

Mitigation Work Group (MWG)

Buildings Ad Hoc Group

Meeting #1: Introductions and Work Plan Review

Facilitator: Mark Stewart, Sustainability Manager, University of Maryland

Agenda

- Introductions
- Overview of the Topic
- Work Plan Review
- Discussion

Introductions

Introductions

- Mark Stewart – Sustainability Manager, University of Maryland (Buildings Subgroup Facilitator)
- Kim Coble – Executive Director, Maryland League of Conservation Voters (MWG Co-Chair)
- Michael Powell – Attorney, Gordon Feinblatt (MWG Co-Chair)
- Chris Hoagland – Climate Change Program Manager, MD Dept. of the Environment
- Cindy Osorto – Legislative and Policy Analyst, MD Dept. of the Environment
- David Smedick – Senior Campaign Representative, Sierra Club
- Tom Ballentine – Vice President for Policy and Government Relations, NAIOP – Commercial Real Estate Dev. Assoc.
- William Ellis – Senior Portfolio Manager for Energy Efficiency, Pepco
- Eric Coffman – Energy Programs Director, MD Energy Administration
- Susan Stevens-Miller – Attorney, Earthjustice
- Tom Walz – Multi Family Energy Production Manager, MD Dept. of Housing and Community Development
- David St. Jean – Director of Energy and Sustainability, MD Dept. of General Services
- Jim Grevatt – Managing Consultant, Energy Futures Group
- Susan Casey – Climate Change Communications Manager, MD Dept. of the Environment
- Amanda Best – Senior Commission Advisor, Public Service Commission
- Alex Butler – Policy Associate, MD Association of Counties

What would a carbon neutral buildings sector in Maryland look like?

Overview of the Topic

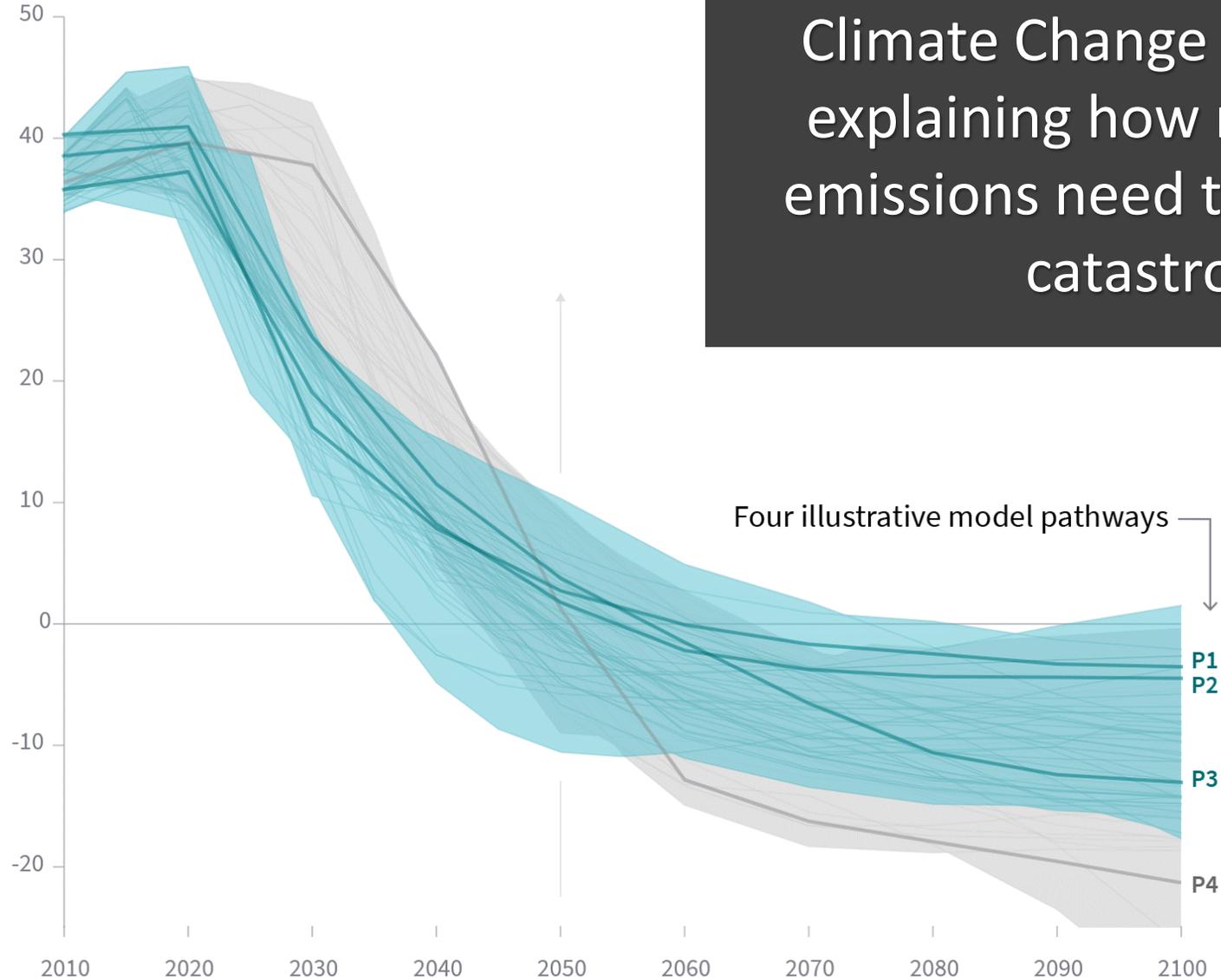
GHG Mitigation Targets – Current Maryland Law

