$9,474,321***

Source: RESI

Figure 282: Land Use Planning GHG Benefits —Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$5,823,891	$5,437,095	$11,260,986
2011	$6,179,006	$5,768,626	$11,947,632
2012	$6,392,075	$5,967,544	$12,359,619
2013	$6,510,447	$6,078,054	$12,588,501
2014	$6,668,276	$6,225,401	$12,893,677
2015	$118,372	$110,510	$228,882
2016	-$426,138	-$397,836	-$823,975
2017	-$749,688	-$699,897	-$1,449,585
2018	-$907,517	-$847,244	-$1,754,761
2019	-$899,625	-$839,877	-$1,739,502
2020	-$812,819	-$758,836	-$1,571,655
Average	***$2,536,025***	***$2,367,595***	***$4,903,620***

Source: RESI

Figure 283: GHG Benefits from Priority Funding Areas and Other Growth Boundaries—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	12,067.7	2,026.7	14,094.4
2011	10,209.2	303.6	10,512.8
2012	8,842.8	-975.8	7,867.0
2013	7,705.1	-2,017.5	5,687.6
2014	6,879.4	-2,671.5	4,208.0
2015	6,232.2	-3,161.7	3,070.5
2016	5,736.2	-3,513.5	2,222.7
2017	5,380.1	-3,738.8	1,641.3
2018	0.0	0.0	0.0
2019	0.0	0.0	0.0
2020	0.0	0.0	0.0
Average	***7,881.6***	***-1,718.6***	***6,163.0***

Source: RESI

Figure 284: GHG Benefits from Priority Funding Areas and Other Growth Boundaries—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$601,829,438	$605,445,953	$1,207,275,391
2011	$474,252,551	$477,102,430	$951,354,980
2012	$377,725,559	$379,995,388	$757,720,947
2013	$297,993,808	$299,784,513	$597,778,320
2014	$244,002,587	$245,468,848	$489,471,436
2015	$202,912,059	$204,131,398	$407,043,457
2016	$172,972,718	$174,012,146	$346,984,863
2017	$153,134,862	$154,055,080	$307,189,941
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$315,602,948***	***$317,499,469***	***$633,102,417***

Source: RESI

Figure 285: GHG Benefits from Priority Funding Areas and Other Growth Boundaries—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$342,484,460	$344,542,518	$687,026,978
2011	$337,433,717	$339,461,424	$676,895,142
2012	$331,546,255	$333,538,584	$665,084,839
2013	$322,829,161	$324,769,106	$647,598,267
2014	$320,273,363	$322,197,950	$642,471,313
2015	$318,463,007	$320,376,715	$638,839,722
2016	$317,960,975	$319,871,667	$637,832,642
2017	$319,299,726	$321,218,462	$640,518,188
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$326,286,333***	***$328,247,053***	***$654,533,386***

Source: RESI

Figure 286: GHG Benefits from Priority Funding Areas and Other Growth Boundaries—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	1,479.6	1,363.6	2,843.1
2018	1,864.3	1,719.2	3,583.4
2019	2,033.2	1,874.2	3,907.4
2020	2,090.0	1,924.2	4,014.3
Average	***1,866.8***	***1,720.3***	***3,587.1***

Source: RESI

Figure 287: GHG Benefits from Priority Funding Areas and Other Growth Boundaries—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$97,324,072	$89,687,646	$187,011,719
2018	$121,432,744	$111,904,658	$233,337,402
2019	$132,677,105	$122,266,742	$254,943,848
2020	$136,996,973	$126,247,656	$263,244,629
Average	***$122,107,724***	***$112,526,676***	***$234,634,399***

Source: RESI

Figure 288: GHG Benefits from Priority Funding Areas and Other Growth Boundaries—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$46,224,170	$42,597,241	$88,821,411
2018	$63,344,821	$58,374,539	$121,719,360
2019	$73,564,801	$67,792,620	$141,357,422
2020	$79,734,906	$73,478,595	$153,213,501
Average	***$65,717,175***	***$60,560,749***	***$126,277,924***

Source: RESI

A.7 Innovative Initiatives

Figure 289: Leadership-by-Example-Local Government—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	123.3	45.3	168.6
2011	125.5	47.0	172.5
2012	124.3	46.1	170.4
2013	122.6	44.7	167.2
2014	120.0	42.4	162.4
2015	116.9	40.3	157.2
2016	114.6	38.9	153.6
2017	113.1	37.9	151.0
2018	111.2	37.1	148.4
2019	109.8	35.9	145.7
2020	109.2	35.3	144.5
Average	***117.3***	***41.0***	***158.3***

Source: RESI

Figure 290: Leadership-by-Example-Local Government—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$9,656,407	$3,374,599	$13,031,006
2011	$9,814,709	$3,429,920	$13,244,629
2012	$9,746,865	$3,406,211	$13,153,076
2013	$9,565,949	$3,342,986	$12,908,936
2014	$9,430,262	$3,295,568	$12,725,830
2015	$9,271,960	$3,240,247	$12,512,207
2016	$9,136,273	$3,192,829	$12,329,102
2017	$9,091,044	$3,177,023	$12,268,066
2018	$9,045,815	$3,161,216	$12,207,031
2019	$9,045,815	$3,161,216	$12,207,031
2020	$9,045,815	$3,161,216	$12,207,031
Average	***$9,350,083***	***$3,267,548***	***$12,617,631***

Source: RESI

Figure 291: Leadership-by-Example-Local Government—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$4,500,293	$1,572,705	$6,072,998
2011	$4,918,662	$1,718,911	$6,637,573
2012	$5,178,729	$1,809,796	$6,988,525
2013	$5,348,338	$1,869,069	$7,217,407
2014	$5,551,869	$1,940,197	$7,492,065
2015	$5,721,478	$1,999,469	$7,720,947
2016	$5,879,780	$2,054,791	$7,934,570
2017	$6,038,081	$2,110,112	$8,148,193
2018	$6,207,690	$2,169,385	$8,377,075
2019	$6,332,070	$2,212,851	$8,544,922
2020	$6,433,836	$2,248,415	$8,682,251
Average	***$5,646,439***	***$1,973,246***	***$7,619,684***

Source: RESI

Figure 292: Leadership-by-Example-Local Government—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2020	1,484.9	352.5	1,837.4
2021	289.1	1,417.1	1,706.1
2022	1,372.2	247.9	1,620.1
2023	1,340.2	218.3	1,558.5
2024	1,317.2	197.8	1,514.9
2025	1,300.6	183.6	1,484.2
Average	***1,184.0***	***436.2***	***1,620.2***

Source: RESI

Figure 293: Leadership-by-Example-Local Government—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2020	$79,885,067	$29,428,898	$109,313,965
2021	$73,685,165	$27,144,913	$100,830,078
2022	$69,358,615	$25,551,053	$94,909,668
2023	$66,325,569	$24,433,708	$90,759,277
2024	$64,095,389	$23,612,131	$87,707,520
2025	$62,534,262	$23,037,027	$85,571,289
Average	***$69,314,011***	***$25,534,621***	***$94,848,633***

Source: RESI

Figure 294: Leadership-by-Example-Local Government—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2020	$75,413,555	$27,781,635	$103,195,190
2021	$78,613,864	$28,960,599	$107,574,463
2022	$81,535,401	$30,036,865	$111,572,266
2023	$84,256,221	$31,039,189	$115,295,410
2024	$86,865,532	$32,000,435	$118,865,967
2025	$89,541,749	$32,986,327	$122,528,076
Average	***$82,704,387***	***$30,467,508***	***$113,171,895***

Source: RESI

Figure 295: Leadership-by-Example-Federal Government—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	77.3	28.6	105.9
2011	78.5	29.4	108.0
2012	77.9	28.8	106.8
2013	77.0	28.2	105.2
2014	75.4	27.0	102.5
2015	73.0	25.2	98.2
2016	72.0	24.6	96.6
2017	70.6	23.5	94.1
2018	69.1	22.8	91.9
2019	68.1	22.2	90.3
2020	67.3	21.2	88.5
Average	***73.3***	***25.6***	***98.9***

Source: RESI

Figure 296: Leadership-by-Example-Federal Government—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$6,061,465	$2,117,246	$8,178,711
2011	$6,151,935	$2,148,846	$8,300,781
2012	$6,106,700	$2,133,046	$8,239,746
2013	$6,016,230	$2,101,445	$8,117,676
2014	$5,970,996	$2,085,645	$8,056,641
2015	$5,790,056	$2,022,444	$7,812,500
2016	$5,744,822	$2,006,643	$7,751,465
2017	$5,699,587	$1,990,843	$7,690,430
2018	$5,654,352	$1,975,043	$7,629,395
2019	$5,654,352	$1,975,043	$7,629,395
2020	$5,563,882	$1,943,442	$7,507,324
Average	***$5,855,852***	***$2,045,426***	***$7,901,278***

Source: RESI

Figure 297: Leadership-by-Example-Federal Government—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$2,827,176	$987,521	$3,814,697
2011	$3,064,659	$1,070,473	$4,135,132
2012	$3,256,907	$1,137,625	$4,394,531
2013	$3,369,994	$1,177,125	$4,547,119
2014	$3,517,007	$1,228,476	$4,745,483
2015	$3,584,859	$1,252,177	$4,837,036
2016	$3,697,946	$1,291,678	$4,989,624
2017	$3,811,033	$1,331,179	$5,142,212
2018	$3,912,812	$1,366,729	$5,279,541
2019	$3,969,355	$1,386,480	$5,355,835
2020	$4,014,590	$1,402,280	$5,416,870
Average	***$3,547,849***	***$1,239,249***	***$4,787,098***

Source: RESI

Figure 298: Leadership-by-Example-Federal Government—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2020	977.8	280.6	1,258.4
2021	283.9	936.7	1,220.6
2022	939.1	246.1	1,185.2
2023	920.0	229.0	1,149.1
2024	903.0	214.4	1,117.4
2025	888.8	202.3	1,091.1
Average	***818.8***	***351.5***	***1,170.3***

Source: RESI

Figure 299: Leadership-by-Example-Federal Government—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2020	$64,437,579	$27,664,472	$92,102,051
2021	$62,814,896	$26,967,819	$89,782,715
2022	$61,192,214	$26,271,165	$87,463,379
2023	$59,569,531	$25,574,512	$85,144,043
2024	$58,117,657	$24,951,190	$83,068,848
2025	$56,921,996	$24,437,867	$81,359,863
Average	***$60,508,979***	***$25,977,837***	***$86,486,816***

Source: RESI

Figure 300: Leadership-by-Example-Federal Government—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2020	$48,114,673	$20,656,689	$68,771,362
2021	$51,285,310	$22,017,913	$73,303,223
2022	$53,762,036	$23,081,226	$76,843,262
2023	$55,704,985	$23,915,377	$79,620,361
2024	$57,413,071	$24,648,696	$82,061,768
2025	$58,971,701	$25,317,850	$84,289,551
Average	***$54,208,629***	***$23,272,958***	***$77,481,588***

Source: RESI

Figure 301: Leadership-by-Example-Maryland Colleges and Universities—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	74.4	27.5	101.9
2011	75.7	28.6	104.3
2012	75.0	27.8	102.9
2013	74.4	27.5	101.9
2014	72.9	26.2	99.1
2015	70.5	24.6	95.0
2016	69.2	23.8	93.0
2017	68.1	22.8	91.0
2018	67.1	22.4	89.4
2019	65.4	21.1	86.5
2020	65.2	20.6	85.8
Average	***70.7***	***24.8***	***95.5***

Source: RESI

Figure 302: Leadership-by-Example-Maryland Colleges and Universities—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$5,806,837	$2,036,180	$7,843,018
2011	$5,942,405	$2,083,718	$8,026,123
2012	$5,874,621	$2,059,949	$7,934,570
2013	$5,806,837	$2,036,180	$7,843,018
2014	$5,761,648	$2,020,335	$7,781,982
2015	$5,603,485	$1,964,874	$7,568,359
2016	$5,513,106	$1,933,183	$7,446,289
2017	$5,467,917	$1,917,337	$7,385,254
2018	$5,467,917	$1,917,337	$7,385,254
2019	$5,422,727	$1,901,491	$7,324,219
2020	$5,377,538	$1,885,646	$7,263,184
Average	***$5,640,458***	***$1,977,839***	***$7,618,297***

Source: RESI

Figure 303: Leadership-by-Example-Maryland Colleges and Universities—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$2,722,661	$954,707	$3,677,368
2011	$2,937,311	$1,029,974	$3,967,285
2012	$3,129,366	$1,097,319	$4,226,685
2013	$3,264,934	$1,144,856	$4,409,790
2014	$3,377,907	$1,184,471	$4,562,378
2015	$3,468,286	$1,216,162	$4,684,448
2016	$3,547,367	$1,243,892	$4,791,260
2017	$3,660,341	$1,283,507	$4,943,848
2018	$3,773,314	$1,323,121	$5,096,436
2019	$3,818,504	$1,338,967	$5,157,471
2020	$3,886,288	$1,362,735	$5,249,023
Average	***$3,416,934***	***$1,198,156***	***$4,615,090***

Source: RESI

Figure 304: Leadership-by-Example-Maryland Colleges and Universities—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2020	78.0	18.1	96.0
2021	14.4	74.4	88.8
2022	71.6	12.2	83.9
2023	69.7	10.6	80.3
2024	68.7	9.6	78.4
2025	68.4	9.3	77.7
Average	***61.8***	***22.4***	***84.2***

Source: RESI

Figure 305: Leadership-by-Example-Maryland Colleges and Universities—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2020	$78.0	$18.1	$96.0
2021	$14.4	$74.4	$88.8
2022	$71.6	$12.2	$83.9
2023	$69.7	$10.6	$80.3
2024	$68.7	$9.6	$78.4
2025	$68.4	$9.3	$77.7
Average	**$61.8**	**$22.4**	**$84.2**

Source: RESI

Figure 306: Leadership-by-Example-Maryland Colleges and Universities—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2020	$3,955,194	$1,431,158	$5,386,353
2021	$4,168,080	$1,508,189	$5,676,270
2022	$4,302,535	$1,556,840	$5,859,375
2023	$4,459,398	$1,613,600	$6,072,998
2024	$4,571,443	$1,654,143	$6,225,586
2025	$4,750,715	$1,719,011	$6,469,727
Average	***$4,367,894***	***$1,580,490***	***$5,948,385***

Source: RESI

Figure 307: State of Maryland Initiative to Lead by Example—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	16.5	8.2	24.7
2011	20.3	11.3	31.6
2012	15.7	9.6	25.3
2013	0.2	0.0	0.2
2014	-0.8	-0.9	-1.7
2015	-1.4	-1.4	-2.7
2016	-1.5	-1.5	-3.0
2017	-1.4	-1.4	-2.8
2018	-1.2	-1.2	-2.3
2019	-0.9	-0.9	-1.8
2020	-0.6	-0.6	-1.3
Average	***4.1***	***1.9***	***6.0***

Source: RESI

Figure 308: State of Maryland Initiative to Lead by Example—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$1,213,538	$571,741	$1,785,278
2011	$1,508,520	$710,718	$2,219,238
2012	$1,181,177	$556,494	$1,737,671
2013	$8,713	$4,105	$12,817
2014	-$75,302	-$35,477	-$110,779
2015	-$121,976	-$57,467	-$179,443
2016	-$131,933	-$62,158	-$194,092
2017	-$121,976	-$57,467	-$179,443
2018	-$103,306	-$48,671	-$151,978
2019	-$77,169	-$36,357	-$113,525
2020	-$56,009	-$26,388	-$82,397
Average	***$293,116***	***$138,097***	***$431,213***

Source: RESI

Figure 309: State of Maryland Initiative to Lead by Example—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$536,135	$252,592	$788,727
2011	$688,916	$324,573	$1,013,489
2012	$568,807	$267,985	$836,792
2013	$55,387	$26,095	$81,482
2014	-$3,734	-$1,759	-$5,493
2015	-$43,252	-$20,377	-$63,629
2016	-$65,967	-$31,079	-$97,046
2017	-$74,679	-$35,184	-$109,863
2018	-$75,613	-$35,624	-$111,237
2019	-$67,834	-$31,959	-$99,792
2020	-$57,876	-$27,268	-$85,144
Average	***$132,754***	***$62,545***	***$195,299***

Source: RESI

Figure 310: State of Maryland Initiative to Lead by Example—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	90.5	66.3	156.8
2011	168.5	138.3	306.8
2012	211.4	177.8	389.2
2013	237.2	201.4	438.7
2014	248.5	210.1	458.6
2015	249.9	210.1	460.0
2016	245.0	204.1	449.1
2017	235.1	193.2	428.4
2018	220.2	178.0	398.2
2019	199.0	156.8	355.8
2020	177.0	134.6	311.7
Average	***207.5***	***170.1***	***377.6***

Source: RESI

Figure 311: State of Maryland Initiative to Lead by Example—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$5,316,565	$4,357,508	$9,674,072
2011	$10,716,987	$8,783,746	$19,500,732
2012	$14,373,173	$11,780,391	$26,153,564
2013	$17,174,013	$14,075,987	$31,250,000
2014	$19,371,079	$15,876,723	$35,247,803
2015	$20,997,915	$17,210,093	$38,208,008
2016	$22,205,463	$18,199,811	$40,405,273
2017	$23,178,209	$18,997,084	$42,175,293
2018	$23,916,155	$19,601,911	$43,518,066
2019	$24,318,671	$19,931,817	$44,250,488
2020	$24,419,300	$20,014,294	$44,433,594
Average	***$18,726,139***	***$15,348,124***	***$34,074,263***

Source: RESI

Figure 312: State of Maryland Initiative to Lead by Example—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$2,171,909	$1,780,117	$3,952,026
2011	$4,209,646	$3,450,266	$7,659,912
2012	$5,610,066	$4,598,064	$10,208,130
2013	$6,582,813	$5,395,337	$11,978,149
2014	$7,303,987	$5,986,418	$13,290,405
2015	$7,740,046	$6,343,816	$14,083,862
2016	$7,916,147	$6,488,150	$14,404,297
2017	$7,924,533	$6,495,023	$14,419,556
2018	$7,706,503	$6,316,324	$14,022,827
2019	$7,119,501	$5,835,211	$12,954,712
2020	$6,389,941	$5,237,257	$11,627,197
Average	***$6,425,008***	***$5,265,999***	***$11,691,007***

Source: RESI

Figure 313: State of Maryland Carbon and Footprint Initiatives—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	0.0	0.0	0.0
2018	0.0	0.0	0.0
2019	0.0	0.0	0.0
2020	0.0	0.0	0.0
Average	***0.0***	***0.0***	***0.0***

Source: RESI

Figure 314: State of Maryland Carbon and Footprint Initiatives—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 315: State of Maryland Carbon and Footprint Initiatives—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 316: State of Maryland Carbon and Footprint Initiatives—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	780.5	365.4	1,146.0
2011	583.3	168.6	752.0
2012	561.6	146.3	708.0
2013	549.1	134.3	683.4
2014	541.8	130.1	671.9
2015	540.3	131.7	672.0
2016	542.8	137.4	680.2
2017	548.5	145.7	694.2
2018	555.8	155.7	711.6
2019	565.1	165.5	730.6
2020	576.5	176.4	753.0
Average	***576.9***	***168.8***	***745.7***

Source: RESI

Figure 317: State of Maryland Carbon and Footprint Initiatives—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$74,979,560	$21,944,268	$96,923,828
2011	$36,710,710	$10,744,124	$47,454,834
2012	$34,444,326	$10,080,821	$44,525,146
2013	$32,862,578	$9,617,891	$42,480,469
2014	$32,343,198	$9,465,884	$41,809,082
2015	$32,343,198	$9,465,884	$41,809,082
2016	$32,673,713	$9,562,616	$42,236,328
2017	$33,287,525	$9,742,260	$43,029,785
2018	$34,326,285	$10,046,274	$44,372,559
2019	$35,128,963	$10,281,194	$45,410,156
2020	$36,167,722	$10,585,207	$46,752,930
Average	***$37,751,616***	***$11,048,766***	***$48,800,382***

Source: RESI

Figure 318: State of Maryland Carbon and Footprint Initiatives—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$29,923,360	$8,757,670	$38,681,030
2011	$22,864,516	$6,691,758	$29,556,274
2012	$22,829,104	$6,681,394	$29,510,498
2013	$22,687,455	$6,639,938	$29,327,393
2014	$22,958,949	$6,719,396	$29,678,345
2015	$23,395,700	$6,847,220	$30,242,920
2016	$23,867,864	$6,985,408	$30,853,271
2017	$24,517,089	$7,175,416	$31,692,505
2018	$25,402,395	$7,434,519	$32,836,914
2019	$26,193,269	$7,665,984	$33,859,253
2020	$27,161,204	$7,949,270	$35,110,474
Average	***$24,709,173***	***$7,231,634***	***$31,940,807***

Source: RESI

Figure 319: GHG Early Voluntary Reduction—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.5	0.3	0.8
2011	0.5	0.3	0.7
2012	0.2	0.1	0.4
2013	0.2	0.0	0.3
2014	0.5	0.2	0.6
2015	0.2	0.1	0.3
2016	0.7	0.3	1.0
2017	0.5	0.0	0.4
2018	0.2	-0.2	0.0
2019	0.5	0.2	0.7
2020	-0.1	-0.2	-0.3
Average	0.4	0.1	0.4

Source: RESI

Figure 320: GHG Early Voluntary Reduction—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$48,375	$12,661	$61,035
2011	$24,187	$6,330	$30,518
2012	$24,187	$6,330	$30,518
2013	$24,187	$6,330	$30,518
2014	$48,375	$12,661	$61,035
2015	$0	$0	$0
2016	$48,375	$12,661	$61,035
2017	$0	$0	$0
2018	$0	$0	$0
2019	$48,375	$12,661	$61,035
2020	$0	$0	$0
Average	***$24,187***	***$6,330***	***$30,518***

Source: RESI

Figure 321: GHG Early Voluntary Reduction—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$12,094	$3,165	$15,259
2011	$12,094	$3,165	$15,259
2012	$0	$0	$0
2013	$12,094	$3,165	$15,259
2014	$12,094	$3,165	$15,259
2015	$12,094	$3,165	$15,259
2016	$24,187	$6,330	$30,518
2017	$24,187	$6,330	$30,518
2018	$12,094	$3,165	$15,259
2019	$24,187	$6,330	$30,518
2020	$24,187	$6,330	$30,518
Average	***$15,392***	***$4,028***	***$19,420***

Source: RESI

Figure 322: GHG Early Voluntary Reduction—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	1.2	0.8	2.0
2012	1.4	1.3	2.7
2013	1.7	1.7	3.4
2014	2.7	2.1	4.9
2015	2.3	1.9	4.2
2016	3.0	2.4	5.4
2017	2.9	2.4	5.2
2018	2.8	2.5	5.3
2019	2.8	2.6	5.4
2020	2.3	1.9	4.3
Average	***2.1***	***1.8***	***3.9***

Source: RESI

Figure 323: GHG Early Voluntary Reduction—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$99,292	$83,814	$183,105
2012	$165,486	$139,690	$305,176
2013	$198,583	$167,628	$366,211
2014	$281,326	$237,473	$518,799
2015	$264,777	$223,504	$488,281
2016	$297,875	$251,442	$549,316
2017	$297,875	$251,442	$549,316
2018	$330,972	$279,380	$610,352
2019	$364,069	$307,318	$671,387
2020	$297,875	$251,442	$549,316
Average	***$236,194***	***$199,376***	***$435,569***

Source: RESI

Figure 324: GHG Early Voluntary Reduction—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$24,823	$20,953	$45,776
2012	$41,371	$34,922	$76,294
2013	$66,194	$55,876	$122,070
2014	$74,469	$62,860	$137,329
2015	$82,743	$69,845	$152,588
2016	$99,292	$83,814	$183,105
2017	$115,840	$97,783	$213,623
2018	$99,292	$83,814	$183,105
2019	$124,114	$104,767	$228,882
2020	$124,114	$104,767	$228,882
Average	***$77,477***	***$65,400***	***$142,878***

Source: RESI

Figure 325: Job Creation and Economic Development Initiatives—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	0.0	0.0	0.0
2018	0.0	0.0	0.0
2019	0.0	0.0	0.0
2020	0.0	0.0	0.0
Average	***0.0***	***0.0***	***0.0***

Source: RESI

Figure 326: Job Creation and Economic Development Initiatives—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 327: Job Creation and Economic Development Initiatives—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 328: Job Creation and Economic Development Initiatives—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	0.0	0.0	0.0
2018	0.0	0.0	0.0
2019	0.0	0.0	0.0
2020	0.0	0.0	0.0
Average	***0.0***	***0.0***	***0.0***

Source: RESI

Figure 329: Job Creation and Economic Development Initiatives—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 330: Job Creation and Economic Development Initiatives—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 331: Public Health Initiatives Related to Climate Changes—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	26.5	10.0	36.5
2011	27.3	10.7	37.9
2012	0.8	0.7	1.4
2013	-0.1	0.1	0.0
2014	0.1	-0.3	-0.2
2015	-0.4	-0.6	-1.0
2016	-0.2	-0.4	-0.6
2017	0.1	-0.2	-0.1
2018	0.3	0.0	0.3
2019	0.3	0.3	0.6
2020	0.4	0.2	0.6
Average	***5.0***	***1.9***	***6.8***

Source: RESI

Figure 332: Public Health Initiatives Related to Climate Changes—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$2,042,627	$764,990	$2,807,617
2011	$2,064,830	$773,305	$2,838,135
2012	$44,405	$16,630	$61,035
2013	-$44,405	-$16,630	-$61,035
2014	-$22,202	-$8,315	-$30,518
2015	-$88,810	-$33,260	-$122,070
2016	-$88,810	-$33,260	-$122,070
2017	-$44,405	-$16,630	-$61,035
2018	-$44,405	-$16,630	-$61,035
2019	$44,405	$16,630	$61,035
2020	$0	$0	$0
Average	***$351,203***	***$131,530***	***$482,733***

Source: RESI

Figure 333: Public Health Initiatives Related to Climate Changes—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$932,504	$349,235	$1,281,738
2011	$999,111	$374,180	$1,373,291
2012	$66,607	$24,945	$91,553
2013	$55,506	$20,788	$76,294
2014	-$11,101	-$4,158	-$15,259
2015	-$11,101	-$4,158	-$15,259
2016	-$44,405	-$16,630	-$61,035
2017	-$11,101	-$4,158	-$15,259
2018	-$22,202	-$8,315	-$30,518
2019	-$22,202	-$8,315	-$30,518
2020	$0	$0	$0
Average	***$175,601***	***$65,765***	***$241,366***

Source: RESI

Figure 334: Public Health Initiatives Related to Climate Changes—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-5.0	-4.3	-9.3
2011	25.6	23.9	49.5
2012	25.9	24.4	50.3
2013	25.6	24.1	49.8
2014	25.1	23.4	48.5
2015	23.9	22.1	46.0
2016	23.0	21.4	44.4
2017	22.7	20.9	43.6
2018	22.1	20.4	42.5
2019	21.3	20.0	41.3
2020	20.8	19.2	40.0
Average	***21.0***	***19.6***	***40.6***

Source: RESI

Figure 335: Public Health Initiatives Related to Climate Changes—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$505,055	-$471,508	-$976,563
2011	$1,167,940	$1,090,361	$2,258,301
2012	$1,215,288	$1,134,565	$2,349,854
2013	$1,199,506	$1,119,830	$2,319,336
2014	$1,183,723	$1,105,096	$2,288,818
2015	$1,104,808	$1,031,423	$2,136,230
2016	$1,073,242	$1,001,954	$2,075,195
2017	$1,041,676	$972,484	$2,014,160
2018	$1,010,110	$943,015	$1,953,125
2019	$1,041,676	$972,484	$2,014,160
2020	$978,544	$913,546	$1,892,090
Average	***$955,587***	***$892,114***	***$1,847,701***

Source: RESI

Figure 336: Public Health Initiatives Related to Climate Changes—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	-$149,938	-$139,979	-$289,917
2011	$449,815	$419,936	$869,751
2012	$528,729	$493,609	$1,022,339
2013	$552,404	$515,711	$1,068,115
2014	$568,187	$530,446	$1,098,633
2015	$583,970	$545,181	$1,129,150
2016	$591,861	$552,548	$1,144,409
2017	$607,644	$567,283	$1,174,927
2018	$615,536	$574,650	$1,190,186
2019	$615,536	$574,650	$1,190,186
2020	$615,536	$574,650	$1,190,186
Average	***$507,207***	***$473,517***	***$980,724***

Source: RESI

Figure 337: Title V Permits for GHG Sources—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	1.0	0.4	1.5
2013	0.8	0.4	1.3
2014	0.8	0.2	1.0
2015	0.8	0.3	1.0
2016	1.0	0.5	1.5
2017	0.8	0.2	1.0
2018	1.0	0.5	1.5
2019	0.5	0.1	0.6
2020	0.5	0.0	0.5
Average	***0.7***	***0.2***	***0.9***

Source: RESI

Figure 338: Title V Permits for GHG Sources—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$88,984	$33,086	$122,070
2013	$66,738	$24,815	$91,553
2014	$88,984	$33,086	$122,070
2015	$44,492	$16,543	$61,035
2016	$88,984	$33,086	$122,070
2017	$88,984	$33,086	$122,070
2018	$44,492	$16,543	$61,035
2019	$88,984	$33,086	$122,070
2020	$44,492	$16,543	$61,035
Average	***$58,649***	***$21,807***	***$80,455***

Source: RESI

Figure 339: Title V Permits for GHG Sources—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$44,492	$16,543	$61,035
2013	$33,369	$12,407	$45,776
2014	$33,369	$12,407	$45,776
2015	$33,369	$12,407	$45,776
2016	$55,615	$20,679	$76,294
2017	$44,492	$16,543	$61,035
2018	$44,492	$16,543	$61,035
2019	$44,492	$16,543	$61,035
2020	$33,369	$12,407	$45,776
Average	***$33,369***	***$12,407***	***$45,776***

Source: RESI

Figure 340: Title V Permits for GHG Sources—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	6.2	2.0	8.2
2012	5.5	1.6	7.1
2013	4.9	1.3	6.2
2014	4.7	0.7	5.4
2015	3.6	-0.2	3.4
2016	3.4	-0.2	3.2
2017	3.3	-0.3	3.0
2018	3.2	-0.3	2.9
2019	2.7	-0.5	2.1
2020	2.7	-0.7	2.0
Average	***3.7***	***0.3***	***4.0***

Source: RESI

Figure 341: Title V Permits for GHG Sources—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$507,891	$41,425	$549,316
2012	$423,243	$34,521	$457,764
2013	$310,378	$25,315	$335,693
2014	$310,378	$25,315	$335,693
2015	$112,865	$9,206	$122,070
2016	$112,865	$9,206	$122,070
2017	$112,865	$9,206	$122,070
2018	$112,865	$9,206	$122,070
2019	$112,865	$9,206	$122,070
2020	$56,432	$4,603	$61,035
Average	***$197,513***	***$16,110***	***$213,623***

Source: RESI

Figure 342: Title V Permits for GHG Sources—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$268,054	$21,863	$289,917
2012	$282,162	$23,014	$305,176
2013	$282,162	$23,014	$305,176
2014	$268,054	$21,863	$289,917
2015	$239,838	$19,562	$259,399
2016	$225,729	$18,411	$244,141
2017	$253,946	$20,713	$274,658
2018	$253,946	$20,713	$274,658
2019	$211,621	$17,260	$228,882
2020	$239,838	$19,562	$259,399
Average	***$229,577***	***$18,725***	***$248,302***

Source: RESI

Figure 343: Outreach and Public Education—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.0	0.0	0.0
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	0.0	0.0
2017	0.0	0.0	0.0
2018	0.0	0.0	0.0
2019	0.0	0.0	0.0
2020	0.0	0.0	0.0
Average	***0.0***	***0.0***	***0.0***

Source: RESI

Figure 344: Outreach and Public Education—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 345: Outreach and Public Education—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$0	$0	$0
2020	$0	$0	$0
Average	***$0***	***$0***	***$0***

Source: RESI

Figure 346: Outreach and Public Education—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	0.1	0.0	0.1
2013	0.0	0.0	0.0
2014	0.0	0.0	0.0
2015	0.0	0.0	0.0
2016	0.0	-0.1	-0.1
2017	0.3	0.1	0.4
2018	0.3	0.1	0.4
2019	0.0	0.2	0.3
2020	0.1	0.0	0.1
Average	***0.1***	***0.0***	***0.1***

Source: RESI

Figure 347: Outreach and Public Education—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$23,703	$6,815	$30,518
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$47,406	$13,629	$61,035
2020	$47,406	$13,629	$61,035
Average	***$10,774***	***$3,098***	***$13,872***

Source: RESI

Figure 348: Outreach and Public Education—Operation Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$0	$0	$0
2013	$0	$0	$0
2014	$0	$0	$0
2015	$0	$0	$0
2016	$0	$0	$0
2017	$11,851	$3,407	$15,259
2018	$0	$0	$0
2019	$23,703	$6,815	$30,518
2020	$11,851	$3,407	$15,259
Average	***$4,310***	***$1,239***	***$5,549***

Source: RESI

Figure 349: Prevention of Significant Deterioration Program—Investment Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	1.0	0.4	1.5
2013	0.8	0.4	1.3
2014	0.8	0.2	1.0
2015	0.8	0.3	1.0
2016	1.0	0.5	1.5
2017	0.8	0.2	1.0
2018	1.0	0.5	1.5
2019	0.5	0.1	0.6
2020	0.5	0.0	0.5
Average	***0.7***	***0.2***	***0.9***

Source: RESI

Figure 350: Prevention of Significant Deterioration Program—Investment Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$88,984	$33,086	$122,070
2013	$66,738	$24,815	$91,553
2014	$88,984	$33,086	$122,070
2015	$44,492	$16,543	$61,035
2016	$88,984	$33,086	$122,070
2017	$88,984	$33,086	$122,070
2018	$44,492	$16,543	$61,035
2019	$88,984	$33,086	$122,070
2020	$44,492	$16,543	$61,035
Average	***$58,649***	***$21,807***	***$80,455***

Source: RESI

Figure 351: Prevention of Significant Deterioration Program—Investment Phase, Wage Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$44,492	$16,543	$61,035
2013	$33,369	$12,407	$45,776
2014	$33,369	$12,407	$45,776
2015	$33,369	$12,407	$45,776
2016	$55,615	$20,679	$76,294
2017	$44,492	$16,543	$61,035
2018	$44,492	$16,543	$61,035
2019	$44,492	$16,543	$61,035
2020	$33,369	$12,407	$45,776
Average	***$33,369***	***$12,407***	***$45,776***

Source: RESI

Figure 352: Prevention of Significant Deterioration Program—Operation Phase, Employment Impacts

Fiscal Year	Direct	Spinoff	Total
2010	0.0	0.0	0.0
2011	0.0	0.0	0.0
2012	2.0	0.7	2.7
2013	1.7	0.7	2.4
2014	1.7	0.4	2.1
2015	0.9	-0.3	0.6
2016	0.8	-0.4	0.5
2017	0.9	-0.5	0.4
2018	0.8	-0.3	0.5
2019	0.5	-0.5	0.0
2020	0.5	-0.6	-0.1
Average	***0.9***	***-0.1***	***0.8***

Source: RESI

Figure 353: Prevention of Significant Deterioration Program—Operation Phase, Output Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$196,503	-$13,398	$183,105
2013	$163,753	-$11,165	$152,588
2014	$163,753	-$11,165	$152,588
2015	$0	$0	$0
2016	$0	$0	$0
2017	$0	$0	$0
2018	$0	$0	$0
2019	$65,501	-$4,466	$61,035
2020	$0	$0	$0
Average	***$53,592***	***-$3,654***	***$49,938***

Source: RESI

Figure 354: Prevention of Significant Deterioration Program—Operation Phase, Wages Impacts

Fiscal Year	Direct	Spinoff	Total
2010	$0	$0	$0
2011	$0	$0	$0
2012	$114,627	-$7,815	$106,812
2013	$114,627	-$7,815	$106,812
2014	$81,876	-$5,582	$76,294
2015	$81,876	-$5,582	$76,294
2016	$81,876	-$5,582	$76,294
2017	$65,501	-$4,466	$61,035
2018	$81,876	-$5,582	$76,294
2019	$81,876	-$5,582	$76,294
2020	$65,501	-$4,466	$61,035
Average	***$69,967***	***-$4,770***	***$65,197***

Source: RESI

Appendix B—Methodology

B.1 General Overview

Several Maryland state agencies have several strategies and subprograms in place to aid The State in meeting its greenhouse gas emissions reduction goals. In some cases, state government agencies associated with these subject areas are developing enhancements to their strategies and subprograms to bridge the gap between achieved emissions reductions and emissions reduction targets.

Greenhouse gas emission reductions are calculated for each strategy/subprogram, but data is supplied by each state agency that is responsible the given strategy. As such, RESI, in coordination with MDE, developed a methodology to analyze the reported data. MDE assisted in the development and finalization of all assumptions used in the economic modeling for the task order. Through this coordinated effort, RESI and MDE determined two phases to be modeled for each strategy and subprogram: an investment phase and an operation phase.

Investment Phase

The investment phase refers to the entire period during which a strategy and its subprograms are being developed, invested in, and enacted. In other words, it is the period during which the implementing entity or entities, whether it be state government agency or agencies, a business entity or entities required to comply, and/or some other individual or group(s), will invest funds and effort into the appropriate sector(s) of the economy to achieve the requirements outlined for the strategy and subprograms.

In all cases, the investment values were discussed with state agencies and data was provided that could best describe that period of time. Some strategies are categorized as “funded,” “awaiting funding,” or “potentially funded.” Those that are funded are currently being implemented and data could be established for those policies from previous years. Strategies listed as “awaiting funding” have approved funding but may have not started their investment phases yet. Yearly totals of investment are then calculated based on the data provided by agencies. Unless other data on spending and implementation of the plans was provided, the total amount of funding was split across the years the agency expects it will take for the policy to go from start to finish for investment. Some agencies provided specific data on what level of investment would take place in each year. Certain programs required a larger initial investment that decreases in future years. Finally, strategies listed as “potential funding” are those that if they had the adequate funding this is how they may effect Maryland’s economy. The programs that are listed at “potential funding” are not evaluated in this report.

In addition, it should be noted that “investment” is not necessarily modeled as a positive inflow of capital for all industry sectors identified in Section B.3. In some cases, “investment” is the outflow of capital for those industries for which strategy compliance is mandated. This causes an inflow of capital for all industry sectors experiencing a positive change due to other industries’ mandated compliance. In some cases, investment originates in the private sector. This may lead to increases or decreases in employment, output, or wages during the investment

phase. Interactions among agencies and their ability to impact Maryland's economy will determine the level of change to these economic indicators.
In other words, some industry sectors are more responsive to variations in the economy, which determines the degree to which employment, output, and wages are impacted. If a more sensitive sector experiences a negative change (or an outflow of capital), the associated negative impacts outweigh the positive change experienced by a less sensitive, benefitting sector (one experiencing an inflow of capital).

Operation Phase
The operation phase refers to the period during which a strategy and its subprograms have already been implemented and the "end user" cost savings (or other monetary benefits) are being realized. In other words, it is the period during which the goals of the strategy and subprograms have been achieved and individuals and/or business entities are realizing cost savings, increased income, etc.

In most cases, this phase is modeled based on the level of savings, increased earnings, or some other measure as calculated from data included in the strategy write-ups supplied by MDE, the implementing agencies, and external research. Therefore, the economic impacts represented are the total actual annual economic impacts unless otherwise specified.

An example of the steps undertaken by RESI and their results for one strategy with all of its subprograms for both phases can be found in Section B.2.

Exclusions and Limitations
Due to lack of data provided by certain agencies, some strategies have been modeled using all external data and assumptions. While impacts resulting from such inputs will not be as accurate as they could be, they will serve as a general frame of reference for potential impacts. Overall, many agencies were very helpful in providing accurate cost/funding data for both the investment and operation phases. For more detailed information regarding the steps undertaken and sources used to model specific strategies, please refer to Appendix C.

B.2 REMI PI+ Model

Overview
To achieve the most concise analysis of program interaction and other factors, RESI will use the Regional Economic Models, Inc. (REMI) PI+ model to analyze data for the 2012 report. The REMI model is a dynamic modeling tool used by various government agencies and state departments in economic policy analysis. REMI will help RESI to build from its base model in the previous report to create a sophisticated model that is calibrated to the specific demographic features of Maryland.

The REMI model features the ability to capture price effects, wage changes, and behavioral effects through time. The model will also allow RESI to capture the effects occurring between industries and minimize the potential for double counting in employment, output, and wages. The ability to capture effects across time will give MDE a detailed representation of the GGRA programs and their effects on Maryland in the longer term.

The model details the impacts based on two categories: direct and spinoff effects. The spinoff effects are defined as intermediate effects plus induced effects.
REMI defines the intermediate effects as the purchase of intermediate goods associated with production. For example, a company may be hired to manufacture blue recycling bins that will be used in office buildings associated with the *Recycling and Source Reduction* policy. The purchase of the bins would be considered a direct effect, but the purchase of the materials to produce the bins is considered an intermediate effect.

REMI defines the induced effects as the economic effects that occur from the spending of wages. For example, an employee hired under the *Voluntary Stationary Source Reductions* policy earns a wage, and with this new wage may go out to dinner once a week. The spending of the employee's wage on dinner is considered an induced effect.

Using the REMI model, RESI will create a dynamic impact analysis detailing the levels of employment, output, and wages associated with each policy for each year from 2008 to 2025.

Reading the Results

REMI uses a regional control based on historical Bureau of Economic Analysis data to forecast values for employment, wages, and output. When economic values are decreased or increased based on parameters from the user in the regional simulation, the forecast is then altered to reflect the changes made by the user.

REMI reports cumulative and non-cumulative results based on the different economic factors being reviewed. In REMI, the results that would be reported as non-cumulative would be population and employment. All other results are viewed as cumulative.

For example, for a policy that increases government spending in 2010 and 2011, the results report an increase of 100 jobs in 2010 and 120 jobs in 2011. These new jobs are the difference from the baseline for that year, not the subsequent year. Therefore, the 100 jobs in 2010 are 100 new jobs for 2010, and the 120 jobs in 2011 are 120 new jobs in 2011. The difference, 20 jobs, would be the estimated increase between the years in the simulation. The 100 jobs would be considered retained employment.

Wages and output are cumulative and build from one year to the next in the REMI model. If the previously mentioned policy notes that the wages in 2010 were $250,000 and then grew to $500,000 in 2011, this would be an increase of $500,000 from the previous year. The model has taken into account the change in the wages from the previous year, and the new number reported would be the increase on an annual basis. When reading this result you would say, "Wages in 2011 increased by $500,000."

Figure 355: Sampling of REMI PI+ Users

Academic Institutions	**State Government**
Arizona State University	Connecticut Department of Economic and Community Development
Ball State University	District of Columbia
Costal Rivers Water Planning and Policy Center	Empire State Development Corporation
Florida State University	Florida Agency for Workforce Innovation
Georgia State University	Florida Legislature
Massachusetts Institute of Technology	Hawaii Department of Business, Economic Development & Tourism
Michigan Small Business & Technology Development Center	Illinois Department of Commerce and Economic Opprotunity
Michigan Technological University	Illinois Department of Revenue
Pennsylvania State University	Indiana Department of Transportation
Southwestern Oklahoma State University	Iowa Department of Revenue
University of Southren Maine	
University New Hampshire	**Private Consulting Firms**
University of Arkansas at Little Rock	Alliance Transportation Group
University of California, Davis	Bechtel SAIC Company, LLC.
University of Connecticut	Cambridge Systematics, Inc.
University of Nevada, Las Vegas	CSA Planning
University of Pittsburgh	Economic & Policy Resources
University of South Dakota	Economic Development Research Group
University of Westren Florida	Economic Research Associates
University South Florida	ERG
York College of Pennsylvania	Ernst & Young
	HR&A Advisors, Inc.
Federal Government	ICF International
U.S. Army Corps of Engineers	Kavet, Rockler & Associates, Inc.
U.S. Environmental Protection Agency	NERA Economic Consulting
	Northern Economics
State Government	REMI-Northwest
Arizona Department of Commerce	RKG Associates, Inc.
Arizona Department of Planning	Stratus Consulting
Arizona Joint Legislative Budget Committee	Wilbur Smith Assoicates

Source: REMI

B.3 REMI PI+ Industry Sectors

RESI determined the industry sectors which would be affected by strategy implementation for both the investment phase and the operation phase for each strategy and subprogram. A complete list of these sectors can be found in Figures 356 and 357.

Figure 356: REMI PI+ Industry Codes—Investment Phase

Strategy	Subprogram	Code	Description
Energy			
3.1.1	Regional Greenhouse Gas Initiative	63	State Government Spending
3.1.2	Greenhouse Gas Reductions from Imported Power	-	*No Investment Costs Specified*
3.1.3	Greenhouse Gas New Source Performance Standard	63	State Government Spending
3.1.4	Maximum Achievable Control Technology (MACT)	63	State Government Spending
3.1.5	EmPOWER Maryland Empowering Finance Initiative	98 63	Investment Spending (Residential) State Government Spending
	EmPOWER Maryland Residential Incentives	98	Investment Spending (Residential)
	MEA Home Performance Rebate Program	63 98	State Government Spending Investment Spending (Residential)
	DHCD Weatherization	98	Investment Spending (Residential)
	Clean Energy Communities Grant	63 98	State Government Spending Investment Spending (Residential)
	Maryland Home Energy Loan Subprogram	98	Investment Spending (Residential)
	Energy Workforce Training	98	Investment Spending (Residential)
	State Energy Efficiency Appliance Rebate Program	98 63	Investment Spending (Residential) State Government Spending
3.1.6	Maryland Save Energy Now	63	State Government Spending
	Jane E. Lawton Conservation Loan Program	63	State Government Spending
	Energy Efficiency and Conservation Block Grant Program	63	State GovernmentSpending
	State Agencies Loan Program	63	State Government Spending
3.1.7	Energy Efficiency Appliances and Other Products	45	Residential Capital
3.1.8	Energy Efficiency in the Power Sector – General	X7809	Production costs, Electrical power distribution, transmission, and generation
3.1.9	Maryland Renewable Energy Portfolio Standard	EQP 13	Producer's Durable Equipment Investment, Electric distribution, transmission, and generation
3.1.10	Commercial Clean Energy Grant Program	63	State Government Spending
	Residential Clean Energy Grants Program	63	State Government Spending
	Clean Energy Incentive Tax Credit Program	63	State Government Spending
	Generating Clean Horizons Program	63	State Government Spending
	Project Sunburst	63	State Government Spending
	Biomass Programs	63	State Government Spending

Strategy	Subprogram	Code	Description
	Land-based Wind Programs	63	State Government Spending
3.1.11	Offshore Wind Initiatives to Support Renewable Energy	X7809	Production costs, Electrical power distribution, transmission, and generation
Transportation			
3.2.1	Maryland Clean Cars Program	63	State Government Spending
		601	Consumer Spending, autos
3.2.2	National Fuel Efficiency and Emissions Standards for Medium- and Heavy-Duty Trucks	X6653	Intermediate Demand, Motor vehicle parts manufacturing
		X7653	Value added (with no effect on sales or employment), Motor vehicle parts manufacturing
		X7851	Production costs, Motor vehicle manufacturing
3.2.3	Clean Fuel Standard	X6653	Intermediate Demand, Motor vehicle parts manufacturing
		X7653	Value added (with no effect on sales or employment), Motor vehicle parts manufacturing
		X7851	Production costs, Motor vehicle manufacturing
3.2.4	Transportation and Climate Initiative	63	State Government Spending
3.2.5	Charm City Circulator and Hampden Neighborhood Shuttle	-	*No Investment Spending Specified*
	Locally Operated Transit Systems	63	State Government Spending
		68	Government Spending including Non-Pecuniary (Amenity) Aspects
	Smart Card Implementation	68	Government Spending including Non-Pecuniary (Amenity) Aspects
	Transit-Oriented Development	-	*No Investment Spending Specified*
	Maryland Commuter Tax Credit	-	*No Investment Spending Specified*
	Guaranteed Ride Home	-	*No Investment Spending Specified*
	College Pass	68	Government Spending including Non-Pecuniary (Amenity) Aspects
	Ride Share	-	*No Investment Spending Specified*
	Commuter Connections – Washington, D.C. Region	-	*No Investment Spending Specified*
	Baltimore Collegetown Network	-	*No Investment Spending Specified*
	Hunt Valley Shuttle	-	*No Investment Specified*
	Kent Street Transit Plaza	-	*No Investment Specified*
	University of Maryland College Park Carpool Program and Shuttle Bus Service	-	*No Investment Specified*
	PlanMaryland	-	*No Investment Specified*
3.2.6	MARC East Baltimore Station	68	Government Spending including Non-Pecuniary (Amenity) Aspects
	Expanded Transit (Purple Line, Corridor Cities Transitway, Red Line)	68	Government Spending including Non-Pecuniary (Amenity) Aspects

Strategy	Subprogram	Code	Description
	MARC Growth and Investment Plan	68	Government Spending including Non-Pecuniary (Amenity) Aspects
3.2.7	MARC Station Parking Enhancements	63	State Government Spending
		68	Government Spending including Non-Pecuniary (Amenity) Aspects
	Refurbishing MARC and Other Rail Vehicles	68	Government Spending including Non-Pecuniary (Amenity) Aspects
	Update on Maryland High Speed Rail	68	Government Spending including Non-Pecuniary (Amenity) Aspects
3.2.8	Bicycle/Pedestrian Enhancements	68	Government Spending including Non-Pecuniary (Amenity) Aspects
	Bike Racks on Buses, MARC, Subway, Light Rail	-	*No Investment Specified*
	Construction of Bike Lanes and Bike Paths	-	*No Investment Specified*
	East Coast Greenway	-	*No Investment Specified*
	Bike Stations	-	*No Investment Specified*
	Bike Rentals	-	*No Investment Specified*
	Bike Racks	-	*No Investment Specified*
3.2.9	Electronic Toll Collection	-	*No Investment Specified*
	High Occupancy Toll Lanes	68	Government Spending including Non-Pecuniary (Amenity) Aspects
	VMT Fees	-	*No Investment Specified*
	Congestion Pricing and Managed Lanes	-	*No Investment Specified*
	Parking Impact Fees	-	*No Investment Specified*
	Employer Commute Incentives	-	*No Investment Specified*
3.2.10	Traffic Flow Improvements	68	Government Spending including Non-Pecuniary (Amenity) Aspects
	Truck Stop Electrification	-	*No Investment Specified*
	Timing of Highway Construction Schedules	-	*No Investment Specified*
	Electronic Toll Collection	-	*No Investment Specified*
	Traffic Signal Synchronization	-	*No Investment Specified*
	Variable Message Signs	63	State Government Spending
	Telework Partnership With Employers	-	*No Investment Specified*
	Smart Card Implementation	-	*No Investment Specified*
	Light-Emitting Diode Traffic Signals	63	State Government Spending
	Vehicle Technologies	-	*No Investment Specified*
	Transportation Fuels	-	*No Investment Specified*
	Other Areas	-	*No Investment Specified*
3.2.11	Vehicle-to-Grid (V2G)	-	*No Investment Specified*
	Electric Vehicles	-	*No Investment Specified*
	Maryland Electric Vehicles Initiative	68	Government Spending including Non-Pecuniary (Amenity) Aspects
	Maryland Transit Administration Support for Howard County Electric Bus Project	-	*No Investment Specified*
	Clean and Efficient Strategies	-	*No Investment Specified*

Strategy	Subprogram	Code	Description
	Baltimore City Electric Vehicles Infrastructure	68	Government Spending including Non-Pecuniary (Amenity) Aspects
3.2.12	Howard Transit Paratransit Fleet Replacement Vehicles	63	State Government Spending
	Clean and Efficient Strategies	-	*No Investment Specified*
3.2.13	*Evaluating GHG Emissions Impacts of Major Projects*	*OMITTED*	*OMITTED*
3.2.14	Compressed Natural Gas Buses	-	*No Investment Specified*
	Air Emissions Reductions	-	*No Investment Specified*
	BWI Energy Audit	-	*No Investment Specified*
	BWI Utility Master Plan	-	*No Investment Specified*
	BWI Energy Efficiency	-	*No Investment Specified*
	Enhanced Access to BWI by Other Travel Modes	-	*No Investment Specified*
	BWI's Periodic Air Quality Assessments	-	*No Investment Specified*
3.2.15	Port of Baltimore Initiatives	63	State Government Spending
3.2.16	Auxiliary Power Units for Existing Locomotives	-	*No Investment Specified*
	Technology Advances for Non-highway Vehicles	-	*No Investment Specified*
3.2.17	Renewable Fuels Standard	-	*No Investment Specified*
3.2.18	Café Standards: Model Years 2008-2011	-	*No Investment Specified*
3.2.19	Promoting Hybrid and Electric Vehicles	63	State Government Spending
3.2.20	Pay-As-You-Drive Insurance	-	*No Investment Specified*
Agriculture			
3.3.1	Managing Forests to Capture Carbon	X6403	Exogenous Final Demand (Support activities for agriculture and forestry)
3.3.2	Wetland Markets	X6532	Exogenous Final Demand (Other professional, scientific, and technical services
	Stream and Waterway Markets	X6532	Exogenous Final Demand (Other professional, scientific, and technical services
	Forest Markets	X6532	Exogenous Final Demand (Other professional, scientific, and technical services
	Critical Area Markets	X6532	Exogenous Final Demand (Other professional, scientific, and technical services
	Species and Habitat Markets	X6532	Exogenous Final Demand (Other professional, scientific, and technical services
	Nutrient Markets	X6532	Exogenous Final Demand (Other professional, scientific, and technical services
	Carbon Markets: RGGI and Maryland CO2	X6532	Exogenous Final Demand (Other professional, scientific, and