Greenhouse Gas Emissions Reduction Act – Reauthorization (2016)

- “The State shall reduce statewide greenhouse gas emissions by **40% from 2006 levels by 2030.**”
- “The plans shall be developed in recognition of the finding by the Intergovernmental Panel on Climate Change that developed countries will need to reduce greenhouse gas emissions by between **80% and 95% from 1990 levels by 2050.**”
- *Established the use of science-based targets for GHG reduction in Maryland law*

Global total net CO₂ emissions

Billion tonnes of CO₂/yr



In October 2018, the Intergovernmental Panel on Climate Change (IPCC) issued a Special Report explaining how rapidly global greenhouse gas emissions need to decrease in order to prevent catastrophic climate change.

The global economy must rapidly decarbonize and reach net-zero emissions around 2050.

States are Starting to Set Net-Zero by 2045/2050 Targets

California law – Net-zero emissions by 2045

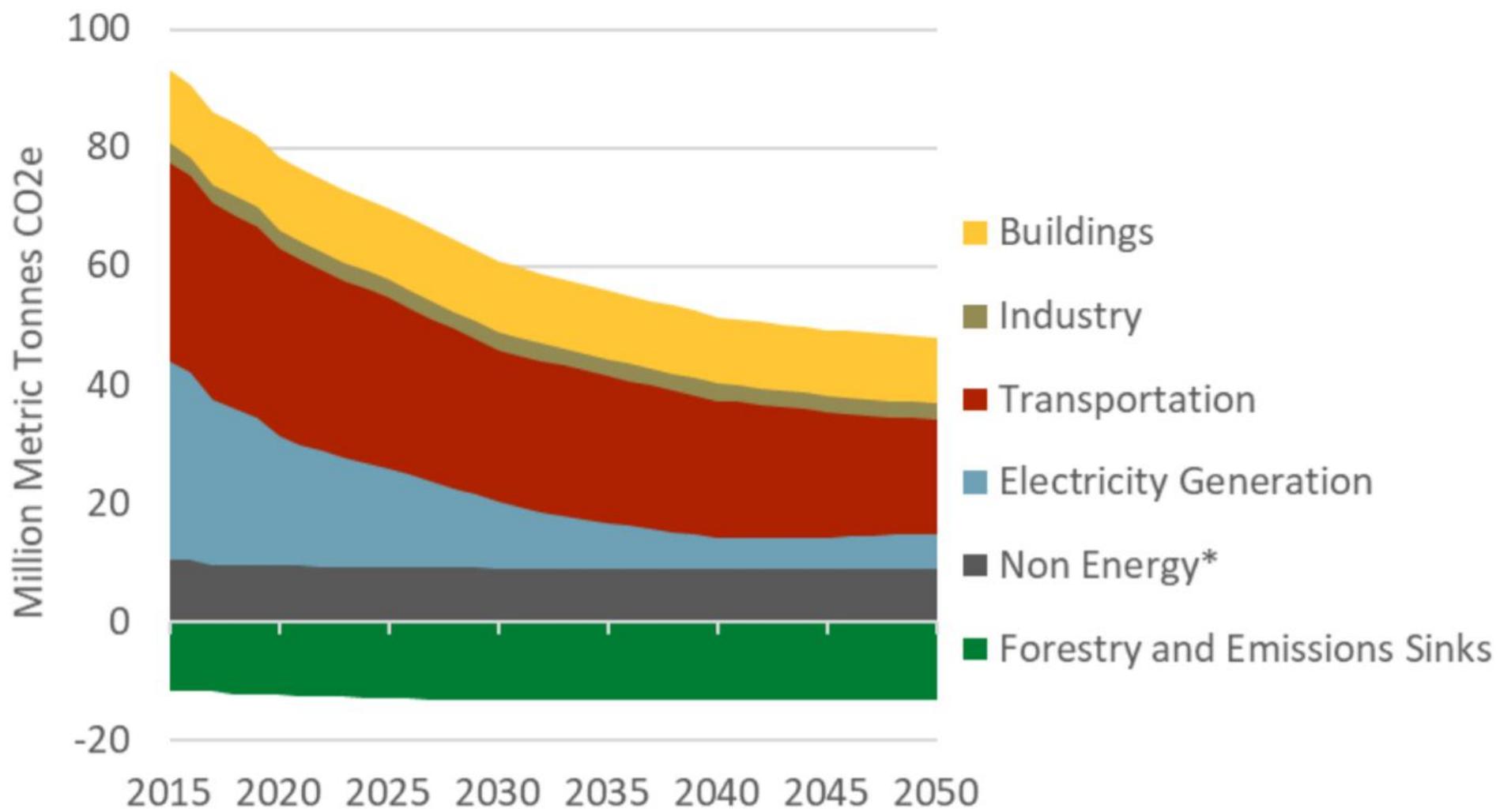
New York law – Net-zero emissions by 2050

Washington DC law – Net-zero emissions by 2050

Maryland's GGRA law (essentially) already aims for this target

- Aims to reduce *gross* emissions between 80% and 95% from 1990 levels by 2050
- MDE estimates that a ~90% reduction of gross emissions from the 2006 baseline would achieve net-zero emissions since the remaining gross emissions would equal carbon sinks in the state.

Maryland's Projected Emissions Based on Current Policy



*Non Energy includes Agriculture, Waste Management, Industrial Process and Fossil Fuel Industry.

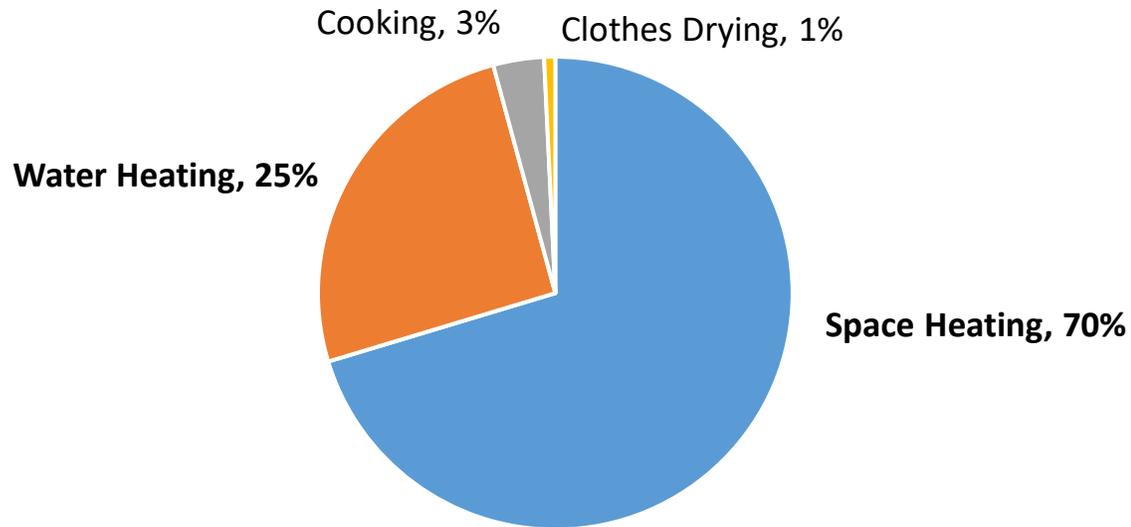
Residential, Commercial, Industrial (RCI) Fuel Use in Maryland

Fuel Type	2017 Emissions (MMtCO ₂ e)	User	2017 Natural Gas Demand (tBtu)
Natural Gas	9.74	Residential	79.4
Petroleum	2.91	Commercial	75.7
Coal	1.17	Industrial	16.5
Wood	0.06	<i>Total</i>	<i>171.6</i>
<i>Total</i>	<i>13.87</i>		

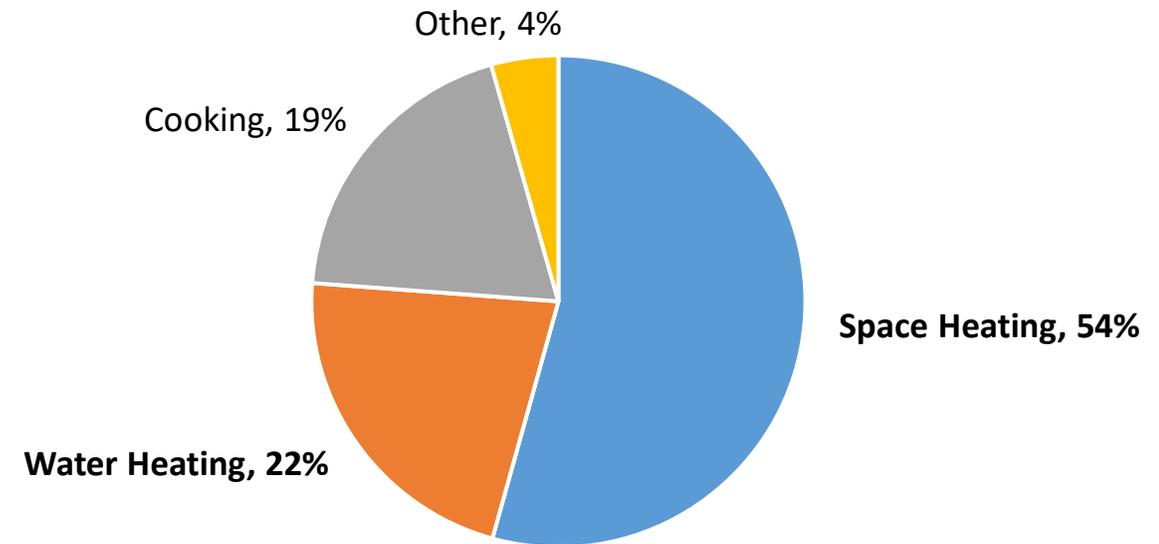
- Natural gas accounts for 70% of Maryland’s RCI fuel use.
- 90% of Maryland’s RCI natural gas use is for residential and commercial buildings.
- Natural gas represents the main challenge for decarbonizing buildings in Maryland.
- Maryland is fortunate (from a GHG perspective) to have low emissions from industry.