Strategy	Subprogram	Code	Description
	Budget Trading Program Offsets		technical services
	Carbon Markets: GGRA of 2009 - Offsets and Early Reductions	X6532	Exogenous Final Demand (Other professional, scientific, and technical services
	Carbon Markets: GGRA of 2009 - Nutrient Trading with Carbon Co-benefits	X6532	Exogenous Final Demand (Other professional, scientific, and technical services
	Biomass Markets	X6532	Exogenous Final Demand (Other professional, scientific, and technical services
3.3.3	Increasing Urban Trees to Capture Carbon	X6412	Exogenous Final Demand (Construction)
		X6526	Exogenous Final Demand (Architecural, engineering, and related services)
		X3203	Exogenous Final Demand (Support activities for agriculture)
3.3.4	Creating and Protecting Wetlands and Waterway Borders to Capture Carbon	63	State Government Spending
3.3.5	Geological Opportunities to Store Carbon	X6530	Exogenous Final Demand (Scientific and professional services)
3.3.6	Planting Forests in Maryland	X3203	Industry Sales, Support activities for agriculture
3.3.7	Expanded Use of Forests and Feedstocks for Energy Production	63	State Government Spending
3.3.8	Conservation of Agricultural Land for GHG Benefits	63	State Government Spending
3.3.9	Buy Local for GHG Benefits	63	State Government Spending
3.3.10	Nutrient Trading for GHG Benefits	63	State Government Spending
Recycling			
3.4.1	Recycling and Source Reduction	-	*No Investment Specified*
Buildings			
3.5.1	Green Buildings	47	Non-residential Capital Investment
3.5.2	Building and Trade Codes in Maryland	63	State Government Spending
3.5.3	BeSMART	63	State Government Spending
3.5.4	Energy Efficiency for Affordable Housing	63	State Government Spending
Land Use			
3.6.1	Maryland Sustainable Growth Commission	-	*No Investment Costs Specified*
	PlanMaryland	-	*No Investment Costs Specified*
3.6.2	Transportation GHG Targets for Local Governments and Metropolitan Planning Organizations	-	*No Investment Costs Specified*
3.6.3	Funding Mechanisms for Smart Growth	63	State Government Spending
3.6.4	GHG Benefits from Priority Funding Areas and	63	State Government Spending

Strategy	Subprogram	Code	Description
	Other Growth Boundaries		
Innovative Initiatives			
3.7.1	Leadership-by-Example - Local Government	63	State Government Spending
3.7.2	Leadership-by-Example - Federal Government	94	Federal Government Spending
3.7.3	Leadership-by-Example – Maryland Colleges and Universities	63	State Government Spending
3.7.4	Greenhouse Gas Early Voluntary Reductions	63	State Government Spending
3.7.5	High Performance Buildings	99 68	Investment Spending, Non-residential Government Spending including Non-Pecuniary (Amenity) Aspects
	Green Maryland Act of 2010	-	*No Investment Costs Specified*
3.7.6	Maryland Environmental Footprint	-	*No Investment Costs Specified*
3.7.7	Job Creation and Economic Development Initiatives	-	*No Investment Costs Specified*
3.7.8	Public Health Initiatives Related to Climate Change	68	Government Spending including Non-Pecuniary (Amenity) Aspects
3.7.9	Title V Permits for GHG Sources	63	State Government Spending
3.7.10	Outreach and Public Education	63	State GovernmentSpending
3.7.11	GHG Prevention of Significant Deterioration Permitting Program	63	State Government Spending
Not Quantified			
3.8.1	*Greenhouse Gas Emissions Inventory Development*	*OMITTED*	*OMITTED*
3.8.2	*Program Analysis, Goals, and Overall Implementation*	*OMITTED*	*OMITTED*

Source: REMI PI+

Figure 357: REMI PI+ Industry Codes—Operation Phase

Strategy	Subprogram	Code	Description
Energy			
3.1.1	Regional Greenhouse Gas Initiative	X7809	Production costs, Electric power distribution, generation and transmission
3.1.2	Greenhouse Gas Reductions from Imported Power	X7809	Production costs, Electric power distribution, generation and transmission
3.1.3	Greenhouse Gas New Source Performance Standard	X7809	Production costs, Electric power distribution, generation and transmission
3.1.4	Maximum Achievable Control Technology (MACT)	X7809	Production costs, Electric power distribution, generation and transmission
3.1.5	EmPOWER Maryland Empowering Finance Initiative	640 78	Consumer spending (electricity) Consumption reallocation
	EmPOWER Maryland Residential Incentives	640 78	Consumer spending (electricity) Consumption reallocation
	MEA Home Performance Rebate Program	640 78	Consumer spending (electricity) Consumption reallocation
	DHCD Weatherization	640 78	Consumer spending (electricity) Consumption reallocation
	Clean Energy Communities Grant	640 78	Consumer spending (electricity) Consumption reallocation
	Maryland Home Energy Loan Program	640 78	Consumer spending (electricity) Consumption reallocation
	Energy Workforce Training	78	Consumption reallocation
	State Energy Efficiency Appliance Rebate Program	640 78	Consumer spending (electricity) Consumption reallocation
3.1.6	Maryland Save Energy Now	80	Electricity (Industrial Sector) Fuel Costs, All Industrial Sectors
		82	Electricity (Commercial Sector) Fuel Costs, All Commercial Sectors
	Jane E. Lawton Conservation Loan Program	80	Electricity (Industrial Sector) Fuel Costs, All Industrial Sectors
		82	Electricity (Commercial Sector) Fuel Costs, All Commercial Sectors
	Energy Efficiency and Conservation Block Grant Program	80	Electricity (Industrial Sector) Fuel Costs, All Industrial Sectors
		82	Electricity (Commercial Sector) Fuel Costs, All

Strategy	Subprogram	Code	Description
			Commercial Sectors
	State Agencies Loan Program	80 82	Electricity (Industrial Sector) Fuel Costs, All Industrial Sectors Electricity (Commercial Sector) Fuel Costs, All Commercial Sectors
3.1.7	Energy Efficiency Appliances and Other Products	640 78	Consumer spending (electricity) Consumption reallocation
3.1.8	Energy Efficiency in the Power Sector – General	X7809	Production costs, Electric power distribution, generation and transmission
3.1.9	Maryland Renewable Energy Portfolio Standard	EQP 13	Producer's Durable Equipment Investment, Electric distribution, transmission, and generation
3.1.10	Commercial Clean Energy Grant Program	82	Electricity (Commercial Sector) Fuel Costs, All Commercial Sectors
	Residential Clean Energy Grants Program	640 78	Consumer spending (electricity) Consumption reallocation
	Clean Energy Incentive Tax Credit Program	-	*No additional costs/benefits associated with program*
	Generating Clean Horizons Program	640 78	Consumer spending (electricity) Consumption reallocation
	Project Sunburst	640 78	Consumer spending (electricity) Consumption reallocation
	Biomass Programs	640 78	Consumer spending (electricity) Consumption reallocation
	Land-based Wind Programs	640 78	Consumer spending (electricity) Consumption reallocation
3.1.11	Offshore Wind Initiatives to Support Renewable Energy	X7809	Production costs, Electric power distribution, generation and transmission
3.1.12	BeSMART	82 640 78	Electricity (Commercial Sector) Fuel Costs, All Commercial Sectors Consumer spending (electricity) Consumption reallocation
3.1.13	Energy Efficiency for Affordable Housing	640 642 78	Consumer spending (electricity) Consumer spending (fuel and oil) Consumption reallocation
Transportation			
3.2.1	Maryland Clean Cars Program	623 78	Consumer spending (gas) Consumption reallocation
3.2.2	National Fuel Efficiency and Emissions Standards for Medium-	623	Consumer spending (gas)

Strategy	Subprogram	Code	Description
	and Heavy-Duty Trucks	78	Consumption reallocation
3.2.3	Clean Fuel Standard	623	Consumer spending (gas)
		78	Consumption reallocation
3.2.4	Transportation and Climate Initiative	-	*No additional benefits or costs have been associated with this program*
3.2.5	Charm City Circulator and Hampden Neighborhood Shuttle	623	Consumer spending (gas)
		78	Consumption reallocation
		651	Consumer spending (intercity bus)
		603	Consumer spending (other motor vehicles)
		648	Consumer spending (Auto insurance, less claims paid)
	Locally Operated Transit Systems	623	Consumer spending (gas)
		78	Consumption reallocation
		651	Consumer spending (intercity bus)
		603	Consumer spending (other motor vehicles)
		648	Consumer spending (Auto insurance, less claims paid)
	Smart Card Implementation	673	Consumer spending (Bank service charges, trust services, and safe deposit box rentals)
		78	Consumption reallocation
	Transit-Oriented Development	623	Consumer spending (gas)
		78	Consumption reallocation
	Maryland Commuter Tax Credit	63	State Government Spending
	Guaranteed Ride Home	653	Consumer spending (taxicabs)
		78	Consumption reallocation
		68	Government Spending including Non-Pecuniary (Amenity) Aspects
	College Pass	623	Consumer spending (gas)
		78	Consumption reallocation
		651	Consumer spending (intercity bus)
	Ride Share	623	Consumer spending (gas)
		78	Consumption reallocation
		68	Government Spending including Non-Pecuniary (Amenity) Aspects
	Commuter Connections – Washington, D.C. Region	623	Consumer spending (gas)
		78	Consumption reallocation
	Baltimore Collegetown Network	623	Consumer spending (gas)
		78	Consumption reallocation
	Hunt Valley Shuttle	623	Consumer spending (gas)

Strategy	Subprogram	Code	Description
		78	Consumption reallocation
	Kent Street Transit Plaza	623	Consumer spending (gas)
		78	Consumption reallocation
		651	Consumer spending (intercity bus)
		648	Consumer spending (Auto insurance, less claims paid)
	University of Maryland College Park Carpool Program and Shuttle Bus Service	623	Consumer spending (gas)
		78	Consumption reallocation
		651	Consumer spending (intercity bus)
		648	Consumer spending (Auto insurance, less claims paid)
3.2.6	MARC East Baltimore Station	652	Intercity mass transit
		648	Consumer spending (Auto insurance, less claims paid)
		603	Consumer spending (Other motor vehicles)
		78	Consumption reallocation
	Expanded Transit (Purple Line, Corridor Cities Transitway, Red Line)	652	Intercity mass transit
		648	Consumer spending (Auto insurance, less claims paid)
		603	Consumer spending (Other motor vehicles)
		78	Consumption reallocation
	MARC Growth and Investment Plan	652	Intercity mass transit
		648	Consumer spending (Auto insurance, less claims paid)
		603	Consumer spending (Other motor vehicles)
		78	Consumption reallocation
3.2.7	MARC Station Parking Enhancements	652	Intercity mass transit
		623	Consumer spending (gas)
		648	Consumer spending (Auto insurance, less claims paid)
		603	Consumer spending (Other motor vehicles)
	Refurbishing MARC and Other Rail Vehicles	652	Intercity mass transit
		623	Consumer spending (gas)
		648	Consumer spending (Auto insurance, less claims paid)
		603	Consumer spending (Other motor vehicles)
	Update on Maryland High Speed Rail	652	Intercity mass transit
		623	Consumer spending (gas)
		648	Consumer spending (Auto insurance, less claims paid)
		603	Consumer spending (Other motor vehicles)
3.2.8	Bicycle/Pedestrian Enhancements	623	Consumer spending (gas)
		78	Consumption reallocation
	Bike Racks on Buses, MARC, Subway, Light Rail	623	Consumer spending (gas)
		78	Consumption reallocation

Strategy	Subprogram	Code	Description
	Construction of Bike Lanes and Bike Paths	623	Consumer spending (gas)
		78	Consumption reallocation
	East Coast Greenway	623	Consumer spending (gas)
		78	Consumption reallocation
	Bike Stations	623	Consumer spending (gas)
		78	Consumption reallocation
	Bike Rentals	623	Consumer spending (gas)
		78	Consumption reallocation
	Bike Racks	623	Consumer spending (gas)
		78	Consumption reallocation
3.2.9	Electronic Toll Collection	623	Consumer spending (gas)
		78	Consumption reallocation
	High Occupancy Toll Lanes	623	Consumer spending (gas)
		78	Consumption reallocation
	VMT Fees	623	Consumer spending (gas)
		78	Consumption reallocation
	Congestion Pricing and Managed Lanes	623	Consumer spending (gas)
		78	Consumption reallocation
	Parking Impact Fees	623	Consumer spending (gas)
		78	Consumption reallocation
	Employer Commute Incentives	623	Consumer spending (gas)
		78	Consumption reallocation
3.2.10	Traffic Flow Improvements	623	Consumer spending (gas)
		78	Consumption reallocation
	Truck Stop Electrification	623	Consumer spending (gas)
		78	Consumption reallocation
	Timing of Highway Construction Schedules	623	Consumer spending (gas)
		78	Consumption reallocation
	Electronic Toll Collection	623	Consumer spending (gas)
		78	Consumption reallocation
	Traffic Signal Synchronization	623	Consumer spending (gas)
		78	Consumption reallocation
	Variable Message Signs	623	Consumer spending (gas)
		78	Consumption reallocation
	Telework Partnership With Employers	623	Consumer spending (gas)
		78	Consumption reallocation
	Smart Card Implementation	673	Consumer spending (Bank service charges, trust

Strategy	Subprogram	Code	Description
			services, and safe deposit box rentals)
		78	Consumption reallocation
	Light-Emitting Diode Traffic Signals	X6409	Exogenous final demand, Electric power generation, distribution and transmission
		63	State Government Spending
	Vehicle Technologies	648	Consumer spending (Auto insurance, less claims paid)
		78	Consumption reallocation
	Transportation Fuels	623	Consumer spending (gas)
		78	Consumption reallocation
3.2.11	Vehicle-to-Grid (V2G)	X6409	Exogenous final demand, Electric power generation, distribution and transmission
	Electric Vehicles	623	Consumer spending (gas)
		78	Consumption reallocation
	Maryland Electric Vehicles Initiative	623	Consumer spending (gas)
		78	Consumption reallocation
	Maryland Transit Administration Support for Howard County Electric Bus Project	63	State Government Spending
	Clean and Efficient Strategies	623	Consumer spending (gas)
		78	Consumption reallocation
	Baltimore City Electric Vehicles Infrastructure	623	Consumer spending (gas)
		78	Consumption reallocation
3.2.12	Howard Transit Paratransit Fleet Replacement Vehicles	623	Consumer spending (gas)
		78	Consumption reallocation
	Clean and Efficient Strategies	623	Consumer spending (gas)
		78	Consumption reallocation
3.2.13	*Evaluating GHG Emissions Impacts of Major Projects*	*OMITTED*	*OMITTED*
3.2.14	Compressed Natural Gas Buses	63	State Government Spending
	Air Emissions Reductions	63	State Government Spending
	BWI Energy Audit	63	State Government Spending
	BWI Utility Master Plan	63	State Government Spending
	BWI Energy Efficiency	63	State Government Spending
	Enhanced Access to BWI by Other Travel Modes	63	State Government Spending
	BWI's Periodic Air Quality Assessments	63	State Government Spending
3.2.15	Port of Baltimore Initiatives	63	State Government Spending
3.2.16	Auxiliary Power Units for Existing Locomotives	63	State Government Spending
		623	Consumer spending (gas)
		78	Consumption reallocation

Strategy	Subprogram	Code	Description
3.2.17	Renewable Fuels Standard	623 78	Consumer spending (gas) Consumption reallocation
3.2.18	CAFÉ Standards: Model Years 2008-2011	623 78	Consumer spending (gas) Consumption reallocation
3.2.19	Promoting Hybrid and Electric Vehicles	623 78	Consumer spending (gas) Consumption reallocation
3.2.20	Pay-As-You-Drive Insurance	648 78	Consumer spending (auto insurance) Consumption reallocation
Agriculture			
3.3.1	Managing Forests to Capture Carbon	X5401	Forestry; fishing, hunting, trapping, Sales
3.3.2	Wetland Markets	63 X7802 X7801	State Government Spending Production costs, Logging Production costs, Forestry, fishing, hunting, trapping
	Stream and Waterway Markets	63 X7802 X7801	State Government Spending Production costs, Logging Production costs, Forestry, fishing, hunting, trapping
	Forest Markets	63 X7802 X7801	State Government Spending Production costs, Logging Production costs, Forestry, fishing, hunting, trapping
	Critical Area Markets	63 X7802 X7801	State Government Spending Production costs, Logging Production costs, Forestry, fishing, hunting, trapping
	Species and Habitat Markets	63 X7802 X7801	State Government Spending Production costs, Logging Production costs, Forestry, fishing, hunting, trapping
	Nutrient Markets	63 X7802 X7801	State Government Spending Production costs, Logging Production costs, Forestry, fishing, hunting, trapping
	Carbon Markets: RGGI and Maryland CO2 Budget Trading Program Offsets	63 X7802 X7801	State Government Spending Production costs, Logging Production costs, Forestry, fishing, hunting, trapping
	Carbon Markets: GGRA of 2009 - Offsets and Early Reductions	63 X7802 X7801	State Government Spending Production costs, Logging Production costs, Forestry, fishing, hunting, trapping
	Carbon Markets: GGRA of 2009 - Nutrient Trading with Carbon Co-benefits	63 X7802 X7801	State Government Spending Production costs, Logging Production costs, Forestry, fishing, hunting, trapping

Strategy	Subprogram	Code	Description
	Biomass Markets	63 X7802 X7801	State Government Spending Production costs, Logging Production costs, Forestry, fishing, hunting, trapping
3.3.3	Increasing Urban Trees to Capture Carbon	640 78 82	Consumer spending (electricity) Consumption reallocation Electricty (Commerical Sector) Fuel Costs, All Commerical Sectors
3.3.4	Creating and Protecting Wetlands and Waterway Borders to Capture Carbon	TOUR1	Tourism spending
3.3.5	Geological Opportunities to Store Carbon	80 84 88	Electricty (Industrial Sector) Fuel Costs, All Industrial Sectors Natural Gas (Industrial Sector) Fuel Costs, All Industrial Sectors Residual (Industrial Sector) Fuel Costs, All Industrial Sector
3.3.6	Planting Forests in Maryland	640 78	Consumer spending (electricity) Consumption reallocation
3.3.7	Expanded Use of Forests and Feedstocks for Energy Production	X7809	Production costs, Electric power distribution, generation and transmission
3.3.8	Conservation of Agricultural Land for GHG Benefits	104	Farm output (total)
3.3.9	Buy Local for GHG Benefits	104 63	Farm output (total) State Government Spending
3.3.10	Nutrient Trading for GHG Benefits	63 99 106	State Government Spending Investment spending, Non-residential Farm Value Added, with no effect on sales or employment
Recycling			
3.4.1	Recycling and Source Reduction	X7939 63	Production costs, Waste management and remediation services State Government Spending
Buildings			
3.5.1	Green Buildings	X6409 63	Exogenous final demand, Electric power generation, transmission, and distribution State Government Spending
3.5.2	Building and Trade Codes in Maryland	X933	Industry Employment, Management of companies and enterprises

Strategy	Subprogram	Code	Description
Land Use			
3.6.1	Maryland Sustainable Growth Commission	X5412	Industry Sales, Construction
	PlanMaryland	-	*No additional benefits or costs associated with this program*
3.6.2	Transportation GHG Targets for Local Governments and Metropolitan Planning Organizations	641 78	Consumer spending (gas) Consumption reallocation
3.6.3	Funding Mechanisms for Smart Growth	X3612	Firm Employment, Construction
3.6.4	GHG Benefits from Priority Funding Areas and Other Growth Boundaries	X3211	Industry Sales, Water, sewage, and other systems
Innovative Initiatives			
3.7.1	Leadership-by-Example - Local Government	X3209 65	Industry sales, Electrical power generation, transmission, and distribution Local Government Spending
3.7.2	Leadership-by-Example - Federal Government	X6409 94	Exogenous final demand, Electric power generation, distribution, and transmission Federal Government Spending
3.7.3	Leadership-by-Example - Maryland Colleges and Universities	X3209 63	Industry sales, Electrical power generation, transmission, and distribution State Government Spending
3.7.4	Greenhouse Gas Early Voluntary Reductions	X7809	Production costs, Electrical power distribution, transmission, and generation
3.7.5	High Performance Buildings	X10540 X10564	Electrical Fuel Costs (Individual Industry), Elementary and secondary schools; Junior colleges, colleges, universities, and professional schools; Other educational services Electrical Fuel Costs (Individual Industry), Civic, social, professional, and similar organizations
	Green Maryland Act of 2010	-	*No additional costs or benefits associated with this program*
3.7.6	Maryland Environmental Footprint	X6409 68	Exogenous final demand, Electric power generation, distribution, and transmission Government Spending including Non-Pecuniary (Amenity) Aspects
3.7.7	Job Creation and Economic Development Initiatives	X7165	Private households, Compensation
3.7.8	State Climate Change Environmental Health and Protection Advisory Council	662 78	Consumer spending (health insurance) Consumption reallocation

Strategy	Subprogram	Code	Description
3.7.9	Title V Permits for GHG Sources	X7809	Production costs, Electrical power distribution, transmission, and generation
		63	State Government Spending
3.7.10	Outreach and Public Education	63	State Government Spending
3.7.11	GHG Prevention of Significant Deterioration Permitting Program	X7809	Production costs, Electrical power distribution, transmission, and generation
		63	State Government Spending
Not Quantified			
3.8.1	*Greenhouse Gas Emissions Inventory Development*	*OMITTED*	*OMITTED*
3.8.2	*Program Analysis, Goals, and Overall Implementation*	*OMITTED*	*OMITTED*

Source: REMI PI+

B.4 Modeling Example

Overview

For the purpose of providing a transparent and accessible analysis, an example of the steps undertaken by RESI (the modeling assumptions) and their results for one strategy and its subprograms are presented below. First, RESI determined the REMI industry codes which would be affected by the strategy and its subprograms. Next, RESI determined the dollar values to be applied for the investment phase as well as the operation phase. The strategy modeled as an example is "Intercity Transportation Initiatives," under Transportation.

According to the strategy write-up provided by MDE, three subprograms have been designed for this strategy: MARC Station Parking Enhancements, Refurbishing MARC and Other Rail Vehicles, and Update on Maryland High Speed Rail. The subprograms were modeled separately as each involves unique goals.

Assumptions

Investment Phase

1. Determine relevant REMI sectors for each program under the policy.
   a. **MARC Station Parking Enhancements**
      i. 63—State Government Spending
      ii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
   b. **Refurbishing MARC and Other Rail Vehicles**
      i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
   c. **Update on Maryland High Speed Rail**
      i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
2. Determine overall cost of policy implementation for each program under the policy.
   a. **MARC Station Parking Enhancements**
      i. 63—$3,214,166.67 per Year from 2011,2015—2016
      ii. 63—$3,794,500 per Year from 2012—2014
      iii. 68—$3,251,666.67 per Year from 2011—2016
   b. **Refurbishing MARC and Other Rail Vehicles**
      i. $1,076,000 per Year from 2011—2017
   c. **Update on Maryland High Speed Rail**
      i. $10,000,000 per Year from 2011—2016
      ii. $41,560,000 per Year from 2012—2020[2]
3. Input investment by sector into REMI model and run impacts.
4. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI sectors.
   a. **MARC Station Parking Enhancements**
      i. 652 – Intercity Mass Transit
      ii. 623—Consumer Spending—Gasoline and oil
      iii. 648—Consumer Spending—Auto insurance less claims paid

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[2] Unfunded

   iv. 603—Consumer Spending—Other motor vehicles
  b. **Refurbishing MARC and Other Rail Vehicles**
   i. 652 – Intercity Mass Transit
   ii. 623—Consumer Spending—Gasoline and oil
   iii. 648—Consumer Spending—Auto insurance less claims paid
   iv. 603—Consumer Spending—Other motor vehicles
  c. **Update on Maryland High Speed Rail**
   i. 652 – Intercity Mass Transit
2. Determine part of program to be affected by savings (from strategy write-up).
  a. **MARC Station Parking Enhancements**
   i. Phase I—428 new parking spaces
   ii. Odenton station feasibility study—2,500 additional parking spaces
  b. **Refurbishing MARC and Other Rail Vehicles**
   i. 23 cars scheduled to be overhauled between FY 2005 and FY 2012
  c. **Update on Maryland High Speed Rail**
   i. $9.4 million allocation to MDOT for high-speed stimulus to complete environmental and engineering work to replace BWI Station as of Sept. 2010
3. Research savings data for each policy according to part of program to be affected by savings.
  a. **MARC Station Parking Enhancements**
   i. Average cost of monthly MARC pass[3]—$349/month (Transit Link Card)
   ii. Average cost savings of using public transit[4]—$9,383/year for Baltimore City
   iii. Average cost of MARC station parking[5]—$6.39/day average (between 7 stations and not including outliers)
   iv. Note about Transit Link Card data use: A Monthly Transit Link pass is used in the calculations of all rail passes. Often users of the MARC system traveling in and around the metropolitan region of Maryland/Washington, D.C. will wish to visit areas within the city which are accessible through walking or easy-to-navigate light rail systems. Instead of purchasing separate fares for each point of travel, most individuals prefer having one card designated for travel within the region. The average cost of monthly fares for MARC has been calculated using the transit link pass over a span of stations from Aberdeen to Washington, D.C.
  b. **Refurbishing MARC and Other Rail Vehicles**
   i. Average cost of monthly MARC pass[6]—$349/month (Transit Link Card)

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[3] MARC Train Service Order Form. CommuterDirect.com®. 2011. MARC. 14 Nov. 2011 <https://www.commuterpage.com/orderforms/transitorders_v3.cfm?sysid=12>.
[4] "Riding Public Transit Saves Individuals $9,242 Annually." APTA Homepage. 1 Dec. 2010. American Public Transportation Association (APTA). 14 Nov. 2011 <http://www.apta.com/mediacenter/pressreleases/2010/Pages/100112_Transit_Savings.aspx>.
[5] MARC Parking Details | Maryland Transit Administration. Home | Maryland Transit Administration. Nov. 2011. Maryland Transit Administration (MTA). 14 Nov. 2011 <http://mta.maryland.gov/marc-parking-details>.

ii. Capacity of MARC train cars (single-level and bi-level)[7]—121 seats (average)

iii. Note about Transit Link Card data use: A Monthly Transit Link pass is used in the calculations of all rail passes. Often users of the MARC system traveling in and around the metropolitan region of Maryland/Washington, D.C. will wish to visit areas within the city which are accessible through walking or easy-to-navigate light rail systems. Instead of purchasing separate fares for each point of travel, most individuals prefer having one card designated for travel within the region. The average cost of monthly fares for MARC has been calculated using the transit link pass over a span of stations from Aberdeen to Washington, D.C.

c. Update on Maryland High Speed Rail

i. Average cost of monthly MARC pass for BWI Rail Station between stations for Baltimore City and Washington, D.C[8].—$227/month (Transit Link Card)

ii. Number of parking spots at BWI Rail Station[9]—3,187 spots

iii. Cost of MARC station parking at BWI Rail Station[10]—$9/day

iv. Cost of BWI Garage (daily)[11]—$12/day

v. Note about Transit Link Card data use: A Monthly Transit Link pass is used in the calculations of all rail passes. Often users of the MARC system traveling in and around the metropolitan region of Maryland/Washington, D.C. will wish to visit areas within the city which are accessible through walking or easy-to-navigate light rail systems. Instead of purchasing separate fares for each point of travel, most individuals prefer having one card designated for travel within the region. The average cost of fare for the BWI Rail Station has been calculated under the assumption that most tourists will travel from BWI to Baltimore and BWI to Washington, D.C.

4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).

a. MARC Station Parking Enhancements

i. 652 – Intercity Mass Transit – $12,262,464 [(428 new Phase I parking spots + 2,500 new Odenton parking spots (assume 1 vehicle parked per day) * $349/month (assume all buy monthly pass) * 12 months)]

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[6] MARC Train Service Order Form. CommuterDirect.com®. 2011. MARC. 14 Nov. 2011 <https://www.commuterpage.com/orderforms/transitorders_v3.cfm?sysid=12>.

[7] Dresser, Michael. "New cars may ease MARC crowding - Baltimore Sun." Featured Articles From The Baltimore Sun. 20 Aug. 2008. The Baltimore Sun. 14 Nov. 2011 <http://articles.baltimoresun.com/2008-08-20/news/0808190131_1_marc-new-cars-passenger-cars>.

[8] MARC Train Service Order Form. CommuterDirect.com®. 2011. MARC. 14 Nov. 2011 <https://www.commuterpage.com/orderforms/transitorders_v3.cfm?sysid=12>.

[9] MARC Parking Details | Maryland Transit Administration. Home | Maryland Transit Administration. Nov. 2011. Maryland Transit Administration (MTA). 14 Nov. 2011 <http://mta.maryland.gov/marc-parking-details>.

[10] Ibid.

[11] Parking. Baltimore Washington International Thurgood Marshall Airport. 11 Nov. 2011. < http://www.bwiairport.com/en/parking/information-rates/daily-garage>.

ii. 652–Intercity Mass Transit–$6,829,120.80 [((2,500 new Odenton parking spots + 428 Phase I parking spots)(assume 1 vehicle parked per day) * $6.39/day on average (assume all park at station garage) * 365 days)]=annual increase in revenue

iii. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$3,712,871.82 [(2,928 Passengers * 2 minutes idle per trip * 2 trips per Day * 365 trips per year * $0.032 conversion to $)]=Value of Fuel Saved per Year by Passengers

iv. 648—Consumer Spending—Auto insurance less claims paid, 78—Consumption Reallocation—All Consumption Categories $6,307,585.44 [((2,928 passengers * 365 days * 2 trips * 13 miles)/1.34 average persons per vehicle trip) * $0.304 Insurance per Mile]=Value of Insurance Saved by Passengers per Year from 2015—2020

v. 603—Consumer Spending—Other motor vehicles, 78—Consumption Reallocation—All Consumption Categories $6,307,585.44 [((2,928 passengers * 365 days * 2 trips * 13 miles)/1.34 average persons per vehicle trip) * $0.304 driving cost per mile less insurance less fuel]=Value of Driving Cost (less fuel less insurance) Saved by Passengers per Year from 2015—2020

b. Refurbishing MARC and Other Rail Vehicles

i. 652 – Intercity Mass Transit—$11,655,204 [(23 cars refurbished (assume still in use in addition to newer cars) * 121 seats per car on average * $349/month (assume all buy monthly pass) * 12 months]=annual increase in revenue per year from 2010—2020

c. Update on Maryland High Speed Rail

i. 652 – Intercity Mass Transit—$16,138,968 [(3,187 spots at BWI Rail Station (assume 1 vehicle parked per day) * $227/month (assume all buy monthly pass) * 12 months)] + [(3,187 spots at BWI Rail Station (assume 1 vehicle parked per day) * $9/day (assume all park at station) * 260 days)] = annual increase in revenue

ii. 652 – Intercity Mass Transit—$2,485,860 (3,187 spots at BWI Rail Station (assume 1 vehicle parked per day) *$3/day savings (comparing $12/day and $9/day parking fees) * 260 days = annual savings for riders)

iii. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Categories—$879,279.15 [0.002 unfunded mmt CO_2e * 405,821,147.4 conversion]=Total value of fuel saved per year from 2012—2020

5. Input savings by sector into REMI model and run impacts.
6. Export impacts and analyze.

Refined Economic Impact Analysis for the Greenhouse Gas Emissions Reduction Act 2012 Plan—Appendices C through E

Prepared for
Maryland Department of the Environment

June 15, 2013

Regional Economic Studies Institute

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Appendix C—Modeling Steps

C.1 Energy

3.1.1 Regional Greenhouse Gas Initiatives

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy.
    a. **Regional Greenhouse Gas Initiatives**
        i. 63—State Government Spending
2. Determine overall cost of policy implementation for each program under the policy.
    a. **Regional Greenhouse Gas Initiatives**
        i. $90,000 per year (per MDE)
3. Distribute inputs among identified REMI PI+ sectors.
    a. **Regional Greenhouse Gas Initiatives**
        i. 100% - State Government Spending
4. Input costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors.
    a. **Regional Greenhouse Gas Initiatives**
        i. X7809-Production Costs-Electric power generation, transmission, and distribution
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **Regional Greenhouse Gas Initiatives**
        i. Total allowances yearly by the state of Maryland for GHG—28,000,000 metric tons
        ii. Cost of Allowance-$1.86/allowance
        iii. Number of Auctions to Date-17 auctions (4 per year, first year only one)
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Regional Greenhouse Gas Initiatives**
        i. Proceeds From Auctions[1]—$52,080,000
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2010-2020).
    a. **Regional Greenhouse Gas Initiatives**
        i. X7809—$12,254,118 [($52,080,000 total proceeds from auctions to date / 4.25 years)]=annual increase in production costs to electricity generation firms
5. Input cost/savings by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

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[1] "Regional Greenhouse Gas Initiative (RGGI) CO2 Budget Trading Program - Auction 13." Regional Greenhouse Gas Initiative (RGGI) CO2 Budget Trading Program - Welcome. 7 Sept. 2011. 11 Nov. 2011 <http://www.rggi.org/market/co2_auctions/results/auction_13>.

3.1.2 GHG Emission Reductions from Imported Power

Investment Phase

No investment costs were specified by the agency for this policy.

Operation Phase

1. Determine relevant REMI PI+ sectors.
    - **a. GHG Emission Reductions from Imported Power**
        - i. X7809-Production Costs-Electric power generation, transmission, and distribution
2. Determine part of program to be affected by savings (from strategy write-up).
    - **a. GHG Emission Reductions from Imported Power**
        - i. 30% Energy is Imported from Outside of Maryland
        - ii. Target to be achieved by 2020—2.75 Million Metric Tons
        - iii. Number of years until Target—8 years
        - iv. Average Reductions per year—343,750 allowances annually
        - v. Average reduction per allowance—91.4 Metric Tons
3. Research savings data for each policy according to part of program to be affected by savings.
    - **a. GHG Emission Reductions from Imported Power**
        - i. Average GHG emissions associated with Electricity[2]—31.43 million metric tons
        - ii. Allowances Sold to Date[3]— 68,507,184
        - iii. Total Proceeds from Auctions to date[4]—$169,600,423.80 total proceeds
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
    - **a. GHG Emission Reductions from Imported Power**
        - i. $2.48 [($169,600,423.80 total proceeds from auctions to date / 68,507,184 total carbon allowances sold to date)]=average cost of carbon allowances
        - ii. $77,809,961.07 [(31,430,000 total carbon allowances sold * $2.48 per allowance for electricity)]=average carbon credits sold annually to firms
        - iii. 31,086,250 [(31,430,000 total carbon allowances sold—343,750 proposed annual reduction target)]=average annual carbon credit to be purchased under reductions
        - iv. $76,958,953.30 [(31,086,250 average annual carbon credits purchased under reduction target * $2.48 average cost per carbon credit allowance)]=average cost to firm for carbon credits under new reduction target

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[2] "Maryland Energy Consumption Data." ERedux Energy: Sustainable Geoscial Products and Services Network. 11 Nov. 2011. Maryland Energy Portal - Maryland's Carbon Footprint. 11 Nov. 2011 <http://www.eredux.com/states/state_detail.php?id=1129>.

[3] "Regional Greenhouse Gas Initiative (RGGI) CO2 Budget Trading Program - Auction 13." Regional Greenhouse Gas Initiative (RGGI) CO2 Budget Trading Program - Welcome. 7 Sept. 2011. 11 Nov. 2011 <http://www.rggi.org/market/co2_auctions/results/auction_13>.

[4] See note 3.

v. X7809—$851,007.77 [($77,809,961.07 current average annual carbon credit costs - $76,958,953.30 average carbon credit costs under target reduction policy)]=reduction in costs to firms

5. Input savings by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.1.3 GHG New Source Performance Standard

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
    a. **GHG New Source Performance Standard**
        i. 63—State Government Spending
2. Determine overall cost of policy implementation for each program under the policy.
    a. **GHG New Source Performance Standard**
        i. $60,000 (per year provided by MDE)
3. Distribute inputs among identified REMI PI+ sectors.
    a. **GHG New Source Performance Standard**
        i. 100% for government administrative costs/responsibilities—$60,000 per year
4. Input costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors.
    a. **GHG New Source Performance Standard**
        i. X7809— Production Costs-Electric power generation, transmission, and distribution
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **GHG New Source Performance Standard**
        i. Annual Reduction Target by 2020—4.48 million metric tons
        ii. Number of years until Target—8 years
        iii. Average Reductions per year—128,750 allowances annually
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **GHG New Source Performance Standard**
        i. Average GHG emissions associated with Electricity[5]—31.43 million metric tons
        ii. Allowances Sold to Date[6]— 68,507,184
        iii. Total Proceeds from Auctions to date[7]—$169,600,423.80 total proceeds

[5] "Maryland Energy Consumption Data." ERedux Energy: Sustainable Geoscial Products and Services Network. 11 Nov. 2011. Maryland Energy Portal - Maryland's Carbon Footprint. 11 Nov. 2011 <http://www.eredux.com/states/state_detail.php?id=1129>.

[6] MD Proceeds by Auction. Regional Greenhouse Gas Initiative (RGGI) CO2 Budget Trading Program - Welcome. Regional Greenhouse Gas Initiative CO2 Budget Trading Program, 2011. Web. 14 Nov. 2011. <http://rggi.org/docs/MD_Proceeds_by_Auction.pdf>.

4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
    a. **GHG New Source Performance Standard**
        i. $2.48 [($169,600,423.80 total proceeds from auctions to date / 68,507,184 total carbon allowances sold to date)]=average cost of carbon allowances
        ii. $77,809,961.07 [(31,430,000 total carbon allowances sold *$2.48 per allowance for electricity)]=average carbon credits sold annually to firms
        iii. 30,825,000 [(31,430,000 total carbon allowances sold—605,000 proposed annual reduction target)]=average annual carbon credit to be purchased under reductions
        iv. $76,312,187.40 [(30,825,000 average annual carbon credits purchased under reduction target * $2.48 average cost per carbon credit allowance)]=average cost to firm for carbon credits under new reduction target
        v. X7809—$1,497,773.67 [($77,809,961.07 current average annual carbon credit costs - $76,312,187.40 average carbon credit costs under target reduction policy)]=savings to firms from reductions
5. Input savings by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.1.4 Maximum Achievable Control Technology (MACT)

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
    a. **Boiler Maximum Achievable Control Technology (MACT)**
        i. 63—State Government Spending
2. Determine overall cost of policy implementation for each program under the policy.
    a. **Boiler Maximum Achievable Control Technology (MACT)**
        i. $40,000 (per year provided by MDE)
3. Distribute inputs among identified REMI PI+ sectors.
    a. **Boiler Maximum Achievable Control Technology (MACT)**
        i. 100% for government administrative costs/responsibilities—$40,000 per year
4. Input costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).

[7] MD Proceeds by Auction. Regional Greenhouse Gas Initiative (RGGI) CO2 Budget Trading Program - Welcome. Regional Greenhouse Gas Initiative CO2 Budget Trading Program, 2011. Web. 14 Nov. 2011. <http://rggi.org/docs/MD_Proceeds_by_Auction.pdf>.

   a. **Boiler Maximum Achievable Control Technology (MACT)**
      i. X7809— Production Costs-Electric power generation, transmission, and distribution
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **Boiler Maximum Achievable Control Technology (MACT)**
      i. Target to 25 combined, 10 of single HAP
      ii. Base Cost - $200 for license + $52.23 per ton
      iii. Target by 2020—.10 million metric tons of CO2 emissions
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **Boiler Maximum Achievable Control Technology (MACT)**
      i. Number of Boilers (Nationally)[8] —13,500 boilers
      ii. Number of Boilers in Maryland[9]—16
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
   a. **Boiler Maximum Achievable Control Technology (MACT)**
      i. 12,500 [(10 million metric tons of CO2 emissions / 8 years)]=average reduction of CO2 emissions per year
      ii. $914,025,200.00 [(17.5 metric tons of HAPs * $52.23 per metric ton) + $200.00 base fee)]=average credit purchase annually from firms
      iii. X7809—$10,446,000.00 [($15,039,337.50 cost to purchase HAP not under rule)] -[(17,500,000 average metric tons HAP output - 17,487,500 average output in metric tons from rule)] * [($52.23 per metric ton)] + [($200.00 base fee)] * [(16 boilers Maryland)]=average annual HAP credits to be purchased under new rule
5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.1.5 Energy Efficiency in the Residential Sector

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
   a. **EmPOWER Maryland Empowering Finance Initiative**
      i. 63—State Government Spending
      ii. 98—Investment Spending (Residential)
   b. **EmPOWER Maryland Residential Incentives**
      i. 98—Investment Spending (Residential)

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[8] "Maryland Energy Consumption Data." ERedux Energy: Sustainable Geoscial Products and Services Network. 11 Nov. 2011. Maryland Energy Portal - Maryland's Carbon Footprint. 11 Nov. 2011 <http://www.eredux.com/states/state_detail.php?id=1129>.

[9] Princeton Energy Resources International, LLC, and Exter Associates, Inc. "The Potential for Biomass Cofiring in Maryland." Maryland Powerplant Research Program. Mar. 2006. Maryland Department of Natural Resources (DNR). 11 Nov. 2011 <http://esm.versar.com/pprp/bibliography/PPES_06_02/PPES_06_02.pdf>.

   c. **MEA Home Performance Rebate Program**
      i. 63—State Government Spending
      ii. 98—Investment Spending (Residential)
   d. **DHCD Weatherization**
      i. 98—Investment Spending (Residential)
   e. **Clean Energy Communities**
      i. 63—State Government Spending
      ii. 98—Investment Spending (Residential)
   f. **Maryland Home Energy Loan Program**
      i. 98—Investment Spending (Residential)
   g. **Energy Workforce Training**
      i. 98—Investment Spending (Residential)
   h. **State Energy Efficiency Appliance Rebate Program**
      i. 63—State Government Spending
      ii. 98—Investment Spending (Residential)
2. Determine overall cost of policy implementation for each program under the policy.
   a. **EmPOWER Maryland Empowering Finance Initiative**[10]
      i. 2010—$44,104,681.87
      ii. 2011—$25,243,359.59
      iii. 2012—$32,753,320.79
      iv. 2013—$34,166,457.70
      v. 2014—$36,831,168.45
      vi. 2015—$37,422,974.39
      vii. 2016—$23,013,551.42
      viii. 2017—$23,013,551.42
      ix. 2018—$23,013,551.42
      x. 2019—$23,013,551.42
      xi. 2020—$23,013,551.42
   b. **EmPOWER Maryland Residential Incentives**
      i. 2010—$40,704,681.87
      ii. 2011—$25,243,359.59
      iii. 2012—$32,753,320.79
      iv. 2013—$34,166,457.70
      v. 2014—$36,831,168.45
      vi. 2015—$37,422,974.39
      vii. 2016—$23,013,551.42
      viii. 2017—$23,013,551.42
      ix. 2018—$23,013,551.42
      x. 2019—$23,013,551.42
      xi. 2020—$23,013,551.42
   c. **MEA Home Performance Rebate Program**[11]
      i. 2010—$42,204,681.87

[10] Program received ARRA funds in 2010.
[11] Program received ARRA funds in 2010.

ii. 2011—$25,243,359.59
iii. 2012—$32,753,320.79
iv. 2013—$34,166,457.70
v. 2014—$36,831,168.45
vi. 2015—$37,422,974.39
vii. 2016—$23,013,551.42
viii. 2017—$23,013,551.42
ix. 2018—$23,013,551.42
x. 2019—$23,013,551.42
xi. 2020—$23,013,551.42

d. DHCD Weatherization

i. 2010—$40,704,681.87
ii. 2011—$25,243,359.59
iii. 2012—$32,753,320.79
iv. 2013—$34,166,457.70
v. 2014—$36,831,168.45
vi. 2015—$37,422,974.39
vii. 2016—$23,013,551.42
viii. 2017—$23,013,551.42
ix. 2018—$23,013,551.42
x. 2019—$23,013,551.42
xi. 2020—$23,013,551.42

e. Clean Energy Communities[12]

i. $2010—$45,504,681.87
ii. 2011—$26,843,359.59
iii. 2012—$32,753,320.79
iv. 2013—$34,166,457.70
v. 2014—$36,831,168.45
vi. 2015—$37,422,974.39
vii. 2016—$23,013,551.42
viii. 2017—$23,013,551.42
ix. 2018—$23,013,551.42
x. 2019—$23,013,551.42
xi. 2020—$23,013,551.42

f. Maryland Home Energy Loan Program

i. 2010—$40,704,681.87
ii. 2011—$25,243,359.59
iii. 2012—$32,753,320.79
iv. 2013—$34,166,457.70
v. 2014—$36,831,168.45
vi. 2015—$37,422,974.39
vii. 2016—$23,013,551.42
viii. 2017—$23,013,551.42

[12] Program received funding from 2010 through 2011.

ix. 2018—$23,013,551.42
x. 2019—$23,013,551.42
xi. 2020—$23,013,551.42

g. **Energy Workforce Training**
i. 2010—$40,704,681.87
ii. 2011—$25,243,359.59
iii. 2012—$32,753,320.79
iv. 2013—$34,166,457.70
v. 2014—$36,831,168.45
vi. 2015—$37,422,974.39
vii. 2016—$23,013,551.42
viii. 2017—$23,013,551.42
ix. 2018—$23,013,551.42
x. 2019—$23,013,551.42
xi. 2020—$23,013,551.42

h. **State Energy Efficiency Appliance Rebate Program**[13]
i. 2010—$45,804,681.87
ii. 2011—$26,543,359.59
iii. 2012—$32,753,320.79
iv. 2013—$34,166,457.70
v. 2014—$36,831,168.45
vi. 2015—$37,422,974.39
vii. 2016—$23,013,551.42
viii. 2017—$23,013,551.42
ix. 2018—$23,013,551.42
x. 2019—$23,013,551.42
xi. 2020—$23,013,551.42

3. Distribute inputs among identified REMI PI+ sectors.

a. **EmPOWER Maryland Empowering Finance Initiative**
i. 92% from utilities compliance with EmPOWER (2010)
ii. 8% American Recovery and Reinvestment Act Funds (2010)
iii. 100% from utilities compliance with EmPOWER through subsequent years (2011-2020)

b. **EmPOWER Maryland Residential Incentives**
i. 100% from utilities compliance with EmPOWER

c. **MEA Home Performance Rebate Program**
i. 96% from utilities compliance with EmPOWER (2010)
ii. 4% American Recovery and Reinvestment Act Funds (2010)
iii. 100% from utilities compliance with EmPOWER through subsequent years (2011-2020)

d. **DHCD Weatherization**
i. 100% from utilities compliance with EmPOWER

[13] Program received funding from 2010-2011.

- **e. Clean Energy Communities**
  - i. 88% from utilities compliance with EmPOWER (2010)
  - ii. 12% American Recovery and Reinvestment Act Funds (2010)
  - iii. 94% from utilities compliance with EmPOWER (2011)
  - iv. 6% American Recovery and Reinvestment Act Funds (2011)
  - v. 100% from utilities compliance with EmPOWER through subsequent years (2012-2020)
- **f. Maryland Home Energy Loan Program**
  - i. 100% from utilities compliance with EmPOWER through subsequent years (2012-2020)
- **g. Energy Workforce Training**
  - i. 100% from utilities compliance with EmPOWER through subsequent years (2012-2020)
- **h. State Energy Efficiency Appliance Rebate Program**
  - i. 87% from utilities compliance with EmPOWER (2010)
  - ii. 13% American Recovery and Reinvestment Act Funds (2010)
  - iii. 95% from utilities compliance with EmPOWER (2011)
  - iv. 5% American Recovery and Reinvestment Act Funds (2011)
  - v. 100% from utilities compliance with EmPOWER through subsequent years (2012-2020)

4. Input costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors.
   - **a. EmPOWER Maryland Empowering Finance Initiative**
     - i. 640—Consumer Spending (electricity)
     - ii. 78—Consumption Reallocation (all categories)
   - **b. EmPOWER Maryland Residential Incentives**
     - i. 640—Consumer Spending (electricity)
     - ii. 78—Consumption Reallocation (all categories)
   - **c. MEA Home Performance Rebate Program**
     - i. 640—Consumer Spending (electricity)
     - ii. 78—Consumption Reallocation (all categories)
   - **d. DHCD Weatherization**
     - i. 640—Consumer Spending (electricity)
     - ii. 78—Consumption Reallocation (all categories)
   - **e. Clean Energy Communities**
     - i. 640—Consumer Spending (electricity)
     - ii. 78—Consumption Reallocation (all categories)
   - **f. Maryland Home Energy Loan Program**
     - i. 640—Consumer Spending (electricity)
     - ii. 78—Consumption Reallocation (all categories)
   - **g. Energy Workforce Training**
     - i. 78—Consumption Reallocation (all categories)

- **h. State Energy Efficiency Appliance Rebate Program**
    - i. 640—Consumer Spending (electricity)
    - ii. 78—Consumption Reallocation (all categories)

2. Determine part of program to be affected by savings (from strategy write-up).
    - **a. EmPOWER Maryland Empowering Finance Initiative** (http://energy.maryland.gov/facts/empower.html)
        - i. CFL Light Replacement=$130
        - ii. Blow in Wall-Insulation=$90
        - iii. Seal Ductwork=$85
        - iv. Repair Ceiling Leaks=$80
        - v. Upgrade to Energy Star Washer=$50
        - vi. Upgrade Attic Insulation=$40
        - vii. Upgrade refrigerator to Energy Star=$40
        - viii. Energy Star Room Air=$30
        - ix. Low Flow Showerhead=$30
    - **b. EmPOWER Maryland Residential Incentives**
        - i. CFL Light Replacement=$130
        - ii. Blow in Wall-Insulation=$90
        - iii. Seal Ductwork=$85
        - iv. Repair Ceiling Leaks=$80
        - v. Upgrade to Energy Star Washer=$50
        - vi. Upgrade Attic Insulation=$40
        - vii. Upgrade refrigerator to Energy Star=$40
        - viii. Energy Star Room Air=$30
        - ix. Low Flow Showerhead=$30
        - x. Annual Sum of Savings=$575
        - xi. Number of Awards since 2009[14]=5,703
        - xii. Number of Awards that are only Residential=5,609
    - **c. MEA Home Performance Rebate Program**
        - i. Money available for rebate=$1,500,000.00
    - **d. DHCD Weatherization**
        - i. Cost Incurred=$1,234,223 (from strategy write up)
    - **e. Clean Energy Communities Grant**
        - i. Grants available to State and Local Governments (from MEA website) =2.13 million
    - **f. Maryland Home Energy Loan Program**
        - i. Total Awarded thus Far=400,000
    - **g. Energy Workforce Training**
    - **h. State Energy Efficiency Appliance Rebate Program**
        - i. Total allocated=$5,400,000
3. Research savings data for each policy according to part of program to be affected by savings.

[14] Residential Clean Energy Grant Program. Maryland Energy Administration. Maryland Energy Administration, 2011. Web. 16 Nov. 2011. <http://energy.maryland.gov/Residential/cleanenergygrants/index.html#updates>.

- **a. EmPOWER Maryland Empowering Finance Initiative**
- **b. EmPOWER Maryland Residential Incentives**
- **c. MEA Home Performance Rebate Program**
- **d. DHCD Weatherization**
    - i. Number of Assist/Completions Yearly[15]=6,164
    - ii. Average Savings Yearly in Energy Bills[16]=$437
- **e. Clean Energy Communities**
- **f. Maryland Home Energy Loan Program**
    - i. Loans Average of Those Possible Max[17]=$11,250
    - ii. Total Homes Applied=36
    - iii. Replacement period=10 years
    - iv. Average Interest Rate on Loan=8.49%
    - v. Total Loan=$12,205.125
    - vi. Total Owed every year on loan=$1,220.51
    - vii. Annual Savings from Programmable Thermostat—$150
    - viii. Annual Savings from Plugging Leaks—$440
- **g. Energy Workforce Training**
    - i. Total Trained to date=1,000 (assumed since 2009)
    - ii. Avg. Trained Yearly=333 (total trained to date/3 years since program initiated)
    - iii. Avg. Income of Green Job[18]=$47,000
- **h. State Energy Efficiency Appliance Rebate Program**

4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
    - **a. EmPOWER Maryland Empowering Finance Initiative**
        - i. 640—$3,278,650 [($575 Average Annual Savings from Energy Efficiency Measures in Household * 5,702 Applicants since 2009)]=Average Savings Associated from Program to All Applicants
        - ii. 78—$3,278,650 [(Reallocation of savings across other consumption categories.)]
    - **b. EmPOWER Maryland Residential Incentives**
        - i. 640—$3,225,175 [($575 Average Annual Savings from Energy Efficiency Measures in Households * 5,609 Residential Applicants for MEA Grants since 2009)]=Average Savings Associated with Program Since 2009 for Residential Sector

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[15] StateStat. Maryland StateStat Report. Department of Housing & Community Development, July 2011. Web. 11 Nov. 2011. <http://www.statestat.maryland.gov/reports/20110825_DHCD_Template.pdf>.