Natural Gas End-Use in Buildings

Residential Natural Gas End-Use (2015)
for Middle and South Atlantic Regions



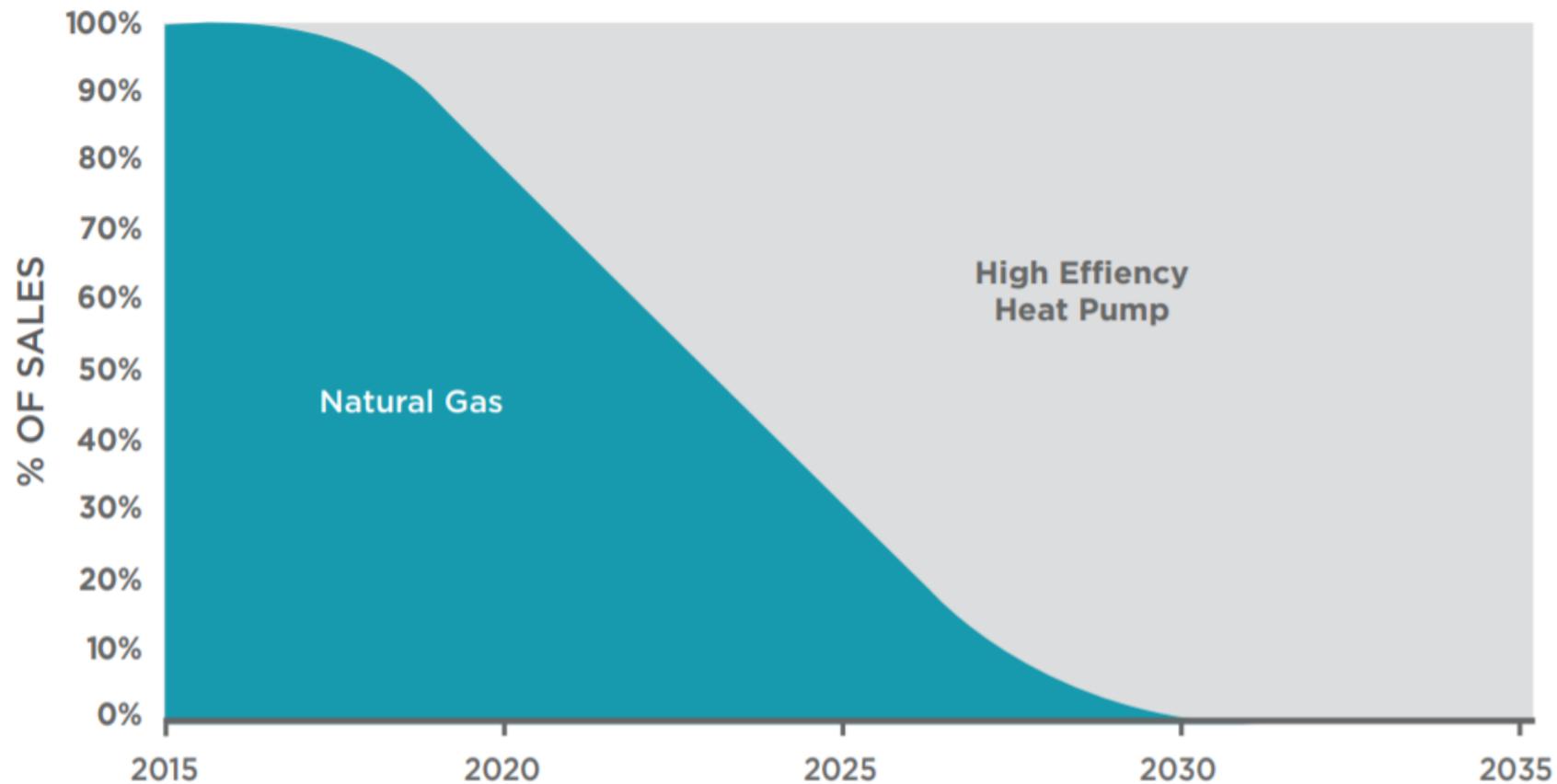
Commercial Natural Gas End-Use (2012)
for Middle and South Atlantic Regions



It's estimated that space heating and water heating account for 95% of natural gas used in homes and 76% of natural gas used in commercial buildings.

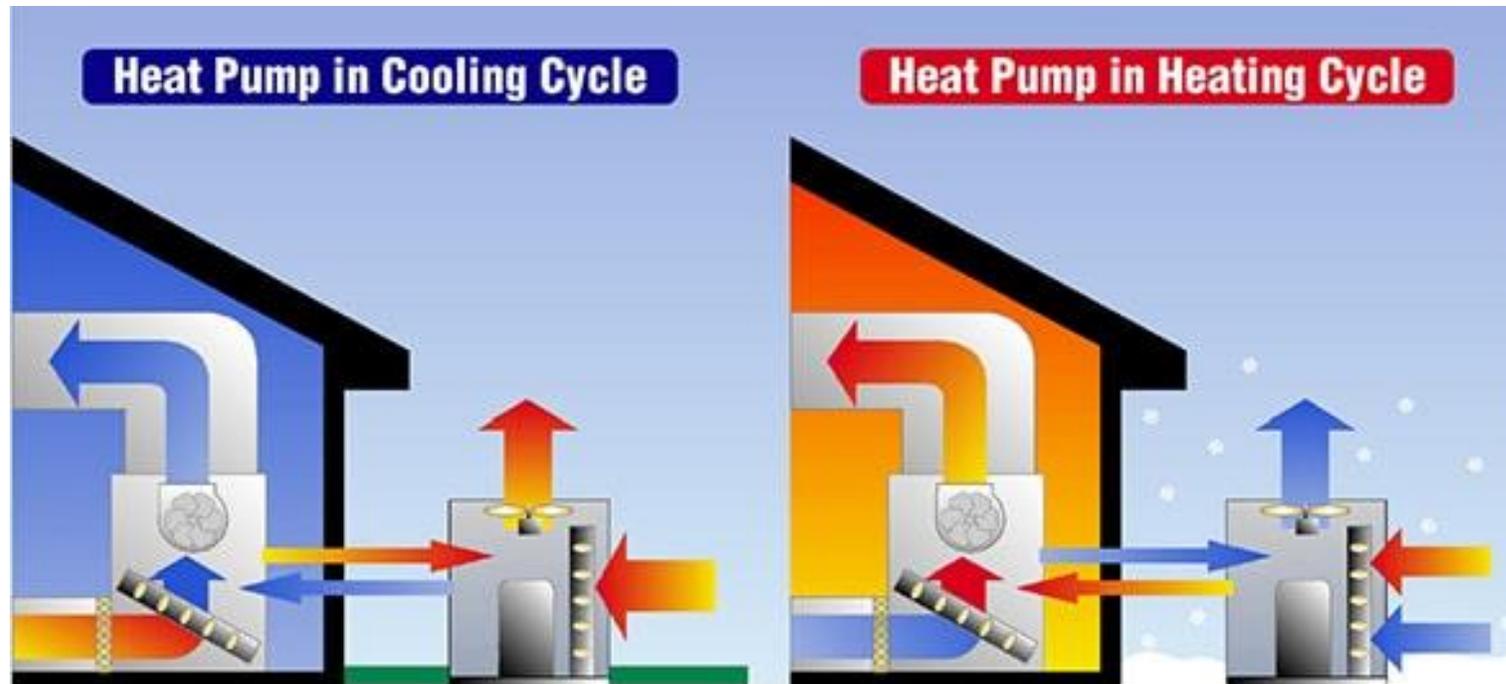
One Solution: Heat Pumps

The Building Decarbonization Coalition recommends that 100% of sales of new space and water heating systems be electric high-efficiency heat pumps by 2030 to achieve California's net-zero emissions by 2045 law.