[16] Weatherization and Intergovernmental Program: Weatherization Assistance Program. EERE: EERE Server Maintenance. U.S. Department of Energy, 25 Apr. 2011. Web. 11 Nov. 2011. <http://www1.eere.energy.gov/wip/wap.html>.

[17] Maryland Home Energy Loan Program. Maryland Home Energy Loan Program. Maryland Clean Energy Centre, 2010. Web. 16 Nov. 2011. <http://www.mcecloans.com/Module/Ext/ExtInfo.aspx?ModulePageAdmin=0fe789d7-d5fc-4297-9917-db58ccb8a660&&ModulePageVisitor=4b0b3b8a-4f4a-4192-98e8-4f0e35b75d90>.

[18] 2009 County Business Patterns. Censtats Database. NAICS, 2009. Web. 11 Nov. 2011. <http://censtats.census.gov/cgi-bin/cbpnaic/cbpsect.pl>.

   ii. 78—$3,225,175 [(Reallocation of savings across other consumption categories.)]

c. **MEA Home Performance Rebate Program**
   i. 640–$1,500,000 [(From Strategy Write Up, Money Available for Grants)]
   ii. 78—$1,500,000 [(Reallocation of savings across other consumption categories.)]

d. **DHCD Weatherization**
   i. $200.23 [($1,234,223 Cost Incurred for All Units to be Weatherized / 6,164 Units to be Completed Yearly)]=Average per Unit Cost of Weatherization
   ii. $236.77 [($437 Average Annual Savings from Weatherization - $200.23 Cost per Unit of Weatherization)]=Average Annual Savings of Weatherization
   iii. 640—$1,459,445 [($236.77 Average Annual Savings of Weatherization per unit * 6,164 Units to be treated)]=Average Savings Across All Households
   iv. 78—$1,459,445 [(Reallocation of savings across other consumption categories.)]

e. **Clean Energy Communities**
   i. 640—$2,130,000 [(Grant Money Available per strategy write up)]
   ii. 78—$2,130,000 [(Reallocation of savings across other consumption categories.)]

f. **Maryland Home Energy Loan Program**
   i. $1,220.51 [($12,205 Average Loan made through Program / 10 Year Payback period)] = Average Annual Loan Payment without Interest
   ii. $955 [($1,220.51 Average Annual Loan Payment Without Interest * 8.49% Interest Rate Associated with Loan Program)]=Average Annual Interest Paid on Loans
   iii. 432—$34,385 [($955 Average Annual Interest Paid on Loans * 36 Applicants for Program)]=Average Annual Revenue Received by Government from Loans
   iv. 640–$21,240 [(36 Applicants * $590 Overall Savings from Program Annually)]=Average Annual Savings to Households that Applied
   v. 78—$21,240 [(Reallocation of savings across other consumption categories.)]

g. **Energy Workforce Training**
   i. 78–$15,666,666.67 [(333 Newly Trained Energy Workforce Labor Every Year * $47,000 Average Annual Income of Green Job)]=Average Additional Income to Households Annually

h. **State Energy Efficiency Appliance Rebate Program**
   i. 640— $5,400,000 [(Allocated per Strategy Write Up)]
   ii. 78—$5,400,000 [(Reallocation of savings across other consumption categories.)]

5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.1.6 Energy Efficiency in the Commercial and Industrial Sectors

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy.
    a. **Maryland Save Energy Now**
        i. 63—State Government Spending
    b. **Jane E. Lawton Conservation Loan Program**
        i. 63—State Government Spending
    c. **Energy Efficiency and Conservation Block Grant Program**
        i. 63—State Government Spending
    d. **State Agencies Loan Program**
        i. 63—State Government Spending
2. Determine overall cost of policy implementation for each program under the policy.[19]
    a. **Maryland Save Energy Now**
        i. 2010—$0
        ii. 2011—$533,765
        iii. 2012—$533,765
        iv. 2013—$150,000
        v. 2014—$150,000
        vi. 2015—$150,000
        vii. 2016—$150,000
        viii. 2017—$150,000
        ix. 2018—$150,000
        x. 2019—$150,000
        xi. 2020—$150,000
    b. **Jane E. Lawton Conservation Loan Program**
        i. 2010—$0
        ii. 2011—$1,335,000
        iii. 2012—$2,500,000
        iv. 2013—$2,500,000
        v. 2014—$2,500,000
        vi. 2015—$2,500,000
        vii. 2016—$2,500,000
        viii. 2017—$2,500,000
        ix. 2018—$2,500,000
        x. 2019—$2,500,000
        xi. 2020—$2,500,000
    c. **Energy Efficiency and Conservation Block Grant Program**
        i. 2010—$3,190,000
        ii. 2011—$3,190,000
        iii. 2012—$3,190,000
    d. **State Agencies Loan Program**
        i. 2010—$0

[19] Costs provided for this policy can be found in the *EmPOWERing Maryland: Clean Energy Programs FY2012* published by MEA. http://energy.maryland.gov/documents/FY12ProgramBook.pdf

ii. 2011—$2,500,000
iii. 2012—$2,500,000
iv. 2013—$2,500,000
v. 2014—$2,500,000
vi. 2015—$2,500,000
vii. 2016—$2,500,000
viii. 2017—$2,500,000
ix. 2018—$2,500,000
x. 2019—$2,500,000
xi. 2020—$2,500,000

3. Distribute inputs among identified REMI PI+ sectors.
   a. **Maryland Save Energy Now**
      i. 100% for government administrative costs/responsibilities
   b. **Jane E. Lawton Conservation Loan Program**
      i. 100% for government administrative costs/responsibilities
   c. **Energy Efficiency and Conservation Block Grant Program**
      i. 100% for government administrative costs/responsibilities
   d. **State Agencies Loan Program**
      i. 100% for government administrative costs/responsibilities
4. Input costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
   a. **Maryland Save Energy Now**
      i. 80—Electricity (Industrial Sector) Fuel Costs, All Industrial Sectors
      ii. 82—Electricity (Commercial Sector) Fuel Costs, All Commercial Sectors
   b. **Jane E. Lawton Conservation Loan Program**
      i. 80—Electricity (Industrial Sector) Fuel Costs, All Industrial Sectors
      ii. 82—Electricity (Commercial Sector) Fuel Costs, All Commercial Sectors
   c. **Energy Efficiency and Conservation Block Grant Program**
      i. 80—Electricity (Industrial Sector) Fuel Costs, All Industrial Sectors
      ii. 82—Electricity (Commercial Sector) Fuel Costs, All Commercial Sectors
   d. **State Agencies Loan Program**
      i. 80—Electricity (Industrial Sector) Fuel Costs, All Industrial Sectors
      ii. 82—Electricity (Commercial Sector) Fuel Costs, All Commercial Sectors
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **Maryland Save Energy Now**
   b. **Jane E. Lawton Conservation Loan Program**
      i. Total Energy Used by Government in 2009—1,500,000,000 kilowatts
   c. **Energy Efficiency and Conservation Block Grant Program**
      i. Potential Energy Reduction from Program—4,200,000 kilowatts
      ii. Potential Energy Reduction from Program in Natural Gas (in kilowatts)—967,135 kilowatts

        iii. Potential Energy Reductions from Program in Oil (in gallons)—35,000 kilowatts
    d. **State Agencies Loan Program**
        i. Savings in kilowatts from program—11,000,000 kilowatts
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Maryland Save Energy Now**
    b. **Jane E. Lawton Conservation Loan Program**
    c. **Energy Efficiency and Conservation Block Grant Program**
    d. **State Agencies Loan Program**
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2010-2020).[20]
    a. **Maryland Save Energy Now**
        i. $128,605,000 [(Savings from 2010-2020 from this program)]
        ii. 80—Annual Savings
            1. 2010—$2,018,774
            2. 2011—$4,067,822
            3. 2012—$6,357,604
            4. 2013—$9,170,329
            5. 2014—$12,474,832
            6. 2015—$15,752,591
            7. 2016—$15,752,591
            8. 2017—$15,752,591
            9. 2018—$15,752,591
            10. 2019—$15,752,591
            11. 2020—$15,752,591
        iii. 82—Annual Savings
            1. 2010—$2,018,774
            2. 2011—$4,067,822
            3. 2012—$6,357,604
            4. 2013—$9,170,329
            5. 2014—$12,474,832
            6. 2015—$15,752,591
            7. 2016—$15,752,591
            8. 2017—$15,752,591
            9. 2018—$15,752,591
            10. 2019—$15,752,591
            11. 2020—$15,752,591
    b. **Jane E. Lawton Conservation Loan Program**
        i. $128,605,000 [(Savings from 2010-2020 from this program)]
        ii. 80—Annual Savings
            1. 2010—$2,018,774

[20] Reduction data provided by MEA from utilities for this program and an average was taken across the programs to determine the value of these programs.

2. 2011—$4,067,822
3. 2012—$6,357,604
4. 2013—$9,170,329
5. 2014—$12,474,832
6. 2015—$15,752,591
7. 2016—$15,752,591
8. 2017—$15,752,591
9. 2018—$15,752,591
10. 2019—$15,752,591
11. 2020—$15,752,591

iii. 82—Annual Savings
1. 2010—$2,018,774
2. 2011—$4,067,822
3. 2012—$6,357,604
4. 2013—$9,170,329
5. 2014—$12,474,832
6. 2015—$15,752,591
7. 2016—$15,752,591
8. 2017—$15,752,591
9. 2018—$15,752,591
10. 2019—$15,752,591
11. 2020—$15,752,591

c. Energy Efficiency and Conservation Block Grant Program

i. $128,605,000 [(Savings from 2010-2020 from this program)]

ii. 80—Annual Savings
1. 2010—$2,018,774
2. 2011—$4,067,822
3. 2012—$6,357,604
4. 2013—$9,170,329
5. 2014—$12,474,832
6. 2015—$15,752,591
7. 2016—$15,752,591
8. 2017—$15,752,591
9. 2018—$15,752,591
10. 2019—$15,752,591
11. 2020—$15,752,591

iii. 82—Annual Savings
1. 2010—$2,018,774
2. 2011—$4,067,822
3. 2012—$6,357,604
4. 2013—$9,170,329
5. 2014—$12,474,832
6. 2015—$15,752,591
7. 2016—$15,752,591
8. 2017—$15,752,591

9. 2018—$15,752,591
10. 2019—$15,752,591
11. 2020—$15,752,591

d. State Agencies Loan Program

i. $128,605,000 [(Savings from 2010-2020 from this program)]

ii. 80—Annual Savings

1. 2010—$2,018,774
2. 2011—$4,067,822
3. 2012—$6,357,604
4. 2013—$9,170,329
5. 2014—$12,474,832
6. 2015—$15,752,591
7. 2016—$15,752,591
8. 2017—$15,752,591
9. 2018—$15,752,591
10. 2019—$15,752,591
11. 2020—$15,752,591

iii. 82—Annual Savings

1. 2010—$2,018,774
2. 2011—$4,067,822
3. 2012—$6,357,604
4. 2013—$9,170,329
5. 2014—$12,474,832
6. 2015—$15,752,591
7. 2016—$15,752,591
8. 2017—$15,752,591
9. 2018—$15,752,591
10. 2019—$15,752,591
11. 2020—$15,752,591

5. Input savings by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.1.7 Energy Efficiency Appliances and Other Products

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).

a. Energy Efficiency Appliances and Other Products

i. 45—Residential Capital

2. Determine overall cost of policy implementation for each program under the policy.

a. Energy Efficiency Appliances and Other Products

i. 2010—$21,116,830
ii. 2011—$20,901,270
iii. 2012—$17,380,320
iv. 2013—$18,140,110
v. 2014—$23,300,840

   vi. 2015—$19,872,100
3. Distribute inputs among identified REMI PI+ sectors.
   a. **Energy Efficiency Appliances and Other Products**
      i. 100% spent by households to upgrade existing capital within the home
4. Input costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors.
   a. **Energy Efficiency Appliances and Other Products**
      i. 640—Consumer Spending (electricity)
      ii. 78—Consumption Reallocation (all categories)
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **Energy Efficiency Appliances and Other Products**
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **Energy Efficiency Appliances and Other Products**
      i. Avg. purchase price of an incandescent bulb[21]—0.25
      ii. Avg. purchase price of a CFL bulb[22]—5
      iii. Lifetime of Incandescent Bulb[23]—1,000 hours
      iv. Lifetime of a CFL Bulb[24]—8,000 hours
      v. Price per hour of Incandescent bulb[25]—0.00025
      vi. Price per hour of CFL Bulb[26]—0.000625
      vii. Number of replacements in 7 years - Incandescent[27]—7
      viii. Number of replacements in 7 year - CFL[28]—7
      ix. Avg. Cost per kwh[29]—0.11
      x. Amount of Watts of Incandescent[30]—60
      xi. Amount of Equivalent CLF[31]—13
      xii. Annual Savings in KWH change from Inca to CFL[32]—51
      xiii. Number of Households[33]—2,092,538

[21] Innovation. Performance. Savings. ENERGY STAR. United States Department of Energy, 2011. Web. 16 Nov. 2011. <http://www.energystar.gov/ia/partners/manuf_res/CFL_PRG_FINAL.pdf>.
[22] Ibid.
[23] Ibid.
[24] Ibid.
[25] Ibid.
[26] Ibid.
[27] Ibid.
[28] Ibid.
[29] Strong Finish to 2011 Natural Gas Storage Injection Season. U.S. Energy Information Administration (EIA). U.S. Energy Information Administration (EIA), Oct. 2011. Web. 14 Nov. 2011. <http://www.eia.gov/>.
[30] Innovation. Performance. Savings. ENERGY STAR. United States Department of Energy, 2011. Web. 16 Nov. 2011. <http://www.energystar.gov/ia/partners/manuf_res/CFL_PRG_FINAL.pdf>.
[31] Ibid.
[32] Ibid.
[33] Maryland QuickFacts from the US Census Bureau. State and County QuickFacts. U.S. Census Bureau, 13 Oct. 2011. Web. 11 Nov. 2011. <http://quickfacts.census.gov/qfd/states/24000.html>.

4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
    a. **Energy Efficiency Appliances and Other Products**
        i. $1.75 [(7 Number of replacements in 7 years incandescent * 0.25 Avg. purchase price of an incandescent bulb)]=Total Cost in 7 Years on Replacements Incandescent
        ii. $0 [(0 Number of replacements in 7 years CFL * 5 Avg. purchase price of an CFL bulb)]=Total Cost in 7 Years on Replacements CFL
        iii. 0.714285714 [(5 Avg. purchase price of an CFL bulb / 7)]=Total Cost Over Lifetime of CFL per year
        iv. $0.71 [(5 Avg. purchase price of an CFL bulb / 7)]=Cost of CFL Annually
        v. 5.8191 [(51 Annual Savings in kwh change from Inca to CFL * 0.11 Avg. Cost per kwh)]=Savings from CFL Annually
        vi. $5.11 [(5.8191 Savings from CFL Annually - 0.714285714 Savings from CFL Annually)]=Savings from ONE CFL Bulb
        vii. $10,682,017.88 [(2,092,538 Number of Households * 5.10481 Savings from ONE CFL Bulb)]=Savings Annually
        viii. 604–$10,682,017.88 [(2,092,538 Number of Households * 5.10481 Savings from ONE CFL Bulb)]=Savings Annually
        ix. 78—$10,682,017.88 [(Reallocation of consumer savings across other consumption categories)]
5. Input savings by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.1.8 Energy Efficiency in the Power Sector—General

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
    a. **Energy Efficiency in the Power Sector—General**
        i. EQP 13—Producer's Durable Equipment Investment, Electrical transmission, distribution, generation
2. Determine overall cost of policy implementation for each program under the policy.
    a. **Energy Efficiency in the Power Sector—General** [34]
        i. 2010—$242,655,500
        ii. 2011—$153,864,300
        iii. 2012—$199,639,289
        iv. 2013—$208,252,695
        v. 2014—$267,544,800
        vi. 2015—$228,101,939
        vii. 2016—$216,676,420
        viii. 2017—$216,676,420
        ix. 2018—$216,676,420
        x. 2019—$216,676,420

[34] All data was provided by MEA from utility companies regarding this program.

xi. 2020—$216,676,420

3. Distribute inputs among identified REMI PI+ sectors.
   a. **Energy Efficiency in the Power Sector—General**
      i. 100% towards private sector in power generation to implement new strategies
4. Input costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
   a. **Energy Efficiency in the Power Sector—General**
      i. X7809—Production Cost, Electrical power generation, distribution, transmission
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **Energy Efficiency in the Power Sector—General**
      i. Potential Biomass=2,700,000 in tons
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **Energy Efficiency in the Power Sector—General**
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2010-2020).[35]
   a. **Energy Efficiency in the Power Sector—General**
      i. X7809—Annual Savings to Power Sector
         1. 2010—$17,133,600
         2. 2011—$19,077,100
         3. 2012—$23,688,900
         4. 2013—$36,847,500
         5. 2014—$54,334,000
         6. 2015—$72,374,100
         7. 2016—$37,242,510
         8. 2017—$37,242,510
         9. 2018—$37,242,510
         10. 2019—$37,242,510
         11. 2020—$37,242,510
5. Input savings by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.1.9 Maryland Renewable Energy Portfolio Standard

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).

[35] Reduction data provided by utilities to MEA.

   a. **Maryland Renewable Energy Portfolio Standard**
      i. EQP 13—Producer's Durable Equipment Investment, Electrical generation, distribution, transmission
2. Determine overall cost of policy implementation for each program under the policy.
   a. **Maryland Renewable Energy Portfolio Standard**[36]
      i. 2010—$23,290,000
      ii. 2011—$345,600,000
      iii. 2012—$125,190,000
      iv. 2013—$310,440,000
      v. 2014—$188,680,000
      vi. 2015—$536,200,000
      vii. 2016—$368,860,000
      viii. 2017—$1,941,270,000
      ix. 2018—$1,705,000,000
      x. 2019—$914,610,000
      xi. 2020—$265,600,000
3. Distribute inputs among identified REMI PI+ sectors.
   a. **Maryland Renewable Energy Portfolio Standard**
      i. 100% for private producers of electricity to move towards new alternative sources.
4. Input costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors.
   a. **Maryland Renewable Energy Portfolio Standard**
      i. X7009—Compensation, Electrical power distribution, generation, transmission
      ii. X7809—Production Cost, Electrical power distribution, generation, transmission
      iii. X10009—Capital Cost, Electrical power distribution, generation, transmission
2. Determine part of program to be affected by ongoing costs for maintenance.
   a. **Maryland Renewable Energy Portfolio Standard**
3. Research costs data for each policy according to part of program to be affected by program.
   a. **Maryland Renewable Energy Portfolio Standard**[37]
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2010-2020).
   a. **Maryland Renewable Energy Portfolio Standard**
      i. X7009—Annual costs to firm
         1. 2010—$6,610,000
         2. 2011—$6,460,000

[36] Funding levels for RPS have been provided on an annual basis by MEA.
[37] All data regarding maintenance and operation estimations have been provided courtesy of MEA.

3. 2012—$6,730,000
4. 2013—$6,730,000
5. 2014—$6,730,000
6. 2015—$14,470,000
7. 2016—$14,470,000
8. 2017—$14,470,000
9. 2018—$15,170,000
10. 2019—$15,170,000
11. 2020—$15,170,000

ii. X7809—Annual costs to firm
1. 2010—$33,205,000
2. 2011—$33,000,000
3. 2012—$33,205,000
4. 2013—$34,540,000
5. 2014—$34,860,000
6. 2015—$38,015,000
7. 2016—$38,675,000
8. 2017—$70,700,000
9. 2018—$91,310,000
10. 2019—$95,340,000
11. 2020—$96,255,000

iii. X10009—Annual costs to firm
1. 2010—$33,205,000
2. 2011—$33,000,000
3. 2012—$33,205,000
4. 2013—$34,540,000
5. 2014—$34,860,000
6. 2015—$38,015,000
7. 2016—$38,675,000
8. 2017—$70,700,000
9. 2018—$91,310,000
10. 2019—$95,340,000
11. 2020—$96,255,000

5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.1.10 Incentives and Grant Programs to Support Renewable Energy

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
   - **a. Commercial Clean Energy Grant Program**
     - i. 63—State Govt. Spending
   - **b. Residential Clean Energy Grants Program**
     - i. 63—State Govt. Spending

c. **Clean Energy Incentive Tax Credit Program**
    i. 63—State Govt. Spending
d. **Generating Clean Horizons Program**
    i. 45—Residential Capital Investment
e. **Project Sunburst**
    i. 63—State Govt. Spending
f. **Biomass Program**
    i. 63—State Govt. Spending
g. **Land-based Wind Programs**
    i. 63—State Govt. Spending

2. Determine overall cost of policy implementation for each program under the policy.
    a. **Commercial Clean Energy Grant Program**
        i. 2010—$0
        ii. 2011—$1,500,000
        iii. 2012—$1,500,000
        iv. 2013—$1,000,000
        v. 2014—$1,000,000
        vi. 2015—$1,000,000
        vii. 2016—$1,000,000
        viii. 2017—$1,000,000
        ix. 2018—$1,000,000
        x. 2019—$1,000,000
        xi. 2020—$1,000,000
    b. **Residential Clean Energy Grants Program**
        i. 2010—$0
        ii. 2011—$5,600,000
        iii. 2012—$5,600,000
        iv. 2013—$4,200,000
        v. 2014—$4,200,000
        vi. 2015—$4,200,000
        vii. 2016—$4,200,000
        viii. 2017—$4,200,000
        ix. 2018—$4,200,000
        x. 2019—$4,200,000
        xi. 2020—$4,200,000
    c. **Clean Energy Incentive Tax Credit Program**[38]
        i. 2010—$2,500,000
        ii. 2011—$2,500,000
        iii. 2012—$2,500,000
        iv. 2013—$2,500,000
        v. 2014—$2,500,000
        vi. 2015—$2,500,000

[38] "Clean Energy Production Tax Credit," *Maryland Energy Administration*, accessed October 17, 2012.

- **d. Generating Clean Horizons Program**[39]
  - i. 2010—$106,700,000
  - ii. 2011—$106,700,000
  - iii. 2012—$106,700,000
- **e. Project Sunburst**[40]
  - i. 2010—$4,690,565
  - ii. 2011—$4,690,565
- **f. Biomass Program**
  - i. 2010—$1,000,500
  - ii. 2011—$1,000,500
  - iii. 2012—$1,000,500
  - iv. 2013—$1,000,500
  - v. 2014—$1,000,500
  - vi. 2015—$1,000,500
  - vii. 2016—$1,000,500
  - viii. 2017—$1,000,500
- **g. Land-based Wind Programs**[41]
  - i. 2010—$100,000
  - ii. 2011—$100,000
  - iii. 2012—$100,000
  - iv. 2013—$100,000
  - v. 2014—$100,000
  - vi. 2015—$100,000
  - vii. 2016—$100,000
  - viii. 2017—$100,000

3. Distribute inputs among identified REMI PI+ sectors.
   - **a. Commercial Clean Energy Grant Program**
     - i. 100% spent by government (from SEIF funds) in form of grants to businesses
   - **b. Residential Clean Energy Grants Program**
     - i. 100% spent by government (from SEIF funds) in form of grants to residential investment
   - **c. Clean Energy Incentive Tax Credit Program**
     - i. 100% spent by government towards reduction of investment costs in clean energy
   - **d. Generating Clean Horizons Program**
     - i. 100% spent by households to improve household energy savings
   - **e. Project Sunburst**
     - i. 100% spent by government in form of grants

[39] Maryland Energy Administration, "Maryland Governor Martin O'Malley Celebrates the Completion of the Largest Solar Farm in the State" (press release, Emmitsburg, Maryland, 2012)
[40] "Project Sunburst," *Maryland Energy Administration*, accessed October 17, 2012.
[41] "Windswept Grant Program," *Maryland Energy Administration*, accessed October 17, 2012.

- f. **Biomass Program**
    - i. 100% spent by government in form of research regarding biomass
- g. **Land-based Wind Programs**
    - i. 100% spent by government to further initiatives in land-based wind

4. Input sales by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors.
    - a. **Commercial Clean Energy Grant Program**
        - i. 82—Electrical (Commercial Sector) Fuel Costs, All Commercial Sectors
    - b. **Residential Clean Energy Grants Program**
        - i. 640—Consumer Spending, (electricity)
        - ii. 78—Consumption Reallocation (all categories)
    - c. **Clean Energy Incentive Tax Credit Program**
        - i. No additional costs or benefits specified
    - d. **Generating Clean Horizons Program**
        - i. 640—Consumer Spending, (electricity)
        - ii. 78—Consumption Reallocation (all categories)
    - e. **Project Sunburst**
        - i. 640—Consumer Spending, (electricity)
        - ii. 78—Consumption Reallocation (all categories)
    - f. **Biomass Program**
        - i. 640—Consumer Spending, (electricity)
        - ii. 78—Consumption Reallocation (all categories)
    - g. **Land-based Wind Programs**
        - i. 640—Consumer Spending, (electricity)
        - ii. 78—Consumption Reallocation (all categories)
2. Determine part of program to be affected by savings (from strategy write-up).
    - a. **Commercial Clean Energy Grant Program**
    - b. **Residential Clean Energy Grants Program**
    - c. **Clean Energy Incentive Tax Credit Program**
    - d. **Generating Clean Horizons Program**
        - i. Total Energy Used by Government in 2009—1,500,000,000 kilowatts
        - ii. Reduction Goal by 2016—16%
    - e. **Project Sunburst**
    - f. **Biomass Program**
    - g. **Land-based Wind Programs**
        - i. Total Wind Energy Generated Annually—120,000 kilowatts
        - ii. Total Wind Energy Generation Added Since Project Windswept—421 kilowatts
        - iii. Average Annual Wind Energy Generated—120,421 kilowatts
3. Research savings data for each policy according to part of program to be affected by savings.

a. **Commercial Clean Energy Grant Program**
    i. Potential Savings from Clean Energy Grant—$575
    ii. Total Applicants for Grants (from MEA website)—42 Businesses
b. **Residential Clean Energy Grants Program**
    i. Total Applicants for Grants (from MEA website)–5,609 Residential Applicants
    ii. Average Grantees A Year—1,870 Residential Grantees a year
    iii. Potential Savings from Clean Energy Grant—$575
c. **Clean Energy Incentive Tax Credit Program**
    i. Number of Business Tax Credit Applicants (From MEA website)—42
d. **Generating Clean Horizons Program**
    i. Maryland Electricity cost (in KWh)[42]—$0.11 per kW/h
e. **Project Sunburst**
    i. Total Awardees (from MEA website)—17
    ii. Total Money Granted (from MEA website)—$9,381,130.00
f. **Biomass Program**
    i. Annual Savings from Biomass Production—$4,282,740.00 (from DNR)
g. **Land-based Wind Programs**
    i. Maryland Electricity cost (in KWh)[43]—$0.11 per kW/h

4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
    a. **Commercial Clean Energy Grant Program**
        i. 82—$24,150 [(42 Applicants to date for Commercial Clean Energy Grants * $575 Annual Savings Associated with Clean Energy Initiatives)]=Average Annual Savings from Strategy
    b. **Residential Clean Energy Grants Program**
        i. 640—$1,075,058 [(1,870 Residential Applicants Annually for Grants * $575 Potential Energy Savings from Grants)]=Average Annual Savings to Households
        ii. 78—$1,075,058 [(Reallocation of savings across other consumption categories)]
    c. **Clean Energy Incentive Tax Credit Program**
        i. No Additional Costs or Benefits associated with this program
    d. **Generating Clean Horizons Program**
        i. $171,150,000.00 [(1,500,000,000 kilowatts of Energy used by Government in 2009 * $0.11 Average Cost of Electricity per kwh)]=Average Cost to Government in 2009 for Energy Consumption
        ii. 240,000,000 [(1,500,000,000 kilowatts of Energy used by Government in 2009 * 16% Reduction goal by 2016)]=Kilowatt Consumption Reduction Goal by 2016

[42] Average Energy Prices in the Washington-Baltimore Area. Mid-Atlantic Information Office. 27 Sept. 2011. U.S. Bureau of Labor Statistics (BLS). 11 Nov. 2011 <http://www.bls.gov/ro3/apwb.htm#wb_energy_table1>.
[43] Ibid.

iii. 60,000,000 [(240,000,000 Kilowatt Consumption Reduction Goal by 2016 / 4 Years until 2016 Deadline)]=Average Annual Reduction Goal until 2016
iv. 1,440,000,000 [(1,500,000,000 kilowatts of Energy used by Government in 2009—60,000,000 Average Annual Reduction Goal Until 2016)]=Average Annual Amount to be used by Government in Next Year
v. $164,304,000.00 [(1,440,000,000 Average Annual Amount to be used by Government in Next Year * $0.11 Average Cost per kilowatt hour)]=Average Annual Cost to Government in Next Year
vi. 640—$6,846,000.00 [($171,150,000.00 Average Annual Cost of Electricity in 2009 to Government - $164,304,000.00 Average Annual Cost of Electricity Next Year to Government)]=Average Annual Savings Associated with Reduction
vii. 78 — $6,846,000 [(Reallocation of savings across all other consumption categories.)]

e. **Project Sunburst**
   i. 640—$9,381,130.00 [(Total Money Granted Under this Project Via the MEA website)]
   ii. 78—$9,381,130 [(Reallocation of savings to other consumption categories.)]

f. **Biomass Program**
   i. 640—$4,282,740.00 [(Biomass Savings Annually provided by DNR)]
   ii. 78 — $4,282,740 [(Reallocation of savings across all other consumption categories.)]

g. **Land-based Wind Programs**
   i. $13,740.04 [($0.11 Average Cost per kwh of Electricity * 120,421 kilowatts generated by Wind Energy)]=Average Annual Savings to Consume Wind Energy
   ii. 640—$13,740
   iii. 78 — $13,740 [(Reallocation of savings across all other consumption categories.)]

5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.1.11 Offshore Wind Initiatives to Support Renewable Energy

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
   a. **Offshore Wind Initiative to Support Renewable Energy**
      i. X7809—Production Cost, Electrical power distribution, generation, transmission
2. Determine overall cost of policy implementation for each program under the policy.

- **a. Offshore Wind Initiative to Support Renewable Energy**[44]
  - i. $639,000,000 (to be allocated for investment in 2017, provided by MEA.)

3. Distribute inputs among identified REMI PI+ sectors.
   - **a. Offshore Wind Initiative to Support Renewable Energy**
     - i. 100% paid by private industry towards investment in offshore wind energy production
4. Input costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors.
   - **a. Offshore Wind Initiative to Support Renewable Energy**
     - i. X7809—Production Cost, Electrical power distribution, generation, transmission
2. Determine part of program to be affected by savings (from strategy write-up).
   - a. **Offshore Wind Initiative to Support Renewable Energy**
     - i. Reduction Total by 2020—20%
3. Research savings data for each policy according to part of program to be affected by savings.
   - a. **Offshore Wind Initiative to Support Renewable Energy**
     - i. Continued operation and maintenance costs annually after 2017 could average $36,940,000 per year. (Data provided courtesy of MEA)
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2010-2020).
   - a. **Offshore Wind Initiative to Support Renewable Energy**
     - i. X7809—annual costs from 2017-2020
       1. 2017 — $36,940,000
       2. 2018 — $36,940,000
       3. 2019 — $36,940,000
       4. 2020 — $36,940,000
5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

C.2 Transportation

3.2.1 Maryland Clean Cars Program

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy.
   - **a. Maryland Clean Cars Program**
     - i. 63—State Govt. Spending
     - ii. 601—Consumer Spending (autos)
2. Determine overall cost of policy implementation for each program under the policy.

[44] Maryland Energy Administration, "Maryland Offshore Wind Energy Act of 2012 Facts & Figures" (Press release, Annapolis, Maryland, 2012).

a. **Maryland Clean Cars Program**
    i. Number of clean cars sold to date—362,955 (provided by MDE)
    ii. Number of clean cars needed to achieve GGRA—3,751,245 (provided by MDE)
    iii. Number of clean cars goal for 2013—325,728 (provided by MDE)
    iv. Average increase in the private sector of clean cars in cost[45]—$1,280 per vehicle
    v. Average increase in the public sector of clean cars in price[46]—$1,223 per vehicle
    vi. Number of vehicles to be replaced by government annual—800
    vii. Number of vehicles left to be replaced by private sector to reach goal in 2013—324,928
    viii. Average Annual vehicles to be replaced from 2014-2020 to reach target—437,509
    ix. Average annual vehicles replaced by government annually—800
    x. Average annual vehicles replaced by consumers annually—436,709

3. Distribute inputs among identified REMI PI+ sectors.
    a. **Maryland Clean Cars Program**
        i. 63—Average annual spending by state government on clean cars for replacement fleet
            1. 2012—$303,200
            2. 2013—$978,000
            3. 2014—$978,000
            4. 2015—$978,000
            5. 2016—$978,000
            6. 2017—$978,000
            7. 2018—$978,000
            8. 2019—$978,000
            9. 2020—$978,000
        ii. 601—Average annual spending by consumers on clean cars
            1. 2012—$463,558,400
            2. 2013—$415,907,840
            3. 2014—$558,987,520
            4. 2015—$558,987,520
            5. 2016—$558,987,520
            6. 2017—$558,987,520
            7. 2018—$558,987,520
            8. 2019—$558,987,520
            9. 2020—$558,987,520
4. Input costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

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[45] Motor Vehicle Administration, “2011 Car Sales Statistics,” *Department of Transportation*, accessed October 17, 2012.
[46] Ibid.

Operation Phase

1. Determine relevant REMI PI+ sectors.
    a. **Maryland Clean Cars Program**
        i. 623—Consumer spending (gas)
        ii. 78—Consumption reallocation
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **Maryland Clean Cars Program**
        i. New CAFE average standards for MPG[47]—29 mpg
        ii. Average MPG of NONPVEC vehicles[48]—27.05
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Maryland Clean Cars Program**
        i. Average savings per mile—1.95 gallons per mile
        ii. Average fuel price per gallon (regular unleaded)[49]—$3.63 per gallon
        iii. Total VMT Driven By Maryland Population in 2011[50]—55,600,000,000 miles
        iv. Average annual growth rate of vehicle miles traveled by MD residents[51]—1.80%
        v. Number of vehicles registered in Maryland—2,221,000
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2010-2020).
    a. **Maryland Clean Cars Program**
        i. 56,600,800,000 miles [((55,600,000,000 miles driven by MD residents in 2011 * 1.80% growth) + 55,600,000,000 miles driven in 2011=new potential total miles traveled by MD residents in 2012
        ii. 25,484 miles [(55,600,800,000 miles in 2012 / 2,221,000 vehicles registered in MD)]=Average number of miles traveled by each vehicle in Maryland in 2012
        iii. $229.96 in 2012 [(25,484 miles in 2012 / 29 miles per gallon)] * [($3.63 per gallon of regular unleaded)]—[(25,484 miles in 2012 / 27.05 miles per gallon)] * [($3.63 per gallon of regular unleaded)]=savings in gasoline by consumer in 2012 if they switched to clean cars
        iv. $83,464,686 [(($229.96 savings for those that switched to clean cars * 362,955 clean cars sold to date)]=average annual savings by clean car consumers in 2012

[47] Csere, Csaba. "How Automakers Will Meet 2016 CAFE Standards - Feature - Car and Driver." Car Reviews - 2011 Car Reviews and 2012 New Cars at Car and Driver. May 2011. Car and Driver. 11 Nov. 2011 <http://www.caranddriver.com/features/how-automakers-will-meet-2016-cafe-standards>.
[48] Bureau of Transportation Statistics, “Table 4-23: Average Fuel Efficiency of U.S. Light Duty Vehicles,” *Research and Innovative Technology Administration*, accessed October 17, 2012.
[49] Daily Fuel Gauge Report--national, state and local average prices for gasoline, diesel and E-85. 11 Nov. 2012. Oil Price Information Service (OPIS). 11 Nov. 2012 <http://fuelgaugereport.aaa.com/?redirectto=http://fuelgaugereport.opisnet.com/index.asp
[50] Maryland Department of Transportation, “Draft 2012 Implementation Play – Appendix.” *Maryland Climate Action Plan* (2011), accessed October 17, 2012.
[51] Ibid.

v. 57,619,614,400 miles [((55,600,800,000 miles driven by MD residents in 2011 * 1.80% growth) + 55,600,800,000 miles driven in 2012=new potential total miles traveled by MD residents in 2013
vi. 16,286 vehicles [(325,728 clean car vehicle goal * 5% for new registrations)]=New registrations possibly in Maryland in 2013
vii. 2,237,286 vehicles [(2,221,000 registered vehicles currently + 16,286 potentially new registrations in 2013 if 5% of new clean cars are new registrations)]=Total registered vehicles in 2013
viii. 25,754 miles [(57,619,614,400 miles in 2012 / 2,237,286 vehicles registered in MD)]=Average number of miles traveled by each vehicle in Maryland in 2013
ix. $232.39 in 2013 [(25,754 miles in 2013 / 29 miles per gallon)] * [($3.63 per gallon of regular unleaded)]—[(25,754 miles in 2013 / 27.05 miles per gallon)] * [($3.63 per gallon of regular unleaded)]=savings in gasoline by consumer in 2013 if they switched to clean cars
x. $75,697,201.95 [(($232.39 savings for those that switched to clean cars * 325,728 clean cars goal in 2013)]=Annual savings by clean car consumers in 2013
xi. $159,161,890 [($83,464,686 total savings to clean car consumers in 2012 + $75,697,201.95 total savings to clean car consumers in 2013)]=total savings from clean car consumers between 2012-2013
xii. $79,580,900 [($159,161,890 total savings between 2012-2013 clean car consumers / 2 years)]=Average annual savings from clean cars
xiii. 623—$79,580,900 average annual savings from clean cars from 2012-2020
xiv. 78—$79,580,900 average annual reallocation of savings across other consumption categories

5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.2.2 National Fuel Efficiency and Emission Standards for Medium- and Heavy-Duty Trucks

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy.
   a. **National Fuel Efficiency and Emission Standards for Medium- and Heavy-Duty Trucks**
      i. X6653—Intermediate Demand, Motor vehicle parts manufacturing
      ii. X7653—Value added (with no effect on sales or employment), Motor vehicle parts manufacturing
      iii. X7851—Production costs, Motor vehicle manufacturing
2. Determine overall cost of policy implementation for each program under the policy.

   a. **National Fuel Efficiency and Emission Standards for Medium- and Heavy-Duty Trucks**
      i. Costs from 2012-2016[52]—$170,000,000 annually

3. Distribute inputs among identified REMI PI+ sectors.
   a. **National Fuel Efficiency and Emission Standards for Medium- and Heavy-Duty Trucks**
      1. X6653—$170,000,000 annually from 2012-2016 for new parts to comply with regulation
      2. X7653—($170,000,000) annually from 2012-2016 (offset to ensure no value added since this is not from new sales but a need for technology)
      3. X7851—$170,000,000 increase in production costs to auto manufacturers that are selling a final product to comply with standards
4. Input costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
   a. **National Fuel Efficiency and Emission Standards for Medium- and Heavy-Duty Trucks**
      i. 641—Consumer Spending (gas)
      ii. 78—Consumption reallocation (across all categories)
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **National Fuel Efficiency and Emission Standards for Medium- and Heavy-Duty Trucks**
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **National Fuel Efficiency and Emission Standards for Medium- and Heavy-Duty Trucks**
      i. Total savings for MD consumers from 2020-2025—$138,906,752 (provided by MDE)
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
   a. **National Fuel Efficiency and Emission Standards for Medium- and Heavy-Duty Trucks**
      i. 641—$23,151,125 reduction in fuel consumption by MD consumers
      ii. 78—$23,151,125 reallocation of savings across other consumption categories
5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

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[52] United States Environmental Protection Agency (2011), "Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles: EPA Response to Comments Document for Join Rulemaking," accessed October 17, 2012.

3.2.3 Clean Fuel Standard

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
   a. **Clean Fuel Standard**
      i. X6653—Intermediate Demand, Motor vehicle parts manufacturing
      ii. X7653—Value added (with no effect on sales or employment), Motor vehicle parts manufacturing
      iii. X7851—Production costs, Motor vehicle manufacturing
2. Determine overall cost of policy implementation for each program under the policy.
   a. **Clean Fuel Standard**
      i. Between 2012-2016 annual costs will be about $27,780,000 to manufacturers[53]
3. Distribute inputs among identified REMI PI+ sectors.
   a. **Clean Fuel Standard**
      1. X6653—$27,780,000 annually from 2012-2016 for new parts to comply with regulation
      2. X7653—($27,780,000) annually from 2012-2016 (offset to ensure no value added since this is not from new sales but a need for technology)
      3. X7851—$27,780,0000 increase in production costs to auto manufacturers that are selling a final product to comply with standards
4. Input costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
   a. **Clean Fuel Standard**
      i. 641—Consumer Spending (gas)
      ii. 78—Consumption reallocation (across all categories)
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **Clean Fuel Standard**
      i. Average annual reduction—2.05% in fuel use
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **Clean Fuel Standard**
      i. Average fuel price per gallon (regular unleaded)[54]—$3.43 per gallon
      ii. Average Annual Miles Driven By Population[55]—13,041 miles

[53] "Clean Fuels Standard," *Northeast States for Coordinated Air Use Management*, accessed October 17, 2012.
[54] Daily Fuel Gauge Report--national, state and local average prices for gasoline, diesel and E-85. 11 Nov. 2011. Oil Price Information Service (OPIS). 11 Nov. 2011 <http://fuelgaugereport.aaa.com/?redirectto=http://fuelgaugereport.opisnet.com/index.asp>.

iii. Annual New Vehicle Registration in Maryland (2010)[56]—186,759 (total for cars and light trucks)
iv. Current CAFE standards for MPG(Light Vehicles)[57]—25.5 mpg (average)
v. Note: RESI will assume that new CAFE standards have not been implemented with year one of the policy and thus use current CAFE standards for policy analysis.

4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2020-2025).
   a. **Clean Fuel Standard**
      i. 511.41 [(13,401 average miles driven annually by MD drivers / 25.5 average miles per gallon)]=average gas consumed annually by Maryland drivers
      ii. $1,754.14 per year [(13,041 miles in one year / 25.5 miles per gallon)] * [($3.43 per gallon of regular unleaded)]=average cost to new car owners in Maryland for gasoline
      iii. 10.48 [(13,041 miles in one year / 25.5 miles per gallon)]—[(13,041 miles in one year / 25.5 miles per gallon)] * [(2.05% reduction in gallons per year of fuel due to policy)]=savings in gasoline by consumer in gallons
      iv. 500.93 [(511.41 gallons used on average a year—10.48 gallons reduced from clean fuel policy)]=average gallons used in Maryland annually under new policy
      v. $1,718.18 [(500.91 gallons used annually under new policy * $3.43 average per gallon of regular unleaded fuel)]=average annual cost to new car owners in Maryland for gasoline
      vi. $35.96 [($1,754.14 per year on gas for new car owners in Maryland without policy - $1,718.18 per year on gas for new car owners in Maryland with policy)]=annual savings from on gas from implementation of new policy annually
      vii. 641—$6,715,838.37 [(186,759 total new registrations on all light vehicles annually * $35.96 average annual savings in gas from new policy implementation)]=total average annual savings for new vehicle purchases in gas in the state of Maryland from policy
      viii. 78—$6,715,838.37 [(Reallocation of savings across all other consumption categories)]
5. Input savings/costs by sector into REMI PI+ model and run impacts.

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[55] Average Annual Miles per Driver by Age Group. 4 April 2011. U.S. Department of Transportation (USDOT), Federal Highway Administration (FHA), Office of Highway Policy Information (OHPI). Web. 11 Nov. 2011. <http://www.fhwa.dot.gov/ohim/onh00/bar8.htm>.
[56] "Maryland Auto Outlook." Www.mdauto.org. 9 Aug. 2011. Maryland Automobile Dealers Association. 11 Nov. 2011 <http://www.mdauto.org/admin/publications/AutoOutlookQuarter22011.pdf>.
[57] Csere, Csaba. "How Automakers Will Meet 2016 CAFE Standards - Feature - Car and Driver." Car Reviews - 2011 Car Reviews and 2012 New Cars at Car and Driver. May 2011. Car and Driver. 11 Nov. 2011 <http://www.caranddriver.com/features/how-automakers-will-meet-2016-cafe-standards>.

6. Export impacts and analyze.

3.2.4 Transportation and Climate Initiative

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy.
    - **a. Transportation and Climate Initiative**
        - i. 63—State Govt. Spending
2. Determine overall cost of policy implementation for each program under the policy.
    - **a. Transportation and Climate Initiative**
        - i. $15,000 annually for oversight of policy (data provided by MDE)
3. Distribute inputs among identified REMI PI+ sectors.
    - **a. Transportation and Climate Initiative**
        - i. 100% paid by government for administrative costs
4. Input costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

No additional costs or benefits have been identified for this policy.

3.2.5 Public Transportation Initiatives

Investment Phase

1. Determine relevant REMI sectors for each program under the policy.
    - **a. Locally Operated Transit Systems**
        - i. 63—State Government Spending
        - ii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
    - **b. Smart Card Implementation**
        - i. 63—State Government Spending
        - ii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
    - **c. College Pass**
        - iii. 63—State Government Spending
        - iv. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
    - **b. Charm City Circulator and Hampden Neighborhood Shuttle**
        - i. 63—State Government Spending
        - ii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
    - **c. Locally Operated Transit Systems**
        - i. 63—State Government Spending
        - ii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
    - **d. Smart Card Implementation**
        - i. 63—State Government Spending
        - ii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
    - **e. Transit Oriented Development**
        - i. 63—State Government Spending
        - ii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects

f. **Maryland Commuter Tax Credit**
    i. 63—State Government Spending
    ii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
g. **Guaranteed Ride Home**
    i. 63—State Government Spending
    ii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
h. **College Pass**
    i. 63—State Government Spending
    ii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
i. **Ride Share**
    i. 63—State Government Spending
    ii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
j. **Commuter Connections—Washington, D.C. Region**
    i. 63—State Government Spending
    ii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
k. **Baltimore Collegetown Network**
    i. 63—State Government Spending
    ii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
l. **Hunt Valley Shuttle**
    i. 63—State Government Spending
    ii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
m. **Kent Street Transit Plaza**
    i. 63—State Government Spending
    ii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
n. **University of Maryland College Park Carpool Program and Shuttle Bus Service**
    i. 63—State Government Spending
    ii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
    iii.

2. Determine overall cost of policy implementation for each program under the policy.
    a. **Charm City Circulator and Hampden Neighborhood Shuttle**
        i. $41,054,429
    b. **Locally Operated Transit Systems**
        i. $41,054,429
    c. **Smart Card Implementation**
        i. $41,054,429
    d. **Transit Oriented Development**
        i. $41,054,429
    e. **Maryland Commuter Tax Credit**
        i. $41,054,429
    f. **Guaranteed Ride Home**
        i. $41,054,429
    g. **College Pass**
        i. $41,054,429

- **h. Ride Share**
  - i. $41,054,429
- **i. Commuter Connections—Washington, D.C. Region**
  - i. $41,054,429
- **j. Baltimore Collegetown Network**
  - i. $41,054,429
- **k. Hunt Valley Shuttle**
  - i. $41,054,429
- **l. Kent Street Transit Plaza**
  - i. $41,054,429
- **m. University of Maryland College Park Carpool Program and Shuttle Bus Service**
  - i. $41,054,429

3. Distribute inputs among identified REMI sectors.
   - **a. Charm City Circulator and Hampden Neighborhood Shuttle**
     - i. 2010—$2,571,429
     - ii. 2011—$4,699,548
     - iii. 2012—$4,699,548
     - iv. 2013—$4,699,548
     - v. 2014—$4,699,548
     - vi. 2015—$4,699,548
     - vii. 2016—$4,699,548
     - viii. 2017—$2,571,429
     - ix. 2018—$2,571,429
     - x. 2019—$2,571,429
     - xi. 2020—$2,571,429
   - **b. Locally Operated Transit Systems**
     - i. 2010—$2,571,429
     - ii. 2011—$4,699,548
     - iii. 2012—$4,699,548
     - iv. 2013—$4,699,548
     - v. 2014—$4,699,548
     - vi. 2015—$4,699,548
     - vii. 2016—$4,699,548
     - viii. 2017—$2,571,429
     - ix. 2018—$2,571,429
     - x. 2019—$2,571,429
     - xi. 2020—$2,571,429
   - **c. Smart Card Implementation**
     - i. 2010—$2,571,429
     - ii. 2011—$4,699,548
     - iii. 2012—$4,699,548
     - iv. 2013—$4,699,548
     - v. 2014—$4,699,548
     - vi. 2015—$4,699,548

vii. 2016—$4,699,548
viii. 2017—$2,571,429
ix. 2018—$2,571,429
x. 2019—$2,571,429
xi. 2020—$2,571,429

d. Transit Oriented Development

i. 2010—$2,571,429
ii. 2011—$4,699,548
iii. 2012—$4,699,548
iv. 2013—$4,699,548
v. 2014—$4,699,548
vi. 2015—$4,699,548
vii. 2016—$4,699,548
viii. 2017—$2,571,429
ix. 2018—$2,571,429
x. 2019—$2,571,429
xi. 2020—$2,571,429

e. Maryland Commuter Tax Credit

i. 2010—$2,571,429
ii. 2011—$4,699,548
iii. 2012—$4,699,548
iv. 2013—$4,699,548
v. 2014—$4,699,548
vi. 2015—$4,699,548
vii. 2016—$4,699,548
viii. 2017—$2,571,429
ix. 2018—$2,571,429
x. 2019—$2,571,429
xi. 2020—$2,571,429

f. Guaranteed Ride Home

i. 2010—$2,571,429
ii. 2011—$4,699,548
iii. 2012—$4,699,548
iv. 2013—$4,699,548
v. 2014—$4,699,548
vi. 2015—$4,699,548
vii. 2016—$4,699,548
viii. 2017—$2,571,429
ix. 2018—$2,571,429
x. 2019—$2,571,429
xi. 2020—$2,571,429

g. College Pass

i. 2010—$2,571,429
ii. 2011—$4,699,548
iii. 2012—$4,699,548

iv. 2013—$4,699,548
v. 2014—$4,699,548
vi. 2015—$4,699,548
vii. 2016—$4,699,548
viii. 2017—$2,571,429
ix. 2018—$2,571,429
x. 2019—$2,571,429
xi. 2020—$2,571,429

h. Ride Share

i. 2010—$2,571,429
ii. 2011—$4,699,548
iii. 2012—$4,699,548
iv. 2013—$4,699,548
v. 2014—$4,699,548
vi. 2015—$4,699,548
vii. 2016—$4,699,548
viii. 2017—$2,571,429
ix. 2018—$2,571,429
x. 2019—$2,571,429
xi. 2020—$2,571,429

i. Commuter Connections—Washington, D.C. Region

i. 2010—$2,571,429
ii. 2011—$4,699,548
iii. 2012—$4,699,548
iv. 2013—$4,699,548
v. 2014—$4,699,548
vi. 2015—$4,699,548
vii. 2016—$4,699,548
viii. 2017—$2,571,429
ix. 2018—$2,571,429
x. 2019—$2,571,429
xi. 2020—$2,571,429

j. Baltimore Collegetown Network

i. 2010—$2,571,429
ii. 2011—$4,699,548
iii. 2012—$4,699,548
iv. 2013—$4,699,548
v. 2014—$4,699,548
vi. 2015—$4,699,548
vii. 2016—$4,699,548
viii. 2017—$2,571,429
ix. 2018—$2,571,429
x. 2019—$2,571,429
xi. 2020—$2,571,429

k. **Hunt Valley Shuttle**
   i. 2010—$2,571,429
   ii. 2011—$4,699,548
   iii. 2012—$4,699,548
   iv. 2013—$4,699,548
   v. 2014—$4,699,548
   vi. 2015—$4,699,548
   vii. 2016—$4,699,548
   viii. 2017—$2,571,429
   ix. 2018—$2,571,429
   x. 2019—$2,571,429
   xi. 2020—$2,571,429

l. **Kent Street Transit Plaza**
   i. 2010—$2,571,429
   ii. 2011—$4,699,548
   iii. 2012—$4,699,548
   iv. 2013—$4,699,548
   v. 2014—$4,699,548
   vi. 2015—$4,699,548
   vii. 2016—$4,699,548
   viii. 2017—$2,571,429
   ix. 2018—$2,571,429
   x. 2019—$2,571,429
   xi. 2020—$2,571,429

m. **University of Maryland College Park Carpool Program and Shuttle Bus Service**
   i. 2010—$2,571,429
   ii. 2011—$4,699,548
   iii. 2012—$4,699,548
   iv. 2013—$4,699,548
   v. 2014—$4,699,548
   vi. 2015—$4,699,548
   vii. 2016—$4,699,548
   viii. 2017—$2,571,429
   ix. 2018—$2,571,429
   x. 2019—$2,571,429
   xi. 2020—$2,571,429

4. Input investment by sector into REMI model and run impacts.
5. Export impacts and analyze.

Operation Phase

2. Determine relevant REMI sectors.
   a. **Charm City Circulator and Hampden Neighborhood Shuttle**
      i. 623—Consumer Spending—Gasoline and oil
      ii. 78—Consumption Reallocation—All Consumption Categories

iii. 651—Consumer Spending—Intercity bus
iv. 603—Consumer Spending—Other motor vehicles
v. 648—Consumer Spending—Auto insurance less claims paid

b. Locally Operated Transit Systems

i. 623—Consumer Spending—Gasoline and oil
ii. 78—Consumption Reallocation—All Consumption Categories
iii. 651—Consumer Spending—Intercity bus
iv. 603—Consumer Spending—Other motor vehicles
v. 648—Consumer Spending—Auto insurance less claims paid

c. Smart Card Implementation

i. 673—Consumer Spending—Bank service charges, trust services, and safe deposit box rentals
ii. 78—Consumption Reallocation—All Consumption Categories

d. Transit Oriented Development

i. 623—Consumer Spending—Gasoline and oil
ii. 78—Consumption Reallocation—All Consumption Categories

e. Maryland Commuter Tax Credit

i. 63—State Government Spending

f. Guaranteed Ride Home

i. 653—Consumer Spending—Taxicabs
ii. 78—Consumption Reallocation—All Consumption Categories
iii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects

g. College Pass

i. 623—Consumer Spending—Gasoline and oil
ii. 78—Consumption Reallocation—All Consumption Categories
iii. 651—Consumer Spending—Intercity bus

h. Ride Share

i. 623—Consumer Spending—Gasoline and oil
ii. 78—Consumption Reallocation—All Consumption Categories
iii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects

i. Commuter Connections—Washington, D.C. Region

i. 623—Consumer Spending—Gasoline and oil
ii. 78—Consumption Reallocation—All Consumption Categories

j. Baltimore Collegetown Network

i. 623—Consumer Spending—Gasoline and oil
ii. 78—Consumption Reallocation—All Consumption Categories

k. Hunt Valley Shuttle

i. 623—Consumer Spending—Gasoline and oil
ii. 78—Consumption Reallocation—All Consumption Categories

l. Kent Street Transit Plaza

i. 623—Consumer Spending—Gasoline and oil
ii. 78—Consumption Reallocation—All Consumption Categories
iii. 651—Consumer Spending—Intercity bus
iv. 648—Consumer Spending—Auto insurance less claims paid

   m. **University of Maryland College Park Carpool Program and Shuttle Bus Service**
      i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
      ii. 623—Consumer Spending—Gasoline and oil
      iii. 78—Consumption Reallocation—All Consumption Categories
      iv. 63—State Government Spending
3. Determine part of program to be affected by savings (from strategy write-up).
   a. **Charm City Circulator and Hampden Neighborhood Shuttle**
   b. **Locally Operated Transit Systems**
   c. **Smart Card Implementation**
   d. **Transit Oriented Development**
   e. **Maryland Commuter Tax Credit**
   f. **Guaranteed Ride Home**
   g. **College Pass**
   h. **Ride Share**
   i. **Commuter Connections—Washington, D.C. Region**
      i. Number using the commuter Connections Page[58]—20,000
      ii. Total Commuting to Work—20,000
   j. **Baltimore Collegetown Network**
   k. **Hunt Valley Shuttle**
   l. **Kent Street Transit Plaza**
   m. **University of Maryland College Park Carpool Program and Shuttle Bus Service**
4. Research savings data for each policy according to part of program to be affected by savings.
   a. **Charm City Circulator and Hampden Neighborhood Shuttle**
      i. **Hampden Neighborhood Shuttle**[59]
         1. Riders per Day—250
         2. Operating Days per Year—260
         3. Average Trip Length in Miles—2
         4. One Way Fare—$1.00 ($0.50 for Seniors)
         5. Reduction in CO2e in 2020 in mmt—0.0001
      ii. Charm City Circulator[60]
         1. Average Daily Ridership—11,955
      iii. Passenger Trips—69,315,249

[58] Civilian Labor Force, Employment & Unemployment by Place of Residence (LAUS) - Maryland - Division of Workforce Development and Adult Learning. Welcome to the Maryland Department of Labor, Licensing and Regulation. Maryland Department of Labor, Licensing and Regulation, 21 Oct. 2011. Web. 14 Nov. 2011. <http://www.dllr.state.md.us/lmi/laus/maryland.shtml>.
[59] O'Malley, Martin, Anthony Brown, and Beverly Swaim-Staley. Maryland Department of Transportation, "Maryland Climate Action Plan." Last modified 2012. Accessed October 2012. http://www.mdot.maryland.gov/Office of Planning and Capital Programming/Plans_Programs_Reports/Documents/Climate_Change_2011_Appendix.pdf.
[60] Baltimore City Department of Transportation, "Month of October Ridership Stats." Last modified 2012. http://www.charmcitycirculator.org/news/2012/nov/month-october-ridership-stats.

    iv. Number of Buses—698
    v. Bus Fare—1.06
    vi. Miles Traveled Annually by all Buses—22,414,441
    vii. Average Annual Passengers—2,633,760

b. **Locally Operated Transit Systems**
    i. Passenger Trips—69,315,249
    ii. Number of Buses—698
    iii. Bus Fare—$1.06

c. **Smart Card Implementation**
    i. Number of Boardings (Rail)—71,311
    ii. Number of Boardings (Bus)—231,795
    iii. Percentage Rail—75%
    iv. Percentage Bus—60%
    v. Average ATM fee—$2.40
    vi. Average Fare—$1.60

d. **Transit Oriented Development**
    i. Number of Properties—6
    ii. Potential Savings per Person—$9,087
    iii. Potential Parking—1,245.33

e. **Maryland Commuter Tax Credit**
    i. Number of Firms—18
    ii. Number of Employees—950
    iii. Average Tax Credit per Employee—$52.50

f. **Guaranteed Ride Home**
    i. Mean Cost Per Claim[61]—$36.95
    ii. Cost of Cab[62]—$161.80
    iii. Number of Commuters in Baltimore—8,650.71

g. **College Pass**
    i. Cost of Monthly Pass—$64.00
    ii. Cost to College Students—$39.00
    iii. Number of College Students in Collegetown Network—120,000
    iv. Reduction in CO2e—0.0029 mmt CO2e

h. **Ride Share**
    i. Average Daily Miles VMT[63]—$28.97
    ii. Cost of Gas—$3.61
    iii. Avg. MPG—27 mpg
    iv. Number of those employed in MD[64]—2,771,833

[61] Menczer, William B. Journal of Public Transportation. 4th ed. Vol. 10. Ser. 2007. Guaranteed Ride Home Programs. Federal Transportation Administration. Web. 14 Nov. 2011. <http://www.nctr.usf.edu/jpt/pdf/JPT%2010-4%20Menczer.pdf>.
[62] Taxi Fares in Major U.S. Cities. Schaller Consulting Home Page. Schaller Consulting, Jan. 2006. Web. 14 Nov. 2011. <http://www.schallerconsult.com/taxi/fares1.htm>.
[63] 2009 National Household Travel. National Household Travel Survey. U.S. Department of Transportation, 2009. Web. 14 Nov. 2011. <http://nhts.ornl.gov/2009/pub/stt.pdf>.

v. Reduction in CO2e—0.0207 mmt CO2e[65]

i. Commuter Connections—Washington, D.C. Region

i. Average Daily Miles VMT[66]—$28.97
ii. Cost of Gas—$3.61
iii. Avg. MPG—27

j. Baltimore Collegetown Network

i. Total Students—74,000
ii. Number of Buses—698
iii. Bus Fare—$1.06
iv. Miles traveled annually by All Buses[67]—14
v. Average Annual Passengers—74,000

k. Hunt Valley Shuttle

i. Insurance Premium—$922
ii. Travel Distance from York to Hunt Valley—37.1
iii. Avg. MPG—27
iv. Cost of Gas—$3.61
v. Time—1
vi. One Month Pass[68]—$136.00
vii. Time—2
viii. Total One Way Ridership[69]—17,333

l. Kent Street Transit Plaza

i. Cost of Monthly Pass[70]—$64
ii. Cost of Gas—$3.61
iii. Length of Track—15.5 miles
iv. Average Annual Ridership—8,650.71
v. Average Cost of Gas—$3.61
vi. Average MPG—27
vii. Annual Congestion Cost—$713
viii. Average Cost of Insurance[71]—$922

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[64] Civilian Labor Force, Employment & Unemployment by Place of Residence (LAUS) - Maryland - Division of Workforce Development and Adult Learning. Welcome to the Maryland Department of Labor, Licensing and Regulation. Maryland Department of Labor, Licensing and Regulation, 21 Oct. 2011. Web. 14 Nov. 2011. <http://www.dllr.state.md.us/lmi/laus/maryland.shtml>.

[65] O'Malley, Martin, Anthony Brown, and Beverly Swaim-Staley. Maryland Department of Transportation, "Maryland Climate Action Plan." Last modified 2012. Accessed October 2012. http://www.mdot.maryland.gov/Office of Planning and Capital Programming/Plans_Programs_Reports/Documents/Climate_Change_2011_Appendix.pdf.

[66] 2009 National Household Travel. National Household Travel Survey. U.S. Department of Transportation, 2009. Web. 14 Nov. 2011. <http://nhts.ornl.gov/2009/pub/stt.pdf>.

[67] Colleges - Miles and Minutes. 2011. Baltimore Collegetown Network. 14 Nov. 2011 <http://www.baltimorecollegetown.org/colleges/miles-and-minutes/>.

[68] RabbitEXPRESS – Fares and Accommodations. Rabbittransit - Welcome! York County Transportation Authority, 2011. Web. 14 Nov. 2011. <http://www.rabbittransit.org/express/pages/cashfarechart.html>.

[69] 2010 Annual Report. Rabbittransit-Welcome. Rabbittransit, 2011. Web. 14 Nov. 2011. <http://www.rabbittransit.org/docs/2010_Annual_Report.pdf>.

[70] Regular Fares | Maryland Transit Administration. Home | Maryland Transit Administration. Maryland Transit Administration, 14 Nov. 2011. Web. 14 Nov. 2011. <http://mta.maryland.gov/regular-fares>.

m. **University of Maryland College Park Carpool Program and Shuttle Bus Service**
   i. Number of Annual Riders[72]—2,967,164
   ii. Cost of Shuttle—$0.00
   iii. Parking Spots[73]—19,270
   iv. Number of Permits[74]—17,906
   v. Revenue from Permit Sales[75]—$8,030,897.00
   vi. Annual Citations[76]—72,546
   vii. Annual Revenue from Citations—$1,862,333.00
   viii. Total Enrollment—37,631
   ix. Total Employment—13,081
   x. Total Residing On Campus[77]—8,363
   xi. Commuter Student Permit Price—$217.00

5. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
   a. **Charm City Circulator and Hampden Neighborhood Shuttle**
      i. 65,000 [250 Daily Riders * 260 Operating Days]:=Total Rides Per Year
      ii. 651—Consumer Spending—All Categories—$48,750 [Total Rides per Year * $0.75 Fare (assume half of riders are seniors)]:=Total Fare Revenue Per Year for Hampden Shuttle from (applied from years 2010 to 2020)
      iii. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Categories—$40,582.15 [0.001 mmt CO2e * 405,821,147.4 (conversion factor[78])]:=Fuel Savings from CO2e Reduction from Hampden Shuttle
      iv. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Categories—$7,579,812.60 [11,955 Daily Riders * 365 * (1/27 Avg. MPG) * $3.61 per Gallon of Gas = Dollars of Fuel Saved by Riders of Charm City Circulator
      v. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Categories—$276,131.58 [11,955 Daily Riders * 365 *2 minutes Idle Time per Trip (saved) * 0.03164 (conversion

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[71] Auto Insurance. Insurance Information Institute. U.S. Department of Labor, Bureau of Labor Statistics; National Association of Realtors, 2011. Web. 11 Nov. 2011. <http://www.iii.org/media/facts/statsbyissue/auto/>.
[72] Departmental Mission Statement. Department of Transportation. University of Maryland, 2011. Web. 14 Nov. 2011. <http://www.transportation.umd.edu/images/about/pdfs/ANNUAL%20REPORT%20FY%2011.pdf>.
[73] Ibid.
[74] Ibid.
[75] Ibid.
[76] Ibid.
[77] Residence Halls at a Glance. Department of Resident Life | University of Maryland, College Park. Department of Resident Life | University of Maryland, College Park, 2011. Web. 14 Nov. 2011. <http://www.resnet.umd.edu/hallsatglance/>.
[78] Environmental Protection Agency, "Greenhouse Gas Equivalencies Calculator." Last modified 2012. Accessed October 2012. http://www.epa.gov/cleanenergy/energy-resources/calculator.html.

factor[79])]:=Value of Fuel Saved from Avoided Idle Time by Charm City Circulator Users

vi. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Categories—$1,981,063.05 [11,955 Daily Riders * 365 * $0.454 Non-Fuel Driving Cost Per Mile (savings)]:=Total Non-Fuel Driving Cost Savings

b. Locally Operated Transit Systems

i. 99,306 [(69,315,249 Passenger Trips / 698 Number of Buses)]=Total Average per Bus

ii. 651—Consumer Spending—Intercity bus—$5,157,928.41 [(99,306 Total Average per Bus * $1.06 Bus Fare * 49)]=Total Yearly Fare Revenue from 2010 to 2020

c. Smart Card Implementation

i. 171,146.40 [((71,311 Number of Rail Boardings * 0.75) * ($1.60 Average Fare * 2))]=Total Annual Boards (Rail/Smart Card)

ii. 445,046.40 [((231,795 Number of Bus Boardings * 0.60) * ($1.60 Average Fare * 2))]=Total Annual Boards (Bus/Smart Card)

iii. $410,751.36 [((71,311 Number of Rail Boardings * 0.75) * ($1.60 Average Fare * 2) * $2.40 Average ATM fee)]=Total Annual Boards (Rail)

iv. $1,068,111.36 [((231,795 Number of Bus Boardings * 0.60) * ($1.60 Average Fare * 2) * $2.40 Average ATM fee)]=Total Annual Boards (Bus)

v. $239,604.96 [($410,751.36 Total Annual Boards (Rail) - $171,146.40 Total Annual Boards (Rail/Smart Card))]=Annual Savings for Rail

vi. $623,064.96 [($1,068,111.36 Total Annual Boards (Bus) - $445,046.40 Total Annual Boards (Bus/Smart Card))]=Annual Savings for Bus

vii. $862,669.92 [($239,604.96 Annual Savings for Rail + $623,064.96 Annual Savings for Bus)]=Total Annual Savings

viii. 673—Consumer Spending—Bank service charges, trust services, and safe deposit box rentals, 78—Consumption Reallocation—All Consumption Categories—
$862,669.92 [($239,604.96 Annual Savings for Rail + $623,064.96 Annual Savings for Bus)]=Total Annual Savings per Year from 2010 to 2020

d. Transit Oriented Development

i. $11,316,344.00 [($9,087 Potential Savings per Person * 1,245.33 Potential Parking)]=Total Potential Savings

ii. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$11,316,344.00 [($9,087

[79] O'Malley, Martin, Anthony Brown, and Beverly Swaim-Staley. Maryland Department of Transportation, "Maryland Climate Action Plan." Last modified 2012. Accessed October 2012. http://www.mdot.maryland.gov/Office of Planning and Capital Programming/Plans_Programs_Reports/Documents/Climate_Change_2011_Appendix.pdf.

Potential Savings per Person * 1,245.33 Potential Parking)]=Total Potential Savings per Year from 2010 to 2020

e. **Maryland Commuter Tax Credit**
   i. $598,500.00 [(950 Number of Employees * 52.5 Average Tax per Employee * 12)]=Total of tax credits
   ii. 63—State Government Spending—$598,500.00 [(950 Number of Employees * 52.5 Average Tax per Employee * 12)]=Total Value of Tax Credits per Year for the years 2010 to 2020

f. **Guaranteed Ride Home**
   i. $124.85 [(%161.80 Cost of Cab - $36.95 Mean Cost Per Claim)]=Savings
   ii. $1,080,041.06 [(8650.71 Number of Commuters in Baltimore * $124.85 Savings)]=Savings to Commuters
   iii. 653—Consumer Spending—Taxicabs, 78—Consumption Reallocation—All Consumption Categories—63—State Government Spending$1,080,041.06 [(8650.71 Number of Commuters in Baltimore * $124.85 Savings)]=Savings to Commuters per Year from 2010 to 2020

g. **College Pass**
   i. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$1,176,881.33 [0.0029 mmt CO_2e * Conversion Factor[80]]= Fuel Savings to Consumers from Reduced Idling Time per Year from 2011 to 2020
   ii. 63—State Government Spending—$36,000,000 [(120,000 Number of College Students in Collegetown Network * 12 * ($64.00-$39.00) Subsidized Cost of a Monthly Pass)]=Investment in College Pass per Year from 2010 to 2020
   iii. 651—Consumer Spending—Intercity bus—$4,468,000.00 [(120,000 Number of College Students in Collegetown Network * $39.00 Cost of a College Students)]= Increase in Fare Revenue Associated With College Pass
   iv. $7,680,000.00 [(120,000 Number of College Students in Collegetown Network * $64.00 Cost of a Monthly Pass)]=Value of Monthly Passes Before Subsidy
   v. 651—Consumer Spending—Intercity—bus $4,468,000.00 [(120,000 Number of College Students in Collegetown Network * $39.00 Cost of a College Students)]=Value of Monthly Passes After Subsidy
   vi. $3,000,000.00 [($7,680,000.00 - $4,468,000.00)]=Total Monthly Value of Subsidy
   vii. 78—Consumption Reallocation—All Consumption Categories—$36,000,000 [($7,680,000.00 - $4,468,000.00)*12]=Yearly Value of Subsidy from 2011 to 2020

[80] Environmental Protection Agency, "Greenhouse Gas Equivalencies Calculator." Last modified 2012. Accessed October 2012. http://www.epa.gov/cleanenergy/energy-resources/calculator.html.

h. Ride Share

i. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$24,552,178.61 [0.0605 mmt CO2e * Conversion Factor] = Fuel Savings from CO2e Reduction in 2020
ii. 63—State Government Spending—$720,833.33 [$4,324,999.98 Total Cost of Implementation in Operations Phase]=Yearly Cost of Implementation from 2011 to 2016

i. Commuter Connections—Washington, D.C. Region

i. 1.07 [(28.97 Average Daily Miles VMT / 27 Avg. MPG)]=Gallons Used Daily
ii. $3.86 [(1.07 Gallons Used Daily * $3.61 Cost of Gas)]=Price to Travel Daily
iii. $77,205.85 [(20,000 Total Commuting to Work * $3.86 Price to Travel Daily)]=Total Cost to Those Commuting by Car
iv. $38,602.93 [($77,205.85 Total Cost to Those Commuting by Car / 2)]=Price of Gas per Car, if carpooling 2 to a car
v. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$38,602.93 [($77,205.85 Total Cost to Those Commuting by Car - $38,602.93 Price of Gas per Car, if carpooling 2 to a car)]=Savings per Year from 2010 to 2020

j. Baltimore Collegetown Network

i. 106 [(74,000 Total Students / 698 Number of Buses)]=Total Average per Bus
ii. $5,506.53 [(106 Total Average per Bus * $1.06 Bus Fare * 49)]=Total Average Bus Fare
iii. 4,140 [((14 Miles traveled annually by All Buses * 2) * 150)]=Average Miles Traveled by all Buses
iv. 153 [(4,140 Average Miles Traveled by all Buses / 27)]=Average Gallons Used
v. $553.26 [(153 Average Gallons Used * $3.61)]=Average Cost of Sedan
vi. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$40,941,240 [(74,000 Average Annual Passengers * 526 Average Cost of Sedan)]=Average Savings to College Students

k. Hunt Valley Shuttle

i. $2.75 [((37.1 Travel Distance from York to Hunt Valley * 2) / 27 Avg. MPG)]=Total Cost on Trip Up and Back
ii. $9.43 [($2.75 Total Cost on Trip Up and Back * $3.61 Cost of Gas)]=Total Cost on Trip
iii. $4,296.56 [(($9.43 Total Cost on Trip * (365 - 7)) + $922 Insurance Premium)]=Annual Cost to Travel by Car
iv. 7.25 [((2—1) * 7.25)]=Time Value
v. $4,227.50 [((136 * 12 months) + (7.25 Time Value * (365—7))]=Annual Cost to Travel by Bus

vi. $69.06 [($4,296.56 Annual Cost to Travel by Car - $4,227.50 Annual Cost to Travel by Bus)]=Savings
vii. 34,666 [(17,333 Total One Way Ridership * 2)]=Both Way Assumption
viii. 11,555.33 [(34,666 Both Way Assumption / 3)]=Three Routes
ix. 11,555.33 [(34,666 Both Way Assumption / 3)]=Avg. Rider for 83S Route
x. $798,023.30 [(11,555.33 Avg. Rider for 83S Route * $69.06 Savings)]=Total Savings
xi. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$829,911.87 [(11,555.33 Avg. Rider for 83S Route * $69.06 Savings)]=Total Savings

l. Kent Street Transit Plaza

i. $768 [($64 Cost of a Monthly Pass * 12)]=Cost of a Pass for a Year
i. 651—Consumer Spending—Intercity bus—$6,643,745.28 [($768 Cost of a Pass for a Year * 8,650.71 Riders per Year)]=Total Fare Spending per Year from 2010 to 2020
ii. 617.91 [(8,650.71 Average Annual Ridership / 14)]=Per Station
iii. 0.57 [(15.5 Length of Track / 27 Average MPG)]=Average Gallons Needed to Travel per Day
iv. $751.06 [((0.57 Average Gallons Needed to Travel per Day * $3.61 Average Cost of Gas) * 365)]=Average Cost of Gas a Year
v. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$464,087.79 [($751.06 * 617.91)]=Total Value of Fuel Savings per Year from 2010 to 2020
vi. 648—Consumer Spending—Auto insurance less claims paid, 78—Consumption Reallocation—All Consumption Categories—$569,713.02 [(617.91 Riders * $922 Average Cost of Insurance)]=Cost to Travel Annual from 2010 to 2020

m. University of Maryland College Park Carpool Program and Shuttle Bus Service

i. $448.50 [($8,030,897.00 Revenue from Permit Sales / 17,906 Number of Permits)]=Avg. Cost of Permit
ii. $25.67 [($1,862,333.00 Annual Revenue from Citations / 72,546 Annual Citations)]=Avg. Cost of Citation
iii. $474.17 [($448.50 Avg. Cost of Permit + $25.67 Avg. Cost of Citation)]=Avg. Cost to Drive to Campus
iv. 50,712 [(37,631 Total Enrollment + 13,081 Total Employment)]=Total Population
v. 30,907.96 [(((2,967,164 / 12 months) / 4 weeks) / 2 times a day)]=Total Riding Shuttle
vi. 19,804.04 [(50,712 Total Population - 30,907.96 Total Riding Shuttle)]=Total Not Riding Shuttle
vii. 29,268 [(8,363 Total Residing On Campus—37,631 Total Enrollment)]=Total Not On Campus
viii. 42,349 [(29,268 Total Not On Campus + 13,081 Total Employment)]=People Commuting

ix. 24,443 [(42,349 People Commuting—17,906 Total Permit Holders)]=Non Permit Holders
x. $5.42 [(132,455 / 24,443 Non Permit Holders)]=Total Meter Costs Per Non Holder
xi. $76.19 [($1,862,333 Annual Revenue from Citations / 24,443 Non Permit Holders)]=Citation Costs Per Non Holder
xii. $32.27 [($788,824 / 24,443 Non Permit Holders)]=Affiliate Costs for Non Permit
xiii. $113.88 [($5.42 Total Meter Costs Per Non Holder + $76.19 Citation Costs Per Non Holder + $32.27 Affiliate Costs for Non Permit)]=Total Possible Cost to Non Permit Holder
xiv. $6,351,156.00 [($217 Commuter Student Permit Price * 29,268 Total Not on Campus)]=Total Cost to Commute
xv. $3,175,578.00 [($6,351,156.00 Total Cost to Commute / 2)]=If Commuter Students Carpool, 2 to each car
xvi. 623—Consumer Spending—Gasoline and oil, 603—Consumer Spending—Other motor vehicles—$3,175,578.00 [($6,351,156.00 Total Cost to Commute - $3,175,578.00 If Commuter Students Carpool, 2 to each car)]=Savings
xvii. 623—Consumer Spending—Gasoline and oil—78—Consumption Reallocation—All Consumption Categories—$73,562.96 [42,349 Commuters * 0.5 (result of carpooling) * 13 Avg. Commute Miles * 2 Ways * (1/27 Avg. MPG) * $3.61]:= Value of Gasoline Savings to Commuters per Year from 2010 to 2020

6. Input savings by sector into REMI model and run impacts.
7. Export impacts and analyze.

3.2.6 Initiatives to Double Ridership by 2020

Investment Phase

1. Determine relevant REMI sectors for each program under the policy.
   a. **MARC East Baltimore Station**
      i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
   b. **Expanded Transit (Purple Line, Corridor Cities Transitway, Red Line)**
      i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
   c. **MARC Growth and Investment Plan**
      i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
2. Determine overall cost of policy implementation for each program under the policy.
   a. **MARC East Baltimore Station**
      i. $11,974,417 per year from 2015—2020
   b. **Expanded Transit (Purple Line, Corridor Cities Transitway, Red Line)**
      i. $290,900,000 per Year from 2011 - 2020

- c. **MARC Growth and Investment Plan**
  - i. $82,750,000 per year (2012-2020)
3. Input investment by sector into REMI model and run impacts.
4. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI sectors.
   - a. **MARC East Baltimore**
     - i. 652—Intercity Mass Transit
     - ii. 648—Consumer Spending—Auto insurance less claims paid
     - iii. 603—Consumer Spending—Other motor vehicles
     - iv. 78—Consumption Reallocation—All Consumption Categories
   - b. **Expanded Transit (Purple Line, Corridor Cities Transitway, Red Line)**
     - i. 652—Intercity Mass Transit
     - ii. 648—Consumer Spending—Auto insurance less claims paid
     - iii. 603—Consumer Spending—Other motor vehicles
     - iv. 78—Consumption Reallocation—All Consumption Categories
   - c. **MARC Growth and Investment Plan**
     - i. 652—Intercity Mass Transit
     - ii. 648—Consumer Spending—Auto insurance less claims paid
     - iii. 603—Consumer Spending—Other motor vehicles
     - iv. 78—Consumption Reallocation—All Consumption Categories
2. Determine part of program to be affected by savings (from strategy write-up).
   - a. **MARC East Baltimore Station**
   - b. **Expanded Transit (Purple Line, Corridor Cities Transitway, Red Line)**
   - c. **MARC Growth and Investment Plan**
3. Research savings data for each policy according to part of program to be affected by savings.
   - a. **MARC East Baltimore Station**
     - i. Number of Annual Passengers on Metro[81]—8,095,577
     - ii. Number of Stations[82]—40
     - iii. Average Cost of Gas—$3.61
     - iv. Average Annual Miles Traveled—774,575,600
     - v. Average Miles Per Gallon of Sedan—27
     - vi. Average Cost of Monthly MARC Pass—$349.00
   - b. **Expanded Transit (Purple Line, Corridor Cities Transitway, Red Line)**
     - i. Cost of Daily Pass[83]—$3.50
     - ii. Cost of gas—$3.61

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[81] National Transit Information. National Transit Database. National Transit Database, 2011. Web. 14 Nov. 2011. <http://www.ntdprogram.gov/ntdprogram/cs?action=showRegionAgencies&region=3>.

[82] MARC Station Information | Maryland Transit Administration. Home | Maryland Transit Administration. Maryland Transit Administration, 14 Nov. 2011. Web. 14 Nov. 2011. <http://mta.maryland.gov/marc-station-information>.

[83] Regular Fares | Maryland Transit Administration. Home | Maryland Transit Administration. Maryland Transit Administration, 14 Nov. 2011. Web. 14 Nov. 2011. <http://mta.maryland.gov/regular-fares>.

iii. Length of Track—15.5
iv. Average Annual Ridership—8,650.71
v. Average cost of gas—$3.61
vi. Average MPG—27
vii. Annual Congestion Cost—713
viii. Average Cost of Insurance[84]—922
ix. Red Line Weekly Ridership in 2030—57,000
x. Purple Line Annual Net Boardings in 2030—16,500,000

c. **MARC Growth and Investment Plan**
i. Number of Annual Passengers—8,095,577
ii. Number of Stations—40
iii. Added by 2035[85]—130,000
iv. Current Seats[86]—27,000
v. Miles Travel Annually—774,575,600
vi. Cost of Gas—$3.61
vii. Average Per MPG—27
viii. Cost of Monthly Pass—$349.00

4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).

a. **Expanded Transit (Purple Line, Corridor Cities Transitway, Red Line)**
i. 652—Intercity Mass Transit– $25,467,681.50 [$22,376,891.33 Net Fare Revenue per Year for Red Line[87] from 2020—2025 + $3,090,790.17 Net Fare Revenue per Year for Purple Line[88] from 2020—2025]=Total Net Increase in Fare Revenue per Year 2020—2025
ii. $3,090,790.17[(45,851.65 Rides per Week in 2020 * $3.61 Gas Price * 13 Average Miles per Vehicle Trip) / (1.34 Average Passengers per Trip * 27 Average Miles per Gallon for Sedan)]=Value of Fuel Saved by Purple Line Riders in 2020 (note: riders increase by 21,285 per year until 20205)
iii. $4,143,935.03 [61,475 Riders per Week in 2020 * $3.61 Gas Price * 13 Average Miles per Vehicle Trip) / (1.34 Average Passengers per Trip * 27 Average Miles per Gallon for Sedan)]=Value of Fuel Saved by Red Line Riders in 2020
iv. $29,744,122.36 [441,251 Riders per Week in 202011 * $3.61 Gas Price * 13 Average Miles per Vehicle Trip) / (1.34 Average Passengers per Trip *

[84] Auto Insurance. Insurance Information Institute. U.S. Department of Labor, Bureau of Labor Statistics; National Association of Realtors, 2011. Web. 11 Nov. 2011. <http://www.iii.org/media/facts/statsbyissue/auto/>.
[85] MARC Growth and Investment Plan. Maryland Transit Administration. Maryland Transit Administration, Sept. 2007. Web. 14 Nov. 2011. <http://mta.maryland.gov/sites/default/files/marcplanfull.pdf>.
[86] Ibid.
[87] Maryland Transit Administration, "Red Line Financial Plan Synopsis." Last modified 2012. Accessed October 2012.http://www.baltimoreredline.com/images/stories/redline_documents/preliminary_engineering/04_financial_plan/01_Financial_Plan_Synopsis.pdf.
[88] Maryland Transit Administration, "Purple Line Financial Plan." Last modified 2012. Accessed October 2012. http://dlslibrary.state.md.us/publications/JCR/2010/2010_61(PL).pdf.

27 Average Miles per Gallon for Sedan)]=Value of Fuel Saved by MARC Riders in 2020

v. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$36,978,847.56 [$3,090,790.17 Purple Line Fuel Savings + $4,143,935.03 Red Line Fuel Savings + $29,744,122.36 MARC Growth and Investment Plan]=Total Fuel Savings in 2020

vi. 648—Consumer Spending—Auto insurance less claims paid, 78—Consumption Reallocation—All Consumption Categories—$7,039,894.07 [(45,851.65 Rides per Week in 2020 * 13 Average Miles per Vehicle Trip * 52 Weeks * $0.23 Insurance Cost per Mile[89]) / (1.34 Average Passengers per Trip)=Value of Insurance Saved by Purple Line Riders in 2020 (note: riders increase by 21,285 per year until 2025)

vii. 648—Consumer Spending—Auto insurance less claims paid, 78—Consumption Reallocation—All Consumption Categories—$5,250,766.53 [(61,475 Rides per Week in 2020 * 13 Average Miles per Vehicle Trip * 52 Weeks * $0.23 Insurance Cost per Mile[90]) / (1.34 Average Passengers per Trip)=Value of Insurance Saved by Red Line Riders in 2020

viii. 648—Consumer Spending—Auto insurance less claims paid, 78—Consumption Reallocation—All Consumption Categories—$50,531,198.49 [(441,251 Rides per Week in 2011 * 13 Average Miles per Vehicle Trip * 52 Weeks * $0.23 Insurance Cost per Mile[91]) / (1.34 Average Passengers per Trip)=Value of Insurance Saved by MARC Riders in 2011

ix. 603—Consumer Spending—Other motor vehicles, 78—Consumption Reallocation—All Consumption Categories—$7,039,894.07 [(45,851.65 Rides per Week in 2020 * 13 Average Miles per Vehicle Trip * 52 Weeks * $0.23 Insurance Cost per Mile[92]) / (1.34 Average Passengers per Trip)=Value of Driving (Less Insurance and Fuel) Saved by Purple Line Riders in 2020 (note: riders increase by 21,285 per year until 2025)

x. 603—Consumer Spending—Other motor vehicles, 78—Consumption Reallocation—All Consumption Categories—$5,250,766.53 [(61,475 Rides per Week in 2020 * 13 Average Miles per Vehicle Trip * 52 Weeks * $0.23 Driving (Less Insurance and Fuel) Cost per Mile[93]) / (1.34 Average Passengers per Trip)=Value of Driving (Less Insurance and Fuel) Saved by Red Line Riders in 2020

xi. 603—Consumer Spending—Other motor vehicles, 78—Consumption Reallocation—All Consumption Categories—$50,531,198.49 [(441,251 Rides per Week in 2011 * 13 Average Miles per Vehicle Trip * 52 Weeks

[89] AAA Association Communication, "Your Driving Costs." Last modified 2012. Accessed October 2012. http://newsroom.aaa.com/wp-content/uploads/2012/04/YourDrivingCosts2012.pdf.
[90] Ibid.
[91] Ibid.
[92] Ibid.
[93] Ibid.

* $0.23 Driving (Less Insurance and Fuel) Cost per Mile[94]) / (1.34 Average Passengers per Trip)=Value of Driving (Less Insurance and Fuel) Saved by MARC Riders in 2011

5. Input savings by sector into REMI model and run impacts.
6. Export impacts and analyze.

3.2.7 Intercity Transportation Initiatives

Investment Phase

1. Determine relevant REMI sectors for each program under the policy.
   a. **MARC Station Parking Enhancements**
      i. 63—State Government Spending
      ii. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
   b. **Refurbishing MARC and Other Rail Vehicles**
      i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
   c. **Update on Maryland High Speed Rail**
      i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
2. Determine overall cost of policy implementation for each program under the policy.
   a. **MARC Station Parking Enhancements**
      i. 63—$4,385,158.50 in 2011
      ii. 68—$4,385,158.50 in 2011
      iii. 63—$4,530,541.50 per year 2012-2013
      iv. 68—$4,530,541.50 per year 2012-2013
      v. 63—$3,717,625 in 2014
      vi. 68—$3,717,625 in 2014
      vii. 63—$3,572,541.50 in 2014-2015
      viii. 68—$3,572,541.50 per year 2015-2016
   b. **Refurbishing MARC and Other Rail Vehicles**
      i. 63—$4,385,158.50 in 2011
      ii. 68—$4,385,158.50 in 2011
      iii. 63—$4,530,541.50 per year 2012-2013
      iv. 68—$4,530,541.50 per year 2012-2013
      v. 63—$3,717,625 in 2014
      vi. 68—$3,717,625 in 2014
      vii. 63—$3,572,541.50 in 2014-2015
      viii. 68—$3,572,541.50 per year 2015-2016
   c. **Update on Maryland High Speed Rail**
      i. No funding specified
3. Input investment by sector into REMI model and run impacts.
4. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI sectors.

[94] AAA Association Communication, "Your Driving Costs." Last modified 2012. Accessed October 2012. http://newsroom.aaa.com/wp-content/uploads/2012/04/YourDrivingCosts2012.pdf.

- **a. MARC Station Parking Enhancements**
  - i. 652—Intercity Mass Transit
  - ii. 623—Consumer Spending—Gasoline and oil
  - iii. 648—Consumer Spending—Auto insurance less claims paid
  - **iv.** 603—Consumer Spending—Other motor vehicles
- **b. Refurbishing MARC and Other Rail Vehicles**
  - i. 652—Intercity Mass Transit
  - ii. 623—Consumer Spending—Gasoline and oil
  - iii. 648—Consumer Spending—Auto insurance less claims paid
  - iv. 603—Consumer Spending—Other motor vehicles
- **c. Update on Maryland High Speed Rail**
  - i. 652—Intercity Mass Transit

2. Determine part of program to be affected by savings (from strategy write-up).
   - **a. MARC Station Parking Enhancements**
     - i. Phase I—428 new parking spaces
     - ii. Odenton station feasibility study—2,500 additional parking spaces
   - **b. Refurbishing MARC and Other Rail Vehicles**
     - i. 23 cars scheduled to be overhauled between FY 2005 and FY 2012
   - **c. Update on Maryland High Speed Rail**
     - i. $9.4 million allocation to MDOT for high-speed stimulus to complete environmental and engineering work to replace BWI Station as of Sept. 2010
3. Research savings data for each policy according to part of program to be affected by savings.
   - **a. MARC Station Parking Enhancements**
     - i. Average cost of monthly MARC pass[95]—$349/month (Transit Link Card)
     - ii. Average cost savings of using public transit[96]—$9,383/year for Baltimore City
     - iii. Average cost of MARC station parking[97]—$6.39/day average (between 7 stations and not including outliers)
     - iv. Note about Transit Link Card data use: A Monthly Transit Link pass is used in the calculations of all rail passes. Often users of the MARC system traveling in and around the metropolitan region of Maryland/Washington, D.C. will wish to visit areas within the city which are accessible through walking or easy-to-navigate light rail systems. Instead of purchasing separate fares for each point of travel, most individuals prefer having one card designated for travel within the region. The cost benefit ranges from easy parking to less time spent searching for dollars to pay for extra fare

[95] MARC Train Service Order Form. CommuterDirect.com®. 2011. MARC. 14 Nov. 2011 <https://www.commuterpage.com/orderforms/transitorders_v3.cfm?sysid=12>.
[96] "Riding Public Transit Saves Individuals $9,242 Annually." APTA Homepage. 1 Dec. 2010. American Public Transportation Association (APTA). 14 Nov. 2011 <http://www.apta.com/mediacenter/pressreleases/2010/Pages/100112_Transit_Savings.aspx>.
[97] MARC Parking Details | Maryland Transit Administration. Home | Maryland Transit Administration. Nov. 2011. Maryland Transit Administration (MTA). 14 Nov. 2011 <http://mta.maryland.gov/marc-parking-details>.

cards or to add value to existing fare cards. The average cost of monthly fares for MARC has been calculated using the transit link pass over a span of stations from Aberdeen to Washington, D.C.

b. Refurbishing MARC and Other Rail Vehicles

i. Average cost of monthly MARC pass[98]—$349/month (Transit Link Card)

ii. Capacity of MARC train cars (single-level and bi-level)[99]—121 seats (average)

iii. Note about Transit Link Card data use: A Monthly Transit Link pass is used in the calculations of all rail passes. Often users of the MARC system traveling in and around the metropolitan region of Maryland/Washington, D.C. will wish to visit areas within the city which are accessible through walking or easy-to-navigate light rail systems. Instead of purchasing separate fares for each point of travel, most individuals prefer having one card designated for travel within the region. The cost benefit ranges from easy parking to less time spent searching for dollars to pay for extra fare cards or to add value to existing fare cards. The average cost of monthly fares for MARC has been calculated using the transit link pass over a span of stations from Aberdeen to Washington, D.C.

c. Update on Maryland High Speed Rail

i. Average cost of monthly MARC pass for BWI Rail Station between stations for Baltimore City and Washington, D.C[100].—$227/month (Transit Link Card)

ii. Number of parking spots at BWI Rail Station[101]—3,187 spots

iii. Cost of MARC station parking at BWI Rail Station[102]—$9/day

iv. Cost of BWI Garage (daily)[103]—$12/day

v. Note about Transit Link Card data use: A Monthly Transit Link pass is used in the calculations of all rail passes. Often users of the MARC system traveling in and around the metropolitan region of Maryland/Washington, D.C. will wish to visit areas within the city which are accessible through walking or easy-to-navigate light rail systems. Instead of purchasing separate fares for each point of travel, most individuals prefer having one card designated for travel within the region. The cost benefit ranges from easy parking to less time spent searching for dollars to pay for extra fare cards or to add value to existing fare cards. The average cost of fare for the

[98] MARC Train Service Order Form. CommuterDirect.com®. 2011. MARC. 14 Nov. 2011 <https://www.commuterpage.com/orderforms/transitorders_v3.cfm?sysid=12>.
[99] Dresser, Michael. "New cars may ease MARC crowding - Baltimore Sun." Featured Articles From The Baltimore Sun. 20 Aug. 2008. The Baltimore Sun. 14 Nov. 2011 <http://articles.baltimoresun.com/2008-08-20/news/0808190131_1_marc-new-cars-passenger-cars>.
[100] MARC Train Service Order Form. CommuterDirect.com®. 2011. MARC. 14 Nov. 2011 <https://www.commuterpage.com/orderforms/transitorders_v3.cfm?sysid=12>.
[101] MARC Parking Details | Maryland Transit Administration. Home | Maryland Transit Administration. Nov. 2011. Maryland Transit Administration (MTA). 14 Nov. 2011 <http://mta.maryland.gov/marc-parking-details>.
[102] Ibid.
[103] Parking. Baltimore Washington International Thurgood Marshall Airport. 11 Nov. 2011. < http://www.bwiairport.com/en/parking/information-rates/daily-garage>.

BWI Rail Station has been calculated under the assumption that most tourists will travel from BWI to Baltimore and BWI to Washington, D.C.

4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
   a. **MARC Station Parking Enhancements**
      i. 652—Intercity Mass Transit—$12,262,464 [(428 new Phase I parking spots + 2,500 new Odenton parking spots (assume 1 vehicle parked per day) * $349/month (assume all buy monthly pass) * 12 months)]
      ii. 652–Intercity Mass Transit–$6,829,120.80 [((2,500 new Odenton parking spots + 428 Phase I parking spots)(assume 1 vehicle parked per day) * $6.39/day on average (assume all park at station garage) * 365 days)]=annual increase in revenue
      iii. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$3,712,871.82 [(2,928 Passengers * 2 minutes idle per trip * 2 trips per Day * 365 trips per year * $0.032 conversion to $)]=Value of Fuel Saved per Year by Passengers
      iv. 648—Consumer Spending—Auto insurance less claims paid, 78—Consumption Reallocation—All Consumption Categories $6,307,585.44 [((2,928 passengers * 365 days * 2 trips * 13 miles)/1.34 average persons per vehicle trip) * $0.304 Insurance per Mile]=Value of Insurance Saved by Passengers per Year from 2015—2020
      v. 603—Consumer Spending—Other motor vehicles, 78—Consumption Reallocation—All Consumption Categories $6,307,585.44 [((2,928 passengers * 365 days * 2 trips * 13 miles)/1.34 average persons per vehicle trip) * $0.304 driving cost per mile less insurance less fuel]=Value of Driving Cost (less fuel less insurance) Saved by Passengers per Year from 2015—2020
   b. **Refurbishing MARC and Other Rail Vehicles**
      i. 652—Intercity Mass Transit—$11,655,204 [(23 cars refurbished (assume still in use in addition to newer cars) * 121 seats per car on average * $349/month (assume all buy monthly pass) * 12 months]=annual increase in revenue per year from 2010—2020
   c. **Update on Maryland High Speed Rail**
      i. 652—Intercity Mass Transit—$16,138,968 [(3,187 spots at BWI Rail Station (assume 1 vehicle parked per day) * $227/month (assume all buy monthly pass) * 12 months)] + [(3,187 spots at BWI Rail Station (assume 1 vehicle parked per day) * $9/day (assume all park at station) * 260 days)] = annual increase in revenue
      ii. 652—Intercity Mass Transit—$2,485,860 (3,187 spots at BWI Rail Station (assume 1 vehicle parked per day) *$3/day savings (comparing $12/day and $9/day parking fees) * 260 days = annual savings for riders)
5. Input savings by sector into REMI model and run impacts.
6. Export impacts and analyze.

3.2.8 Bike and Pedestrian Initiatives

Investment Phase

1. Determine relevant REMI sectors for each program under the policy.
   - **a. Bicycle/Pedestrian Enhancements**
     - i. 68—Government Spending Non-Pecuniary (Amenity)
   - **b. Bike Racks on Buses, MARC, Subway, Light Rail**
     - i. 68—Government Spending Non-Pecuniary (Amenity)
   - **c. Construction of Bike Lanes and Bike Paths**
     - i. 68—Government Spending Non-Pecuniary (Amenity)
   - **d. East Coast Greenway**
     - i. 68—Government Spending Non-Pecuniary (Amenity)
   - **e. Bike Stations**
     - i. 68—Government Spending Non-Pecuniary (Amenity)
   - **f. Bike Rentals**
     - i. 68—Government Spending Non-Pecuniary (Amenity)
   - **g. Bike Racks**
     - i. 68—Government Spending Non-Pecuniary (Amenity)
2. Determine overall cost of policy implementation for each program under the policy.
   - **a. Bicycle/Pedestrian Enhancements**
     - ii. $19,168,800 per year 2012-2016
   - **h. Bike Racks on Buses, MARC, Subway, Light Rail**
     - *i. No funding specified*
   - **i. Construction of Bike Lanes and Bike Paths**
     - *i. No funding specified*
   - **j. East Coast Greenway**
     - *i. No funding specified*
   - **k. Bike Stations**
     - i. $32,081,600 in 2011
     - ii. $26,787,930 per year 2012-2013
     - iii. $24,743,270 in 2014
     - iv. $23,201,600 in 2015
     - v. $20,455,130 in 2016
     - vi. $18,605,800 per year 2017-2020
   - **l. Bike Rentals**
     - i. $32,081,600 in 2011
     - ii. $26,787,930 per year 2012-2013
     - iii. $24,743,270 in 2014
     - iv. $23,201,600 in 2015
     - v. $20,455,130 in 2016
     - vi. $18,605,800 per year 2017-2020
   - **m. Bike Racks**
     - i. $32,081,600 in 2011
     - ii. $26,787,930 per year 2012-2013
     - iii. $24,743,270 in 2014
     - iv. $23,201,600 in 2015

v. $20,455,130 in 2016
vi. $18,605,800 per year 2017-2020

3. Input investment by sector into REMI model and run impacts.
4. Export impacts and analyze.

Operation Phase

2. Determine relevant REMI sectors.
   a. **Bicycle/Pedestrian Enhancements**
      i. 623—Consumer Spending—Gasoline and Oil
      ii. 78—Consumption Reallocation—All Consumption Categories
   b. **Bike Racks on Buses, MARC, Subway, Light Rail**
      i. 623—Consumer Spending—Gasoline and Oil
      ii. 78—Consumption Reallocation—All Consumption Categories
   c. **Construction of Bike Lanes and Bike Paths**
      i. 623—Consumer Spending—Gasoline and Oil
      ii. 78—Consumption Reallocation—All Consumption Categories
   d. **East Coast Greenway**
      i. 623—Consumer Spending—Gasoline and Oil
      ii. 78—Consumption Reallocation—All Consumption Categories
   e. **Bike Stations**
      i. 623—Consumer Spending—Gasoline and Oil
      ii. 78—Consumption Reallocation—All Consumption Categories
   f. **Bike Rentals**
      i. 623—Consumer Spending—Gasoline and Oil
      ii. 78—Consumption Reallocation—All Consumption Categories
   g. **Bike Racks**
      i. 623—Consumer Spending—Gasoline and Oil
      ii. 78—Consumption Reallocation—All Consumption Categories
3. Determine part of program to be affected by savings (from strategy write-up)[104].
   a. **Bicycle/Pedestrian Enhancements**
      i. Total reduction achieved by 2020—57.14 metric tons of Co2
      ii. Annual reduction over 10 years (2011—2020)—5.71 metric tons of Co2
   b. **Bike Racks on Buses, MARC, Subway, Light Rail**
      i. Total reduction achieved by 2020—57.14 metric tons of Co2
      ii. Annual reduction over 10 years (2011—2020)—5.71 metric tons of Co2
   c. **Construction of Bike Lanes and Bike Paths**
      i. Total reduction achieved by 2020—57.14 metric tons of Co2
      ii. Annual reduction over 10 years (2011—2020)—5.71 metric tons of Co2
   d. **East Coast Greenway**
      i. Total reduction achieved by 2020—57.14 metric tons of Co2

[104] O'Malley, Martin, Anthony Brown, and Beverly Swaim-Staley. Maryland Department of Transportation, "Maryland Climate Action Plan." Last modified 2012. Accessed October 2012. http://www.mdot.maryland.gov/Office of Planning and Capital Programming/Plans_Programs_Reports/Documents/Climate_Change_2011_Appendix.pdf.

   ii. Annual reduction over 10 years (2011—2020)—5.71 metric tons of Co2

   e. Bike Stations
   i. Total reduction achieved by 2020—57.14 metric tons of Co2
   ii. Annual reduction over 10 years (2011—2020)—5.71 metric tons of Co2

   f. Bike Rentals
   i. Total reduction achieved by 2020—57.14 metric tons of Co2
   ii. Annual reduction over 10 years (2011—2020)—5.71 metric tons of Co2

   g. Bike Racks
   i. Total reduction achieved by 2020—57.14 metric tons of Co2
   ii. Annual reduction over 10 years (2011—2020)—5.71 metric tons of Co2

4. Research savings data for each policy according to part of program to be affected by savings.
5. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).

   a. Bicycle/Pedestrian Enhancements
   i. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$16,232.85 [(400 metric tons CO2 * (1/1,000,000) * $405,821,147 Conversion[105] to $ Fuel)/10]=Value of Fuel Use Reductions in 2011 (note: Value of Fuel Use Reduction incrementally increases by $16,232.85 per year until $162,328 in 2020)

   b. Bike Racks on Buses, MARC, Subway, Light Rail
   i. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$16,232.85 [(400 metric tons CO2 * (1/1,000,000) * $405,821,147 Conversion to $ Fuel)/10]=Value of Fuel Use Reductions in 2011 (note: Value of Fuel Use Reduction incrementally increases by $16,232.85 per year until $162,328 in 2020)

   c. **Construction of Bike Lanes and Bike Paths**
   i. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$16,232.85 [(400 metric tons CO2 * (1/1,000,000) * $405,821,147 Conversion to $ Fuel)/10]=Value of Fuel Use Reductions in 2011 (note: Value of Fuel Use Reduction incrementally increases by $16,232.85 per year until $162,328 in 2020)

   d. East Coast Greenway
   i. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$16,232.85 [(400 metric tons CO2 * (1/1,000,000) * $405,821,147 Conversion to $ Fuel)/10]=Value of Fuel Use Reductions in 2011 (note: Value of Fuel Use

[105] All Conversions : Environmental Protection Agency, "Greenhouse Gas Equivalencies Calculator." Last modified 2012. Accessed October 2012. http://www.epa.gov/cleanenergy/energy-resources/calculator.html.

Reduction incrementally increases by $16,232.85 per year until $162,328 in 2020)

   e. **Bike Stations**
      i. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$16,232.85 [(400 metric tons CO2 * (1/1,000,000) * $405,821,147 Conversion to $ Fuel)/10]=Value of Fuel Use Reductions in 2011 (note: Value of Fuel Use Reduction incrementally increases by $16,232.85 per year until $162,328 in 2020)
   f. **Bike Rentals**
      i. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$16,232.85 [(400 metric tons CO2 * (1/1,000,000) * $405,821,147 Conversion to $ Fuel)/10]=Value of Fuel Use Reductions in 2011 (note: Value of Fuel Use Reduction incrementally increases by $16,232.85 per year until $162,328 in 2020)
   g. **Bike Racks**
      i. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$16,232.85 [(400 metric tons CO2 * (1/1,000,000) * $405,821,147 Conversion to $ Fuel)/10]=Value of Fuel Use Reductions in 2011 (note: Value of Fuel Use Reduction incrementally increases by $16,232.85 per year until $162,328 in 2020)

6. Input savings by sector into REMI model and run impacts.
7. Export impacts and analyze.

3.2.9 Pricing Initiatives

Investment Phase

1. Determine relevant REMI sectors for each program under the policy.
   a. **Electronic Toll Collection**
      i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
   b. **High Occupancy Toll Lanes**
      i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
   c. **VMT Fees**
      i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
   d. **Congestion Pricing and Managed Lanes**
      i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
   e. **Parking Impact Fees**
      i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
   f. **Employer Commute Incentives**
      i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
2. Determine overall cost of policy implementation for each program under the policy.
   a. **Electronic Toll Collection**
      i. $15,004,210 per year 2011-2014

- **b. High Occupancy Toll Lanes**
  - i. $15,004,210 per year 2011-2014
- **c. VMT Fees**
  - i. $15,004,210 per year 2011-2014
- **d. Congestion Pricing and Managed Lanes**
  - i. $15,004,210 per year 2011-2014
- **e. Parking Impact Fees**
  - i. $15,004,210 per year 2011-2014
- **f. Employer Commute Incentives**
  - i. $15,004,210 per year 2011-2014

3. Distribute inputs among identified REMI sectors.
4. Input investment by sector into REMI model and run impacts.
5. Export impacts and analyze.