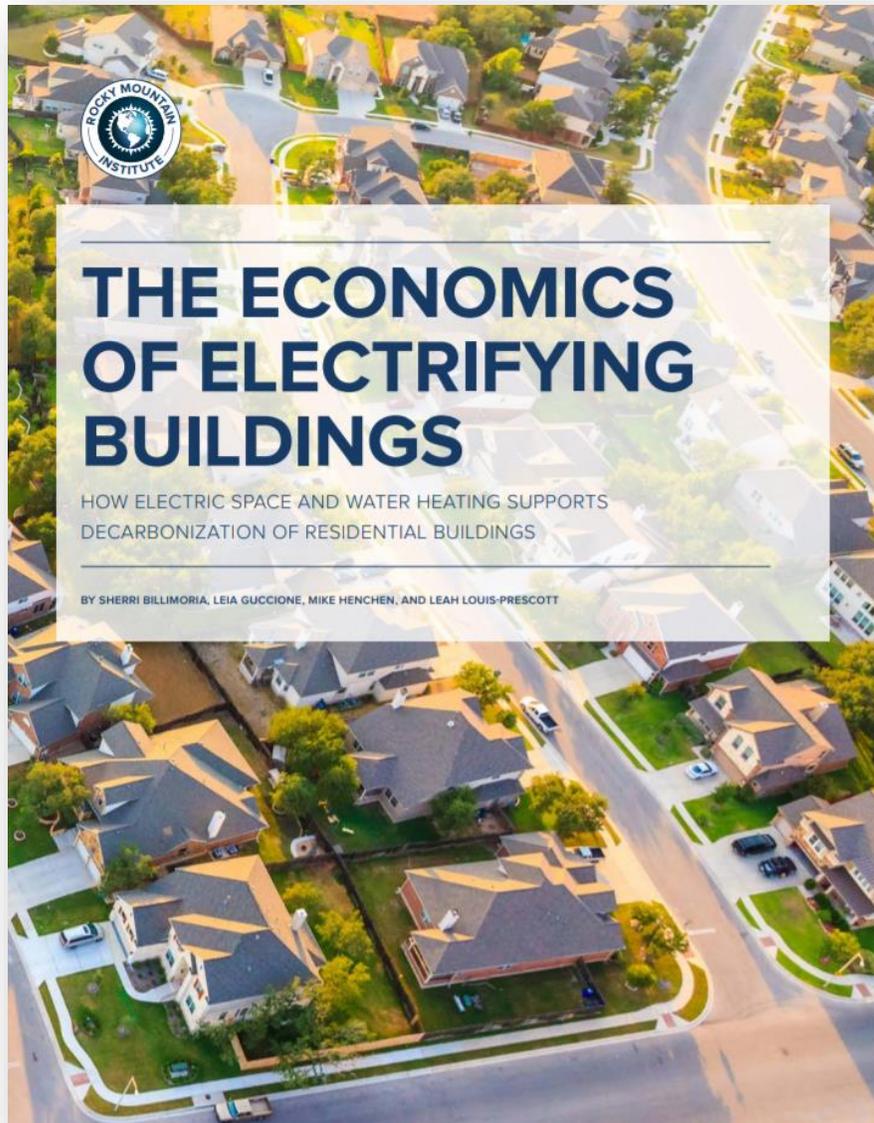


Heat Pump Basics

“Heat pumps use a coolant to transfer heat from one part of a system to another. This process works through the compression and expansion of coolant. As coolant is compressed, it heats up. As it expands, the coolant can draw heat out of the surrounding environment. This process is the same for air conditioners, heating systems, some water heaters, and more.”



Electrification Can be the Lowest-Cost Option for Homes

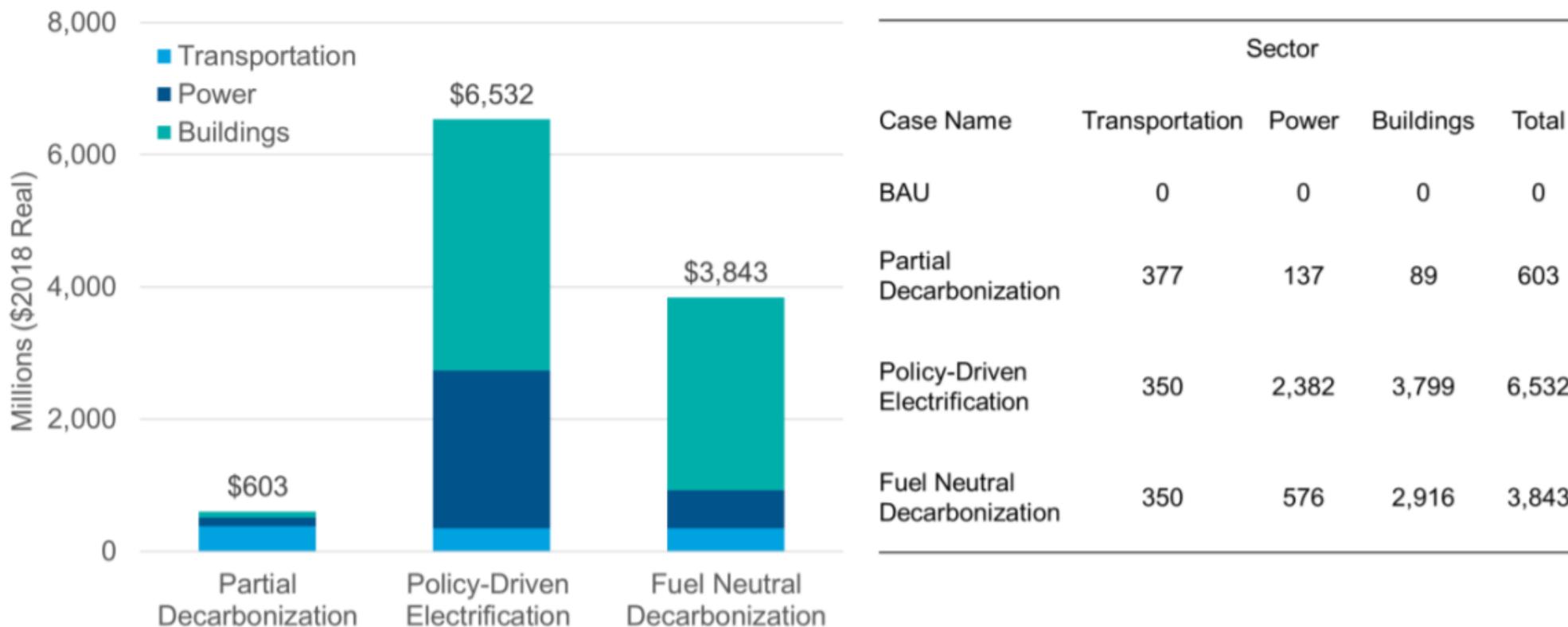


“We find electrification is cost-effective for customers switching away from propane or heating oil, for those gas customers who would otherwise need to replace both a furnace and air conditioner simultaneously, for customers who bundle rooftop solar with electrification, and for most new home construction, especially when considering the avoided cost of gas mains, services, and meters not needed in all-electric neighborhoods.”