Operation Phase

2. Determine relevant REMI sectors.
   - **a. Electronic Toll Collection**
     - i. 623—Consumer Spending—Gasoline and oil
     - ii. 78—Consumption Reallocation—All Consumption Categories
   - **b. High Occupancy Toll Lanes**
     - i. 623—Consumer Spending—Gasoline and oil
     - ii. 78—Consumption Reallocation—All Consumption Categories
   - **c. VMT Fees**
     - i. 623—Consumer Spending—Gasoline and oil
     - ii. 78—Consumption Reallocation—All Consumption Categories
   - **d. Congestion Pricing and Managed Lanes**
     - i. 623—Consumer Spending—Gasoline and oil
     - ii. 78—Consumption Reallocation—All Consumption Categories
   - **e. Parking Impact Fees**
     - i. 652—Intercity Mass Transit
   - **f. Employer Commute Incentives**
     - i. 623—Consumer Spending—Gasoline and oil
     - ii. 78—Consumption Reallocation—All Consumption Categories
3. Determine part of program to be affected by savings (strategy write-up).
   - **a. Electronic Toll Collection**
   - **b. High Occupancy Toll Lanes**
   - **c. VMT Fees**
   - **d. Congestion Pricing and Managed Lanes**
   - **e. Parking Impact Fees**
   - **f. Employer Commute Incentives**
4. Research savings data for each policy according to part of program to be affected by savings.

a. **Electronic Toll Collection**
    i. Avg. Wait Time at Toll Booth Reduction[106]=2.5 minutes
    ii. Avg. Annual Commuters Passing Through Tolls [107]=153,800,000
    iii. Number of hours a year=8,765
    iv. Number of Tolls Booths in MD[108]=10
    v. Gas wasted in idle per year[109]=5,528,176.045
    vi. Assumed Price per Gallon of Gas=3.43

b. **High Occupancy Toll Lanes**
    i. Avg. Reduction in Time from HOT Lane[110]=2%
    ii. Current Congestion Time In MD (Total by Commuter Annually)[111]=34
    iii. Number of those employed in MD[112]=2,771,833
    iv. Assumed Price per Gallon of Gas =3.43
    v. Gas wasted in idle per minute Idle[113]=0.014377571

c. **VMT Fees**
    i. Net Annual Revenue Projections[114]=644.1 millions

d. **Congestion Pricing and Managed Lanes**
    i. Toll Lane Miles in MD[115]=3,140
    ii. Total that are congested[116]=30.40%
    iii. Gas wasted in idle per minute Idle[117]=0.014377571
    iv. Current Congestion Time In MD (Total by Commuter Annually)[118]=2,040 in min

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106 Saka, Anthony A., Dennis K. Agboh, Simon Ndiritu, and Richard A. Glassco. "An Estimation of Mobile Emissions Reduction." RITA | National Transportation Library. National Transportation Centre, Mar. 2000. Web. 14 Nov. 2011. <http://ntl.bts.gov/lib/16000/16800/16888/PB2000105915.pdf>.

107 MdTA Toll Facilities. MdTA Index. Maryland Transportation Authority, 2011. Web. 14 Nov. 2011. <http://www.mdta.maryland.gov/TollFacilities/facilities.html>.

108 Ibid.

109 ISDH: ISDH Home. IN.gov: Home. IN.gov. Web. 14 Nov. 2011. <http://www.in.gov/isdh/files/Idling_Brochure.>.

110 Baker, Michael, and Cambridge Systematics. "Maryland Climate Action Plan Draft 2012." Maryland Department of Transportation. Maryland Department of Transportation, 11 Apr. 2011. Web. 16 Nov. 2011. <http://www.mdot.maryland.gov/Planning/Plans_Programs_Reports/Documents/Climate_Change_2011_Appendix.pdf>.

111 Ibid.

112 Civilian Labor Force, Employment & Unemployment by Place of Residence (LAUS) - Maryland - Division of Workforce Development and Adult Learning. Welcome to the Maryland Department of Labor, Licensing and Regulation. Maryland Department of Labor, Licensing and Regulation, 21 Oct. 2011. Web. 14 Nov. 2011. <http://www.dllr.state.md.us/lmi/laus/maryland.shtml>.

113 ISDH: ISDH Home. IN.gov: Home. IN.gov. Web. 14 Nov. 2011. <http://www.in.gov/isdh/files/Idling_Brochure.>.

114 Baker, Michael, and Cambridge Systematics. "Maryland Climate Action Plan Draft 2012." Maryland Department of Transportation. Maryland Department of Transportation, 11 Apr. 2011. Web. 16 Nov. 2011. <http://www.mdot.maryland.gov/Planning/Plans_Programs_Reports/Documents/Climate_Change_2011_Appendix.pdf>.

115 Ibid.

116 Ibid.

117 ISDH: ISDH Home. IN.gov: Home. IN.gov. Web. 14 Nov. 2011. <http://www.in.gov/isdh/files/Idling_Brochure.>.

v. Number of those that pass through a MD Toll Annually[119]= 207,530
vi. Avg. Price of Gas=$3.61 (assumed)

e. Parking Impact Fees

i. Daily Parking[120]=$0.75 average per hour
ii. Assume 8 Hours=$6.00 (cost per day) (daily parking*8)
iii. Number of those that work in the city of Baltimore[121]=1,289,169

f. Employer Commute Incentives

i. Assume 15% of Employers in Metro Area provide Passes or something to employees[122]
ii. Reduction in Annual VMT[123]=1,094,381
iii. Avg. MPG=27 mpg
iv. Avg. Assumed Price Per Gallon=$3.61 per gallon

5. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).

a. Electronic Toll Collection

i. 384,500,000 [Avg. Annual Commuters Passing Through Tolls * Avg. Wait Time at Toll Booth Reduction]: = Total Number of Idle Minutes Saved per Year.
ii. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$121,165,780.71 [Total Number of Idle Minutes Saved per Year * 0.0316 (conversion factor)]: = $19,944,277.13

b. High Occupancy Toll Lanes

i. Current Congestion Time in MD (Total by Commuter Annually Mins)=2,040 (Current Congestion Time In MD (Total by Commuter Annually)*60)

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[118] Baker, Michael, and Cambridge Systematics. "Maryland Climate Action Plan Draft 2012." Maryland Department of Transportation. Maryland Department of Transportation, 11 Apr. 2011. Web. 16 Nov. 2011. <http://www.mdot.maryland.gov/Planning/Plans_Programs_Reports/Documents/Climate_Change_2011_Appendix.pdf>.

[119] Civilian Labor Force, Employment & Unemployment by Place of Residence (LAUS) - Maryland - Division of Workforce Development and Adult Learning. Welcome to the Maryland Department of Labor, Licensing and Regulation. Maryland Department of Labor, Licensing and Regulation, 21 Oct. 2011. Web. 14 Nov. 2011. <http://www.dllr.state.md.us/lmi/laus/maryland.shtml>.

[120] Documents – Resource Types – SFpark. SFpark. Municipal Transportation Agency, 2011. Web. 16 Nov. 2011. <http://sfpark.org/resource-type/documents/>

[121] Civilian Labor Force, Employment & Unemployment by Place of Residence (LAUS) - Maryland - Division of Workforce Development and Adult Learning. Welcome to the Maryland Department of Labor, Licensing and Regulation. Maryland Department of Labor, Licensing and Regulation, 21 Oct. 2011. Web. 14 Nov. 2011. <http://www.dllr.state.md.us/lmi/laus/maryland.shtml>.

[122] Baker, Michael, and Cambridge Systematics. "Maryland Climate Action Plan Draft 2012." Maryland Department of Transportation. Maryland Department of Transportation, 11 Apr. 2011. Web. 16 Nov. 2011. <http://www.mdot.maryland.gov/Planning/Plans_Programs_Reports/Documents/Climate_Change_2011_Appendix.pdf>.

[123] Ibid.

ii. Total Yearly Congestion For those Passing Through MD tolls=5,654,539,320 (Current Congestion Time in MD (Total by Commuter Annually Mins)* Number of those employed in MD)
iii. If HOT Lanes Enforced, Avg. Annual Time Reduced=106,022,612.3 (Avg. Reduction in Time from HOT Lane*Current Congestion Time in MD [(Total by Commuter Annually Mins))*(Number of those employed in MD)]
iv. IF HOT Lanes enforced, new avg. annual congestion time=5,548,516,708 (Total Yearly Congestion For those Passing Through MD tolls-If HOT Lanes Enforced, Avg. Annual Time Reduced)
v. Amount Wasted on Time a Year (mins) =5,654,539,320 (Current Congestion Time in MD (Total by Commuter Annually Mins)* (Number of those employed in MD))
vi. Amount Wasted on Time a Year - WITH HOT LANES (mins)=5,548,516,708 [(Current Congestion Time in MD (Total by Commuter Annually Mins)- Current Congestion Time in MD (Total by Commuter Annually Mins)* Avg. Reduction in Time from HOT Lane))* (Number of those employed in MD)]
vii. Amount of Gas Wasted Without HOT Lanes=81,298,540.48 [(Amount Wasted on Time a Year (mins)* Gas wasted in idle per minute Idle)]
viii. Amount of Gas Wasted With HOT Lanes =79,774,192.85 [(Amount Wasted on Time a Year - WITH HOT LANES (mins)* (Gas wasted in idle per minute Idle)]
ix. Amount of Gas Wasted without HOT Lanes ($)=$278,853,993.86 [(Assumed Price per Gallon of Gas)*(Amount of Gas Wasted Without HOT Lanes)]
x. Amount of Gas Wasted with HOT Lanes ($)=$273,625,481.48 [(Assumed Price per Gallon of Gas)*(Amount of Gas Wasted With HOT Lanes)]
xi. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$5,499,465.17 [(Amount of Gas Wasted without HOT Lanes ($))—(Amount of Gas Wasted with HOT Lanes ($))]=Savings From HOT Lanes per year from 2010—2020

c. **VMT Fees**
   i. 63—State Government Spending—$644,100,000 [(Annual Net Revenue Projection from MDOT MD Climate Action Plan 2012 Draft)]

d. **Congestion Pricing and Managed Lanes**
   i. Total Gallons of Gas Wasted Annually =29.33024482 (Gas wasted in idle per minute Idle* Current Congestion Time In MD (Total by Commuter Annually))
   ii. Avg. Cost to Consumer Due to Congestion=$100.60 (Total Gallons of Gas Wasted Annually*avg. price of gas)
   iii. If Congestion is reduced by 30.4%
      1. Total Congestion Time Reduced Annually (in mins)=620.16 (Total that are congested* Current Congestion Time In MD (Total by Commuter Annually))

2. Total Minutes in Congestion Under Congestion Cost Policy=1419.84 (Current Congestion Time In MD (Total by Commuter Annually)—(Total Congestion Time Reduced Annually (in mins))
3. Avg. Gallons Used in New Congestion=20.41385039 (Gas wasted in idle per minute Idle* Total Minutes in Congestion Under Congestion Cost Policy)
4. Avg. Cost to Consumer under new Pricing=$70.02 (Avg. Price of Gas* Avg. Gallons Used in New Congestion)

iv. Savings to consumer=$30.58 (Avg. Cost to Consumer Due to Congestion- Avg. Cost to Consumer under new Pricing)

v. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$89,164,662.06 (Savings to consumer* Number of those employed in MD)=Total Avg. Annual Savings to All those on MD Roads 2010—2020

e. Parking Impact Fees

i. Suppose they work in Baltimore but live outside City=30 weekly cost (assumer 8 hrs*5)

ii. Annual Cost to Consumer to Park in Baltimore City=1560 (Suppose they work in Baltimore but live outside City*52)

iii. 63—State Government Spending—$100,555,182.00 [(Number of those that work in the city of Baltimore*0.05)*(Annual Cost to Consumer to Park in Baltimore City)]=Total Possible Revenue Recouped from City if 5% commute to areas without parking lots

f. Employer Commute Incentives

i. Avg. Gallons Saved Annually=40,532.62963 (Reduction in Annual VMT/Avg. MPG)

ii. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$139,026.92 (Avg. Gallons Saved Annually* Avg. Assumed Price Per Gallon)= Savings Annually 2010—2020

6. Input savings by sector into REMI model and run impacts.
7. Export impacts and analyze.

3.2.10 Transportation Technology Initiatives

Investment Phase

1. Determine relevant REMI sectors for each program under the policy.

a. Traffic Flow Improvements

i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects

b. Truck Stop Electrification

i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects

c. **Timing of Highway Construction Schedules**
    i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
d. **Electronic Toll Collection**
    i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
e. **Traffic Signal Synchronization**
    i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
f. **Variable Message Signs**
    i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
g. **Telework Partnership with Employers**
    i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
h. **Smart Card Implementation**
    i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
i. **Light-Emitting Diode Traffic Signals**
    i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
j. **Vehicle Technologies**
    i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
k. **Transportation Fuels**
    i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects

2. Determine overall cost of policy implementation for each program under the policy.
    a. **Traffic Flow Improvements**
        i. *No funding specified*
    b. **Truck Stop Electrification**
        i. *No funding specified*
    c. **Timing of Highway Construction Schedules**
        i. *No funding specified*
    d. **Electronic Toll Collection**
        i. *No funding specified*
    e. **Traffic Signal Synchronization**
        i. *No funding specified*
    f. **Variable Message Signs**
        i. $250,000 per year 2011-2014
    g. **Telework Partnership with Employers**
        i. *No funding specified*
    h. **Smart Card Implementation**
        i. *No funding specified*

- **i. Light-Emitting Diode Traffic Signals**
  - i. $3,744,000 in 2012
- **j. Vehicle Technologies**
  - *i. No funding specified*
- **k. Transportation Fuels**
  - *i. No funding specified*

3. Input investment by sector into REMI model and run impacts.
4. Export impacts and analyze.

Operation Phase

7. Determine relevant REMI sectors.
   - **a. Traffic Flow Improvements**
     - i. 623—Consumer Spending—Gasoline and oil
     - ii. 78—Consumption Reallocation—All consumption categories
   - **b. Truck Stop Electrification**
     - i. 623—Consumer Spending—Gasoline and oil
     - ii. 78—Consumption Reallocation—All consumption categories
   - **c. Timing of Highway Construction Schedules**
     - i. 623—Consumer Spending—Gasoline and oil
     - ii. 78—Consumption Reallocation—All consumption categories
   - **d. Electronic Toll Collection**
     - i. 623—Consumer Spending—Gasoline and oil
     - ii. 78—Consumption Reallocation—All consumption categories
   - **e. Traffic Signal Synchronization**
     - i. 623—Consumer Spending—Gasoline and oil
     - ii. 78—Consumption Reallocation—All consumption categories
   - **f. Variable Message Signs**
     - i. 623—Consumer Spending—Gasoline and oil
     - ii. 78—Consumption Reallocation—All consumption categories
   - **g. Telework Partnership with Employers**
     - i. 623—Consumer Spending—Gasoline and oil
     - ii. 78—Consumption Reallocation—All consumption categories
   - **h. Smart Card Implementation**
     - i. 673—Consumer Spending—Bank service charges, trust services, and safe deposit box rentals
     - ii. 78—Consumption Reallocation—All consumption categories
   - **i. Light-Emitting Diode Traffic Signals**
     - i. X6409—Exogenous Final Demand—Electric power generation, transmission, and distribution
     - ii. 63—State Government Spending
   - **j. Vehicle Technologies**
     - i. 648—Consumer Spending—Auto insurance less claims paid
     - ii. 78—Consumption Reallocation—All consumption categories
   - **k. Transportation Fuels**
     - i. 623—Consumer Spending—Gasoline and oil

   ii. 78—Consumption Reallocation—All consumption categories

8. Determine part of program to be affected by savings (from strategy write-up).
   a. **Traffic Flow Improvements**
      i. Annual Reduction in Diesel Fuel=2,520,000 gallons (assume 40% of vehicles traveling are trucks) (6,300,000*0.4)
      ii. Annual Reduction in Fuel=3,780,000 (assumer 60% of vehicles traveling are cars) (6,300,000*0.6)
   b. **Truck Stop Electrification**
      i. 23 cars scheduled to be overhauled between FY 2005 and FY 2012
   c. **Timing of Highway Construction Schedules**
   d. **Electronic Toll Collection**
   e. **Traffic Signal Synchronization**
   f. **Variable Message Signs**
   g. **Telework Partnership with Employers**
      i. Total Employers=35
      ii. Savings for 50 people working from home=$789,810
   h. **Smart Card Implementation**
   i. **Light-Emitting Diode Traffic Signals**
      i. 39,000 traffic signals in Baltimore City (From write-up)
   j. **Vehicle Technologies**
   k. **Transportation Fuels**
9. Research savings data for each policy according to part of program to be affected by savings.
   a. **Traffic Flow Improvements**
      i. Cost of Diesel Fuel[124]= $3.89 per gallon
      ii. Assumed Price of Gas= $3.61 per gallon
   b. **Truck Stop Electrification**
      i. Number of Parking Spaces at Station[125]=63
      ii. Avg. Fuel Saved per hour of Operation[126]=0.8 (gallons of fuel saved an hour)
      iii. Rest Period of 8 Hours (sleep)=8
      iv. Cost of Diesel Fuel[127]=$3.89 per gallon
      v. Hours in a Day=24
   c. **Timing of Highway Construction Schedules**
      i. Example of overnight(non-peak) lane closure for I-95/I-495 near Branch Ave (Capitol Beltway)

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[124] Lowest Diesel Fuel Prices in the Last 24 Hours. Maryland Gas Prices - Find Cheap Gas Prices in Maryland. 2011. Web. 14 Nov. 2011. <http://www.marylandgasprices.com/index.aspx?fuel=D>.
[125] Maryland Moves. Baltimore Metropolitan Council. Baltimore Metropolitan Council for the Regional Transportation Board May 2006. Web. 16 Nov. 2011. <http://www.baltometro.org/eNews/MM-5-06.pdf>.
[126] Truck Stop Electrification. California Energy Commission. California Energy Commission, June 2006. Web. 16 Nov. 2011. <http://www.energy.ca.gov/2006publications/CEC-600-2006-001/CEC-600-2006-001-FS.PDF>.
[127] Lowest Diesel Fuel Prices in the Last 24 Hours. Maryland Gas Prices - Find Cheap Gas Prices in Maryland. 2011. Web. 14 Nov. 2011. <http://www.marylandgasprices.com/index.aspx?fuel=D>.

   ii. Average Delay from Construction=55.5mins (Example of I-95 in Howard County from SHA Work Zone Analysis Guide: Appendix C)
   iii. On Peak Assume 50%=83.25 minutes
   iv. Gas wasted in idle per minute Idle[128]=0.014377571
   v. Assumed Price of Gas=$3.61 per gallon
   vi. Avg. Cars Overnight=8,812 (Example of I-95 in Howard County from SHA Work Zone Analysis Guide: Appendix C)
   vii. Cost of Diesel Fuel[129]=$3.89 per gallon

d. **Electronic Toll Collection**
   i. Avg. Wait Time at Toll Booth Reduction[130]=2.5 minutes
   ii. Avg. Annual Commuters Passing Through Tolls[131]=153,800,000
   iii. Number of Tolls Booths in MD[132]=10
   iv. Gas wasted in idle[133]=5,528,176 gallons
   v. Number of hours a year=8,765
   vi. Assumed Price per Gallon of Gas=$3.61 per gallon

e. **Traffic Signal Synchronization**
   i. Min delay in time[134]=13%
   ii. Gas wasted in idle per minute Idle[135]=0.014377571
   iii. Current Congestion Time In MD (Total by Commuter Annually)[136]=2,040 in minutes
   iv. Number of Registered Vehicles=3,382,451 (provided by MDE courtesy of MVA)

f. **Variable Message Signs**
   i. Avg. Reduction with VMS=17%
   ii. Gas wasted in idle per minute Idle[137]=0.014377571

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[128] ISDH: ISDH Home. IN.gov: Home. IN.gov. Web. 14 Nov. 2011. <http://www.in.gov/isdh/files/Idling_Brochure.>.
[129] Lowest Diesel Fuel Prices in the Last 24 Hours. Maryland Gas Prices - Find Cheap Gas Prices in Maryland. 2011. Web. 14 Nov. 2011. <http://www.marylandgasprices.com/index.aspx?fuel=D>.
[130] Saka, Anthony A., Dennis K. Agboh, Simon Ndiritu, and Richard A. Glassco. "An Estimation of Mobile Emissions Reduction." RITA | National Transportation Library. National Transportation Centre, Mar. 2000. Web. 14 Nov. 2011. <http://ntl.bts.gov/lib/16000/16800/16888/PB2000105915.pdf>.
[131] MdTA Toll Facilities. MdTA Index. Maryland Transportation Authority, 2011. Web. 14 Nov. 2011. <http://www.mdta.maryland.gov/TollFacilities/facilities.html>.
[132] MdTA Toll Facilities. MdTA Index. Maryland Transportation Authority, 2011. Web. 14 Nov. 2011. <http://www.mdta.maryland.gov/TollFacilities/facilities.html>.
[133] ISDH: ISDH Home. IN.gov: Home. IN.gov. Web. 14 Nov. 2011. <http://www.in.gov/isdh/files/Idling_Brochure.>.
[134] "RITA | ITS | Benefits: The Texas Traffic Light Synchronization program reduced delays by 24.6 percent by updating traffic signal control equipment and optimizing signal timing." RITA | ITS | Welcome to the Costs Database. 10 Aug. 2005. U.S. Department of Transportation (USDOT). 11 Nov. 2011 <http://www.itscosts.its.dot.gov/its/benecost.nsf/ID/D0DCC197DC7382BE852573D8006F7EDA?OpenDocument>.
[135] ISDH: ISDH Home. IN.gov: Home. IN.gov. Web. 14 Nov. 2011. <http://www.in.gov/isdh/files/Idling_Brochure.>.
[136] Baker, Michael, and Cambridge Systematics. "Maryland Climate Action Plan Draft 2012." Maryland Department of Transportation. Maryland Department of Transportation, 11 Apr. 2011. Web. 16 Nov. 2011. <http://www.mdot.maryland.gov/Planning/Plans_Programs_Reports/Documents/Climate_Change_2011_Appendix.pdf>.

- iii. Number of Registered Vehicles=3,382,451 (provided by MDE courtesy of MVA)
- iv. Current Congestion Time In MD (Total by Commuter Annually)[138]=2,040 in minutes

g. Telework Partnership with Employers

h. Smart Card Implementation

- i. Number of Boardings (Rail)—71,311
- ii. Number of Boardings (Bus)—231,795
- iii. Percentage Rail—75%
- iv. Percentage Bus—60%
- v. Average ATM fee—$2.40
- vi. Average Fare—$1.60

i. Light-Emitting Diode Traffic Signals

- i. 20,500 Traffic Signals replaced with LED Traffic Signals
- ii. $276,000—Savings a year in energy costs from switch
- iii. $154,000—Savings in labor and maintenance
- iv. $430,000—Total Yearly Savings
- v. Total Yearly Savings/Number of Traffic Signals=$20.98 per signal in savings

j. Vehicle Technologies

- i. Goal in 2016=35mpg
- ii. Current Average miles per gallon=27 mpg
- iii. Difference=8 mpg
- iv. Annual growth in mpg to reach goal=2 mpg
- v. Average Annual Miles Driven By Population[139]=13,041
- vi. New Vehicle Registrations in MD=2,700 (courtesy of MVA)

k. Transportation Fuels

- i. Annual increase in renewable fuels[140]=8,750,000
- ii. Reduction that can come about from Biofuels[141]=0.29

10. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).

a. Traffic Flow Improvements

- i. $9,802,800 [2,520,000 gallons of diesel * $3.89 price per gallon]=Value of diesel saved

[137] ISDH: ISDH Home. IN.gov: Home. IN.gov. Web. 14 Nov. 2011. <http://www.in.gov/isdh/files/Idling_Brochure.>.

[138] Baker, Michael, and Cambridge Systematics. "Maryland Climate Action Plan Draft 2012." Maryland Department of Transportation. Maryland Department of Transportation, 11 Apr. 2011. Web. 16 Nov. 2011. <http://www.mdot.maryland.gov/Planning/Plans_Programs_Reports/Documents/Climate_Change_2011_Appendix.pdf>.

[139] "State & Urbanized Area Statistics - Our Nation's Highways - 2000." Home | Federal Highway Administration. 4 Apr. 2011. Federal Highway Administration (FHWA). 11 Nov. 2011 <http://www.fhwa.dot.gov/ohim/onh00/onh2p11.htm>.

[140] Task Force on Renewable Alternative Fuels. State of Maryland. 31 Dec. 2007. Web. 14 Nov. 2011. < http://www.mda.state.md.us/pdf/altfuelsreport.pdf>.

[141] Ibid.

ii. $13,637,295 [3,780,000 gallons of gasoline * $3.61 price per gallon]=value of gasoline saved
iii. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$23,440,095 [$9,802,800 + $13,637,295]=Total value of fuel saved per year from 2010—2020

b. Truck Stop Electrification

i. Gallons Saved Per Rest Period =6.4 (Avg. Fuel Saved per hour of Operation*Rest Period of 8 Hours (sleep))
ii. Savings of Fuel Per Truck Rest =$26.19 (Gallons Saved Per Rest Period*Price of Diesel Fuel)
iii. Assume one truck every 8 hours=3 trucks a day (hours in a day/8)
iv. Total Fuel Saved a Day =$78.56 saved daily (Savings of Fuel Per Truck Rest*Assume one truck every 8 hours)
v. Annual Fuel Saved=$28,673.85 (Total Fuel Saved a Day*365)
vi. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$1,806,452.28 [(Annual Fuel Saved*Number of Parking Spaces at Station)]= Total Annual Savings from Truck Stop Electrification Stopping in MD

c. Timing of Highway Construction Schedules

i. Avg. Gas Wasted Idle Peak Hours=1.196932785 (On Peak Assume 50%*Gas wasted in idle per minute Idle)
ii. Avg. Gas Wasted Idle Non-Peak Hours =0.79795519 (Average Delay from Construction*Gas wasted in idle per minute Idle)
iii. Cost of Peak Hours=4.318234255 (Avg. Gas Wasted Idle Peak Hours*Assumed Price of Gas)
iv. Cost of Off Peak Hours =2.878822837 (Avg. Gas Wasted Idle Non-Peak Hours*Assumed Price of Gas)
v. Savings to Night time Construction=1.439411418 (Cost of Peak Hours-Cost of Off Peak Hours)
vi. Assume 40% Trucks=3524.8 (Avg. Cars Overnight*0.4)
vii. Assume 60% Cars=5287.2 (Avg. Cars Overnight*0.6)
viii. Total Cost to Truck on Peak=4,218.94868 gallons fuel wasted (Assume 40% Trucks*Avg. Gas Wasted Idle Peak Hours)
ix. Cost to Truck on Peak= $17,262.21 (Total Cost to Truck on Peak*Cost of Diesel Fuel)
x. Total Cost to Trucks Off-Peak=2,812.632453 gallons fuel (Assume 40% Trucks*Avg. Gas Wasted Idle Non-Peak Hours)
xi. Cost to Truck Off-Peak =$11,508.14 (Total Cost to Trucks Off-Peak*Cost of Diesel Fuel)
xii. Savings to Trucks if Construction Night =$5,754.07 (Cost to Truck on Peak - Cost to Truck Off-Peak)
xiii. Total Cost to Cars On Peak=6,328.42302 (Assume 60% Cars*Avg. Gas Wasted Idle Peak Hours)
xiv. Assumed Price of Gas =3.61

xv. Cost to Cars on Peak =$22,831.37 (Total Cost to Cars On Peak*Assumed Price of Gas)
xvi. Total Cost to Cars Off Peak=2,812.632453 (Assume 40% Trucks*Avg. Gas Wasted Idle Non-Peak Hours)
xvii. Assumed Price of Gas =3.61
xviii. Cost to Cars Off Peak =$10,147.28 (Total Cost to Cars Off Peak* Assumed Price of Gas)
xix. Savings to Cars =$12,684.09 (Cost to Cars on Peak - Cost to Cars Off Peak)
xx. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$18,438.16 [$12,684.09 savings to cars + $5,754.07]=Total fuel savings per year from 2010 to 2020

d. Electronic Toll Collection

i. Number of Mins a year=525,900 (Number of hours a year*60)
ii. Amount of Time Saved in a Year on Avg. =384,500,000 mins (Avg. Wait Time at Toll Booth Reduction* Avg. Annual Commuters Passing Through Tolls)
iii. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$19,944,277.13 [(Gas wasted in idle* Assumed Price per Gallon of Gas)]=Total Saved From Electronic Tolls

e. Traffic Signal Synchronization

i. Reduction in time=265.2 [(Current Congestion Time In MD (Total by Commuter Annually))* (Min delay in time)]
ii. Savings in Fuel for Typical Consumer=3.812931826 (Gas wasted in idle per minute Idle*reduction in time)
iii. Savings in Dollar Amounts=13.7561048 (Savings in Fuel for Typical Consumer*3.61)
iv. iii. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$46,529,350.46 [(Number of Registered Vehicles* Savings in Dollar Amounts)== Annual Savings to All Registered Vehicles in MD

f. Variable Message Signs

i. Assume Only 25% of vehicles registered see sign =845,612.75 (Number of Registered Vehicles*0.25)
ii. VMS Sign Reduction=346.8 [(Current Congestion Time In MD (Total by Commuter Annually)*(Avg. Reduction with VMS)]
iii. New Minutes Traveled =1693.2 [(Current Congestion Time In MD (Total by Commuter Annually)—(VMS Sign Reduction)]
iv. Total Gallons of Gas Wasted=24.3441032 (New Minutes Traveled* Gas wasted in idle per minute Idle)
v. Cost to Drivers =87.82743832 (Total Gallons of Gas Wasted*3.61)
vi. Total Savings to MD Drivers=74,181,492.61 (Cost to Drivers* Assume Only 25% of vehicles registered see sign)

vii. Assume half are trucks =$37,090,746.31 (Total Savings to MD Drivers/2)
viii. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$37,090,746.31 = Total fuel savings to households

g. Telework Partnership with Employers

i. 26,071.43 Car Trips Avoided Per Year = (50 * (365-104.2857 Weekend Days) * 2)
ii. 12,552.91 Gallons of Fuel Saved Per Year = (26,071.43 * 13 Average Miles Per Trip * (1/27 Average MPG))
iii. $45,287.76 Value of Gas Saved = (# Gallons Saved * Assumed Price of Gas)
iv. $1,649.83 Value of Gas Saved From Idling = (Car Trips Avoided * 2 min Average Idling Per Trip * 0.031 (conversion factor))
v. viii. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$46,937.59 [$45,287.76 + $1,649.83]=Total value of fuel saved
vi. 603—Consumer Spending—Other motor vehicles, 78—Consumption Reallocation—All Consumption Categories—$11,836.43 [(26,071.43 * 13 Average Miles Per Trip * 0.454 (non-fuel Driving Cost Per Mile))= Value of Non-Fuel Driving Cost Saved

h. Smart Card Implementation

i. $171,146.40 [((71,311 Number of Rail Boardings * 0.75) * ($1.60 Average Fare * 2))]=Total Annual Boards (Rail/Smart Card)
ii. $445,046.40 [((231,795 Number of Bus Boardings * 0.60) * ($1.60 Average Fare * 2))]=Total Annual Boards (Bus/Smart Card)
iii. $410,751.36 [((71,311 Number of Rail Boardings * 0.75) * ($1.60 Average Fare * 2) * $2.40 Average ATM fee)]=Total Annual Boards (Rail)
iv. $1,068,111.36 [((231,795 Number of Bus Boardings * 0.60) * ($1.60 Average Fare * 2) * $2.40 Average ATM fee)]=Total Annual Boards (Bus)
v. $239,604.96 [($410,751.36 Total Annual Boards (Rail) - $171,146.40 Total Annual Boards (Rail/Smart Card))]=Annual Savings for Rail
vi. $623,064.96 [($1,068,111.36 Total Annual Boards (Bus) - $445,046.40 Total Annual Boards (Bus/Smart Card))]=Annual Savings for Bus
vii. $862,669.92 [($239,604.96 Annual Savings for Rail + $623,064.96 Annual Savings for Bus)]=Total Annual Savings
viii. 673—Consumer Spending—Bank Service charges, trust services, and safe deposit box rentals, 78—Consumption Reallocation—All Consumption Categories—$862,669.92 [($239,604.96 Annual Savings for Rail + $623,064.96 Annual Savings for Bus)]=Total Annual Savings

i. Light-Emitting Diode Traffic Signals

i. 63—State Government Spending, X6409—Exogenous Final Demand—Electric power generation, transmission, and distribution—$818,220

[(39,000 Number of Traffic Signals to be Replaced * $20.98 per Signal Savings)]=Average Estimated Savings Annually for 39,000 Signals Replaced from 2010—2020

j. **Vehicle Technologies**

   i. Current Gas Wasted by a driver =483 (Average Annual Miles Driven By Population/current avg)
   ii. Current Cost=$1,742.54 (Current Gas Wasted by a driver* 3.61)
   iii. If move 2 mpg next year=449.6896552 (Average Annual Miles Driven By Population/29)
   iv. Gallons Saved =33.31034483 (Current Gas Wasted by a driver-If move 2 mpg next year)
   v. Cost next year =$120.18 (Gallons Saved*3.61)
   vi. Savings=$120.18
   vii. Transport by Truck=$162,236.78 (savings/2)
   viii. Households=$162,236.78
   ix. 603—Consumer Spending—Other motor vehicles, 78—Consumption Reallocation—All Consumption Categories—$324,486.00 [(New Vehicle Registrations in MD*savings)]=Savings

k. **Transportation Fuels**

   i. 77,962,500 [(8,750,000 Average Proposed Reduction in Regular Fuel * 8.91)] = Average Annual Reduction in Fuel Converted to Kilograms
   ii. 77,962.50 [(77,962,500 CO2 emissions from Regular Fuel in kilograms / 1000)] = Conversion to CO2 in metric tons
   iii. 22,609.125 [(0.29 Reduction that can come about from Biofuels * 77,962.50 Conversion to CO2 in metric tons)] = Average Annual Reduction from Biofuels in CO2 metric tons
   iv. 55,353.375 [(77,962.50 GHG Conversion to CO2 in metric tons—22,609.13 Reduction to account for Biofuels)] = Average Reductions from Strategy not a part of biofuels
   v. 55,353,375 [(55,353.375 Average Reduction from Strategy not a part of biofuels * 1,000)] = Average Reduction from Strategy not a part of biofuels in kilograms
   vi. 6,212,500 (55,353,375 Average Reduction from Strategy not a part of biofuels in kg / 8.91)] = Average Reduction from Strategy not a part of biofuels converted to gallons of gas
   vii. $30,012,500 [(8,750,000 Annual increase in renewable fuels * $3.61 Average Cost of a Gallon of Gas)] = Average Annual Cost if no Reduction Occurs
   viii. $21,308,875 (6,212,500 Reductions in Current Fuels not associated with biofuels * $3.61 average gallon of gas)] = Average Annual Savings from Conversion of Renewable Fuels not associated with biofuels
   ix. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$9,154,665.63 ($30,012,500 Cost if no reduction occurred in regular gas - $21,308,875 Savings from

reduction in gas)*1.052 adjust price of fuel] = Average Annual Savings Associated with Reduction

11. Input savings by sector into REMI model and run impacts.
12. Export impacts and analyze.

3.2.11 Electric Vehicles Initiatives

Investment Phase

1. Determine relevant REMI sectors for each program under the policy.
    a. **Vehicle-to-Grid (V2G)**
        i. 68—Government Spending including Non-Pecuniary (Amenity)
    b. **Electric Vehicles**
        i. 68—Government Spending including Non-Pecuniary (Amenity)
    c. **Maryland Electric Vehicles Initiatives**
        i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
    d. **Maryland Transit Administration Support for Howard County Bus Project**
        i. 68—Government Spending including Non-Pecuniary (Amenity)
    e. **Clean and Efficient Strategies**
        i. 68—Government Spending including Non-Pecuniary (Amenity)
    f. **Baltimore City Electric Vehicles Infrastructure**
        i. 68—Government Spending including Non-Pecuniary (Amenity) Aspects
2. Determine overall cost of policy implementation for each program under the policy.
    a. **Vehicle-to-Grid (V2G)**
        i. *No Investment Costs Specified*
    b. **Electric Vehicles**
        i. $409,344 per year (2010-2020)
    c. **Maryland Electric Vehicles Initiatives**
        i. $511,680 per year (2010-2020)
    d. **Maryland Transit Administration Support for Howard County Bus Project**
        i. $28,814 per year (2010-2020)
    e. **Clean and Efficient Strategies**
        i. *No Investment Costs Specified*
    f. **Baltimore City Electric Vehicles Infrastructure**
        i. *No Investment Costs Specified*
3. Input investment by sector into REMI model and run impacts.
4. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI sectors.
    a. **Vehicle-to-Grid (V2G)**
        i. X6409—Exogenous Final Demand—Electric power generation, transmission, and distribution
    b. **Electric Vehicles**
        i. 623—Consumer Spending—Gasoline and oil

        ii. 78—Consumption Reallocation—All consumption categories
    c. **Maryland Electric Vehicles Initiatives**
        i. 623—Consumer Spending—Gasoline and oil
        ii. 78—Consumption Reallocation—All consumption categories
    d. **Maryland Transit Administration Support for Howard County Bus Project**
        i. 63—State Government Spending
    e. **Clean and Efficient Strategies**
        i. 623—Consumer Spending—Gasoline and oil
        ii. 78—Consumption Reallocation—All consumption categories
    f. **Baltimore City Electric Vehicles Infrastructure**
        i. 623—Consumer Spending—Gasoline and oil
        ii. 78—Consumption Reallocation—All consumption categories
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **Vehicle-to-Grid (V2G)**
        i. $30 per megawatt in Maryland's regulated energy market
    b. **Electric Vehicles**
        i. Currently 10,874 cars are registered in the state of Maryland as Hybrids
        ii. 65 new recharging stations to be installed
        iii. Proposed 20% tax credit for charging station infrastructure
    c. **Maryland Electric Vehicles Initiatives**
        i. Currently 10,874 cars are registered in the state of Maryland as Hybrids
        ii. 65 new recharging stations to be installed
    d. **Maryland Transit Administration Support for Howard County Bus Project**
        i. Replace 3 diesel buses with new Electric Buses
        ii. Add 2 quick charge stations
    e. **Clean and Efficient Strategies**
        i. Two (2) quick charge stations to be installed for Baltimore Fleet
    f. **Baltimore City Electric Vehicles Infrastructure**
        i. Plans to install 8 new charge stations in Baltimore City garages
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Vehicle-to-Grid (V2G)**
        i. Maryland Electricity cost (in KWh)[142]—$0.133 per kW/h
        ii. Average kilowatt introduced into grid by electric vehicle[143]—6 kilowatts
        iii. Annual New Vehicle Registration in Maryland (2010)[144]—186,759 (total for cars and light trucks)

[142] "Average Energy Prices in the Washington-Baltimore Area." U.S. Bureau of Labor Statistics. 27 Sept. 2011. 11 Nov. 2011 <http://www.bls.gov/ro3/apwb.htm#wb_energy_table1>.
[143] Motavalli, Jim. "In a Blackout, Nissan, Mitsubishi and Toyota E.V.'s Could Function as Generators - NYTimes.com." Automobiles - Wheels Blog - NYTimes.com 1 Sept. 2011. 22 Nov. 2011 <http://wheels.blogs.nytimes.com/2011/09/01/in-a-blackout-nissan-mitsubishi-and-toyota-e-v-s-could-function-as-generators/>.
[144] "Maryland Auto Outlook." Www.mdauto.org. 9 Aug. 2011. Maryland Automobile Dealers Association. 11 Nov. 2011 <http://www.mdauto.org/admin/publications/AutoOutlookQuarter22011.pdf>.

iv. Energy consumed per capita in the state of Maryland[145]—1,429 trillion Btu
v. Annual Energy Generation for the state of Maryland[146]—248 trillion Btu
vi. Note: External research was conducted to construct an average price for Electric Vehicles in the US. RESI constructed this average price across the top 5 reported prices for new 2012 models of Electric Vehicles. Ford's Focus EV has yet to report an official price for their 2012 model and thus was not included in the average. Instead the Honda Fit EV was included in the top five and used to create the average price of Electric Vehicles.

b. **Electric Vehicles**

i. Average Cost for One Recharge Station[147]—$7,872.00 annual maintenance
ii. Maryland Electricity cost (in KWh)[148]—$0.133 per kW/h
iii. Average fuel price per gallon (regular unleaded)[149]—$3.61 per gallon
iv. Average Annual Miles Driven By Population[150]—13,041 miles
v. Annual New Vehicle Registration in Maryland (2010)[151]—186,759 (total for cars and light trucks)
vi. Average Cost per Mile for Electric Vehicles—$0.02 per mile
vii. Average mile per kilowatt-hour—95.88 miles/KWh
viii. Average Cost to MD driver annually (in gasoline)—$1,764.99
ix. Average Battery Size charge time—5.1 hours
x. Note: External research was conducted to construct an average price for Electric Vehicles in the US. RESI constructed this average price across the top 5 reported prices for new 2012 models of Electric Vehicles. Ford's Focus EV has yet to report an official price for their 2012 model and thus was not included in the average. Instead the Honda Fit EV was included in the top five and used to create the average price of Electric Vehicles.

c. **Maryland Electric Vehicles Initiatives**

i. Average Cost for One Recharge Station[152]—$7,872.00 annual maintenance

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[145] Data - Prices. Maryland. Nov. 2011. U.S. Energy Information Administration (EIA). 14 Nov. 2011 <http://www.eia.gov/state/state-energy-profiles-data.cfm?sid=MD#Prices>.
[146] Ibid.
[147] "Electric Vehicle Charging Stations." 2010. EVsRoll.com. 14 Nov. 2011 <http://www.evsroll.com/Electric_Vehicle_Charging_Stations.html>.
[148] "Average Energy Prices in the Washington-Baltimore Area." U.S. Bureau of Labor Statistics. 27 Sept. 2011. 11 Nov. 2011 <http://www.bls.gov/ro3/apwb.htm#wb_energy_table1>.
[149] Daily Fuel Gauge Report--national, state and local average prices for gasoline, diesel and E-85. 11 Nov. 2011. Oil Price Information Service (OPIS). 11 Nov. 2011 <http://fuelgaugereport.aaa.com/?redirectto=http://fuelgaugereport.opisnet.com/index.asp
[150] "State & Urbanized Area Statistics - Our Nation's Highways - 2000." Home | Federal Highway Administration. 4 Apr. 2011. Federal Highway Administration (FHWA). 11 Nov. 2011 <http://www.fhwa.dot.gov/ohim/onh00/onh2p11.htm>.
[151] "Maryland Auto Outlook." Www.mdauto.org. 9 Aug. 2011. Maryland Automobile Dealers Association. 11 Nov. 2011 <http://www.mdauto.org/admin/publications/AutoOutlookQuarter22011.pdf>.
[152] "Electric Vehicle Charging Stations." 2010. EVsRoll.com. 14 Nov. 2011 <http://www.evsroll.com/Electric_Vehicle_Charging_Stations.html>.

ii. Maryland Electricity cost (in KWh)[153]—$0.133 per kW/h
iii. Average fuel price per gallon (regular unleaded)[154]—$3.61 per gallon
iv. Average Annual Miles Driven By Population[155]—13,041 miles
v. Annual New Vehicle Registration in Maryland (2010)[156]—186,759 (total for cars and light trucks)
vi. Average Cost per Mile for Electric Vehicles—$0.02 per mile
vii. Average mile per kilowatt-hour—95.88 miles/KWh
viii. Average Cost to MD driver annually (in gasoline)—$1,764.99
ix. Average Battery Size charge time—5.1 hours
x. Note: External research was conducted to construct an average price for Electric Vehicles in the US. RESI constructed this average price across the top 5 reported prices for new 2012 models of Electric Vehicles. Ford's Focus EV has yet to report an official price for their 2012 model and thus was not included in the average. Instead the Honda Fit EV was included in the top five and used to create the average price of Electric Vehicles.

d. Maryland Transit Administration Support for Howard County Bus Project

i. Maryland Electricity cost (in KWh)[157]—$0.133 per kW/h
ii. Total Miles of Routes 1 and 2 (Annual)[158]—779,928 annual miles
iii. Average Cost of Diesel Fuel[159]—$3.76 per gallon
iv. Average Miles per gallon of Hybrid Bus[160]— 5.4 miles per gallon
v. Average miles per gallon of transit buses[161]—6.4 miles per gallon
vi. Average Cost for One Recharge Station[162]—$7,872.00 annual maintenance
vii. Note –RESI will take into consideration that Hybrid Transit Buses have a diesel hybrid. Partial energy is derived from the ion-battery cells and from

153 "Average Energy Prices in the Washington-Baltimore Area." U.S. Bureau of Labor Statistics. 27 Sept. 2011. 11 Nov. 2011 <http://www.bls.gov/ro3/apwb.htm#wb_energy_table1>.
154 Daily Fuel Gauge Report--national, state and local average prices for gasoline, diesel and E-85. 11 Nov. 2011. Oil Price Information Service (OPIS). 11 Nov. 2011 <http://fuelgaugereport.aaa.com/?redirectto=http://fuelgaugereport.opisnet.com/index.asp
155 "State & Urbanized Area Statistics - Our Nation's Highways - 2000." Home | Federal Highway Administration. 4 Apr. 2011. Federal Highway Administration (FHWA). 11 Nov. 2011 <http://www.fhwa.dot.gov/ohim/onh00/onh2p11.htm>.
156 "Maryland Auto Outlook." Www.mdauto.org. 9 Aug. 2011. Maryland Automobile Dealers Association. 11 Nov. 2011 <http://www.mdauto.org/admin/publications/AutoOutlookQuarter22011.pdf>.
157 "Average Energy Prices in the Washington-Baltimore Area." U.S. Bureau of Labor Statistics. 27 Sept. 2011. 11 Nov. 2011 <http://www.bls.gov/ro3/apwb.htm#wb_energy_table1>.
158 KFH Group, Inc. "Harford County Transportation Development Plan." Harford County. June 2007. Office of Planning, Maryland Transit Administration (MTA). 14 Nov. 2011 <http://www.harfordcountymd.gov/services/community/doc/985.pdf>.
159 Ibid.
160 Allison Hybrid H 40 EP | H 50 EP. Allisontransmission.com. 2011. Allison Transmission. 14 Nov. 2011 <http://www.allisontransmission.com/servlet/DownloadFile?Dir=publications/pubs&FileToGet=SA5983EN.pdf>
161 RITA | BTS | Table 4-15: Bus Fuel Consumption and Travel. RITA | Bureau of Transportation Statistics (BTS). Bureau of Transportation, 26 Apr. 2010. Web. 14 Nov. 2011. <http://www.bts.gov/publications/national_transportation_statistics/html/table_04_15.html>.
162 "Electric Vehicle Charging Stations." 2010. EVsRoll.com. 14 Nov. 2011 <http://www.evsroll.com/Electric_Vehicle_Charging_Stations.html>.

the diesel counterpart. RESI assumes that this energy distribution is equal for all intents and purposes.

e. Clean and Efficient Strategies

i. Average Cost for One Recharge Station[163]—$7,872.00 annual maintenance
ii. Maryland Electricity cost (in KWh)[164]—$0.133 per kW/h
iii. Average fuel price per gallon (regular unleaded)[165]—$3.61 per gallon
iv. Average number of vehicles in downtown fleet[166]—5,800 vehicles
v. Percentage of downtown fleet that are fuel efficient[167]—35%
vi. Average Annual Miles Driven By Population[168]—13,041 miles
vii. Average Cost per Mile for Electric Vehicles—$0.02 per mile
viii. Average mile per kilowatt-hour—95.88 miles/KWh
ix. Average Cost to MD driver annually (in gasoline)—$1,764.99
x. Average Battery Size charge time—5.1 hours
xi. Note: External research was conducted to construct an average price for Electric Vehicles in the US. RESI constructed this average price across the top 5 reported prices for new 2012 models of Electric Vehicles. Ford's Focus EV has yet to report an official price for their 2012 model and thus was not included in the average. Instead the Honda Fit EV was included in the top five and used to create the average price of Electric Vehicles.

f. Baltimore City Electric Vehicles Infrastructure

i. Average Cost for One Recharge Station[169]—$7,872.00 annual maintenance
ii. Maryland Electricity cost (in KWh)[170]—$0.133 per kW/h
iii. Average fuel price per gallon (regular unleaded)[171]—$3.61 per gallon

[163] "Electric Vehicle Charging Stations." 2010. EVsRoll.com. 14 Nov. 2011 <http://www.evsroll.com/Electric_Vehicle_Charging_Stations.html>.
[164] "Average Energy Prices in the Washington-Baltimore Area." U.S. Bureau of Labor Statistics. 27 Sept. 2011. 11 Nov. 2011 <http://www.bls.gov/ro3/apwb.htm#wb_energy_table1>.
[165] Daily Fuel Gauge Report--national, state and local average prices for gasoline, diesel and E-85. 11 Nov. 2011. Oil Price Information Service (OPIS). 11 Nov. 2011 <http://fuelgaugereport.aaa.com/?redirectto=http://fuelgaugereport.opisnet.com/index.asp>.
[166] "Baltimore Ready to Install 9 Electric Vehicle Charging Stations." General Services / Press Releases. 2010. City of Baltimore, Maryland - Official Website. 14 Nov. 2011 <http://baltimorecity.gov/Government/AgenciesDepartments/GeneralServices/PressReleases/tabid/1028/articleType/ArticleView/articleId/1143/Baltimore-Ready-to-Install-9-Electric-Vehicle-Charging-Stations.aspx>.
[167] Ibid.
[168] "State & Urbanized Area Statistics - Our Nation's Highways - 2000." Home | Federal Highway Administration. 4 Apr. 2011. Federal Highway Administration (FHWA). 11 Nov. 2011 <http://www.fhwa.dot.gov/ohim/onh00/onh2p11.htm>.
[169] "Electric Vehicle Charging Stations." 2010. EVsRoll.com. 14 Nov. 2011 <http://www.evsroll.com/Electric_Vehicle_Charging_Stations.html>.
[170] "Average Energy Prices in the Washington-Baltimore Area." U.S. Bureau of Labor Statistics. 27 Sept. 2011. 11 Nov. 2011 <http://www.bls.gov/ro3/apwb.htm#wb_energy_table1>.
[171] Daily Fuel Gauge Report--national, state and local average prices for gasoline, diesel and E-85. 11 Nov. 2011. Oil Price Information Service (OPIS). 11 Nov. 2011 <http://fuelgaugereport.aaa.com/?redirectto=http://fuelgaugereport.opisnet.com/index.asp>.

iv. Average Annual Miles Driven By Population[172]—13,041 miles
v. Annual New Vehicle Registration in Maryland (2010)[173]—186,759 (total for cars and light trucks)
vi. Average Cost per Mile for Electric Vehicles—$0.02 per mile
vii. Average mile per kilowatt-hour—95.88 miles/KWh
viii. Average Cost to MD driver annually (in gasoline)—$1,764.99
ix. Average Battery Size charge time—5.1 hours
x. Note: External research was conducted to construct an average price for Electric Vehicles in the US. RESI constructed this average price across the top 5 reported prices for new 2012 models of Electric Vehicles. Ford's Focus EV has yet to report an official price for their 2012 model and thus was not included in the average. Instead the Honda Fit EV was included in the top five and used to create the average price of Electric Vehicles.

4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
   a. **Vehicle-to-Grid (V2G)**
      i. 600 [(10,874 hybrids registered in the state of Maryland / 186,759 new vehicle registrations (light vehicles) annually in Maryland)] * [(186,759 new vehicle registrations (light vehicles) annually in Maryland)]=average possible purchases of electric vehicles in the state of Maryland
      ii. 1,314,872 [(6 kilowatts produced by an electric vehicle * 600 average possible purchase of electric vehicles * 365 days a year)]=average possible kilowatts introduced into grid by electric vehicles
      iii. 418,798,559,276 [(1,469 trillion BTUs * 0.000293071 kilowatt hours for 1 BTU)]=average consumption of kilowatts in Maryland annually
      iv. $55,700,208,383.72 [($0.133 average cost per kilowatt hour * 418,798,559 average consumption of kilowatt hours in Maryland annually)]=average annual cost of consumption of kilowatt hours in Maryland
      v. 418,797,244,404 [(418,798,559 average consumption of kilowatts in Maryland - 1,314,872 contribution of kilowatts from electric vehicles annually)]=annual consumption of kilowatt hours less contribution from EVs
      vi. $55,700,033,505.75 [(417,483,687 annual consumption of kilowatt hours less contribution from EVs * $0.133 average cost per kilowatt hour)]=average cost of kilowatt consumption annually in Maryland less the kilowatt contribution of EVs
      vii. $174,877.97 [($55,700,208.38 annual consumption costs of kilowatts in Maryland - $55,525,330.41 annual consumption costs of kilowatts in Maryland less the EV contribution)]=annual savings from EVs in V2G

[172] "State & Urbanized Area Statistics - Our Nation's Highways - 2000." Home | Federal Highway Administration. 4 Apr. 2011. Federal Highway Administration (FHWA). 11 Nov. 2011 <http://www.fhwa.dot.gov/ohim/onh00/onh2p11.htm>.
[173] "Maryland Auto Outlook." Www.mdauto.org. 9 Aug. 2011. Maryland Automobile Dealers Association. 11 Nov. 2011 <http://www.mdauto.org/admin/publications/AutoOutlookQuarter22011.pdf>.

viii. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$39,446.16 [(1,314,872 contribution of kilowatts from electric vehicles annually / 1000 kilowatts per one megawatt)] * [($30.00 per megawatt hour)]=average annual savings to electric companies

b. Electric Vehicles

i. 600 [(10,874 hybrids registered in the state of Maryland / 186,759 new vehicle registrations (light vehicles) annually in Maryland)] * [(186,759 new vehicle registrations (light vehicles) annually in Maryland)]=average possible purchases of electric vehicles in The State of Maryland

ii. $1.80 [(5.1 average battery charge time * $0.133 per KW/h average price per kilowatt-hour in Maryland])=average cost to fill a tank to electric vehicle consumer

iii. $0.02 [($1.80 average cost to fill tank of EV / 95.88 average miles per tank)]=average cost per mile of electric vehicle

iv. $244.28 [($0.02 average cost per mile of EV * 13,041 miles driven annually by Maryland residents)]=average annual cost to drive an EV in Maryland

v. $1,617.44 [($1,861.72 cost to drive annually with gasoline powered vehicles - $244.28 cost to drive an EV annually in MD)]=annual savings to those that purchase EV

vi. $970,460.82 [($1,617.44 annual savings to EV owners * 600 average annual possible purchase of EVs in Maryland)]=average annual savings to EV car owners in Maryland

vii. $409,344.00 [($7,872.00 average cost of maintenance for one recharge station annually * 65 charge stations in Maryland—20% tax credit)]=annual cost to maintain new charge stations

viii. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$561,116.82 [($970,460.82 average annual fuel savings to EV car owners - $409,344.00 annual maintenance fees of 65 new recharge stations)]=average annual savings to Maryland EV owners net convenience fees of recharge stations

c. Maryland Electric Vehicles Initiatives

i. 600 [(10,874 hybrids registered in the state of Maryland / 186,759 new vehicle registrations (light vehicles) annually in Maryland)] * [(186,759 new vehicle registrations (light vehicles) annually in Maryland)]=average possible purchases of electric vehicles in the state of Maryland

ii. $1.80 [(5.1 average battery charge time * $0.133 per KW/h average price per kilowatt-hour in Maryland])=average cost to fill a tank to electric vehicle consumer

iii. $0.02 [($1.80 average cost to fill tank of EV / 95.88 average miles per KW/h)]=average cost per mile of electric vehicle

iv. $244.28 [($0.02 average cost per mile of EV * 13,041 miles driven annually by Maryland residents)]=average annual cost to drive an EV in Maryland

v. $1,617.44 [($1,861.72 cost to drive annually with gasoline powered vehicles - $244.28 cost to drive an EV annually in MD)]=annual savings to those that purchase EV
vi. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$970,464 [($1,617.44 annual savings to EV owners * 600 average annual possible purchase of EVs in Maryland)]=average annual savings to EV car owners in Maryland
vii. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$511,680.00 [($7,872.00 average cost of maintenance for one recharge station annually * 65 charge stations in Maryland)]=annual cost to maintain new charge stations

d. Maryland Transit Administration Support for Howard County Bus Project

i. $474,554.14 [(779,928 average annual miles of Routes 1 and 2 / 6.4 average miles per gallon of transit buses)] * [($3.89 per gallon of diesel fuel)]=average cost annually of one diesel bus for Routes 1 and 2
ii. $1,423,662.41 [($474,554.14 average annual cost of one diesel bus for Routes 1 and 2 * 3 buses to be replaced)]=average cost annually of three diesel bus for Routes 1 and 2
iii. $9,604.67 [(779,928 average annual miles of Routes 1 and 2 / 5.4 average miles per gallon of transit bus * .50 energy distribution)] * [($0.133 Maryland energy cost per kilowatt hour)]=average annual cost of new hybrid bus for Routes 1 and 2 (Electricity)
iv. $281,217.36 [(779,928 average annual miles of Routes 1 and 2 / 5.4 average miles per gallon of transit bus * .50 energy distribution)] * [($3.89 per gallon of diesel fuel)]=average annual cost of new hybrid bus for Routes 1 and 2 (Diesel)
v. $888,210.09 [(($9,604.67 average cost in electric + $281,217.36 average cost in diesel fuel for Routes 1 and 2 for a single bus) * 3 new buses)] + [($7,872.00 average cost of maintenance for one recharge station annually *2)]=average annual costs of 3 new hybrid bus and 2 recharge stations
vi. 623—State Government Spending—$580,010.33 [($1,423,662.41 average annual cost for three diesel buses on Routes 1 and 2 - $888,210.09 annual costs for 3 new hybrid buses and 2 recharge stations for Routes 1 and 2)]=Overall Average Annual Savings from replacing three diesel buses and adding two recharge stations

e. Clean and Efficient Strategies

i. 2,030 [(5,8000 total vehicles registered with the downtown fleet * 35% are fuel efficient vehicles)]=average possible purchases of electric vehicles for downtown fleet
ii. $1.80 [(5.1 average battery charge time * $0.133 per KW/h average price per kilowatt-hour in Maryland])=average cost to fill a tank to electric vehicle
iii. $0.02 [($1.80 average cost to fill tank of EV / 95.88 average miles per KW/h)]=average cost per mile of electric vehicle

iv. $244.28 [($0.02 average cost per mile of EV * 13,041 miles driven annually by Maryland residents)]=average annual cost to drive an EV in Maryland
v. $1,617.44 [($1,861.72 cost to drive annually with gasoline powered vehicles - $244.28 cost to drive an EV annually in MD)]=annual savings attributed to purchase of an Electric Vehicles
vi. $3,283,392.44 [($1,617.44 annual savings to EV owners * 2,030 possible purchase of EVs for downtown fleet)]=average annual savings in gas for EV fleet
vii. $15,744.00 [($7,872.00 average cost of maintenance for one recharge station annually * 2 charge stations in Maryland)]=annual cost to maintain new charge stations
viii. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$3,071,327.40 [($3,087,071.40 average annual fuel savings to EV cars - $15,744.00 annual maintenance fees of 2 new recharge stations)]=average annual savings to Downtown Fleet

f. Baltimore City Electric Vehicles Infrastructure

i. 600 [(10,874 hybrids registered in the state of Maryland / 186,759 new vehicle registrations (light vehicles) annually in Maryland)] * [(186,759 new vehicle registrations (light vehicles) annually in Maryland)]=average possible purchases of electric vehicles in the state of Maryland
ii. $1.80 [(5.1 average battery charge time * $0.133 per KW/h average price per kilowatt-hour in Maryland])=average cost to fill a tank to electric vehicle consumer
iii. $0.02 [($1.80 average cost to fill tank of EV / 95.88 average miles per KW/h)]=average cost per mile of electric vehicle
iv. $244.28 [($0.02 average cost per mile of EV * 13,041 miles driven annually by Maryland residents)]=average annual cost to drive an EV in Maryland
v. $1,617.44 [($1,861.72 cost to drive annually with gasoline powered vehicles - $244.28 cost to drive an EV annually in MD)]=annual savings to those that purchase EV
vi. viii. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$970,460.82 [($1,617.44 annual savings to EV owners * 600 average annual possible purchase of EVs in Maryland)]=average annual savings to EV car owners in Maryland
vii. 623—Consumer Spending—Other motor vehicles, 78—Consumption Reallocation—All Consumption Categories—$62,976.00 [($7,872.00 average cost of maintenance for one recharge station annually * 8 charge stations in Maryland)]=annual cost to maintain new charge stations

5. Input savings by sector into REMI model and run impacts.
6. Export impacts and analyze.

3.2.12 Low-Emitting Vehicles Initiatives

Investment Phase

1. Determine relevant REMI sectors for each program under the policy.
    a. **Howard Transit Paratransit Fleet Replacement Vehicles**
        i. 63—State Government Spending
    b. **Clean and Efficient Strategies**
        i. 63—State Government Spending
2. Determine overall cost of policy implementation for each program under the policy.
    a. **Howard Transit Paratransit Fleet Replacement Vehicles**
        i. 2010: $1,600,000
        ii. 2011—2020: $400,000 per year
    b. **Clean and Efficient Strategies**
        i. *No Investment Costs Specified*
3. Input investment by sector into REMI model and run impacts.
4. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI sectors.
    a. **Howard Transit Paratransit Fleet Replacement Vehicles**
        i. 623—Consumer Spending—Gasoline and oil
        ii. 78—Consumption Reallocation—All consumption categories
    b. **Clean and Efficient Strategies**
        i. 623—Consumer Spending—Gasoline and oil
        ii. 78—Consumption Reallocation—All consumption categories
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **Howard Transit Paratransit Fleet Replacement Vehicles**
        i. Number of Sedans=4
        ii. Number of Buses=1
    b. **Clean and Efficient Strategies**
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Howard Transit Paratransit Fleet Replacement Vehicles -** We have calculated the savings in dollars for Howard County Transportation
        i. Average Savings for EV=$1,520
        ii. Vehicles Miles for ADA=1,545
        iii. Cost of Diesel Fuel=3.76
        iv. Average Miles per gallon of Diesel Sedan=25.5 mpg
        v. Average cost of EV per miles=$0.02
        vi. Average MPG of Hybrid Buses=5.4 mpg
        vii. Average MPG of Diesel Buses = 6.1 mpg
        viii. Cost for Diesel Bus to Travel ADA Route Annually - $907.54

b. **Clean and Efficient Strategies**
   i. **Clean and Efficient Strategies (all reductions)**[174]
      1. Baltimore City 18.9 tons
      2. Howard County 4.98 tons
      3. JHU 1.992 tons
      4. Anne Arundel Schools 15.22 tons
   ii. Avg. price per gallon of fuel =3.43

4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
   a. **Howard Transit Paratransit Fleet Replacement Vehicles**
      i. Average Annual Savings =$ 235.65 (Average Cost of Diesel Sedan (Gas) - Average cost of EV for ADA route)
      ii. Average Annual Savings from 3 sedans=$706.95 (Average Annual Savings*3)
      iii. Average Miles per gallon of Bus=6.4
      iv. Average Cost of Diesel Bus=938.92 [(Vehicles Miles for ADA/Average Miles per gallon of Bus)* (Cost of Diesel Fuel)]
      v. Average MPG of Hybrid Buses=5.4
      vi. Average Gallons of Fuel Needed =286.0648148 (Vehicles Miles for ADA/Average MPG of Hybrid Buses)
      vii. Average Cost of Hybrid Buses for Electricity=$19.02
      viii. Average Cost of Hybrid Buses for Diesel =$556.39 [(Cost of Diesel Fuel*Average Gallons of Fuel Needed)/2]
      ix. Average Overall Annual Cost of Hybrid Bus=$575.42 (Average Cost of Hybrid Buses for Electricity + Average Cost of Hybrid Buses for Diesel)
      x. Average Annual Savings from Hybrid Bus=$350.72 (Average Cost of Diesel Bus - Average Overall Annual Cost of Hybrid Bus)
      xi. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$1,057.67 [(Average Annual Savings from Hybrid Bus+ Average Annual Savings from 3 sedans)]= Total Savings Annually from Policy
   b. **Clean and Efficient Strategies**
      i. Total reduction of CO_2=0.0039 mmt
      ii. $1,600,000 [0.0039 * 405,821,147.4 conversion]=Total value of reduction
5. Input savings by sector into REMI model and run impacts.
6. Export impacts and analyze.

3.2.13 Evaluating the GHG Emissions Impacts from Major Projects and Plans

This policy was omitted from the analysis.

[174] "U.S. EPA Sensitive Population Grant for the City of Baltimore and the City of Annapolis (Fire Trucks and Ambulances)." Maryland Department of the Environment (MDE). 14 Nov. 2011 <http://www.mde.state.md.us/programs/Air/MobileSources/DieselVehicleInformation/DieselRetrofitProjects/Pages/balto_annapcity_retrofit.aspx>.

3.2.14 Airport Initiatives

Investment Phase

No investment costs were specified by the agency for this policy.

Operation Phase

1. Determine relevant REMI sectors.
    a. **Compressed Natural Gas Buses**
        i. 63—State Government Spending
    b. **Air Emissions Reductions**
        i. 63—State Government Spending
    c. **BWI Energy Audit**
        i. 63—State Government Spending
    d. **BWI Utility Master Plan**
        i. 63—State Government Spending
    e. **BWI Energy Efficiency**
        i. 63—State Government Spending
    f. **Enhanced Access to BWI by Other Travel Modes**
        i. 63—State Government Spending
    g. **BWI's Periodic Air Quality Assessments**
        i. 63—State Government Spending
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **Compressed Natural Gas Buses**
    b. **Air Emissions Reductions**
    c. **BWI Energy Audit**
    d. **BWI Utility Master Plan**
    e. **BWI Energy Efficiency**
    f. **Enhanced Access to BWI by Other Travel Modes**
    g. **BWI's Periodic Air Quality Assessments**
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Compressed Natural Gas Buses**
        i. Average Cost of Fuel—$3.61 per gallon
    b. **Air Emissions Reductions**
        i. Average Cost of Fuel—$3.61 per gallon
    c. **BWI Energy Audit**
        i. Average Cost of Fuel—$3.61 per gallon
    d. **BWI Utility Master Plan**
        i. Average Cost of Fuel—$3.61 per gallon
    e. **BWI Energy Efficiency**
        i. Average Cost of Fuel—$3.61 per gallon
    f. **Enhanced Access to BWI by Other Travel Modes**
        i. Average Cost of Fuel—$3.61 per gallon
    g. **BWI's Periodic Air Quality Assessments**
        i. Average Cost of Fuel—$3.61 per gallon

4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
    a. **Compressed Natural Gas Buses**
        i. 63—State Government Spending—$2,509,315.04 [.006 mmt CO2e * $405,821,147.4 conversion]=Value of fuel saved at BWI per year from 2012—2020
    b. **Air Emissions Reductions**
        i. 63—State Government Spending—$2,509,315.04 [.006 mmt CO2e * $405,821,147.4 conversion]=Value of fuel saved at BWI per year from 2012—2020
    c. **BWI Energy Audit**
        i. 63—State Government Spending—$2,509,315.04 [.006 mmt CO2e * $405,821,147.4 conversion]=Value of fuel saved at BWI per year from 2012—2020
    d. **BWI Utility Master Plan**
        i. 63—State Government Spending—$2,509,315.04 [.006 mmt CO2e * $405,821,147.4 conversion]=Value of fuel saved at BWI per year from 2012—2020
    e. **BWI Energy Efficiency**
        i. 63—State Government Spending—$2,509,315.04 [.006 mmt CO2e * $405,821,147.4 conversion]=Value of fuel saved at BWI per year from 2012—2020
    f. **Enhanced Access to BWI by Other Travel Modes**
        i. 63—State Government Spending—$2,509,315.04 [.006 mmt CO2e * $405,821,147.4 conversion]=Value of fuel saved at BWI per year from 2012—2020
    g. **BWI's Periodic Air Quality Assessments**
        i. 63—State Government Spending—$2,509,315.04 [.006 mmt CO2e * $405,821,147.4 conversion]=Value of fuel saved at BWI per year from 2012—2020
5. Input savings by sector into REMI model and run impacts.
6. Export impacts and analyze.

3.2.15 Port Initiatives

Investment Phase

1. Determine relevant REMI sectors for each program under the policy.
    a. **Port of Baltimore Initiatives**
        i. 63—State Government Spending
2. Determine overall cost of policy implementation for each program under the policy.
    a. **Port of Baltimore Initiatives**
        i. 2010: $14,400
3. Input investment by sector into REMI model and run impacts.
4. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI sectors.
    a. **Port of Baltimore Initiatives**
        i. 63—State Government Spending
2. Determine part of program to be affected by savings (from 6.2.11 write-up).
    a. **Port of Baltimore Initiatives**
        i. Retrofit tire gantry cranes with Diesel Oxidation Catalysts
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Port of Baltimore Initiatives**
        i. Total Tire Gantry Cranes to be Retrofitted[175]—12 tire gantry cranes
        ii. Average cost of Diesel Oxidation Catalysts Retrofit[176]—$1,200.00 per retrofitted vehicle
        iii. Reductions resulting from DOC retrofit[177]—20% air particles
        iv. Fees associated with Title V Permit for emissions [178]—$52.23 per ton + $200 base fee
        v. Useful Life of a Rubber Tire Gantry[179]—19 years per RTG
        vi. Emissions from Rubber Tire Gantry (average annually)[180]—875 tons of pollutants per RTG
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
    a. **Port of Baltimore Initiatives**
        i. $757.89 [(12 tire gantry cranes * $1,200.00 per retrofitted vehicle)] / [(19 number of useful years)]=annual cost incurred per retrofit of RTGs
        ii. $548,615.00 [(875 tons of pollutants from RTGs on average a year * $52.23 per ton)] + {($200.00 base fee of Title V permit)] * [(12 cranes in operation at Seagirt)]=annual average cost of permit from RTGs
        iii. 8,400 [(875 tons of pollutants from RTGs on average a year * 20% reduction in RTG pollution due to retrofit * 12 cranes)]=average reduction in tons of air pollutants from DOC retrofit

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175 Port of Baltimore. 2009. Ports America - Home. PortsAmerica.com 11 Nov. 2011 <http://www.portsamerica.com/baltimore-maryland.html>.
176 "U.S. EPA Sensitive Population Grant for the City of Baltimore and the City of Annapolis (Fire Trucks and Ambulances)." Maryland Department of the Environment (MDE). 14 Nov. 2011 <http://www.mde.state.md.us/programs/Air/MobileSources/DieselVehicleInformation/DieselRetrofitProjects/Pages/balto_annapcity_retrofit.aspx>.
177 Green Port of Baltimore. Air Quality. Maryland Department of Transportation; Port Administration. 11 Nov. 2011 <http://mpa.maryland.gov/content/air-quality.php>.
178 MARC Parking Details | Maryland Transit Administration. Home | Maryland Transit Administration. Nov. 2011. Maryland Transit Administration (MTA). 14 Nov. 2011 <http://mta.maryland.gov/marc-parking-details>.
179 Starcrest Consulting Group, LLC. "Rubber Tired Gantry (RTG) Crane Load Factor Study." Nov. 2009. Port of Los Angeles; Port of Long Beach. 14 Nov. 2011 <http://www.polb.com/civica/filebank/blobdload.asp?BlobID=6915>.
180 New Hybrid Crane to Reduce the Carbon Footprint. About MAERSK. 31 March 2011. MAERSK. 11 Nov. 2011. <http://www.maersk.com/AboutMaersk/News/Pages/20110331-154630.aspx>.

iv. $439,489.89 [((8,400 tons on average of air pollutants from RTG retrofitted * $52.23 per ton of pollutant) + $200.00 base fee of permit)]=average annual cost of permit after retrofitting of twelve cranes
v. $440,247.79 [($438,732.00 average cost of new permit after retrofit + ($63.16 per crane for cost of retrofit annually))]=average annual cost of reduction in emissions
vi. 63—State Government Spending—$108,367.21 [($548,615.00 before retrofit permit costs - $440,247.79 average annual costs (permit and depreciating costs of retrofit))]=annual savings to industry

5. Input savings by sector into REMI model and run impacts.
6. Export impacts and analyze.

3.2.16 Freight and Freight Rail Strategies

Investment Phase

5. Determine relevant REMI sectors for each program under the policy.
    a. **Freight and Freight Rail Strategies**
        i. 63—State Government Spending
6. Determine overall cost of policy implementation for each program under the policy.
    b. **Freight and Freight Rail Strategies**
        i. 2010: $14,400
7. Input investment by sector into REMI model and run impacts.
8. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI sectors.
    a. **Auxiliary Power Units for Existing Locomotives**
        i. 63—State Government Spending
        ii. 623—Consumer Spending—Gasoline and oil
        iii. 78—Consumption Reallocation—All Consumption Categories
2. Determine part of program to be affected by savings (from 6.2.3 write-up).
    a. **Auxiliary Power Units for Existing Locomotives**
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Auxiliary Power Units for Existing Locomotives**
        i. Marginal Savings per Year[181]=$1,339
        ii. Number of Locomotives with CSX[182]=20
    b. **Technology Advances for Non-highway Vehicles**
        i. Avg. Contribution in 2006 of CO2 Emissions from US[183]=55,400,000 tons

[181] Truck and Locomotive Idling Solutions. South East Diesel Collaborative, 25 June 2008. Web. 14 Nov. 2011. <http://www.southeastdiesel.org/Presentations%20for%203rd%20Annual%20Meeting/Day%202/Idle%20Reduct%20Tech-%20anthony%20erb.pdf>.
[182] Fuel Efficiency. CSX Corporation. Web. 11 Nov. 2011. < http://www.csx.com/index.cfm/about-csx/projects-and-partnerships/fuel-efficiency/>.
[183] Pathways to Reduced Transportation CO2 in the Year 2050. Cornell University. 11 Nov. 2011 <http://www.cee.cornell.edu/academics/graduate/loader.cfm?csModule=security/getfile&PageID=84226>.

ii. Avg. Rail Miles in the US[184]=140,000
iii. Avg. Rail Miles in Maryland[185]=759
iv. Avg. Potential Fuel Reduction of Elect Loco[186]=0.625
v. Average Reduction of Emissions from Program—30%
vi. Avg. Cost of a gallon of gas in MD=$3.61 per gallon

4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
    a. **Auxiliary Power Units for Existing Locomotives**
        i. 63—State Government Spending—$26,780 [($1,339 Marginal Savings per Year * 20 Number of Locomotives with CSX)]=Average Annual Savings Associated with this program
5. Input savings by sector into REMI model and run impacts.
6. Export impacts and analyze.

3.2.17 Federal Renewable Fuel Standard

Investment Phase

No investment costs were specified by the agency for this policy.

Operation Phase

1. Determine relevant REMI sectors.
    a. **Federal Renewable Fuel Standard**
        i. 623—Consumer Spending—Gasoline and oil
        ii. 78—Consumption Reallocation—All Consumption Categories
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **Federal Renewable Fuel Standard**
        i. Reduction=240,000 metric tons (.24*1,000,000)
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Federal Renewable Fuel Standard**
        i. Cost of Avg. Gallon of Gas=$3.61 per gallon
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
    a. **Federal Renewable Fuel Standard**
        i. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$12,147,306.40 [(0.24 mmt CO2e * 405,821,147.4)/8]=Total value of fuel saved per year from 2013—2020
5. Input savings by sector into REMI model and run impacts.

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[184] Rail Track Mileage and Number of Class I Rail Carriers, United States, 1830-2008. The Geography of Transport Systems. Web. 14 Nov. 2011.
< http://people.hofstra.edu/geotrans/eng/ch3en/conc3en/usrail18402003.html>.

[185] Freight Railroads in Maryland. Association of American Railroads. 2009. Web. 11 Nov. 2011.
< http://www.aar.org/Railroads-States/Maryland-2009.pdf>.

[186] Pathways to Reduced Transportation CO2 in the Year 2050. Cornell University. 11 Nov. 2011
<http://www.cee.cornell.edu/academics/graduate/loader.cfm?csModule=security/getfile&PageID=84226>.

6. Export impacts and analyze.

3.2.18 CAFE Standards: Model Years 2008-2011

Investment Phase

No investment costs were specified by the agency for this policy.

Operation Phase

1. Determine relevant REMI sectors.
   a. **CAFE Standards: Model Years 2008-2011**
      i. 623—Consumer Spending—Gasoline and oil
      ii. 78—Consumption Reallocation—All Consumption Categories
2. Determine part of program to be affected by savings (from 6.2.6 write-up).
   a. **CAFE Standards: Model Years 2008-2011**
      i. Raise MPG standards for all new light vehicles to 27.5 mpg by 2011
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **CAFE Standards: Model Years 2008-2011**
      i. By 2011 New MPG[187]=27.3 mpg
      ii. Average Annual Miles Driven By Population[188]=13,041
      iii. Avg. Price of Gas=$3.61
      iv. Previous Ruling on CAFE Standards[189]=22.5 mpg
      v. Average Annual Miles Driven By Population[190]=13,041
      vi. New Vehicle Registrations in MD=2,700 courtesy of MVA
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
   a. **CAFE Standards: Model Years 2008-2011**
      i. Annual Gallons of Gas Used=477.6923077 (By 2011 New MPG/ Average Annual Miles Driven By Population)
      ii. Average Cost to MD Driver Under new CAFE=$1,723.39 (Annual Gallons of Gas Used* Avg. Price of Gas)
      iii. Annual Gallons of Gas Used Under old CAFE=579.6 (Average Annual Miles Driven By Population/ Previous Ruling on CAFE Standards)
      iv. Average price of gas today=3.61
      v. Cost to Drivers today under old CAFE=$2,091.05 (Annual Gallons of Gas Used Under old CAFE*average price of gas)
      vi. 623—Consumer Spending—Gasoline and oil, 78—Consumption Reallocation—All Consumption Categories—$5,645,840.13 (Cost to

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[187] "Average Fuel Economy Standards for Light Trucks." Department of Transportation. 14 Nov. 2011 <http://www.nhtsa.gov/DOT/NHTSA/Rulemaking/Rules/Associated%20Files/2006FinalRule.pdf>

[188] "State & Urbanized Area Statistics - Our Nation's Highways - 2000." Home | Federal Highway Administration. 4 Apr. 2011. Federal Highway Administration (FHWA). 11 Nov. 2011 <http://www.fhwa.dot.gov/ohim/onh00/onh2p11.htm>.

[189] "Average Fuel Economy Standards for Light Trucks." Department of Transportation. 14 Nov. 2011 <http://www.nhtsa.gov/DOT/NHTSA/Rulemaking/Rules/Associated%20Files/2006FinalRule.pdf>

[190] Ibid.

Drivers today under old CAFE* New Vehicle Registrations in MD)= Annual Savings from New CAFE Standards

5. Input savings by sector into REMI model and run impacts.
6. Export impacts and analyze.

3.2.19 Promoting Hybrid and Electric Vehicles

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
   a. **Promoting Hybrid and Electric Vehicles**
      i. 63—State Government Spending
2. Determine overall cost of policy implementation for each program under the policy.
   a. **Promoting Hybrid and Electric Vehicles**
      i. $110,000 annually (provided by MEA)
3. Distribute inputs among identified REMI PI+ sectors.
   a. **Promoting Hybrid and Electric Vehicles**
      i. 100% spent by government on administrative costs and oversight
4. Input costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors.
   a. **Promoting Hybrid and Electric Vehicles**
      i. 641—Consumer spending (gas)
      ii. 78—Consumption Reallocation
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **Promoting Hybrid and Electric Vehicles**
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **Promoting Hybrid and Electric Vehicles**
      i. Total Hybrids registered in Maryland=10,874 (MDOT provided)
      ii. Average Annual Savings to Drive an EV (from 3.2.11)=$1,520.73
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
   a. **Electric Vehicle Infrastructure Program**
      i. 641—$16,536,361.76 [(10,874 Total Hybrids Registered in Maryland * $1,520.73 Average Annual Savings to Drive an EV)]=Average Savings to all Hybrid Owners in Maryland
      ii. 78—$16,536,361.76 [(reallocation of savings across all other consumption categories)]
5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.2.20 Pay-as-You-Drive (PAYD) Insurance

Investment Phase

No investment costs were specified by the agency for this policy.

Operation Phase

1. Determine relevant REMI PI+ sectors.
   a. **Voluntary Efforts to Promote Pay as Your Drive Insurance**
      i. 648—Consumer spending (auto insurance)
      ii. 78—Consumption reallocation (across all categories)
2. Determine part of program to be affected by savings (strategy write-up).
   a. **Voluntary Efforts to Promote Pay as Your Drive Insurance**
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **Voluntary Efforts to Promote Pay as Your Drive Insurance**
      i. MD Population age 18 and older[191]—4,481,657
      ii. Baltimore City Population age 18 and older[192]—485,828
      iii. Progressive 2011 market share—5.72% (data provided by MIA)
      iv. Total employed and living in Baltimore City[193]–101,968
      v. Average annual premium to Baltimore City residents for car insurance—$4,074
      vi. Average savings from PAYD—10% (Progressive's website)
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
   a. **Voluntary Efforts to Promote Pay as Your Drive Insurance**
      i. 10.8% [(485,828 Baltimore City population age 18 or older / 4,481,657 MD population age 18 or older)]=percentage of potential insurance holders in Baltimore City
      ii. 256,351 [(485,828 MD population age 18 or older * 5.72% market share of Progressive members in MD)]=Potential number of Progressive customers in Maryland
      iii. 27,789 [(256,351 potential number of Progressive customers in Maryland * 10.8% percentage of potential insurance holder in Baltimore City)]=Number of potential progressive clients residing in Baltimore City
      iv. 0.6% [(27,789 number of potential progressive clients residing in Baltimore City / 4,481,657 MD population age 18 or older)]=percentage of those that are insured by progressive in Maryland residing in Baltimore City
      v. 632 [(101,968 total employed and living in Baltimore City * 0.6% percentage of those that are insured by Progressive in Maryland residing

[191] United States Census Bureau, "ACS Demographic and Housing Estimates: 2010 American Community Survey 1-Year Estimates," *American FactFinder*, (Maryland and Baltimore City, Maryland), accessed October 17, 2012.
[192] Ibid.
[193] United States Census Bureau's Center for Economic Studies, "OnTheMap," *Longitudinal Employer-Household Dynamics*, accessed October 17, 2012.

in Baltimore City)]=Number of potential Progressive members in Baltimore City that may take advantage of PAYD

vi. $407 [($4,074 average annual premium paid by Baltimore City residents for car insurance * 10% discount on average for PAYD consumers through Progressive)]=Annual premium savings to consumers using PAYD

vii. $257,577 [(632 number of potential Progressive members in Baltimore City that may take advantage of PAYD * $407 average annual premium savings to consumers using PAYD)]=Average annual savings from PAYD to Maryland residents

viii. 648—$257,577 savings to Maryland residents from PAYD

ix. 78—$257,577 reallocation of savings across other consumption categories

5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

C.3 Agriculture and Forestry

3.3.1 Managing Forests to Capture Carbon

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
    a. **Managing Forests to Capture Carbon**
        i. X6403—Exogenous Final Demand (Support activities for agriculture and forestry)
2. Determine overall cost of policy implementation for each program under the policy.
    a. **Managing Forests to Capture Carbon**
        i. $3,700,000 per year (2010-2020) (costs provided by DNR)
3. Distribute inputs among identified REMI PI+ sectors.
    a. **Managing Forests to Capture Carbon**
        i. 100% paid by government for forestry projects between 2010-2020
4. Input costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
    a. **Managing Forests to Capture Carbon**
        i. X5401—Forestry; fishing, hunting, trapping, Sales
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **Managing Forests to Capture Carbon**
        i. Contribution to GDP per Acre=$478
        ii. Number of acres to be planted=30,000
        iii. Acres planted thus far=12,618
        iv. Total acres left=17,382 (number of acres planted- acres planted thus far)
3. Research savings data for each policy according to part of program to be affected by savings.

   a. **Managing Forests to Capture Carbon**
      i. Annual acres of trees planted per year=2,173
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2012-2020).
   a. **Managing Forests to Capture Carbon**
      i. $8,308,596—[($478 Contribution to GDP per Acre * 17,382 Number of Acres to Planted)] = Average Annual Contribution to GDP for Acres Left to Plant
      ii. X5401—$1,038,575 [($8,308,596 Average Annual Contribution to GDP for Acres Left to Plant / 8 years left until 2020)] = Average Annual Contribution to GDP over remainder of project
5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.3.2 Creating Ecosystem Markets to Encourage GHG Emissions Reductions

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
   a. **Wetland Markets**
      i. 63—State Govt. Spending
   b. **Stream and Waterway Markets**
      i. 63—State Govt. Spending
   c. **Forest Markets**
      i. 63—State Govt. Spending
   d. **Critical Area Markets**
      i. 63—State Govt. Spending
   e. **Species and Habitat Markets**
      i. 63—State Govt. Spending
   f. **Nutrient Markets**
      i. 63—State Govt. Spending
   g. **Carbon Markets: RGGI and Maryland CO2 Budget Trading Program Offsets**
      i. 63—State Govt. Spending
   h. **Carbon Markets: GGRA of 2009—Offsets and Early Reductions**
      i. 63—State Govt. Spending
   i. **Carbon Markets: GGRA of 2009—Nutrient Trading with Carbon Co-benefits**
      i. 63—State Govt. Spending
   j. **Biomass Markets**
      i. 63—State Govt. Spending
2. Determine overall cost of policy implementation for each program under the policy. [194]

[194] DNR has stated that the program would potentially cost $50,000 annually. RESI has analyzed this program from 2010-2020 at that cost to the government.

- **a. Wetland Markets**
  - i. $5,000 (provided by DNR)
- **b. Stream and Waterway Markets**
  - i. $5,000 (provided by DNR)
- **c. Forest Markets**
  - i. $5,000 (provided by DNR)
- **d. Critical Area Markets**
  - i. $5,000 (provided by DNR)
- **e. Species and Habitat Markets**
  - i. $5,000 (provided by DNR)
- **f. Nutrient Markets**
  - i. $5,000 (provided by DNR)
- **g. Carbon Markets: RGGI and Maryland CO2 Budget Trading Program Offsets**
  - i. $5,000 (provided by DNR)
- **h. Carbon Markets: GGRA of 2009—Offsets and Early Reductions**
  - i. $5,000 (provided by DNR)
- **i. Carbon Markets: GGRA of 2009—Nutrient Trading with Carbon Co-benefits**
  - i. $5,000 (provided by DNR)
- **j. Biomass Markets**
  - i. $5,000 (provided by DNR)

3. Distribute inputs among identified REMI PI+ sectors.
   - **a. Wetland Markets**
     - i. 100% paid by government to cover administrative costs
   - **b. Stream and Waterway Markets**
     - i. 100% paid by government to cover administrative costs
   - **c. Forest Markets**
     - i. 100% paid by government to cover administrative costs
   - **d. Critical Area Markets**
     - i. 100% paid by government to cover administrative costs
   - **e. Species and Habitat Markets**
     - i. 100% paid by government to cover administrative costs
   - **f. Nutrient Markets**
     - i. 100% paid by government to cover administrative costs
   - **g. Carbon Markets: RGGI and Maryland CO2 Budget Trading Program Offsets**
     - i. 100% paid by government to cover administrative costs
   - **h. Carbon Markets: GGRA of 2009—Offsets and Early Reductions**
     - i. 100% paid by government to cover administrative costs
   - **i. Carbon Markets: GGRA of 2009—Nutrient Trading with Carbon Co-benefits**
     - i. 100% paid by government to cover administrative costs
   - **j. Biomass Markets**
     - i. 100% paid by government to cover administrative costs

4. Input costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
    a. **Wetland Markets**
        i. 63—State Government Spending
        ii. X7802—Production costs, Logging
        iii. X7801—Production costs, Forestry; fishing, hunting, trapping
    b. **Stream and Waterway Markets**
        i. 63—State Government Spending
        ii. X7802—Production costs, Logging
        iii. X7801—Production costs, Forestry; fishing, hunting, trapping
    c. **Forest Markets**
        i. 63—State Government Spending
        ii. X7802—Production costs, Logging
        iii. X7801—Production costs, Forestry; fishing, hunting, trapping
    d. **Critical Area Markets**
        i. 63—State Government Spending
        ii. X7802—Production costs, Logging
        iii. X7801—Production costs, Forestry; fishing, hunting, trapping
    e. **Species and Habitat Markets**
        i. 63—State Government Spending
        ii. X7802—Production costs, Logging
        iii. X7801—Production costs, Forestry; fishing, hunting, trapping
    f. **Nutrient Markets**
        i. 63—State Government Spending
        ii. X7802—Production costs, Logging
        iii. X7801—Production costs, Forestry; fishing, hunting, trapping
        iv. 80—Electricity (Industrial Sector) Fuel Costs, All Industrial sectors
    g. **Carbon Markets: RGGI and Maryland CO2 Budget Trading Program Offsets**
        i. 63—State Government Spending
        ii. X7802—Production costs, Logging
        iii. X7801—Production costs, Forestry; fishing, hunting, trapping
    h. **Carbon Markets: GGRA of 2009—Offsets and Early Reductions**
        i. 80—Electricity (Industrial Sector) Fuel Costs, All Industrial sectors
    i. **Carbon Markets: GGRA of 2009—Nutrient Trading with Carbon Co-benefits**
        i. 80—Electricity (Industrial Sector) Fuel Costs, All Industrial sectors
    j. **Biomass Markets**
        i. 63—State Government Spending
        ii. X7802—Production costs, Logging
        iii. X7801—Production costs, Forestry; fishing, hunting, trapping
2. Determine part of program to be affected by savings (from strategy write-up).

a. **Wetland Markets**
    i. Acres of Wetlands=45
b. **Stream and Waterway Markets**
c. **Forest Markets**
    i. Contribution to GDP per 1 acre of Forest Land—$478
d. **Critical Area Markets**
    i. Contribution to GDP per 1 acre of Forest Land—$478
e. **Species and Habitat Markets**
f. **Nutrient Markets**
g. **Carbon Markets: RGGI and Maryland CO2 Budget Trading Program Offsets**
    i. Total allowances yearly by the state of Maryland for GHG—37,503,983 metric tons
    ii. Number of years of auctions—4 years
h. **Carbon Markets: GGRA of 2009—Offsets and Early Reductions**
i. **Carbon Markets: GGRA of 2009—Nutrient Trading with Carbon Co-benefits**
j. **Biomass Markets**

3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Wetland Markets**
        i. Average Value of Wetland (1 acre)=$175,000
    b. **Stream and Waterway Markets**
        i. Current Miles of Waterway=15,000
        ii. Benefit to Healthy Waterway=$568,000,000 (spent by fishers on equipment to fish in MD in 2008)
        iii. Percentage of Streams Unhealthy=46%
    c. **Forest Markets**
        i. Average Acreage Lost a year[195]=7,000
    d. **Critical Area Markets**
        i. Total Critical Area Acres in MD=680,000 acres
        ii. Cost of Buffer=$2 per feet
        iii. Intensely Developed Land=0.05
    e. **Species and Habitat Markets**
        i. Cost per acre of habitat area[196]=$5,750 per acre
        ii. Species of Wildlife[197]=167
        iii. Plants[198]=447
        iv. Total Habitat Creatures/Plants=614
        v. Assuming each species needs 45 acres=27,630 acres needed

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[195] Ecosystem Services Working Group Final Report. Maryland Department of Natural Resources. Maryland Department of Natural Resources, Oct. 2011. Web. 14 Nov. 2011. <http://www.dnr.state.md.us/dnrnews/pdfs/ESWGFinalReportOct2011.pdf>.
[196] Ibid.
[197] Ibid.
[198] Ibid.

f. **Nutrient Markets**
   i. Total Potential Realization[199]=$45,000,000.00
g. **Carbon Markets: RGGI and Maryland CO2 Budget Trading Program Offsets**
   i. Total Proceeds to Date [200]=$169,600,423.80
   ii. Number of Years=4
h. **Carbon Markets: GGRA of 2009—Offsets and Early Reductions**
   i. ERA Awardees 2009-2011[201]
   ii. AES Warriors Run=$75,169
   iii. Mirant Chalk Point=$142,534
   iv. Sum of Awarded CO2=$217,703
   v. Auction Price at Time of Award=2.19
i. **Carbon Markets: GGRA of 2009—Nutrient Trading with Carbon Co-benefits**
   i. Assumption-We will stack the benefits together and package
   ii. 50% CO2 Credits=$21,200,052.98 (50% reduced revenue)
   iii. 50% Potential Nutrient Credit[202]=$22,500,000.00 (50% reduced revenue)
j. **Biomass Markets**
   i. Annual Savings from 2015-2020=$21,413,700.00 (from DNR)

4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
   a. **Wetland Markets**
      i. $7,875,000 [(45 acres of Wetlands to be restored * $175,000 value of an acre of wetland)]=Average Savings from Restoration of 45 Acres of Wetlands
      ii. 63—$984,375 [($7,875,000 / 8 years)]=average revenue paid to government by private firms
      iii. X7802—$474,188 average annual costs
      iv. X7801—$474,188 average annual costs
   b. **Stream and Waterway Markets**
      i. $261,280,000 [($568,000,000 Annual Benefit attributed to Healthy Waterways * 46% Waterways unhealthy)]=Current Loss of Savings, But Potential Realization of Savings if these Waterways are Brought from unhealthy to healthy

[199] Jones, CY, Evan Branosky, Mindy Selman, and Michelle Perez. "How Nutrient Trading Could Help Restore the Chesapeake Bay." World Resource Institute. World Resource Institute, Feb. 2010. Web. 14 Nov. 2011. <http://pdf.wri.org/working_papers/how_nutrient_trading_could_help_restore_the_chesapeake_bay.pdf>.
[200] MD Proceeds by Auction. Regional Greenhouse Gas Initiative (RGGI) CO2 Budget Trading Program - Welcome. Regional Greenhouse Gas Initiative CO2 Budget Trading Program, 2011. Web. 14 Nov. 2011. <http://rggi.org/docs/MD_Proceeds_by_Auction.pdf>.
[201] Early Reduction CO2 Allowance Awards. Regional Greenhouse Gas Initiative (RGGI) CO2 Budget Trading Program. Regional Greenhouse Gas Initiative (RGGI) CO2 Budget Trading Program, 18 Dec. 2009. Web. 16 Nov. 2011. <http://www.rggi.org/docs/md_proceeds_by_auction.pdf>.
[202] Jones, CY, Evan Branosky, Mindy Selman, and Michelle Perez. "How Nutrient Trading Could Help Restore the Chesapeake Bay." World Resource Institute. World Resource Institute, Feb. 2010. Web. 14 Nov. 2011. <http://pdf.wri.org/working_papers/how_nutrient_trading_could_help_restore_the_chesapeake_bay.pdf>.

ii. 63—$32,660,000 [($261,280,000 / 8 years)]=average annual revenue paid to government by private firms
iii. X7802—$16,330,000 average annual costs
iv. X7801—$16,330,000 average annual costs

c. **Forest Markets**
i. $3,346,000 [(7,000 acres of Forest Land Lost Annually * $478 Contribution to GDP of one acre of Forest Area)]=Average Annual Savings of restoration of Forest Areas
ii. 63—$418,250 [($3,346,000 / 8 years)]=average annual revenue paid to government by private firms
iii. X7802—$209,125 average annual costs
iv. X7801—$209,125 average annual costs

d. **Critical Area Markets**
i. 34,000 acres [(680,000 acres of Critical Area in MD * 5% Intensely Developed Land)]=Total Acres of Intensely Developed Land in acres
ii. 8,851.38 square feet [(square root(34,000 acres of Intensely Developed Land * 43,560 sq feet per acre) * 23% of which may be buffer area)]=Sq. Feet of Critical Areas that are Buffer Zone
iii. $17,702.77 [(8,851.38 sq feet of buffer area * $2.00 per sq feet)]=Average Savings to Buffer Area
iv. $15,392,269.20 [($478 Total Contribution to GDP from Forest Acres * 32,201.4 Acres of Woods)]=Average Annual Savings from Rest of Critical Area
v. $15,409,971.97 [($17,702.77 Average Savings to Buffer Area + $15,392,269.20 Average Annual Savings from Rest of Critical Area)]=Average Annual Savings From Whole Critical Area
vi. 63—$1,926,246.50 [($15,392,269.20 / 8 years)]=average annual revenue paid to government by private firms
vii. X7802—$963,123.25 average annual costs
viii. X7801—$963,123.25 average annual costs

e. **Species and Habitat Markets**
i. 2,763 [(27,630 acres available *10% sold a year)]=Average Annual Acres Sold a Year
ii. $15,887,250 [(2,763 acres * $5,750 Value of Habitat Area)]=Average Revenue from Sale of Habitat Area
iii. 63—$1,985,906.25 [($15,887,250 / 8 years)]=average annual revenue paid to government by private firms
iv. X7802—$992,953.13 average annual costs
v. X7801—$992,953.13 average annual costs

f. **Nutrient Markets**
i. $45,000,000 [(Potential Realization from DNR website)]
ii. 63—$5,625,000 [($45,000,000 / 8 years)]=average annual revenue paid to government by private firms
iii. X7802—$2,812,500 average annual costs
iv. X7801—$2,812,500 average annual costs

g. **Carbon Markets: RGGI and Maryland CO2 Budget Trading Program Offsets**
    i. $42,400,105.95 [($169,600,423.80 Total Proceeds to Date / 4 Years of Auctions to Date)]=Average Revenue from RGGI Auctions
    ii. 63—$5,300,013.25 [($42,400,105.95 / 8 years)]=average annual funds paid over next 8 years
    iii. X7802—$2,650,006.63 average annual costs
    iv. X7801—$2,650,006.63 average annual costs

h. **Carbon Markets: GGRA of 2009—Offsets and Early Reductions**
    i. 217,703 ERAs [(75,169 AES Warriors Run ERA + 142,534 Mirant Chalk Point ERA)]=Sum of ERAs Awarded thus Far
    ii. $476,769.57 [(217,703 Sum of ERAs Awarded thus Far * $2.19 Auction Prices at Time Of Award)]=Average Savings to Awardees
    iii. 80—$59,596.25 [($476,769.57 average savings to awardees / 8 years)]=average annual savings

i. **Carbon Markets: GGRA of 2009—Nutrient Trading with Carbon Co-benefits**
    i. $43,700,052.98 [($21,200,052.98 Potential Profits from CO2 Credit Sales + $22,500,000 Potential Profit from Nutrient Credit Sales)]=Total Potential Revenue from the Bundle
    ii. 80—$5,462,506.63 [($43,700,052.98 / 8 years)]=average annual savings

j. **Biomass Markets**
    i. $4,282,740.00 [(From DNR)]
    ii. 63—$535,342.50 [($4,282,740 / 8 years)]=average annual revenue from Biomass Markets
    iii. X7802—$267,671.25 costs to production
    iv. X7802—$267,671.25 costs to production

5. Input savings by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.3.3 Increasing Urban Trees to Capture Carbon

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy.
    a. **Increasing Urban Trees to Capture Carbon**
        i. X6412—Exogenous Final Demand (Construction)
        ii. X6526—Exogenous Final Demand (Architectural, engineering, and related services)
        iii. X6403—Exogenous Final Demand (Support activities for agriculture and forestry)
2. Determine overall cost of policy implementation for each program under the policy.
    a. **Increasing Urban Trees to Capture Carbon**
        i. $1,200,000 total from 2010-2020 (provided by DNR)
3. Distribute inputs among identified REMI PI+ sectors.
    a. **Increasing Urban Trees to Capture Carbon**
        i. 100% from government to plant tree and for administrative costs

4. Input costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
   a. **Increasing Urban Trees to Capture Carbon**
      i. 640—Consumer spending (electricity)
      ii. 78—Reallocation of savings (across all consumption categories)
      iii. 82—Electricity (Commercial Sector) Fuel Costs, All Commercial sectors
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **Increasing Urban Trees to Capture Carbon**
      i. Number of Trees to be planted=12,500,000
      ii. Trees planted thus far=5,114,478
      iii. Remaining Trees to Plant=6,535,522
      iv. Number of years Left=8
      v. Average Planting of Trees per year=933,646
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **Increasing Urban Trees to Capture Carbon**
      i. Average savings in energy per tree[203]=$20.00
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2010-2020).
   a. **Increasing Urban Trees to Capture Carbon**
      i. $250,000,000 per year—[($20.00 energy savings per tree * 12,500,000 trees planted after full implementation)] = total savings after full implementation in 2020
      ii. $22,727,272.73 savings annually [($250,000,000 total savings after full implementation in 2020 / 11 years of the program)]=average annual savings during operation phase
      iii. $11,363,636.50 [($22,727,272.73 average annual savings / 2 sectors)]=average annual savings per sector
      iv. 640—$11,363,636.50 average annual savings to consumers
      v. 78—$11,363,636.50 reallocation of savings across all other consumption categories
      vi. 82—$11,363,636.50 average annual savings to the commercial sector
5. Input savings by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.3.4 Creating and Protecting Wetlands and Waterway Borders to Capture Carbon

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy.

[203] David J. Nowak, Susan M. Stein, Paula B. Randler, Eric J. Greenfield, Sara J. Comas, Mary A. Carr, and Ralph J. Alig, “Sustaining America’s Urban Trees and Forest,” *General Technical Report NRS-62* (June 2010), Newton Square, Pennsylvania: United States Department of Agriculture.

   a. **Creating and Protecting Wetlands and Waterway Borders to Capture Carbon**
      i. X6532—Exogenous Final Demand (Other professional, technical, and scientific services)
2. Determine overall cost of policy implementation for each program under the policy.
   a. **Creating and Protecting Wetlands and Waterway Borders to Capture Carbon**
      i. $17,187,817 (total from 2010-2020) (provided by DNR)
3. Distribute inputs among identified REMI PI+ sectors.
   a. **Creating and Protecting Wetlands and Waterway Borders to Capture Carbon**
      i. 100% spent by state to use for administrative costs and restoration costs
4. Input sales by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
   a. **Creating and Protecting Wetlands and Waterway Borders to Capture Carbon**
      i. TOUR1—Tourism spending (amount)
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **Creating and Protecting Wetlands and Waterway Borders to Capture Carbon**
      i. Acres to be restored—1,142
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **Creating and Protecting Wetlands and Waterway Borders to Capture Carbon**
      i. Total visitors to State Parks in 2010[204]—10,000,000
      ii. Out-of-state visitors—29%
      iii. In-state visitors—71%
      iv. In-state pass cost—$75.00
      v. Out-of-state pass—$100.00
      vi. In-state visitors—7,100,000
      vii. Out-of-state visitors—2,900,000
      viii. Number of acres in state parks—137,000
      ix. Average secondary spending by state park visitors in 2010—$594.33
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2010-2020).