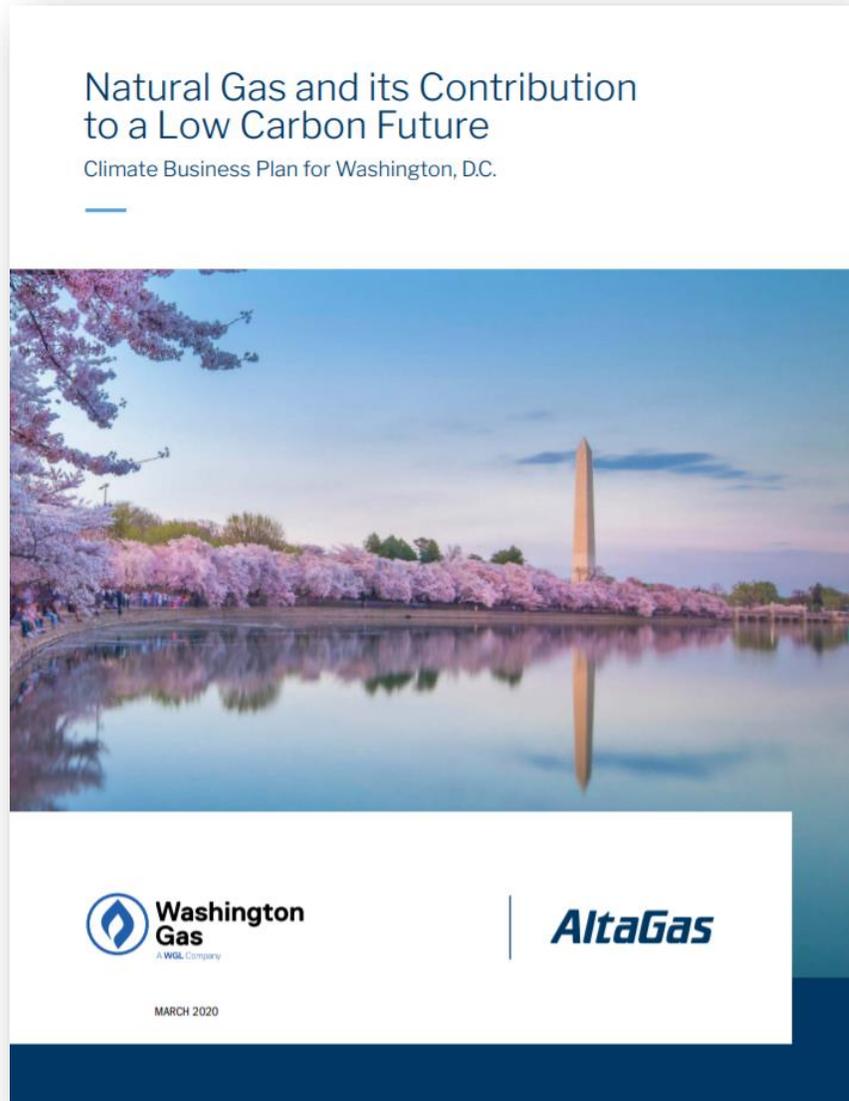
...but is Full Scale Electrification too Expensive?

ICF estimates that, for the District of Columbia, an electrification strategy would be more expensive than a “fuel neutral decarbonization” strategy due to incremental electricity costs for meeting a large wintertime peak electricity demand.

Figure 4. Impact on District Wide Energy Costs by Sector from 2020 to 2050¹²



Another Solution: Hybrid Heating and Green Gas



- Washington DC's Goal: Net-Zero Emissions by 2050
- Washington Gas/WGL/AltaGas just published their Climate Business Plan for DC:
 - 51% reduction in emissions from end-use efficiency including **hybrid heating** (electric heat pumps that meet 80% of heating demand with gas furnace as backup)
 - 44% reduction in emissions from **replacing natural gas with renewable natural gas (RNG)** and, to a lesser degree, power-to-gas and green hydrogen
 - 5% reduction in emissions from transmission and distribution efficiency (reducing fugitive emissions)

Emissions reductions noted above are based on a 2017 baseline.

...but is there Enough RNG to Decarbonize Natural Gas?

Region	Estimated Annual RNG Production by 2040 in ICF's "Achievable Scenario," tBtu/y
Greater DC Region	55
South Atlantic Region (MD to FL)	530
<i>MD's population-proportional share</i>	<i>50</i>
United States	4,500

Region	Percentage of Current RCI Natural Gas Use that could be replaced by RNG*
MD (based on Greater DC Region)	32%
MD (based on MD's population-proportional share of South Atlantic Region)	29%
South Atlantic Region	33%
United States	23%

* Assuming all RNG would be used for RCI, not electricity generation or transportation. Currently, most RNG is used for transportation.

... and Should RNG be Reserved for Industry?

Region	Estimated Annual RNG Production by 2040 in ICF's "Achievable Scenario," tBtu/y	Current Natural Gas Use for Industry Only, tBtu/y	Percentage of Current Industry Natural Gas Use that could be replaced by RNG ²
United States	4,500	10,560	43%
Maryland	50 ¹	16.5	300%

- Industry is hard to decarbonize and the most expensive sector to electrify with many high-heat processes.
- Nationally, **less than half of industry's current gas use could be met using *all* of the nation's RNG resources** by mid-century.
- In Maryland, 100% of industry's gas demand could be met using RNG, which could be the lowest-cost option for decarbonizing industry in the State.