[204] Rebecca Dougherty (March 2011), "2010 Maryland State Parks Economic Impact and Visitor Study," Department of Business and Economic Development, accessed October 17, 2012.

a. **Creating and Protecting Wetlands and Waterway Borders to Capture Carbon**
    i. $532,500,000 [($75.00 in-state park pass * 7,100,000 in-state visitors in 2010)] = Total cost of tourism to state parks by in-state visitors in 2010
    ii. $290,000,000 [($100.00 out-of-state park pass * 2,900,000 out-of-state visitors in 2010)] = Total cost of tourism to state parks by out-of-state visitors in 2010
    iii. $822,500,000 [($532,500,000 potential park pass revenues from in-state residents in 2010 + $290,000,000 potential park pass revenues from out-of-state residents in 2010)] = total potential revenues received in 2010 from state park visitors
    iv. $6,003.65 [($822,500,000 total potential park revenues received in 2010 from state park visitors / 137,000 acres in state parks)]=average spending per acre by visitors to state park annually
    v. $5,943,300,000 [($594.33 additional tourism spending by visitors in 2010 * 10,000,000 visitors in 2010 to state parks)]=total additional spending by visitors in 2010
    vi. $5,943,300,000 [($594.33 additional tourism spending by visitors in 2010 * 10,000,000 visitors in 2010 to state parks)]=total additional spending by visitors in 2010
    vii. $43,831.75 [($5,943,300,000 total additional spending by visitors in 2010 / 137,000 number of acres)]=average additional spending by acre by visitors
    viii. $49,385.40 [($43,831.75 average additional spending by acre by visitors in 2010 + $6,003.65 average spending per acre by visitors to state park annually)]=average total spending by visitors annually
    ix. $56,397,670 [($49,385.40 average total spending by visitors annually per acre * 1,142 acres to be restored)]=total additional revenue between 2010-2020
    x. $5,127,061 [($56,397,670 total additional revenue between 2010-2020 / 11 years over program life)]=average annual additional tourism spending from restored acres
    xi. TOUR1—$5,127,061 average annual spending by visitors visiting restored acres of wetlands

5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.3.5 Geological Opportunities to Store Carbon

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
    a. **Geological Opportunities to Store Carbon**
        i. X932—Employment, Other professional, scientific, and technical services
2. Determine overall cost of policy implementation for each program under the policy.

a. **Geological Opportunities to Store Carbon**
    i. 4 $66,701 total from 2010-2020 (provided by DNR)
3. Distribute inputs among identified REMI PI+ sectors.
    a. **Geological Opportunities to Store Carbon**
        i. 100% spending by state government through hiring of professionals
4. Input costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
    a. **Geological Opportunities to Store Carbon**
        i. 80—Electricity (Industrial sectors) Fuel Cost, All Industrial Sectors
        ii. 84—Natural Gas (Industrial sectors) Fuel Cost, All Industrial Sectors
        iii. 88—Residual (Industrial sectors) Fuel Cost, All Industrial Sectors
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **Geological Opportunities to Store Carbon**
        i. Target Waste Gate Formation 4.4 gigatonnes
        ii. Target Needmore Shale 0.01 gigatonnes
        iii. Target Oriskany Sandstone 0.981 gigatonnes
        iv. Target Medina Sandstone 3.382 gigatonnes
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Geological Opportunities to Store Carbon**
        i. Tonnes to Gallon Conversion=317.76
        ii. Number of Gallons in a barrel=42
        iii. Cost per Barrel [205]=101

Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).

b. **Geological Opportunities to Store Carbon**
    i. 8.773 gigatonnes (4.4 gigatonnes of waste gate formation + 0.01 gigatonnes of Needmore Shale + 0.981 gigatonnes + 3.382 gigatonnes of Medina Sandstone) = Total Target Gigatonnes
    ii. 8,773,000,000 tonnes (8.773 total target in gigatonnes * 10^9) = conversion from gigatonnes to tonnes
    iii. 27,608,925.19 gallons of fuel (8,773,000,000 total target tonnes / 317.75 gallons associated with a tonne) = target reduction in gallons of fuel
    iv. 657,355.36 barrels of oil (27,608,925.19 target reduction in gallons of fuel / 42 gallons to a barrel) = Average Reduction Target in Number of Barrels conserved
    v. $66,392,891.54 [(657,355.36 average reduction target in number of barrels conserved * $101 per barrel)] = average savings from reduction techniques associated with strategy by 2020

[205] "Petroleum and other Liquids." U.S. Energy Information Agency. EIA. Gov Web. 16 Nov 2011 < http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=RCLC1&f=D>

vi. $6,035,717 [($66,392,891.54 average savings from reduction techniques associated with strategy by 2020 / 11 years)]=average annual savings from 2010-2020
vii. 80—$2,011,906 average annual reduction in fuel costs
viii. 84—$2,011,906 average annual reduction in fuel costs
ix. 88—$2,011,906 average annual reduction in fuel costs

4. Input savings/costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

3.3.6 Planting Forests in Maryland

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy.
   a. **Planting Forests in Maryland**
      i. X3203—Industry sales, Support activities for agriculture
2. Determine overall cost of policy implementation for each program under the policy.
   a. **Planting Forests in Maryland**
      i. $7,651,200 (provided by DNR)
3. Distribute inputs among identified REMI PI+ sectors.
   a. **Planting Forests in Maryland**
      i. 100% spent by towards activities for agriculture increasing sales of forestry growth
4. Input sales/costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
   a. **Planting Forests in Maryland**
      i. 640—Consumer spending (electricity)
      ii. 78—Consumption reallocation (across all other consumption categories)
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **Planting Forests in Maryland**
      i. Number of trees planted by 2020=43,030
      ii. Average energy savings per tree=$20.00 (see urban trees)
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **Planting Forests in Maryland**
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2010-2020).
   a. **Planting Forests in Maryland**
      i. $860,600 [(43,030 total trees to be planted by 2020 * $20.00 energy saving per tree)]=Total savings by 2020 in energy costs
      ii. $78,236.36 [($860,000 total savings by 2020 from newly planted trees / 11 years of program)]=average annual energy savings attributed to program
      iii. 640—$78,236.36 average annual energy savings
      iv. 78—$78,236.36 savings reallocation across other consumption categories

5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.3.7 Expanded Use of Forests and Feedstocks for Energy Production

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy.
    a. **Expanded Use of Forests and Feedstocks for Energy Production**
        i. EQP13—Producer's Durable Equipment Investment (Electrical transmission, distribution, and industrial apparatus)
2. Determine overall cost of policy implementation for each program under the policy.
    a. **Expanded Use of Forests and Feedstocks for Energy Production**
        i. $100,000,000 total costs from 2010-2020 (provided by DNR)
3. Distribute inputs among identified REMI PI+ sectors.
    a. **Expanded Use of Forests and Feedstocks for Energy Production**
        i. 100% spent by government toward program startup and costs
4. Input sales/costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
    a. **Expanded Use of Forests and Feedstocks for Energy Production**
        i. X7809—Production costs, Electric power generation, transmission, and distribution
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **Expanded Use of Forests and Feedstocks for Energy Production**
        i. Annual Savings Per Year from Write up - $1,019,700
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Expanded Use of Forests and Feedstocks for Energy Production**
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2010-2020).
    a. **Expanded Use of Forests and Feedstocks for Energy Production**
        i. X7809— $1,019,700.00 (applicable savings from strategy write-up)
5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.3.8 Conservation of Agricultural Land for GHG Benefits

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
    a. **Conservation of Agricultural Land for GHG Benefits**
        i. 63—State Govt. Spending
2. Determine overall cost of policy implementation for each program under the policy.

   a. **Conservation of Agricultural Land for GHG Benefits**
      i. $46,693,142 (projected costs based on current implementation costs to date provided by MDA)
3. Distribute inputs among identified REMI PI+ sectors.
   a. **Conservation of Agricultural Land for GHG Benefits**
      i. 100% spent by government towards agricultural land conservation
4. Input sales by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
   a. **Conservation of Agricultural Land for GHG Benefits**
      i. 104—Farm output, Total
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **Conservation of Agricultural Land for GHG Benefits**
      i. Total Acres to Be Conserved by 2020—1,062,000 (provided by MDA)
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **Conservation of Agricultural Land for GHG Benefits**
      i. Value of Real Estate for Farmland per acre[206]—$1,131 per ace
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2010-2020).
   a. **Conservation of Agricultural Land for GHG Benefits**
      i. $109,192,909 [(($1,131 Value of Real Estate for Farmland per acre * 1,062,000 Total Acres to Be Conserved by 2020)) / 11 years)]=Total Annually Additional Farm Output that Can be Achieved through Conservation
      ii. 104—$491,040,000.00
5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.3.9 Buy Local for GHG Benefits

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
   a. **Buy Local for GHG Benefits**
      i. 63—State Govt. Spending
2. Determine overall cost of policy implementation for each program under the policy.
   a. **Buy Local for GHG Benefits**
      i. $12,346,424 (provided by MDA)
3. Distribute inputs among identified REMI PI+ sectors.

[206] "Cost of Net Farmland Change," *Maryland Smart, Green & Growing*, accessed October 17, 2012.

   a. **Buy Local for GHG Benefits**
      i. 100% spent by government towards the promotion and building of local farmer's markets in the Maryland region
4. Input sales/costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
   a. **Buy Local for GHG Benefits**
      i. 104—Farm output, Total
      ii. 63—State Govt. Spending
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **Buy Local for GHG Benefits**
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **Buy Local for GHG Benefits**
      i. Average cost of Farmer's Market Association[207]—$37.50
      ii. Total Farmer's Markets Active in Maryland[208]—43
      iii. Number of Vendors on Average at Each Market[209]—12
      iv. Average Customers Visiting a Farmer's Market Weekly[210]—387
      v. Number of Months Farmer's Markets are Active[211]—6.1
      vi. Average Number of Weeks[212]—24.4
      vii. Average Sales per Customer Trip[213]—$17.30
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2010-2020).
   a. **Buy Local for GHG Benefits**
      i. $19,350 [($37.50 price for license to sell at Farmer's Market * 12 vendors per market * 43 markets in Maryland)]=Average annual increased revenue to state from Farmer's Market licenses
      ii. 63—$19,350 spending by government back into state from Farmer's Market licenses
      iii. $6,695.10 [($17.30 average sales per customer trip to Farmer's Market * 387 average customers per week)]=average weekly purchases made at Farmer's Markets by customers at a single market

[207] Aaron Adalja, James C. Hanson, and Amy G. Crone, "Assessing the Need for a Statewide Farmers' Market Association in Maryland," *Fact Sheet 934,* (2011), University of Maryland Extension and Maryland Department of Agriculture.
[208] Ibid.
[209] Ibid.
[210] "Maryland Farmers' Market," *The Official Site of the Maryland Office of Tourism,* accessed October 17, 2012.
[211] Ibid.
[212] Ibid.
[213] Geoffrey S. Becker, "Farmers' Markets: The USDA Role," *CRS Report for Congress RS21652,* (Updated January 3, 2006), Congressional Research Service and the Library of Congress.

iv. $163,360.44 [($6,695.10 average weekly purchases made at a Farmer's Market by customers * 24.4 weeks the markets are in operation)]=total sales at a single market over the period of operation
v. $7,024,498.92 [($163,360.44 total sales at a single market over the period of operation * 43 markets in Maryland)]=total sales from all Maryland Farmer's Markets in a year
vi. 104—$7,024,498.92

5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.3.10 Nutrient Trading for GHG Benefits

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
    a. **Nutrient Trading for GHG Benefits**
        i. 63—State Govt. Spending
2. Determine overall cost of policy implementation for each program under the policy.
    a. **Nutrient Trading for GHG Benefits**
        i. $3,770,500 (provided by MDA, total investment needed)
3. Distribute inputs among identified REMI PI+ sectors.
    a. **Nutrient Trading for GHG Benefits**
        i. 100% spent by government for administrative and startup costs to establish nutrient trading markets in Maryland
4. Input sales/costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
    a. **Nutrient Trading for GHG Benefits**
        i. 63—State Govt. Spending
        ii. 99—Investment spending, Non-residential
        iii. 106—Farm Value Added, with no effect on sales or employment
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **Nutrient Trading for GHG Benefits**
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Nutrient Trading for GHG Benefits**
        i. Total Potential Realization[214]—$45,000,000.00
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).

[214] Jones, CY, Evan Branosky, Mindy Selman, and Michelle Perez. "How Nutrient Trading Could Help Restore the Chesapeake Bay." World Resource Institute. World Resource Institute, Feb. 2010. Web. 14 Nov. 2011. <http://pdf.wri.org/working_papers/how_nutrient_trading_could_help_restore_the_chesapeake_bay.pdf>.

a. **Nutrient Trading for GHG Benefits**
   i. $4,090,909.09 [($45,000,000.00 total potential revenue realization between 2010-2020 / 11 years)]=Average annual revenue realization
   ii. 63—$2,045,454.55 if half credits are purchased by state
   iii. 99—$2,045,454.55 if half credits are purchased by private investment
   iv. 106—$4,090,909.09 additional value to farms (not from sales of output or employment)

5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

C.4 Recycling

3.4.1 Recycling and Source Reduction

Investment Phase

No investment costs were specified by the agency for this policy.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
   a. **Recycling and Source Reduction**
      i. X7939—Production costs, Waste management and remediation services
      ii. 63—State Govt. Spending
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **Recycling and Source Reduction**
      i. Average Landfill capacity is 1,000 pounds per cubic year (0.5 tons)
      ii. Total Recycled Annually (from MDE website) [215]—6,866,424 tons
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **Recycling and Source Reduction**
      i. Average Percentage of Recycled Waste in Maryland[216]—43.88% annual average
      ii. Cubic Yard to GHG—3.3 cubic yards per GHG emission
      iii. Total Cubic Yards Saved—3,433,212 cubic yards in landfills
      iv. Base Cost - $200 for license + $52.23 per ton
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
   a. **Recycling and Source Reduction**
      i. 1,040,367 metric tons [(3,433,212 cubic yards of landfill saved from recycling / 3.3 cubic yards per GHG emissions)]=Average Total Reduction in GHG emissions from recycling by 2020
      ii. $54,338,582.65 [(1,040,367 metric tons reduced that can be sold * $52.23 carbon permit per ton)]=Average total savings associated with landfill offset

[215] County Recyclables by Commodity in Tons for Calendar Year 2008. Marylend Department of the Environment (MDE). 2008. Web. 11 Nov. 2011. <www.mde.maryland.gov/assets/document/recycling_chart.pdf>.
[216] Ibid.

iii. $27,169,291.33 [(split by Government and Private sector)]
iv. $2,716,929.13 [($27,169,291.33 average total savings per sector / 10 years)]
v. 63—$2,716,929.13 total offset government can spend on other projects
vi. X7939—$2,716,929.13 total reduction in costs to landfills

5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

C.5 Buildings

3.5.1 Building and Trade Codes in Maryland

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
    a. **Building and Trade Codes in Maryland**
        i. 63—State Govt. Spending
2. Determine overall cost of policy implementation for each program under the policy.
    a. **Building and Trade Codes in Maryland**
        i. $700,000 annually spent on program[217]
3. Distribute inputs among identified REMI PI+ sectors.
    a. **Building and Trade Codes in Maryland**
        i. 100% spent by government for trainings
4. Input sales/costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase[218]

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
    a. **Building and Trade Codes in Maryland**
        i. X933—Industry Employment, Management of companies and enterprises
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **Building and Trade Codes in Maryland**
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Building and Trade Codes in Maryland**
        i. Number of additional individuals able to be trained through program—614 average annually[219]
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
    a. **Building and Trade Codes in Maryland**
        i. X933—614 new individuals annually able to be trained

[217] "Housing and Community Development," Maryland Department of Housing and Community Development (2011), accessed October 17, 2012.
[218] Impacts from this policy in the operation phase are adjusted and reduced to 3 percent. Marginally, there is a 3 percent additional costs to projects involving LEED certification and codes, therefore RESI uses this estimate from EIA to estimate the potential marginal increase from Green Building projects.
[219] Office of Energy Performance and Conservation, "StateStat Template," *StateStat Maryland* (September 18, 2012), Maryland Department of General Services, accessed October 17, 2012.

5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Adjustment of 3 percent to account for jobs directly related to meeting LEED certification or Green Standards.[220]
7. Export impacts and analyze.

3.5.2 BeSMART

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
    a. **BeSMART**
        i. 63—State Govt. Spending
2. Determine overall cost of policy implementation for each program under the policy.
    a. **BeSMART**
        i. Data provided by StateStat for the BeSMART program funding, courtesy of DHCD.[221]
            1. 2010—$0
            2. 2011—$3,454,843
            3. 2012—$1,450,226
3. Adjustment of costs to marginally corresponding with the 3 percent that is directly accountable to meeting LEED certification.[222]
4. Distribute inputs among identified REMI PI+ sectors.
    a. **BeSMART**
        i. 100% provided by government under Federal funds to assist in residential refurbishing.
5. Input costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

[220] "Estimating Renewable Energy Costs" *United States Energy Information Administration,* accessed May 21, 2013.
[221] Office of Energy Performance and Conservation, "StateStat Template," *StateStat Maryland* (September 18, 2012), Maryland Department of General Services, accessed October 17, 2012.
[222] "Estimating Renewable Energy Costs" *United States Energy Information Administration,* accessed May 21, 2013.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
    a. **BeSMART**
        i. 82—Electricity (Commercial Sector) Fuel Costs, All Commercial Sectors
        ii. 640—Consumer Spending (Electricity)
        iii. 78—Consumption Reallocation
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **BeSMART**
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **BeSMART**
        i. Average energy savings supported by the BeSMART program—15-30%
        ii. Average monthly consumption of energy by Maryland consumers (kwh)[223]—1,030
        iii. Average price per kwh in Maryland[224]—$0.1331
        iv. Average monthly cost to Maryland residents for energy[225]—$137.17
        v. Number of participants in program (residential)[226]—8
        vi. Number of participants in program (commercial)[227]—19
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
    a. **BeSMART**
        i. 22.5% [((0.15+0.30)/2)]=Average reduction after BeSMART completion
        ii. 231.75 kwh [(1,030 average monthly consumption before BeSMART * 22.5% average reduction after BeSMART completion)]=Average monthly reduction in energy consumption
        iii. $30.85 [(231.75 reduction of monthly consumption after BeSMART program * $0.1331 per kwh average cost)]=Average monthly savings to those in the BeSMART program
        iv. $246.77 [($30.85 average monthly savings * 8 residential participants in the program)]=Average monthly savings to residential participants in program
        v. $586.07 [($30.85 average monthly savings * 19 business participants in the program)]=Average monthly savings to the commercial sector participants in the program
        vi. $2,961.21 [($246.77 average monthly savings to residential participants in program * 12 months)]=average annual savings to residential sector
        vii. $7,032.87 [($586.07 average monthly savings to commercial sector participants * 12 months)]=average annual savings to commercial sector

[223] "Frequently Asked Questions: How Much Electricity Does an American Home Use?" *United States Energy Information Administration*, accessed October 17, 2012.
[224] Ibid.
[225] Ibid.
[226] Office of Energy Performance and Conservation, "StateStat Template," *StateStat Maryland* (September 18, 2012), Maryland Department of General Services, accessed October 17, 2012.
[227] Ibid.

viii. 82—$7,032.87 annual savings to commercial sector from 2013-2020
ix. 640—$2,961.21 annual savings to residential sector from 2013-2020
x. 78—$2,961.21 [(Reallocation of savings to other consumption categories)]

5. Input savings by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.5.3 Weatherization and Energy Efficiency for Low-Income Houses

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
   a. **Weatherization and Energy Efficiency for Low-Income Houses**
      i. 63—State govt. spending
2. Determine overall cost of policy implementation for each program under the policy.
   a. **Weatherization and Energy Efficiency for Low-Income Houses** [228]
      i. Annual allocations for program:
         1. 2010—$649,200
         2. 2011—$741,377
         3. 2012—$698,417
         4. 2013—$700,000
         5. 2014—$700,000
         6. 2015—$700,000
         7. 2016—$700,000
         8. 2017—$700,000
         9. 2018—$700,000
         10. 2019—$700,000
         11. 2020—$700,000
3. Distribute inputs among identified REMI PI+ sectors.
   a. **Weatherization and Energy Efficiency for Low-Income Houses**
      i. 100% from government spending for grants towards programs for energy efficiency in affordable housing
4. Input costs by sector into REMI PI+ model and run impacts.
5. Adjustment of 3 percent to capture those green jobs that area directly linked to these building/construction costs to meet green initiatives.[229]
6. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
   a. **Weatherization and Energy Efficiency for Low-Income Houses**
      i. 640—Consumer Spending (electricity)

[228] "Housing and Community Development," Maryland Department of Housing and Community Development (2011), accessed October 17, 2012.
[229] "Estimating Renewable Energy Costs" *United States Energy Information Administration,* accessed May 21, 2013.

    ii. 642—Consumer Spending (fuel and oil)
    iii. 78—Consumption Reallocation
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **Weatherization and Energy Efficiency for Low-Income Houses**
        i. Number of units completed[230]
            1. 2012—2,167
            2. 2013—2,166
            3. 2014—2,166
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Weatherization and Energy Efficiency for Low-Income Houses**
        i. Average Savings[231]=$437 a year per unit
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2010-2020).
    a. **Weatherization and Energy Efficiency for Low-Income Houses**
        i. $946,979 [($437 Average Annual Savings per Unit * 2,167 number of units completed in 2012)]=Total savings in 2012
        ii. $946,542 [($437 Average annual savings per unit * 2,166 number of units completed in 2013)]=Total savings in 2013
        iii. $946,542 [($437 average annual savings per unit * 2,166 number of units completed in 2014)]=Total savings in 2014
        iv. $473,490 [($946,979 total savings in 2012 / 2 sectors to represent electricity and heating)]=Average savings across electricity and heating for retrofitted units
        v. $473,270 [($946,542 total savings in 2013 / 2 sectors to represent electricity and heating)]=Average savings across electricity and heating for retrofitted units
        vi. $473,270 [($946,542 total savings in 2014 / 2 sectors to represent electricity and heating)]=Average savings across electricity and heating for retrofitted units
        vii. 640—$473,490 savings in 2012
        viii. 642—$473,490 savings in 2012
        ix. 78 — $946,979 reallocation of savings in 2012 across other consumption categories
        x. 640—$473,270 savings in 2013
        xi. 642—$473,270 savings in 2013
        xii. 78—$946,542 reallocation of savings in 2013 across other consumption categories
        xiii. 640—$473,270 savings in 2014
        xiv. 642—$473,270 savings in 2014

[230] Office of Energy Performance and Conservation, "StateStat Template," *StateStat Maryland* (September 18, 2012), Maryland Department of General Services, accessed October 17, 2012.
[231] Weatherization and Intergovernmental Program: Weatherization Assistance Program. EERE: EERE Server Maintenance. U.S. Department of Energy, 25 Apr. 2011. Web. 11 Nov. 2011. <http://www1.eere.energy.gov/wip/wap.html>.

xv. 78—$946,542 reallocation of savings in 2014 across other consumption categories

2. Input savings/costs by sector into REMI PI+ model and run impacts.
3. Export impacts and analyze.

C.6 Land Use

3.6.1 Reducing GHG Emissions from the Transportation Sector through Land Use and Location Efficiency

Investment Phase

No investment costs were specified for this policy.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
    a. **Maryland Sustainable Growth Commission**
        i. X5412—Industry Sales, Construction
    b. **PlanMaryland**
        i. No additional benefits or costs were specified.
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **Maryland Sustainable Growth Communities**
    b. **Plan Maryland**
        i. No additional benefits or costs were specified.
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Maryland Sustainable Growth Commission**[232]
        i. Tax Credit Given to Projects in 2010[233]= $3,820,000
        ii. Tax Credit Given to 10 Projects in 2011[234] = $11,180,000
    b. **Plan Maryland**
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2010-2011).
    a. **Maryland Sustainable Growth Commission**
        i. X5412—$3,820,000 (2010)
        ii. X5412— $11,180,000 (2011)
    b. **Plan Maryland**
5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

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[232] Please note that $3.8 million and $11.1 million are allocated to *Industry Sales, Construction* under 3.6.1 and also appear under 3.6.3 as investment phase *State Govt. Spending*, though are not double-counted in estimating economic impacts. This is done to capture construction-specific impacts of the SCTC program.

[233] Maryland Department of Planning Staff, “Maryland Smart Growth Sub-Cabinet Report on State Spending Inside and Outside of the Priority Funding Areas for Fiscal Years 2006-2009 and 2009 Annual Report,” *Maryland Smart, Green & Growing* (December 2009), Maryland Department of Planning.

[234] Ibid.

3.6.2 Transportation GHG Targets for Local Governments and Metropolitan Planning Organizations

Investment Phase

No investment costs were specified by the agency for this policy.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
    a. **Transportation GHG Targets for Local Governments and Metropolitan Planning Organizations**
        i. 641—Consumer spending (gas)
        ii. 78—Consumption reallocation (across all other consumption categories)
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **Transportation GHG Targets for Local Governments and Metropolitan Planning Organizations**
        i. Reduction by 2020- Assume that there is a 1.875% reduction annually (by 2020 we will have a 15% reduction in CO2 from this sector)
        ii. Number of Registered Vehicles=3,382,451 (provided by MDE courtesy of MVA)
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Transportation GHG Targets for Local Governments and Metropolitan Planning Organizations**
        i. Conversion from Metric tons into Gallons of Gas
            1. Change to kg=0.01875
        ii. Average Annual Miles Driven By Population[235]=13,041
        iii. Avg. MPG for a 4-door sedan=27
        iv. Transfer from Gallons to KG[236]=1,455,647,935
        v. Transfer to Metric Tons of Co2=1,455,647.935 (annual metric tons from driving in MD)
        vi. Avg. Cost of Gas Per Gallon in MD=3.43
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
    a. **Transportation GHG Targets for Local Governments and Metropolitan Planning Organizations**
        i. Assume 10% Are State Owned Fleet=338,245.1 (number of registered vehicles*0.1)
        ii. Total Miles Traveled in MD=4,411,054,349 (average annual miles driven by population*Assume 10% Are State Owned Fleet)
        iii. Number of Gallons used =163,372,383.3 (total miles traveled in MD*avg. MPG for a 4-door sedan)

[235] State and Urbanized Area Statistics. U.S. Department of Transportation, 4 April. 2011. Web. 11 Nov. 2011. < http://www.fhwa.dot.gov/ohim/onh00/onh2p11.htm>.

[236] "How We Calculate Your Carbon Footprint." Carbon offsets for your carbon footprint & fighting global warming. 2011. CarbonFund.org. 14 Nov. 2011 <http://www.carbonfund.org/site/pages/carbon_calculators/category/Assumptions#Transportation>.

iv. Reduction=27,293.39879 (Change to kg*Transfer to Metric Tons of Co2)
v. New Metric Tons of Co2 Consumed=1,428,355 (Transfer to Metric Tons of Co2-reduction)
vi. Convert to kg =1,428,354,536 (New Metric Tons of Co2 Consumed*1,000)
vii. Convert to Gallons=160,309,151.1 (convert to kg/8.91)
viii. Previous Cost to Travel Annually=560,367,274.7 (Number of Gallons used*Avg. Cost of Gas Per Gallon in MD)
ix. New Cost to Travel Annually =549,860,388.3 (Convert to Gallons*Avg. Cost of Gas Per Gallon in MD)
x. 641—$10,506,886.40 (Previous Cost to Travel Annually-New Cost to Travel Annually)
xi. 78—$10,506,886.40 [(reallocation of savings across all other consumption categories)]

5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.6.3 Land Use Planning for GHG Benefits

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
   a. **Funding Mechanisms for Smart Growth**
      i. 63—State Govt. Spending
2. Determine overall cost of policy implementation for each program under the policy.
   a. **Funding Mechanisms for Smart Growth**
      i. $5,599,638—spending in 2010 on SCTC tax credit (provided by MDP)
      ii. $12,879,736—spending in 2011 on SCTC tax credit (provided by MDP)
3. Distribute inputs among identified REMI PI+ sectors.
   a. **Funding Mechanisms for Smart Growth**
      i. 100% spent by government on SCTC tax credit
4. Input sales/costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
   a. **Funding Mechanisms for Smart Growth**
      i. X3612—Firm Employment, Construction
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **Funding Mechanisms for Smart Growth**
      i. Average Jobs Created per $1 million investment[237]—72.5

[237] Cronyn, Joseph and Evans Paull. *Heritage Tax Credits: Maryland's Own Stimulus to Renovate Buildings for Productive Use and Create Jobs, an $8.53 Return on Every State Dollar Invested*. The Abell Foundation 22.1(March 2009) p. 1-8.

3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Funding Mechanisms for Smart Growth**
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2010-2020).

   a. **Funding Mechanisms for Smart Growth**
      i. 406.0 jobs [($5,599,638 tax credit in 2010 / $1,000,000) * 72.5 jobs created per $1 million in tax credit)]=average jobs created in 2010
      ii. 933.8 jobs [($12,879,736 tax credit in 2011 / $1,000,000) * 72.5 jobs created per $1 million in tax credit)]=average jobs created in 2011
      iii. 669.9 jobs [(406.0 + 993.8)/2 years)]=average annual jobs if average tax credit continues through 2020
      iv. X3612—669.9 jobs annually
5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.6.4 GHG Benefits from Priority Funding Areas and Other Growth Boundaries

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy.
   a. **GHG Benefits from Priority Funding Areas and Other Growth Boundaries**
      i. 63—Govt. State Spending
2. Determine overall cost of policy implementation for each program under the policy.
   a. **GHG Benefits from Priority Funding Areas and Other Growth Boundaries**
      i. $779,000,000 annually investment on Chesapeake Bay TMDL from 2010-2017[238]
3. Distribute inputs among identified REMI PI+ sectors.
   a. **GHG Benefits from Priority Funding Areas and Other Growth Boundaries**
      i. 100% spent by government on storm water drainage updates
4. Input sales/costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
   a. **GHG Benefits from Priority Funding Areas and Other Growth Boundaries**
      i. X3211—Industry Sales, Water, sewage, and other systems
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **GHG Benefits from Priority Funding Areas and Other Growth Boundaries**
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **GHG Benefits from Priority Funding Areas and Other Growth Boundaries**
      i. Costs from 2017-2020 for Maintenance[239]—$81,116,728
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2010-2020).
   a. **GHG Benefits from Priority Funding Areas and Other Growth Boundaries**
      i. X3211—$81,116,728 annually from 2017-2020
5. Input savings/costs by sector into REMI PI+ model and run impacts.

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[238] "Chesapeake Bay TMDL," United States Environmental Protection Agency, accessed October 17, 2012.
[239] "The Chesapeake Bay TMDL, Maryland's Watershed Implementation Plan and Maryland's 2012-2013 Milestone Goals," Maryland Department of the Environment, accessed October 17, 2012.

6. Export impacts and analyze.

C.7 Innovative Initiatives

3.7.1 Leadership-by-Example—Local Government

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
    - **b. Leadership-by-Example—Local Government**
        - i. 63—State Govt. Spending
2. Determine overall cost of policy implementation for each program under the policy.
    - **c. Leadership-by-Example—Local Government**
        - ii. $62,060,217 (total allocation towards program from 2010-2020, provided by MDE)
3. Distribute inputs among identified REMI PI+ sectors.
    - **d. Leadership-by-Example—Local Government**
        - iii. 100% spent by government on implementation of program
4. Input sales/costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
    - **a. Leadership-by-Example—Local Government**
        - i. 65—Local government spending
        - ii. X3209—Industry sales, Electrical power generation, transmission, and distribution
2. Determine part of program to be affected by savings (from strategy write-up).
    - **a. Leadership-by-Example—Local Government**
3. Research savings data for each policy according to part of program to be affected by savings.
    - **a. Leadership-by-Example—Local Government**
        - i. Avg. Number of Sq. Feet Needed per Employee[240]—387
        - ii. Energy Consumption per Sq. Feet[241]—68.61
        - iii. Avg. Cost per kwh[242]—0.11
        - iv. Number of Local Government Employees[243]—241,869

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[240] Employment and Payrolls - Industry Series - Maryland 2009 - Employment and Payrolls - Division of Workforce Development and Adult Learning. Maryland Department of Labor, Licensing and Regulation. Maryland Department of Labor, Licensing and Regulation, 1 June 2011. Web. 11 Nov. 2011. <http://www.dllr.state.md.us/lmi/emppay/md2010ep.shtml>.

[241] Building Energy Data Book. Buildings Energy Data Book. U.S. Energy Information Administration, Mar. 2011. Web. 11 Nov. 2011. <http://buildingsdatabook.eren.doe.gov/ChapterIntro3.aspx>.

[242] A Look at Office Buildings - How Many Employees Are There. U.S. Energy Information Administration (EIA). U.S. Energy Information Administration (EIA), 3 Jan. 2001. Web. 14 Nov. 2011. <http://www.eia.gov/emeu/consumptionbriefs/cbecs/pbawebsite/office/office_howmanyempl.htm>.

[243] Employment and Payrolls - Industry Series - Maryland 2009 - Employment and Payrolls - Division of Workforce Development and Adult Learning. Maryland Department of Labor, Licensing and Regulation. Maryland Department

4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2020-2025).
    a. **Leadership-by-Example—Local Government**
        i. 93,603,303 [(387 Avg. Number of Sq. Feet Needed per Employee * 241,869 Local Government Employees)]=Avg. Sq Feet of Local Government Buildings
        ii. 6,422,122,618.83 [(68.61 Units of Energy Consumed per Sq. Feet * 93603303 Avg. Sq Feet of Local Government Buildings)]=Avg. Energy Consumption in Local Govt. Buildings in kilowatts
        iii. $706,433,488.07 [(6,422,122,618.83 Avg. Energy Consumption in Local Govt. Buildings * 0.11 Cost in kWh)]=Avg. Cost of Energy Consumption in Local Govt.
        iv. 834,875,940.45 [(6,422,122,618.83 Avg. Energy Consumption in Local Govt. Buildings * 0.13)]=If Target is 13% for savings in kilowatts
        v. 5,587,246,678.38 [(6,422,122,618.83 Avg. Energy Consumption in Local Govt. Buildings - 834,875,940.45 If Target is 13% for savings)]=New Energy Consumption in kilowatts
        vi. $614,597,134.62 [(5,587,246,678.38 New Energy Consumption * 0.11 Cost in khw)]=New Costs in kwh
        vii. $91,836,353.45 [($706,433,488.07 Avg. Cost of Energy Consumption in Local Govt. - $614,597,134.62 New Costs)]=New Savings
        viii. X3209—$91,836,353.45 annual reduction in sales for energy
        ix. 65—$91,836,353.45 annual reallocation of spending by local government
5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.7.2 Leadership-by-Example—Federal Government

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
    a. **Leadership-by-Example—Federal Government**
        i. 94—Federal Govt. Spending
2. Determine overall cost of policy implementation for each program under the policy.
    a. **Leadership-by-Example—Federal Government**
        i. $40,049,749 (provided by MDE, budget for 2010-2020)
3. Distribute inputs among identified REMI PI+ sectors.
    a. **Leadership-by-Example—Federal Government**
        ii. 100% spent by government on Lead-by-Example initiatives
4. Input sales/costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

of Labor, Licensing and Regulation, 1 June 2011. Web. 11 Nov. 2011. <http://www.dllr.state.md.us/lmi/emppay/md2010ep.shtml>.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
    a. **Leadership-by-Example—Federal Government**
        i. X6409—Exogenous final demand, Electric power generation, distribution, and transmission
        ii. 94—Federal Govt. Spending
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **Leadership-by-Example—Federal Government**
        i. Energy Saved—13.00%
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Leadership-by-Example—Federal Government**
        i. Avg. Number of Sq. Feet Needed per Employee[244]—387
        ii. Energy Consumption per Sq. Feet[245]—68.61
        iii. Avg. Cost per kwh[246]—0.11
        iv. Federal Employees in MD[247]—139,927
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2020-2025).
    a. **Leadership-by-Example—Federal Government**
        i. $587,156.93 [((68.61 units of energy consumed per sq. feet * 75000 sq. feet) * 0.11 per kwh)]=Avg. Cost per 75,000 Sq. Feet
        ii. $76,330.40 [($587,156.93 Avg. Cost per 75,000 Sq. Feet * 13.00% Energy Saved)]=Reduction
        iii. $510,826.53 [($587,156.93 Avg. Cost per 75,000 Sq. Feet - $76,330.40 Reduction)]=Avg. Annual Savings
        iv. 54,151,749 [(139,927 Federal Employees in MD * 387 Sq. Feet per employee)]=Estimated Number of Sq. Feet
        v. 3,715,521,464.23 [(54,151,749 Estimated Number of Sq. Feet * 68.61 units of energy consumed per sq. feet)]=Avg. Used in Federal Building per Sq. Feet
        vi. $423,940,999.07 [(3,715,521,464.23 Avg. Used in Federal Building per Sq. Feet * 0.11 Avg. Cost per kwh)]=Avg. Cost per khw

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[244] Employment and Payrolls - Industry Series - Maryland 2009 - Employment and Payrolls - Division of Workforce Development and Adult Learning. Maryland Department of Labor, Licensing and Regulation. Maryland Department of Labor, Licensing and Regulation, 1 June 2011. Web. 11 Nov. 2011. <http://www.dllr.state.md.us/lmi/emppay/md2010ep.shtml>.
[245] Building Energy Data Book. Buildings Energy Data Book. U.S. Energy Information Administration, Mar. 2011. Web. 11 Nov. 2011. <http://buildingsdatabook.eren.doe.gov/ChapterIntro3.aspx>.
[246] A Look at Office Buildings - How Many Employees Are There. U.S. Energy Information Administration (EIA). U.S. Energy Information Administration (EIA), 3 Jan. 2001. Web. 14 Nov. 2011. <http://www.eia.gov/emeu/consumptionbriefs/cbecs/pbawebsite/office/office_howmanyempl.htm>.
[247] Employment and Payrolls - Industry Series - Maryland 2009 - Employment and Payrolls - Division of Workforce Development and Adult Learning. Maryland Department of Labor, Licensing and Regulation. Maryland Department of Labor, Licensing and Regulation, 1 June 2011. Web. 11 Nov. 2011. <http://www.dllr.state.md.us/lmi/emppay/md2010ep.shtml>.

vii. 483,017,790.40 [(3,715,521,464.23 Avg. Used in Federal Building per Sq. Feet * 13.00% Energy Saved)]=Avg. Savings
viii. 3,232,503,674 [(3,715,521,464.23 Avg. Used in Federal Building per Sq. Feet - 483,017,790.40 Avg. Savings)]=New Amount Used
ix. $368,828,669.19 [(3,232,503,674 New Amount Used * 0.11 Avg. Cost per kwh)]=Total Cost of New Amount
x. $55,112,329.88 [($423,940,999.07 Avg. Cost per khw - $368,828,669.19 Total Cost of New Amount)]=Avg. Annual Savings
xi. X6409—$55,112,329.88 reduction in energy demand from federal government installations in Maryland
xii. 94—$55,112,329.88 reallocation of spending by federal government from reduced energy costs

5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.7.3 Leadership-by-Example—Maryland Colleges and Universities

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy.
   a. **Leadership-by-Example—Maryland Colleges and Universities**
      i. 63—State Govt. Spending
2. Determine overall cost of policy implementation for each program under the policy.
   a. **Leadership-by-Example—Maryland Colleges and Universities**
      i. $38,686,850 (provided by MDE, budget from 2010-2020)
3. Distribute inputs among identified REMI PI+ sectors.
   a. **Leadership-by-Example—Maryland Colleges and Universities**
      i. 100% spent by government on Lead-by-Example initiatives
4. Input sales/costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
   a. **Leadership-by-Example—Maryland Colleges and Universities**
      i. X3209—Industry sales, Electric power generation, transmission, and distribution
      ii. 63—State Govt. Spending
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **Leadership-by-Example—Maryland Colleges and Universities**
      i. Number of MD Public Universities—64,222
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **Leadership -by-Example—Maryland Colleges and Universities**
      i. Avg. Number of Sq. Feet Needed per Employee[248]—387

[248] Employment and Payrolls - Industry Series - Maryland 2009 - Employment and Payrolls - Division of Workforce Development and Adult Learning. Maryland Department of Labor, Licensing and Regulation. Maryland Department

      ii. Energy Consumption per Sq. Feet[249]—68.61
      iii. Avg. Cost per kwh[250]—0.11
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2020-2025).
   a. **Leadership-by-Example—Maryland Colleges and Universities**
      i. 24,853,914 [(64,222 MD Public Universities * 387 Sq. Feet Needed per Employee)]=Avg. Sq feet in Universities
      ii. 1,705,227,040 [(24,853,914 Avg. Sq. Feet in Universities * 68.61 Units of Energy Consumed per Sq. Feet)]=Avg. Electricity Used in Universities
      iii. $187,574,974.35 [(1,705,227,040 Avg. Electricity Used in Universities * $0.11 Cost in khw)]=Avg. Cost
      iv. 0.215 [((0.1 + 0.33) / 2)]=Avg. Reduction Target by 2020 from Universities
      v. 0.026875 [(0.215 Avg. Reduction Target by 2020 from Universities / 8)]=Target Reduction Annually
      vi. 45,827,976.69 [(1,705,227,040 Avg. Electricity Used in Universities * 0.026875 Target Reduction Annually)]=Savings Annually
      vii. 1,659,399,063 [(1,705,227,040 Avg. Electricity Used in Universities - 45,827,976.69 Savings Annually)]=Avg. Annual Savings
      viii. $182,533,896.91 [(1,659,399,063 Avg. Annual Savings * $0.11 Cost in khw)]=Avg. Cost After Reduction
      ix. $5,041,077.44 [($187,574,974.35 Avg. Cost - $182,533,896.91 Avg. Cost After Reduction)]=Avg. Annual Savings
      x. X3209—$5,041,077.44 annual reduction in energy sales to energy sector
      xi. 64—$5,041,077.44 government reallocation of funds from energy savings
5. Input savings by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.8.4 GHG Early Voluntary Reductions

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
   a. **GHG Early Voluntary Reductions**
      i. 63—State Govt. Spending
2. Determine overall cost of policy implementation for each program under the policy.
   a. **GHG Early Voluntary Reductions**
      i. $15,000 annually (provided by MDE)
3. Distribute inputs among identified REMI PI+ sectors.

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of Labor, Licensing and Regulation, 1 June 2011. Web. 11 Nov. 2011. <http://www.dllr.state.md.us/lmi/emppay/md2010ep.shtml>.

[249] Building Energy Data Book. Buildings Energy Data Book. U.S. Energy Information Administration, Mar. 2011. Web. 11 Nov. 2011. <http://buildingsdatabook.eren.doe.gov/ChapterIntro3.aspx>.

[250] A Look at Office Buildings - How Many Employees Are There. U.S. Energy Information Administration (EIA). U.S. Energy Information Administration (EIA), 3 Jan. 2001. Web. 14 Nov. 2011. <http://www.eia.gov/emeu/consumptionbriefs/cbecs/pbawebsite/office/office_howmanyempl.htm>.

   a. **GHG Early Voluntary Reductions**
      i. 100% spent by government for administrative costs
4. Input sales/costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors.
   a. **GHG Early Voluntary Reductions**
      i. X7809—Production costs, Electric power generation, transmission, and distribution
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **GHG Early Voluntary Reductions**
      i. Annual Reduction Target by 2020—1.03 million metric tons
      ii. Number of years of auctions—4 years
      iii. Number of years until Target—8 years
      iv. Average Reductions per year—128,750 allowances annually
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **GHG Early Voluntary Reductions**
      i. Proceeds From Auctions[251]—$169,600,423.80 (total to date)
      ii. Allowances Sold to Date[252]— 68,507,184
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
   a. **GHG Early Voluntary Reductions**
      i. $42,400,105.95 [($169,600,423.80 total proceeds from auctions to date / 4 years)]=annual cost from sales of allowances
      ii. $2.48 [($169,600,423.80 total proceeds from auctions to date / 68,507,184 total carbon allowances sold to date)]=average cost of carbon allowances
      iii. 17,126,796 [(68,507,184 total carbon allowances sold to date / 4 years)]=average carbon credits sold annually
      iv. 16,998,046 [(17,126,796 average carbon credits sold annually—128,750 proposed annual reduction target)]=average annual carbon credit to be purchased under reductions
      v. $42,081,364.86 [(16,998,046 average annual carbon credits purchased under reduction target * $2.48 average cost per carbon credit allowance)]=average cost to firm for carbon credits under new reduction target
      vi. $318,741.09 [($42,400,105.95 current average annual carbon credit costs - $42,081,364.86 average carbon credit costs under target reduction policy)]=savings to firms from reductions

[251] MD Proceeds by Auction. Regional Greenhouse Gas Initiative (RGGI) CO2 Budget Trading Program - Welcome. Regional Greenhouse Gas Initiative CO2 Budget Trading Program, 2011. Web. 14 Nov. 2011. <http://rggi.org/docs/MD_Proceeds_by_Auction.pdf>.
[252] Ibid.

vii. X7809—$318,741.09 annual reduction in production costs from early reduction strategies

5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.7.4 GHG Early Voluntary Reductions

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy.
   a. **GHG Early Voluntary Reductions**
      i. 63—State Government Spending
2. Determine overall cost of policy implementation for each program under the policy.
   a. **GHG Early Voluntary Reductions**
      i. $15,000 annually (provided by MDE)
3. Distribute inputs among identified REMI PI+ sectors.
   a. **GHG Early Voluntary Reductions**
      i. 100% spent by government on administrative costs
4. Input sales/costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors.
   a. **GHG Early Voluntary Reductions**
      i. X7809—Production costs, Electrical power distribution, transmission, and generation
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **GHG Early Voluntary Reductions**
      i. Annual Reduction Target by 2020—1.03 million metric tons
      ii. Number of years of auctions—4 years
      iii. Number of years until Target—8 years
      iv. Average Reductions per year—128,750 allowances annually
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **GHG Early Voluntary Reductions**
      i. Proceeds From Auctions[253]—$169,600,423.80 (total to date)
      ii. Allowances Sold to Date[254]— 68,507,184
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).

[253] MD Proceeds by Auction. Regional Greenhouse Gas Initiative (RGGI) CO2 Budget Trading Program - Welcome. Regional Greenhouse Gas Initiative CO2 Budget Trading Program, 2011. Web. 14 Nov. 2011. <http://rggi.org/docs/MD_Proceeds_by_Auction.pdf>.

[254] MD Proceeds by Auction. Regional Greenhouse Gas Initiative (RGGI) CO2 Budget Trading Program - Welcome. Regional Greenhouse Gas Initiative CO2 Budget Trading Program, 2011. Web. 14 Nov. 2011. <http://rggi.org/docs/MD_Proceeds_by_Auction.pdf>.

a. **GHG Early Voluntary Reductions**
    i. $42,400,105.95 [($169,600,423.80 total proceeds from auctions to date / 4 years)]=annual cost from sales of allowances
    ii. $2.48 [($169,600,423.80 total proceeds from auctions to date / 68,507,184 total carbon allowances sold to date)]=average cost of carbon allowances
    iii. 17,126,796 [(68,507,184 total carbon allowances sold to date / 4 years)]=average carbon credits sold annually
    iv. 16,998,046 [(17,126,796 average carbon credits sold annually—128,750 proposed annual reduction target)]=average annual carbon credit to be purchased under reductions
    v. $42,081,364.86 [(16,998,046 average annual carbon credits purchased under reduction target * $2.48 average cost per carbon credit allowance)]=average cost to firm for carbon credits under new reduction target
    vi. X7809—$318,741.09 [($42,400,105.95 current average annual carbon credit costs - $42,081,364.86 average carbon credit costs under target reduction policy)]=savings to firms annually from reductions

5. Input savings by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.7.5 State of Maryland Initiative to Lead by Example

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
    a. **High Performance Buildings**
        i. 99—Investment spending, Non-residential
        ii. 68—State Govt. Spending (including non-pecuniary amenity aspects)
    b. **Green Maryland Act of 2010**
        i. No investment costs were specified by the agency for this program.
    c. **Green Buildings**
        i. 47—Non-residential capital investment
2. Determine overall cost of policy implementation for each program under the policy.
    a. **High Performance Buildings**[255]
        i. $33,219,574 (spending in 2010, per MD Statestat data)
        ii. $43,563,417 (spending in 2011, per MD Statestat data)
        iii. $36,156,867 (spending in 2012, per MD Statestat data)
    b. **Green Maryland Act of 2010**
        i. No investment costs were specified by the agency for this program.
    c. **Green Buildings**
        i. $193,650,429 (total spending over 2010-2013)[256]

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[255] Office of Energy Performance and Conservation, "StateStat Template," *StateStat Maryland* (September 18, 2012), Maryland Department of General Services, accessed October 17, 2012.
[256] Office of Energy Performance and Conservation, "StateStat Template," *StateStat Maryland* (September 18, 2012), Maryland Department of General Services, accessed October 17, 2012.

3. Distribute inputs among identified REMI PI+ sectors.
   a. **High Performance Buildings**
      i. 49.8% for government administrative costs/responsibilities
      ii. 50.1% spread among investment spending, non-residential
   b. **Green Maryland Act of 2010**
      i. No investment costs were specified by the agency for this program.
   c. **Green Buildings**
      i. 100% private sector spending for implementation
4. Input sales/costs by sector into REMI PI+ model and run impacts.
5. Adjust for 3 percent of costs only being attributed to green building intiatives.[257]
6. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
   a. **High Performance Buildings**
      i. X10540—Electrical Fuel Costs (Individual Industry), Elementary and secondary schools; Junior colleges, colleges, universities, and professional schools; Other educational services
      ii. X10564— Electrical Fuel Costs (Individual Industry), Civic, social, professional, and similar organizations
   b. **Green Maryland Act of 2010**
      i. No operation costs/benefits specified.
   c. **Green Buildings**
      i. X6409—Exogenous final demand (amount), Electric power generation, distribution, transmission
      ii. 63—State Govt. Spending
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **High Performance Buildings**
   b. **Green Maryland Act of 2010**
      i. No operation costs/benefits specified.
   c. **Green Buildings**
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **High Performance Buildings**
      i. Average Energy Savings for retrofitted buildings[258]
         1. 2010—$13,618,966
         2. 2011-2012—$21,504,572
   b. **Green Maryland Act of 2010**
   c. **Green Buildings**
      i. Avg. Savings from Green Buildings[259]= 30%

[257] "Estimating Renewable Energy Costs" *United States Energy Information Administration,* accessed May 21, 2013.
[258] Office of Energy Performance and Conservation, "StateStat Template," *StateStat Maryland* (September 18, 2012), Maryland Department of General Services, accessed October 17, 2012.

    ii. Avg. Cost to Build a Green Building= $4 per sq foot
    iii. Avg. use of energy in a commercial building [260]=1,153,191.49
    iv. Avg. Cost per kwh[261]=$0.11
    v. Avg. Savings=$39,473.75
    vi. Number of Buildings Proposed[262]=37

4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2010-2020).
    a. **High Performance Buildings**
        i. 2010
            1. X10540—$6,809,493 reduction in energy costs from retrofit
            2. X10564—$6,809,493 reduction in energy costs from retrofit
        ii. 2011-2020
            1. X10540—$10,752,286 reduction in energy costs from retrofit
            2. X10564—$10752,286 reduction in energy costs from retrofit
    b. **Green Maryland Act of 2010**
    c. **Green Buildings**
        i. $131,579.15 (1,153,191.49 Avg. Use in kwH in a commercial building annually * $0.11 Avg, Cost per kwH for electricity) = Average Annual Electricity Costs for a Commercial Building
        ii. $39,473.75 ($131,579.15 Average Annual Electricity Costs for a Commercial Building * 30% reduction associated with Green Buildings) = Average Annual Savings for a Green Building in Energy
        iii. $1,460,528.55 ($39,473.75 Average Annual Savings for a Green Building * 37 Proposed Green Buildings to be Built) = Average Annual Savings for Proposed Strategy
        iv. X6409—$1,460,528.55 average annual reduction in energy demand from buildings
        v. 63—$1,460,528.55 average annual increase in funds from energy reduction state can spend towards other projects
5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.7.6 State of Maryland Carbon and Footprint Initiatives

Investment Phase

No investment costs were specified by the agency for this policy.

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[259] Kats, Gregory H. "Green Building Costs and Financial Benefits." NH Partnership for High Performance Schools - Home. Http://www.nhphps.org/docs/documents/GreenBuildingspaper.pdf, 2003. Web. 11 Nov. 2011. <http://www.nhphps.org/>.

[260] Building Energy Data Book. Buildings Energy Data Book. U.S. Energy Information Administration, Mar. 2011. Web. 11 Nov. 2011. <http://buildingsdatabook.eren.doe.gov/ChapterIntro3.aspx>.

[261] SEDS | State Energy Data System. U.S. Energy Information Administration (EIA). U.S. Energy Information Administration (EIA, 2009. Web. 16 Nov. 2011. <http://www.eia.gov/state/seds/hf.jsp?incfile=sep_prices/com/pr_com_MD.html&mstate=Maryland>.

[262] Maryland Green Building Council 2010 Annual Report. Maryland Green Building Council. Maryland Department of General Services, 2011. Web. 11 Nov. 2011. <http://www.dgs.maryland.gov/pdfs/2010GreenBldgReport.pdf>.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
    a. **Maryland Environment Footprint**
        i. X6409—Exogenous final demand, Electric power generation, distribution, and transmission
        ii. 68—Government spending (including non-pecuniary spending)
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **Maryland Environment Footprint**
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **Maryland Environment Footprint**
        i. Electric Use in 2008 (kwH)[263]=1,732,064,108
        ii. Electric Use in 2009 (KwH)[264]=1,455,031,107
        iii. Cost per KwH[265]=0.11
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
    a. **Maryland Environment Footprint**
        i. 277,033,001 [(1,732,064,108 kilowatt Electric Use in 2008 (kwH) - 1,455,031,107 Electric Use in 2009 (KwH))] = Savings in Electric Used Annually in kilowatts
        ii. $31,609,465.41 [(277,033,001 kilowatts Savings in Electric Used Annually (kwH) * $0.11 Cost per kwH in Maryland)] = Average Annual Savings associated with cost of electric
        iii. X6409—$31,609,465.41 annual reduction in demand for energy
        iv. 68—$31,609,465 reallocation of savings from energy to new programs
5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.7.7 Job Creation and Economic Development

Investment Phase

No investment costs were specified by the agency for this policy.

Operation Phase

All impacts from the operation of this program would be captured throughout the GGRA in the creation of jobs or training to meet the new demand for green jobs.

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263 Maryland Environmental Footprint. Maryland: Smart, Green and Growing. Maryland Environmental Service, Spring 2010. Web. 16 Nov. 2011. <http://www.green.maryland.gov/carbon_footprint_page.html>.

264 Ibid.

265 SEDS | State Energy Data System. U.S. Energy Information Administration (EIA). U.S. Energy Information Administration (EIA, 2009. Web. 16 Nov. 2011. <http://www.eia.gov/state/seds/hf.jsp?incfile=sep_prices/com/pr_com_MD.html&mstate=Maryland>.

3.7.8 Public Health Initiatives Related to Climate Change

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy (taken from REMI PI+ Excel file).
    a. **State Climate Change Environmental Health and Protection Advisory Council**
        i. 68—Govt. Spending (including non-pecuniary aspects)
2. Determine overall cost of policy implementation for each program under the policy.
    a. **State Climate Change Environmental Health and Protection Advisory Council**
        i. $1,250,000 from 2010-2011 (from Center for Disease Control grant to DHMH)
3. Distribute inputs among identified REMI PI+ sectors.
    a. **State Climate Change Environmental Health and Protection Advisory Council**
        i. 100% spent by government in creation of tracking system
4. Input sales/costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
    a. **State Climate Change Environmental Health and Protection Advisory Council**
        i. 662—Consumer spending, Health insurance, income loss, worker's comp
        ii. 78—Consumption reallocation (across all other consumption categories)
2. Determine part of program to be affected by savings (from strategy write-up).
    a. **State Climate Change Environmental Health and Protection Advisory Council**
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **State Climate Change Environmental Health and Protection Advisory Council**
        i. Avg. Cost of an ER visit for Asthma attacks[266]—$512
        ii. Number of those in MD diagnosed with Asthma[267]—11,474
        iii. Number of Deaths from Asthma in 2009[268]—221
        iv. Average Funeral Costs in Maryland[269]—$4,500

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[266] Collins, Mary, and Judy Chen. "Under-Controlled Asthma ™s Economic Impact | Feature Articles | Perspectives | Payer Solutions." IMS Health. IMS Health, Spring 2010. Web. 14 Nov. 2011. <http://www.imshealth.com/portal/site/imshealth/menuitem.a46c6d4df3db4b3d88f611019418c22a/?vgnextoid=da12b0ac2e6e6210VgnVCM100000ed152ca2RCRD>.

[267] Asthma Hospitalizations in Maryland. Family Health Administration. Department of Health and Mental Hygiene, Aug. 2011. Web. 14 Nov. 2011. <http://fha.maryland.gov/pdf/mch/DataBrief-3-AsthmaHospitalizationsinMaryland2011.pdf>.

[268] Asthma Mortality in Maryland. Family Health Administration. Department of Health and Mental Hygiene, Aug. 2011. Web. 14 Nov. 2011. <http://fha.maryland.gov/pdf/mch/DataBrief2-AsthmaMortalityinMaryland2011.pdf>.

4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
    a. **State Climate Change Environmental Health and Protection Advisory Council**
        i. $5,874,688 [(11,474 Number of those in MD diagnosed with Asthma * 512 Avg. Cost of an ER visit for Asthma attacks)]=Cost to MD Households Annually
        ii. 662—$5,874,688 average reduction in health expenses from system
        iii. 78—$5,874,688 savings reallocation across all other consumption categories
5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.7.9 Title V Permits for GHG Sources

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy.
    a. **Title V Permits for GHG Sources**
        i. 63—State Govt. Spending
2. Determine overall cost of policy implementation for each program under the policy.
    a. **Title V Permits for GHG Sources**
        i. $40,000 annually (provided by MDE)
3. Distribute inputs among identified REMI PI+ sectors.
    a. **Title V Permits for GHG Sources**
        i. 100% spent by government on administrative costs
4. Input sales/costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

2. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
    a. **Title V Permits for GHG Sources**
        i. X7809— Production costs, Electric power generation, transmission, and distribution
        ii. 63—State Govt. Spending
3. Determine part of program to be affected by savings (from 6.1.8 write-up).
    a. **Title V Permits for GHG Sources**
        i. Minimum air pollution sources to obtain permit—17,000 sources
        ii. Minimum possible annually—100 tons per year of CO_2 equivalent
4. Research savings data for each policy according to part of program to be affected by savings.
    a. **Title V Permits for GHG Sources**

[269] Mary, Stephenson J., and Donna Brinsfield. "Funeral Planning." University of Maryland Cooperative Extension Fact Sheet. University of Maryland Cooperative Extension. Web. 14 Nov. 2011. <http://extension.umd.edu/publications/pdfs/fs409.pdf>.

i. Fees associated with Compliance[270]—$52.23 per ton + $200.00 base fee annually
ii. Number of Agencies currently holding permits[271]—120
iii. Total Minimum for Any Air Pollutant[272]—100 tons
iv. Total Minimum for Nitrogen Oxides[273]—25 tons
v. Total Minimum for Volatile Organic Components[274]—37.5 tons (varies by county, average)
vi. Total Minimum for Hazardous Air Pollutants (average)[275]—17.5 tons (single is 10 tons, and combination of variety is 25 tons)

5. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
   a. **Title V Permits for GHG Sources**
      i. $650,760.00 [(120 current permit holders * ($52.23 per ton * 100 ton minimum + $200.00 base fee)]=annual revenue to government from companies compliance with Clean Air Act
      ii. $180,690.00 [(120 current permit holders * ($52.23 per ton * 25 ton minimum + $200.00 base fee)]=annual revenue to government from companies compliance with Nitrogen Oxide Permit
      iii. $259,035.00 [(120 current permit holders * ($52.23 per ton * 37.5 ton minimum + $200.00 base fee)]=annual revenue to government from companies compliance with Volatile Organic Component Permit
      iv. $133,683.00 [(120 current permit holders * ($52.23 per ton * 17.5 ton minimum + $200.00 base fee)]=annual revenue to government from companies compliance with Hazardous Air Pollutants Permit
      v. $306,042.00 [($650,760.00 annual revenue if all apply under any air pollutant + $180,690.00 annual revenue if all apply under nitrogen oxide permit + $259,035.00 annual revenue if all apply under volatile organic component permit + $133,683.00 annual revenue if all apply under hazardous air pollutants permit)] / [(4 different types of permits)]=average possible annual minimum revenue from Title V permits
      vi. X7809—$306,042 annual increase in production costs attributable to permits
      vii. 63—$306,042 increased spending for various government projects from the revenue of permits sold

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[270] “Tile V Fee Sheet” The Department of the Environment. 14 Nov. 2011 <http://www.mde.state.md.us/programs/Permits/AirManagementPermits/TitleVProgramInformation/Pages/title5feesheet.aspx>
[271] “Issued Part 70 Permits” The Department of the Environment. 14 Nov. 2011 <http://www.mde.state.md.us/programs/Permits/AirManagementPermits/TitleVProgramInformation/Pages/title5issuedpermits.aspx>
[272] “Chronology of Maryland’s Part 70 Permit Program” The Department of the Environment. 14 Nov. 2011 <http://www.mde.state.md.us/programs/Permits/AirManagementPermits/TitleVProgramInformation/Pages/title5factsheet.aspx>
[273] Ibid.
[274] Ibid.
[275] Ibid.

6. Input savings/costs by sector into REMI PI+ model and run impacts.
7. Export impacts and analyze.

3.7.10 Outreach and Public Education

Investment Phase

No investment costs were specified by the agency for this policy.

Operation Phase

1. Determine relevant REMI PI+ sectors (taken from REMI PI+ Excel file).
   a. **Outreach and Public Education**
      i. 63—State Govt. Spending
2. Determine part of program to be affected by savings (from strategy write-up).
   a. **Outreach and Public Education**
      i. Staffing costs annually—$12,500 (provided by MDE)
3. Research savings data for each policy according to part of program to be affected by savings.
   a. **Outreach and Public Education**
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2010-2020).
   a. **Outreach and Public Education**
      i. 63—$12,500 annually
5. Input savings/costs by sector into REMI PI+ model and run impacts.
6. Export impacts and analyze.

3.7.11 GHG Prevention of Significant Deterioration Permitting Program

Investment Phase

1. Determine relevant REMI PI+ sectors for each program under the policy.
   a. **GHG Prevention of Significant Deterioration Permitting Program**
      i. 63—State Govt. Spending
2. Determine overall cost of policy implementation for each program under the policy.
   a. **GHG Prevention of Significant Deterioration Permitting Program**
      i. $40,000 annually (provided by MDE)
3. Distribute inputs among identified REMI PI+ sectors.
   a. **GHG Prevention of Significant Deterioration Permitting Program**
      i. 100% spent by government on administrative costs associated with program
4. Input sales/costs by sector into REMI PI+ model and run impacts.
5. Export impacts and analyze.

Operation Phase

1. Determine relevant REMI PI+ sectors.
   a. **GHG Prevention of Significant Deterioration Permitting Program**
      i. X7809—Production costs, Electric power generation, transmission, and distribution
      ii. 63—State Govt. Spending

2. Determine part of program to be affected by savings (from strategy write-up).
    a. **GHG Prevention of Significant Deterioration Permitting Program**
        i. Company is emitting=100,000 tons
        ii. Limit=50,000 tons
        iii. Total Over Limit=50,000 tons (Company is emitting-Limit)
3. Research savings data for each policy according to part of program to be affected by savings.
    a. **GHG Prevention of Significant Deterioration Permitting Program**
        i. Recent Clearing Price of Carbon Credits[276]=1.89 per metric ton
4. Estimate total annual increase in savings/revenue for each program and then calculate for complete study period (2011-2020).
    a. **GHG Prevention of Significant Deterioration Permitting Program**
        i. $94,500 (total over limit*percent clearing price of carbon credits) =Revenue Received to reinvest in The State
        ii. X7809—$94,500 average annual increase in production costs from permit spending
        iii. 63—$94,500 average annual increase for government spending towards other programs
5. Export impacts and analyze.

[276] "Regional Greenhouse Gas Initiative (RGGI) CO2 Budget Trading Program - Auction 13." Regional Greenhouse Gas Initiative (RGGI) CO2 Budget Trading Program - Welcome. 7 Sept. 2011. 11 Nov. 2011 <http://www.rggi.org/market/co2_auctions/results/auction_13>.

Appendix D—Occupational Data

This appendix contains information regarding the five top-gaining industries in terms of total employment for each strategy for both the investment and operation phases. RESI matched these industries with their top occupations in terms of employment on the national level. The top occupations were taken from BLS occupational industry overview data.

These occupations provide examples of some of the jobs which may experience employment gains as a result of investment or operation of each strategy. It is important to note that RESI analyzed the total employment gain rather than the direct employment gain, so some of the occupations listed in this appendix may experience an indirect or induced employment impact. In some cases, some occupations may not experience much impact at all, if any. It is important to note that REMI PI+ does not provide impacts on the occupational level, so the data contained in this appendix serves only as examples of what job titles may be affected due to each strategy.

It is also important to note that job creation during the investment phase does not necessarily assure that such jobs will be retained. In some cases, these jobs may only exist during the implementation period. On the other hand, most operational jobs will ultimately be retained rather than created after initial strategy implementation has occurred.

This appendix is meant to act as a guide for understanding the jobs associated with the industries defined in the final report. Some strategies showed gains in or retention of employment within industries which may not seem to have a direct relation to the relevant strategy. In many cases, such impacts were driven primarily by indirect and induced effects.

Industries which saw a gain from many strategies included in this report are Professional, scientific, and technical services and Public administration. Although the types of jobs contained within these sectors may not be as transparent as Construction or Retail trade, RESI used national level BLS data to demonstrate the types of jobs that exist within these industries. For many strategies, one of the goals is to stimulate green job growth. The industries defined by REMI PI+ do not offer much insight into the exact job titles within them, but consider the following: When a company must comply with certain regulations such as GHG emissions targets or caps, they will often need to hire environmental consultants, lawyers, and eventually developers to assist in cost-effective measures while remaining compliant with regulations. These jobs would typically fall under industries such as Professional, scientific and technical services and Construction.

Some strategies' operation phase revealed a significant impact on employment within Health care and social assistance and Retail trade. These total employment impacts were generally driven by either an indirect or induced effect, as mentioned previously, coming from the change in household income. For example, under the Clean Cars Program for Maryland strategy, RESI expects that many households would probably wait until after the strategy had been implemented and new technology had been introduced to purchase a new vehicle. Once the new vehicles that are compliant with the new regulations become available, car dealerships would see an increase in sales during the operation phase of the strategy. Therefore, they would need to hire new sales representatives to meet the increased demand. This would demonstrate a possible direct effect in Retail trade. The indirect effect may be an equal or lesser effect in Health care and social assistance as a new group of people now have either an increased income or a second income and can then allocate more money toward their personal health. In addition, employers would be providing health benefits to a greater number of people. This could lead to a hiring effect in nursing for doctor's offices and hospitals as the demand for healthcare increases. This is just one example of how these strategies may affect sectors which are not directly discussed within the strategy.

The State of Maryland is home to many highly ranked higher educational institutions such as Johns Hopkins University and the University of Maryland. Students and graduates of such institutions are on the forefront of leading technological advances and medical discoveries within The State's borders on a daily basis. Employment related with many of the industries defined throughout the report as benefitting from the strategies discussed would be ideal fields for future Maryland graduates. If students were to graduate and stay within Maryland after graduation because they received a steady position, this could ultimately lead to a positive effect on The State's gross domestic product.

Please refer to the main body of the report for more information regarding impacts by strategy and phase as well as discussion of some of the potential reasons for employment gain in the top-gaining industries presented here. Please refer to Appendix B for a more detail explanation of direct, indirect, and induced impacts. The tables in Appendix D represent the top five gaining industries for each strategy and its phases in the left column, the total employment impact to the industry in the center column, and the five occupations with the highest employment in that industry in the right column.

D.1 Energy

3.1.1 Regional Greenhouse Gas Initiative (RGGI)—Investment Phase

Sales, office, administrative occupations	1.4	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	1.1	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	0.7	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Construction, extraction occupations	0.5	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Healthcare occupations	0.4	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.1.1 Regional Greenhouse Gas Initiative (RGGI)—Operation Phase

Protective service occupations	37.6	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Sales, office, administrative occupations	35.2	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Management, business, financial occupations	18.2	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	11.6	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	10.6	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators

Sources: BLS, RESI

3.1.2 GHG Reductions from Imported Power—Investment Phase

Protective service occupations	0.0	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	0.0	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Legal occupations	0.0	Lawyers Judicial law clerks Judges, magistrates, and other judicial workers Paralegals and legal assistants Court reporters
Arts, design, entertainment, sports, media occupations	0.0	Artists and related workers Designers Entertainers and performers Sports and related workers Media and communications workers
Education, training, library occupations	0.0	Postsecondary teachers Preschool, primary, and secondary teachers Special education teachers Librarians Archivists, curators, and museum technicians

Sources: BLS, RESI

3.1.2 GHG Reductions from Imported Power—Operation Phase

Construction, extraction occupations	1.4	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Sales, office, administrative occupations	1.4	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Management, business, financial occupations	0.6	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Installation, maintenance, repair occupations	0.6	Computer, automated teller, and office machine repairers Radio and telecommunications equipment installers/repairers Aircraft mechanics and service technicians Automotive mechanics and service technicians Small engine mechanics
Computer, math, architect, engineer occupations	0.4	Actuaries Software developers and programmers Database and system administrators Computer support specialists Aerospace, agricultural, biomedical, and other engineers

Sources: BLS, RESI

3.1.3 Federal New Source Performance Standard—Investment Phase

Sales, office, administrative occupations	2.0	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	1.5	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	1.0	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	1.0	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	0.6	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.1.3 Federal New Source Performance Standard—Operation Phase

Construction, extraction occupations	2.3	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Sales, office, administrative occupations	2.1	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Management, business, financial occupations	0.9	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Installation, maintenance, repair occupations	0.9	Computer, automated teller, and office machine repairers Radio and telecommunications equipment installers/repairers Aircraft mechanics and service technicians Automotive mechanics and service technicians Small engine mechanics
Computer, math, architect, engineer occupations	0.6	Actuaries Software developers and programmers Database and system administrators Computer support specialists Aerospace, agricultural, biomedical, and other engineers

Sources: BLS, RESI

3.1.4 MACT—Investment Phase

Sales, office, administrative occupations	0.2	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	0.1	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	0.1	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	0.1	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Construction, extraction occupations	0.1	Actuaries Software developers and programmers Database and system administrators Computer support specialists Aerospace, agricultural, biomedical, and other engineers

Sources: BLS, RESI

3.1.4 MACT—Operation Phase

Protective service occupations	26.4	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Sales, office, administrative occupations	26.1	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Management, business, financial occupations	13.4	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	8.5	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	7.8	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators

Sources: BLS, RESI

3.1.5 Energy Efficiency in the Residential Sector—Investment Phase

Sales, office, administrative occupations	816.5	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	614.8	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	401.0	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	395.7	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	236.5	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.1.5 Energy Efficiency in the Residential Sector—Operation Phase

Sales, office, administrative occupations	40.5	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Healthcare occupations	25.7	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	21.1	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	11.4	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Transportation, material moving occupations	3.8	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Subway and streetcar operators

Sources: BLS, RESI

3.1.6 Energy Efficiency in the Commercial and Industrial Sectors—Investment Phase

Sales, office, administrative occupations	25.1	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	19.0	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	12.3	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	12.2	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	7.2	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.1.6 Energy Efficiency in the Commercial and Industrial Sectors—Investment Phase

Professional, scientific, and technical services	4.2	Lawyers Accountants and auditors Management analysts Architectural and civil drafters Market research analysts
Retail trade	3.6	Retail salespersons Cashiers Stock clerks and order fillers First-line supervisors/managers of retail sales workers Customer service representatives
Construction	1.1	Construction laborers Carpenters Electricians Operating engineers and other construction equipment operators Construction managers
Health care and social assistance	0.8	Registered nurses Nursing aides, orderlies, and attendants Home health aides Licensed practical and licensed vocational nurses Medical and health services managers
Administrative and support and waste management and remediation services	0.7	Janitors and cleaners, except maids and housekeeping cleaners Security guards Landscaping and grounds keeping workers Laborers and freight, stock, and material movers, hand Office clerks, general

Sources: BLS, RESI

3.1.6 Energy Efficiency in the Commercial and Industrial Sectors—Operation Phase

Sales, office, administrative occupations	219.1	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Building, grounds, personal care, service occupations	88.0	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Management, business, financial occupations	79.5	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Food preparation, serving related occupations	65.1	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Healthcare occupations	47.6	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.1.7 Energy Efficiency—Appliances and Other Products—Investment Phase

Farm, fishing, forestry occupations	0.0	Animal breeders Agricultural inspectors Fishers and hunters Forest and conservation workers Logging workers
Community, social service occupations	-0.1	Counselors Social workers Community and social service specialists Clergy Religious activities and education directors
Legal occupations	-0.2	Lawyers Judicial law clerks Judges, magistrates, and other judicial workers Paralegals and legal assistants Court reporters
Life, physical, social science occupations	-0.2	Agricultural and food scientists Biological scientists Conservation scientists and foresters Epidemiologists Geoscientists
Arts, design, entertainment, sports, media occupations	-0.3	Artists and related workers Designers Entertainers and performers Sports and related workers Media and communications workers

Sources: BLS, RESI

3.1.7 Energy Efficiency—Appliances and Other Products—Operation Phase

Sales, office, administrative occupations	9.3	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Healthcare occupations	6.0	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	4.8	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	2.5	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Transportation, material moving occupations	0.9	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Subway and streetcar operators

Sources: BLS, RESI

3.1.8 Energy Efficiency in the Power Sector—General—Investment Phase

Computer, math, architect, engineer occupations	32.4	Actuaries Software developers and programmers Database and system administrators Computer support specialists Aerospace, agricultural, biomedical, and other engineers
Sales, office, administrative occupations	29.4	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Production occupations	14.9	Assemblers and fabricators Food processing workers Metal workers and plastic workers Printing workers Textile, apparel, and furnishings workers
Management, business, financial occupations	14.2	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Construction, extraction occupations	7.4	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians

Sources: BLS, RESI

3.1.8 Energy Efficiency in the Power Sector—General—Operation Phase

Construction, extraction occupations	39.9	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Sales, office, administrative occupations	39.5	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Management, business, financial occupations	16.7	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Installation, maintenance, repair occupations	16.1	Computer, automated teller, and office machine repairers Radio and telecommunications equipment installers/repairers Aircraft mechanics and service technicians Automotive mechanics and service technicians Small engine mechanics
Computer, math, architect, engineer occupations	10.5	Actuaries Software developers and programmers Database and system administrators Computer support specialists Aerospace, agricultural, biomedical, and other engineers

Sources: BLS, RESI

3.1.9 Maryland Renewable Energy Portfolio Standard Subprogram—Investment Phase

Sales, office, administrative occupations	211.5	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Computer, math, architect, engineer occupations	210.3	Actuaries Software developers and programmers Database and system administrators Computer support specialists Aerospace, agricultural, biomedical, and other engineers
Management, business, financial occupations	94.4	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Production occupations	59.6	Assemblers and fabricators Food processing workers Metal workers and plastic workers Printing workers Textile, apparel, and furnishings workers
Construction, extraction occupations	56.0	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians

Sources: BLS, RESI

3.1.9 Maryland Renewable Energy Portfolio Standard Subprogram—Operation Phase

Farm, fishing, forestry occupations	-0.7	Animal breeders Agricultural inspectors Fishers and hunters Forest and conservation workers Logging workers
Community, social service occupations	-2.3	Counselors Social workers Community and social service specialists Clergy Religious activities and education directors
Legal occupations	-5.7	Lawyers Judicial law clerks Judges, magistrates, and other judicial workers Paralegals and legal assistants Court reporters
Arts, design, entertainment, sports, media occupations	-6.4	Artists and related workers Designers Entertainers and performers Sports and related workers Media and communications workers
Life, physical, social science occupations	-6.6	Agricultural and food scientists Biological scientists Conservation scientists and foresters Epidemiologists Geoscientists

Sources: BLS, RESI

3.1.10 Incentives and Grant Subprograms to Support Renewable Energy—Investment Phase

Protective service occupations	23.4	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Healthcare occupations	5.3	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Sales, office, administrative occupations	5.2	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Building, grounds, personal care, service occupations	3.5	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Education, training, library occupations	2.6	Postsecondary teachers Preschool, primary, and secondary teachers Special education teachers Librarians Archivists, curators, and museum technicians

Sources: BLS, RESI

3.1.10 Incentives and Grant Subprograms to Support Renewable Energy—Operation Phase

Building, grounds, personal care, service occupations	16.7	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	11.3	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Sales, office, administrative occupations	7.8	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Healthcare occupations	4.9	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Arts, design, entertainment, sports, media occupations	0.9	Artists and related workers Designers Entertainers and performers Sports and related workers Media and communications workers

Sources: BLS, RESI

3.1.11 Offshore Wind Initiatives to Support Renewable Energy—Investment Phase

Sales, office, administrative occupations	16.4	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Computer, math, architect, engineer occupations	16.3	Actuaries Software developers and programmers Database and system administrators Computer support specialists Aerospace, agricultural, biomedical, and other engineers
Management, business, financial occupations	7.3	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Construction, extraction occupations	4.6	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Production occupations	4.3	Assemblers and fabricators Food processing workers Metal workers and plastic workers Printing workers Textile, apparel, and furnishings workers

Sources: BLS, RESI

3.1.11 Offshore Wind Initiatives to Support Renewable Energy—Operation Phase

Sales, office, administrative occupations	12.0	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Healthcare occupations	5.7	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Construction, extraction occupations	4.8	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Building, grounds, personal care, service occupations	4.7	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Management, business, financial occupations	2.8	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors

Sources: BLS, RESI

D.2 Transportation

3.2.1 Maryland Clean Cars Subprogram—Investment Phase

Sales, office, administrative occupations	495.2	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Transportation, material moving occupations	68.2	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Subway and streetcar operators
Management, business, financial occupations	50.3	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Installation, maintenance, repair occupations	45.1	Computer, automated teller, and office machine repairers Radio and telecommunications equipment installers/repairers Aircraft mechanics and service technicians Automotive mechanics and service technicians Small engine mechanics
Construction, extraction occupations	43.5	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians

Sources: BLS, RESI

3.2.1 Maryland Clean Cars Subprogram—Operation Phase

Farm, fishing, forestry occupations	-0.7	Animal breeders Agricultural inspectors Fishers and hunters Forest and conservation workers Logging workers
Community, social service occupations	-0.7	Counselors Social workers Community and social service specialists Clergy Religious activities and education directors
Legal occupations	-1.1	Lawyers Judicial law clerks Judges, magistrates, and other judicial workers Paralegals and legal assistants Court reporters
Life, physical, social science occupations	-1.2	Agricultural and food scientists Biological scientists Conservation scientists and foresters Epidemiologists Geoscientists
Education, training, library occupations	-3.3	Postsecondary teachers Preschool, primary, and secondary teachers Special education teachers Librarians Archivists, curators, and museum technicians

Sources: BLS, RESI

3.2.2 Federal Medium- and Heavy-Duty GHG Standards—Investment Phase

Farm, fishing, forestry occupations	-2.1	Animal breeders Agricultural inspectors Fishers and hunters Forest and conservation workers Logging workers
Community, social service occupations	-5.5	Counselors Social workers Community and social service specialists Clergy Religious activities and education directors
Life, physical, social science occupations	-15.7	Agricultural and food scientists Biological scientists Conservation scientists and foresters Epidemiologists Geoscientists
Education, training, library occupations	-16.4	Postsecondary teachers Preschool, primary, and secondary teachers Special education teachers Librarians Archivists, curators, and museum technicians
Legal occupations	-17.5	Lawyers Judicial law clerks Judges, magistrates, and other judicial workers Paralegals and legal assistants Court reporters

Sources: BLS, RESI

3.2.2 Federal Medium- and Heavy-Duty GHG Standards—Investment Phase

Sales, office, administrative occupations	46.1	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Healthcare occupations	20.4	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Construction, extraction occupations	20.2	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Building, grounds, personal care, service occupations	16.5	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Management, business, financial occupations	12.4	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors

Sources: BLS, RESI

3.2.3 Clean Fuel Standard—Investment Phase

Farm, fishing, forestry occupations	-0.4	Animal breeders Agricultural inspectors Fishers and hunters Forest and conservation workers Logging workers
Community, social service occupations	-1.0	Counselors Social workers Community and social service specialists Clergy Religious activities and education directors
Life, physical, social science occupations	-2.9	Agricultural and food scientists Biological scientists Conservation scientists and foresters Epidemiologists Geoscientists
Education, training, library occupations	-3.1	Postsecondary teachers Preschool, primary, and secondary teachers Special education teachers Librarians Archivists, curators, and museum technicians
Legal occupations	-3.3	Lawyers Judicial law clerks Judges, magistrates, and other judicial workers Paralegals and legal assistants Court reporters

Sources: BLS, RESI

3.2.3 Clean Fuel Standard—Operation Phase

Sales, office, administrative occupations	5.8	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Healthcare occupations	4.3	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	3.2	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	1.7	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Transportation, material moving occupations	0.6	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Subway and streetcar operators

Sources: BLS, RESI

3.2.4 Transportation Climate Initiative—Investment Phase

Community, social service occupations	0.0	Counselors Social workers Community and social service specialists Clergy Religious activities and education directors
Farm, fishing, forestry occupations	0.0	Animal breeders Agricultural inspectors Fishers and hunters Forest and conservation workers Logging workers
Life, physical, social science occupations	0.0	Agricultural and food scientists Biological scientists Conservation scientists and foresters Epidemiologists Geoscientists
Arts, design, entertainment, sports, media occupations	0.0	Artists and related workers Designers Entertainers and performers Sports and related workers Media and communications workers
Production occupations	0.0	Assemblers and fabricators Food processing workers Metal workers and plastic workers Printing workers Textile, apparel, and furnishings workers

Sources: BLS, RESI

3.2.5 Public Transportation Initiatives—Investment Phase

Sales, office, administrative occupations	554.2	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	403.1	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	271.1	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	267.8	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	161.4	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.2.5 Public Transportation Initiatives—Operation Phase

Healthcare occupations	104.1	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	96.5	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Transportation, material moving occupations	76.2	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Subway and streetcar operators
Food preparation, serving related occupations	44.3	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Protective service occupations	43.0	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators

Sources: BLS, RESI

3.2.6 Initiatives to Double Transit Ridership by 2020—Investment Phase

Sales, office, administrative occupations	1,609.0	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	1,147.2	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	784.8	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	776.9	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	469.6	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.2.6 Initiatives to Double Transit Ridership by 2020—Operation Phase

Healthcare occupations	164.7	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	139.2	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	77.8	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Transportation, material moving occupations	25.7	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Subway and streetcar operators
Construction, extraction occupations	21.3	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians

Sources: BLS, RESI

3.2.7 Intercity Transportation Initiatives—Investment Phase

Sales, office, administrative occupations	193.2	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	142.9	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	95.5	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	93.7	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	56.1	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.2.7 Intercity Transportation Initiatives—Operation Phase

Transportation, material moving occupations	92.7	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Subway and streetcar operators
Sales, office, administrative occupations	20.2	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Building, grounds, personal care, service occupations	14.1	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Healthcare occupations	9.7	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Management, business, financial occupations	6.8	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors

Sources: BLS, RESI

3.2.8 Bike and Pedestrian Initiatives—Investment Phase

Sales, office, administrative occupations	607.7	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	454.4	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	300.1	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	295.2	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	176.1	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.2.8 Bike and Pedestrian Initiatives—Operation Phase

Healthcare occupations	0.1	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	0.0	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	0.0	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Construction, extraction occupations	0.0	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	0.0	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors

Sources: BLS, RESI

3.2.9 Pricing Initiatives—Investment Phase

Sales, office, administrative occupations	987.1	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	729.0	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	486.9	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	478.5	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	287.0	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.2.9 Pricing Initiatives—Operation Phase

Healthcare occupations	172.1	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	164.2	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	58.9	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Education, training, library occupations	19.0	Postsecondary teachers Preschool, primary, and secondary teachers Special education teachers Librarians Archivists, curators, and museum technicians
Management, business, financial occupations	18.3	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors

Sources: BLS, RESI

3.2.10 Transportation Technology Initiatives—Investment Phase

Sales, office, administrative occupations	5.9	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	4.5	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	2.9	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Construction, extraction occupations	2.8	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Healthcare occupations	1.7	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.2.10 Transportation Technology Initiatives—Operation Phase

Healthcare occupations	141.7	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	128.1	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	41.8	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Education, training, library occupations	14.7	Postsecondary teachers Preschool, primary, and secondary teachers Special education teachers Librarians Archivists, curators, and museum technicians
Community, social service occupations	10.5	Counselors Social workers Community and social service specialists Clergy Religious activities and education directors

Sources: BLS, RESI

3.2.11 Electric Vehicle Initiatives—Investment Phase

Sales, office, administrative occupations	8.6	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	6.2	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	4.2	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Construction, extraction occupations	4.2	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Healthcare occupations	2.5	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.2.11 Electric Vehicle Initiatives—Operation Phase

Healthcare occupations	2.7	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	2.5	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	0.8	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Education, training, library occupations	0.3	Postsecondary teachers Preschool, primary, and secondary teachers Special education teachers Librarians Archivists, curators, and museum technicians
Community, social service occupations	0.2	Counselors Social workers Community and social service specialists Clergy Religious activities and education directors

Sources: BLS, RESI

3.2.12 Low-Emitting Vehicles Initiatives—Investment Phase

Sales, office, administrative occupations	6.3	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	4.7	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	3.2	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	3.1	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	1.8	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.2.12 Low-Emitting Vehicles Initiatives—Operation Phase

Healthcare occupations	3.1	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	2.7	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	0.9	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Education, training, library occupations	0.3	Postsecondary teachers Preschool, primary, and secondary teachers Special education teachers Librarians Archivists, curators, and museum technicians
Community, social service occupations	0.2	Counselors Social workers Community and social service specialists Clergy Religious activities and education directors

Sources: BLS, RESI

3.2.14 Airport Initiatives—Investment Phase

Sales, office, administrative occupations	151.2	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	112.5	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	75.8	Counselors Social workers Community and social service specialists Clergy Religious activities and education directors
Management, business, financial occupations	73.7	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	44.0	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.2.14 Airport Initiatives—Operation Phase[277]

Management, business, financial occupations	0.0	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Computer, math, architect, engineer occupations	0.0	Actuaries Software developers and programmers Database and system administrators Computer support specialists Aerospace, agricultural, biomedical, and other engineers
Life, physical, social science occupations	0.0	Agricultural and food scientists Biological scientists Conservation scientists and foresters Epidemiologists Geoscientists
Community, social service occupations	0.0	Counselors Social workers Community and social service specialists Clergy Religious activities and education directors
Legal occupations	0.0	Lawyers Judicial law clerks Judges, magistrates, and other judicial workers Paralegals and legal assistants Court reporters

Sources: BLS, RESI

[277] The operation phase of this policy did not have significant impacts on the gain or loss of employment in any occupational category.

3.2.15 Port Initiatives—Investment Phase

Sales, office, administrative occupations	4.1	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	3.1	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	2.0	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Construction, extraction occupations	2.0	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Healthcare occupations	1.2	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.2.15 Port Initiatives—Operation Phase[278]

Management, business, financial occupations	0.0	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Computer, math, architect, engineer occupations	0.0	Actuaries Software developers and programmers Database and system administrators Computer support specialists Aerospace, agricultural, biomedical, and other engineers
Life, physical, social science occupations	0.0	Agricultural and food scientists Biological scientists Conservation scientists and foresters Epidemiologists Geoscientists
Community, social service occupations	0.0	Counselors Social workers Community and social service specialists Clergy Religious activities and education directors
Legal occupations	0.0	Lawyers Judicial law clerks Judges, magistrates, and other judicial workers Paralegals and legal assistants Court reporters

*
Sources: BLS, RESI

[278] The operation phase of this policy did not have significant impacts on the gain or loss of employment in any occupational category.

3.2.16 Freight and Freight Rail Strategies—Investment Phase

Sales, office, administrative occupations	4.1	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	3.1	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	2.0	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	2.0	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	1.2	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.2.16 Freight and Freight Rail Strategies—Operation Phase

Healthcare occupations	1.7	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	1.5	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	0.5	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Education, training, library occupations	0.2	Postsecondary teachers Preschool, primary, and secondary teachers Special education teachers Librarians Archivists, curators, and museum technicians
Community, social service occupations	0.1	Counselors Social workers Community and social service specialists Clergy Religious activities and education directors

Sources: BLS, RESI

3.2.17 Renewable Fuels Standard—Operation Phase

Healthcare occupations	4.1	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	3.6	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	1.2	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Education, training, library occupations	0.4	Postsecondary teachers Preschool, primary, and secondary teachers Special education teachers Librarians Archivists, curators, and museum technicians
Community, social service occupations	0.3	Counselors Social workers Community and social service specialists Clergy Religious activities and education directors

Sources: BLS, RESI

3.2.18 CAFE Standards: Model Years 2008-2011—Operation Phase

Healthcare occupations	2.5	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	2.3	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	0.7	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Education, training, library occupations	0.2	Postsecondary teachers Preschool, primary, and secondary teachers Special education teachers Librarians Archivists, curators, and museum technicians
Community, social service occupations	0.2	Counselors Social workers Community and social service specialists Clergy Religious activities and education directors

Sources: BLS, RESI

3.2.19 Promoting Hybrid and Electric Vehicles—Investment Phase

Sales, office, administrative occupations	0.4	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	0.3	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	0.2	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	0.2	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Building, grounds, personal care, service occupations	0.1	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators

Sources: BLS, RESI

3.2.19 Promoting Hybrid and Electric Vehicles—Operation Phase

Sales, office, administrative occupations	11.6	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Healthcare occupations	7.4	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	5.8	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	3.3	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Transportation, material moving occupations	1.2	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Subway and streetcar operators

Sources: BLS, RESI

3.2.20 PAYD Insurance in Maryland—Operation Phase

Computer, math, architect, engineer occupations	0.0	Actuaries Software developers and programmers Database and system administrators Computer support specialists Aerospace, agricultural, biomedical, and other engineers
Healthcare occupations	0.0	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	0.0	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Sales, office, administrative occupations	0.0	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Community, social service occupations	0.0	Counselors Social workers Community and social service specialists Clergy Religious activities and education directors

Sources: BLS, RESI

D.3 Agriculture and Forestry

3.3.1 Managing Forests to Capture Carbon—Investment Phase

Sales, office, administrative occupations	1.4	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	1.0	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	0.7	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	0.7	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	0.4	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.3.1 Managing Forests to Capture Carbon—Operation Phase

Farm, fishing, forestry occupations	9.3	Animal breeders Agricultural inspectors Fishers and hunters Forest and conservation workers Logging workers
Management, business, financial occupations	2.7	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Sales, office, administrative occupations	1.7	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Transportation, material moving occupations	1.1	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Subway and streetcar operators
Building, grounds, personal care, service occupations	1.0	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators

Sources: BLS, RESI

3.3.2 Creating Ecosystem Markets to Encourage GHG Emissions Reductions—Investment Phase

Sales, office, administrative occupations	0.2	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	0.2	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	0.1	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Construction, extraction occupations	0.1	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Healthcare occupations	0.1	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.3.2 Creating Ecosystem Markets to Encourage GHG Emissions Reductions—Operation Phase

Protective service occupations	110.5	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Sales, office, administrative occupations	91.6	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Construction, extraction occupations	44.6	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Healthcare occupations	42.6	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Computer, math, architect, engineer occupations	28.7	Actuaries Software developers and programmers Database and system administrators Computer support specialists Aerospace, agricultural, biomedical, and other engineers

Sources: BLS, RESI

3.3.3 Increasing Urban Trees to Capture Carbon—Investment Phase

Sales, office, administrative occupations	0.4	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	0.3	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	0.2	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	0.2	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Building, grounds, personal care, service occupations	0.1	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators

Sources: BLS, RESI

3.3.3 Increasing Urban Trees to Capture Carbon—Operation Phase

Sales, office, administrative occupations	50.5	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Building, grounds, personal care, service occupations	32.3	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	20.9	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Healthcare occupations	19.3	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Management, business, financial occupations	16.4	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors

Sources: BLS, RESI

3.3.4 Creating and Protecting Wetlands and Waterway Borders to Capture Carbon—Investment Phase

Sales, office, administrative occupations	12.7	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	9.4	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	6.0	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Construction, extraction occupations	5.9	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Healthcare occupations	3.8	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.3.4 Creating and Protecting Wetlands and Waterway Borders to Capture Carbon—Operation Phase

Food preparation, serving related occupations	11.2	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Sales, office, administrative occupations	8.0	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Building, grounds, personal care, service occupations	5.1	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Transportation, material moving occupations	1.6	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Subway and streetcar operators
Management, business, financial occupations	1.6	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors

Sources: BLS, RESI

3.3.5 Geological Opportunities to Store Carbon—Investment Phase

Sales, office, administrative occupations	0.1	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Healthcare occupations	0.1	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Management, business, financial occupations	0.0	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Arts, design, entertainment, sports, media occupations	0.0	Artists and related workers Designers Entertainers and performers Sports and related workers Media and communications workers
Building, grounds, personal care, service occupations	0.0	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators

Sources: BLS, RESI

3.3.5 Geological Opportunities to Store Carbon—Operation Phase

Sales, office, administrative occupations	39.5	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Management, business, financial occupations	13.4	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Building, grounds, personal care, service occupations	11.1	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	8.6	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Installation, maintenance, repair occupations	8.0	Computer, automated teller, and office machine repairers Radio and telecommunications equipment installers/repairers Aircraft mechanics and service technicians Automotive mechanics and service technicians Small engine mechanics

Sources: BLS, RESI

3.3.6 Planting Forests in Maryland—Investment Phase

Farm, fishing, forestry occupations	22.4	Animal breeders Agricultural inspectors Fishers and hunters Forest and conservation workers Logging workers
Management, business, financial occupations	7.3	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Transportation, material moving occupations	7.1	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Subway and streetcar operators
Building, grounds, personal care, service occupations	5.1	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Sales, office, administrative occupations	3.4	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters

Sources: BLS, RESI

3.3.6 Planting Forests in Maryland—Operation Phase

Sales, office, administrative occupations	0.1	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Healthcare occupations	0.1	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	0.0	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	0.0	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Transportation, material moving occupations	0.0	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Subway and streetcar operators

Sources: BLS, RESI

3.3.7 Biomass for Energy Production—Investment Phase

Sales, office, administrative occupations	41.4	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	30.7	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	20.9	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	20.2	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	12.0	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.3.7 Biomass for Energy Production—Operation Phase

Construction, extraction occupations	1.2	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Sales, office, administrative occupations	1.1	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Management, business, financial occupations	0.5	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Installation, maintenance, repair occupations	0.4	Computer, automated teller, and office machine repairers Radio and telecommunications equipment installers/repairers Aircraft mechanics and service technicians Automotive mechanics and service technicians Small engine mechanics
Computer, math, architect, engineer occupations	0.3	Actuaries Software developers and programmers Database and system administrators Computer support specialists Aerospace, agricultural, biomedical, and other engineers

Sources: BLS, RESI

3.3.8 Conservation of Agricultural Land for GHG Benefits—Investment Phase

Sales, office, administrative occupations	18.9	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	14.3	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	9.3	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	9.2	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	5.5	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.3.8 Conservation of Agricultural Land for GHG Benefits—Operation Phase

Farm, fishing, forestry occupations	459.5	Animal breeders Agricultural inspectors Fishers and hunters Forest and conservation workers Logging workers
Management, business, financial occupations	193.7	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Sales, office, administrative occupations	85.9	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Transportation, material moving occupations	41.4	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Subway and streetcar operators
Building, grounds, personal care, service occupations	36.5	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators

Sources: BLS, RESI

3.3.9 Buy Local for GHG Benefits—Investment Phase

Sales, office, administrative occupations	5.0	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	3.9	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	2.4	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Construction, extraction occupations	2.4	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Healthcare occupations	1.4	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.3.9 Buy Local for GHG Benefits—Operation Phase

Farm, fishing, forestry occupations	29.4	Animal breeders Agricultural inspectors Fishers and hunters Forest and conservation workers Logging workers
Management, business, financial occupations	12.5	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Sales, office, administrative occupations	5.6	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Transportation, material moving occupations	2.7	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Subway and streetcar operators
Building, grounds, personal care, service occupations	2.4	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators

Sources: BLS, RESI

3.3.10 Nutrient Trading for GHG Benefits—Investment Phase

Sales, office, administrative occupations	1.6	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	1.2	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	0.8	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	0.8	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	0.4	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.3.10 Nutrient Trading for GHG Benefits—Operation Phase

Sales, office, administrative occupations	12.3	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Construction, extraction occupations	11.2	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Protective service occupations	7.3	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	5.8	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	3.2	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

D.4 Recycling

3.4.1 Recycling and Source Reduction—Operation Phase

Transportation, material moving occupations	2.9	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Subway and streetcar operators
Community, social service occupations	0.0	Counselors Social workers Community and social service specialists Clergy Religious activities and education directors
Farm, fishing, forestry occupations	-0.1	Animal breeders Agricultural inspectors Fishers and hunters Forest and conservation workers Logging workers
Arts, design, entertainment, sports, media occupations	-0.2	Artists and related workers Designers Entertainers and performers Sports and related workers Media and communications workers
Production occupations	-0.3	Assemblers and fabricators Food processing workers Metal workers and plastic workers Printing workers Textile, apparel, and furnishings workers

Sources: BLS, RESI

D.5 Buildings

3.5.1 Building Codes—Investment Phase

Sales, office, administrative occupations	3.3	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	2.4	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	1.6	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	1.6	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	0.9	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.5.1 Building Codes—Operation Phase

Sales, office, administrative occupations	14.3	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Management, business, financial occupations	9.6	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Construction, extraction occupations	3.9	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Computer, math, architect, engineer occupations	3.5	Actuaries Software developers and programmers Database and system administrators Computer support specialists Aerospace, agricultural, biomedical, and other engineers
Building, grounds, personal care, service occupations	2.7	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators

Sources: BLS, RESI

3.5.2 BeSMART—Investment Phase

Sales, office, administrative occupations	0.1	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	0.1	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	0.0	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Construction, extraction occupations	0.0	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Healthcare occupations	0.0	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.5.2 BeSMART—Operation Phase

Management, business, financial occupations	0.0	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	0.0	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Food preparation, serving related occupations	0.0	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Sales, office, administrative occupations	0.0	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	0.0	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators

Sources: BLS, RESI

3.5.3 Weatherization and Energy Efficiency for Low-Income Houses—Investment Phase

Sales, office, administrative occupations	1.3	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	1.1	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	0.7	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	0.6	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	0.4	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.5.3 Weatherization and Energy Efficiency for Low-Income Houses—Operation Phase

Healthcare occupations	0.1	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	0.1	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	0.1	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Management, business, financial occupations	0.0	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Education, training, library occupations	0.0	Postsecondary teachers Preschool, primary, and secondary teachers Special education teachers Librarians Archivists, curators, and museum technicians

Sources: BLS, RESI

D.6 Land Use

3.6.1 Reducing Transportation Issues through Smart Growth—Operation Phase

Construction, extraction occupations	6.1	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Sales, office, administrative occupations	1.7	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Management, business, financial occupations	0.9	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Installation, maintenance, repair occupations	0.8	Computer, automated teller, and office machine repairers Radio and telecommunications equipment installers/repairers Aircraft mechanics and service technicians Automotive mechanics and service technicians Small engine mechanics
Transportation, material moving occupations	0.5	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Subway and streetcar operators

Sources: BLS, RESI

3.6.2 GHG Targets for Local Government's Transportation and Land Use Planning—Operation Phase

Sales, office, administrative occupations	10.3	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Healthcare occupations	6.3	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	5.0	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	2.9	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Transportation, material moving occupations	1.1	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Subway and streetcar operators

Sources: BLS, RESI

3.6.3 Land Use Planning GHG Benefits—Investment Phase

Sales, office, administrative occupations	7.2	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	5.7	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	3.4	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Construction, extraction occupations	3.3	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Healthcare occupations	2.0	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.6.3 Land Use Planning GHG Benefits—Operation Phase

Construction, extraction occupations	49.8	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Sales, office, administrative occupations	14.5	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Management, business, financial occupations	7.2	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Installation, maintenance, repair occupations	6.4	Computer, automated teller, and office machine repairers Radio and telecommunications equipment installers/repairers Aircraft mechanics and service technicians Automotive mechanics and service technicians Small engine mechanics
Transportation, material moving occupations	4.0	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Subway and streetcar operators

Sources: BLS, RESI

3.6.4 Growth Boundary GHG Benefits—Investment Phase

Protective service occupations	1,690.9	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Sales, office, administrative occupations	982.9	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Management, business, financial occupations	455.7	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	446.2	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Construction, extraction occupations	242.3	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians

Sources: BLS, RESI

3.6.4 Growth Boundary GHG Benefits—Operation Phase

Construction, extraction occupations	189.9	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Sales, office, administrative occupations	154.1	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Production occupations	59.1	Assemblers and fabricators Food processing workers Metal workers and plastic workers Printing workers Textile, apparel, and furnishings workers
Management, business, financial occupations	58.2	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Installation, maintenance, repair occupations	49.2	Computer, automated teller, and office machine repairers Radio and telecommunications equipment installers/repairers Aircraft mechanics and service technicians Automotive mechanics and service technicians Small engine mechanics

Sources: BLS, RESI

D.7 Innovative Initiatives
3.7.1 Leadership-by-Example—Local Government—Investment Phase

Sales, office, administrative occupations	33.2	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Construction, extraction occupations	23.8	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Protective service occupations	18.7	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	14.7	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Food preparation, serving related occupations	9.0	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers

Sources: BLS, RESI

3.7.1 Leadership-by-Example—Local Government—Operation Phase

Sales, office, administrative occupations	51.2	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Management, business, financial occupations	31.9	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Building, grounds, personal care, service occupations	26.8	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	19.4	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Construction, extraction occupations	12.8	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians

Sources: BLS, RESI

3.7.2 Leadership-by-Example—Federal Government—Investment Phase

Sales, office, administrative occupations	16.4	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	12.3	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	8.0	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	7.9	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	4.7	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.7.2 Leadership-by-Example—Federal Government—Operation Phase

Sales, office, administrative occupations	206.2	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	174.9	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	105.3	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Construction, extraction occupations	78.5	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Healthcare occupations	68.8	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.7.3 Leadership-by-Example—Maryland University Lead-by-Example Initiatives—Investment Phase

Sales, office, administrative occupations	15.8	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	11.9	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Construction, extraction occupations	7.7	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Management, business, financial occupations	7.7	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	4.5	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.7.3 Leadership-by-Example—Maryland University Lead-by-Example Initiatives—Operation Phase

Sales, office, administrative occupations	16.1	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	15.4	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	8.4	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	5.6	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	5.0	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators

Sources: BLS, RESI

3.7.4 Voluntary Stationary Source Reductions—Investment Phase

Sales, office, administrative occupations	0.1	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	0.1	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	0.0	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Construction, extraction occupations	0.0	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Building, grounds, personal care, service occupations	0.0	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators

Sources: BLS, RESI

3.7.4 Voluntary Stationary Source Reductions—Operation Phase

Construction, extraction occupations	0.1	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Sales, office, administrative occupations	0.1	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Management, business, financial occupations	0.2	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Installation, maintenance, repair occupations	0.2	Computer, automated teller, and office machine repairers Radio and telecommunications equipment installers/repairers Aircraft mechanics and service technicians Automotive mechanics and service technicians Small engine mechanics
Computer, math, architect, engineer occupations	0.1	Actuaries Software developers and programmers Database and system administrators Computer support specialists Aerospace, agricultural, biomedical, and other engineers

Sources: BLS, RESI

3.7.5 State of Maryland Initiatives to Lead by Example—Investment Phase

Sales, office, administrative occupations	1.2	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	0.6	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	0.4	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Computer, math, architect, engineer occupations	0.4	Actuaries Software developers and programmers Database and system administrators Computer support specialists Aerospace, agricultural, biomedical, and other engineers
Healthcare occupations	0.3	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.7.5 State of Maryland Initiatives to Lead by Example—Operation Phase

Sales, office, administrative occupations	56.5	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Management, business, financial occupations	34.6	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Building, grounds, personal care, service occupations	28.3	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	20.2	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Construction, extraction occupations	14.8	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians

Sources: BLS, RESI

3.7.6 State of Maryland Carbon and Footprint Initiatives—Operation Phase

Sales, office, administrative occupations	129.0	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	102.7	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	62.9	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Construction, extraction occupations	47.8	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Healthcare occupations	39.6	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.7.7 Job Creation and Economic Development Initiatives Related to Climate Change—Operation Phase

All jobs would be accounted for in previous GGRA programs through green job training to meet new demand.

Sources: BLS, RESI

3.7.8 Public Health Initiatives Related to Climate Change—Investment Phase

Sales, office, administrative occupations	1.1	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	0.8	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	0.5	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Construction, extraction occupations	0.5	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians
Healthcare occupations	0.3	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.7.8 Public Health Initiatives Related to Climate Change—Operation Phase

Sales, office, administrative occupations	6.6	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Healthcare occupations	3.6	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	3.0	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Food preparation, serving related occupations	2.0	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers
Transportation, material moving occupations	1.0	Aircraft cargo handling supervisors Air traffic controllers Ambulance drivers and attendants Driver/Sales workers and truck drivers Retail sales workers

Sources: BLS, RESI

3.7.9 Title V Permits for GHG Sources—Investment Phase

Sales, office, administrative occupations	0.2	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	0.1	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	0.1	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	0.1	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Construction, extraction occupations	0.1	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians

Sources: BLS, RESI

3.7.9 Title V Permits for GHG Sources—Operation Phase

Protective service occupations	0.9	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Sales, office, administrative occupations	0.8	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Management, business, financial occupations	0.4	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Building, grounds, personal care, service occupations	0.3	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators
Healthcare occupations	0.3	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists

Sources: BLS, RESI

3.7.10 Outreach and Public Education—Investment Phase

Sales, office, administrative occupations	0.0	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Management, business, financial occupations	0.0	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Protective service occupations	0.0	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Healthcare occupations	0.0	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Food preparation, serving related occupations	0.0	Cooks Supervisors of food preparation workers Bartenders Waiters and waitresses Dishwashers

Sources: BLS, RESI

3.7.11 GHG Prevention of Significant Deterioration Permitting Program—Investment Phase

Sales, office, administrative occupations	0.2	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Protective service occupations	0.1	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Management, business, financial occupations	0.1	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	0.1	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Construction, extraction occupations	0.1	Supervisors of construction trade workers Carpenters Brick masons, block masons, and stonemasons Construction equipment operators Electricians

Sources: BLS, RESI

3.7.11 GHG Prevention of Significant Deterioration Permitting Program—Operation Phase

Protective service occupations	0.2	Fire fighters and inspectors Bailiffs, correctional officers, and jailers Fish and game wardens Animal control workers Private detectives and investigators
Sales, office, administrative occupations	0.2	Retail sales workers Advertising sales agents Insurance sales agents Sales representatives in wholesale and manufacturing Models, demonstrators, and product promoters
Management, business, financial occupations	0.1	Legislators Advertising, marketing, and sales managers Compliance officers Cost estimators Accountants and auditors
Healthcare occupations	0.1	Dentists Dietitians and nutritionists Physicians and surgeons Nurses and home health aides Occupational therapists
Building, grounds, personal care, service occupations	0.1	Supervisors of cleaning and maintenance workers Housekeeping and janitorial workers Pest control workers Landscaping and grounds keeping workers Pesticide handlers, sprayers, and applicators

Sources: BLS, RESI

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