1. Based on Maryland population-proportional share of South Atlantic Region's estimated annual RNG production

2. Assuming all RNG would be used for industry, not residential, commercial, electricity generation, or transportation

Work Plan Review

Objectives

Primary Objectives from the MWG:

- Analyze and determine specific targets and timelines for decreasing emissions from residential and commercial buildings (or, information needed to determine such targets and timelines), including: annual building retrofit targets; specific energy efficiency targets; a timeline for requiring all new buildings be carbon neutral; and a timeline for replacing fossil-fuel heating systems with electric heating or other low-carbon systems.
- Analyze and identify specific mechanisms for decreasing emissions from residential and commercial buildings (or, information needed to determine appropriate mechanisms), including: expanding programs that support upgraded electric heating and cooling system; new programs to encourage combined heat and power; incentives and other strategies that support the replacement of fossil-fuel heating with electrical systems.

Secondary Objectives from the Buildings Subgroup:

- Consider how mechanisms for mitigating emissions from residential and commercial buildings could influence the industrial sector's opportunities and costs for mitigating emissions.
- Analyze and identify specific mechanisms for reducing and eventually neutralizing the carbon intensity of fuels delivered to buildings.

Deliverables & Timeline

Subgroup:

- **Develop recommendations – summer 2020**
- **Present a final set of recommendations to the MWG – early fall 2020**

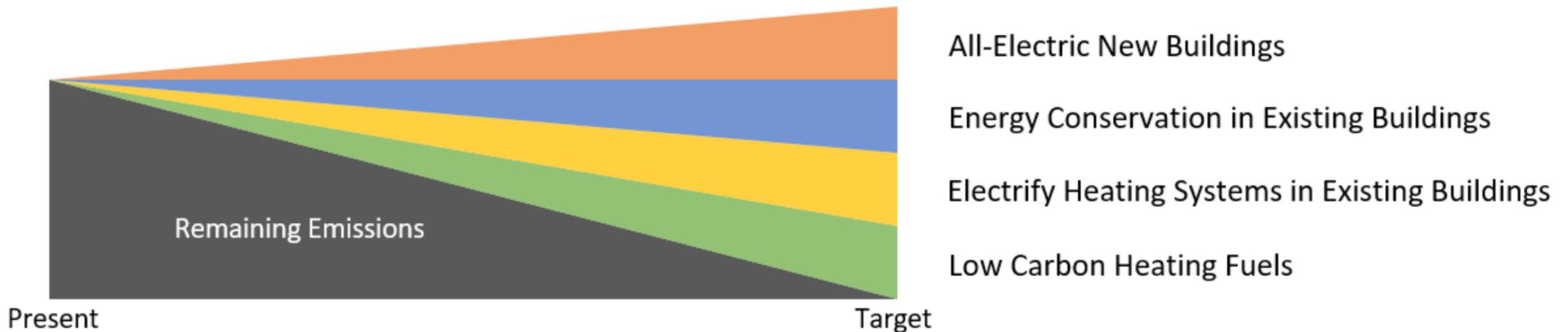
Beyond the Subgroup:

- Maryland Commission on Climate Change's Annual Report – due November 15, 2020
- State's final GGRA Plan – due by the end of 2020

Approach: Build from Current Knowledge

The Buildings Subgroup will base its work on existing technical studies, plans, and policies for decarbonizing buildings. A literature review suggests that four mechanisms are most effective for addressing this challenge at scale:

Conceptual Overview of Emissions Mitigation Mechanisms for Decarbonizing Buildings*



* Not meant to accurately show proportional impact of each mechanism.

By what year should the buildings sector in Maryland – as measured by residential, commercial, and industrial (RCI) fuel use – achieve net-zero emissions to support the State’s Greenhouse Gas Reduction Act (GGRA) goals?

Meeting Schedule

Meeting 1 (June) – Introductions and Work Plan Review

Meeting 2 (July) – **New Buildings**

Meeting 3 (August) – **Existing Buildings**

Meeting 4 (September) – **Low Carbon Heating Fuels**

Meeting 5 (October) – **Review and Approve Final Recommendations**

Does the first Thursday of each month from 3:00 to 5:00 pm work for you?

Guiding Questions for Next Meeting on New Buildings

1. Studies show that all-electric new buildings have lower construction and energy costs than conventional new buildings in several markets. Is that true for residential and commercial buildings in Maryland given current and projected equipment, labor, and energy rates?
2. Should new residential buildings be required to be all-electric? If so, by what date?
3. Should new commercial buildings be required to be all-electric? If so, by what date?
4. Are there exemptions to an all-electric requirement that should be given to specific commercial or residential new buildings? If so, what would qualify for an exemption? Commercial cooking equipment? Commercial buildings with specific high-heat applications?
5. Should the State consider an on-site renewable energy generation (or shade tree) requirement or incentive for new buildings?
6. Should the State consider a ground source heat pump incentive for new buildings, especially for new neighborhoods, large commercial/multifamily buildings, campuses, etc.?
7. Should new buildings be required to have electric vehicle charging infrastructure? If so, by what standard and by what date?

Help!

Within the next two weeks, please send your:

- Response to this question: What requirements should the State adopt for new residential and commercial buildings so that all new buildings will be carbon neutral?
- Questions or comments on the work plan.
- Ideas for experts/guest speakers or other resources that can help address any of our future meeting topics.

Discussion