NEW JERSEY'S ENERGY MASTER PLAN AND BUILDING DECARBONIZATION

Hannah Thonet, Senior Policy Advisor
New Jersey Board of Public Utilities
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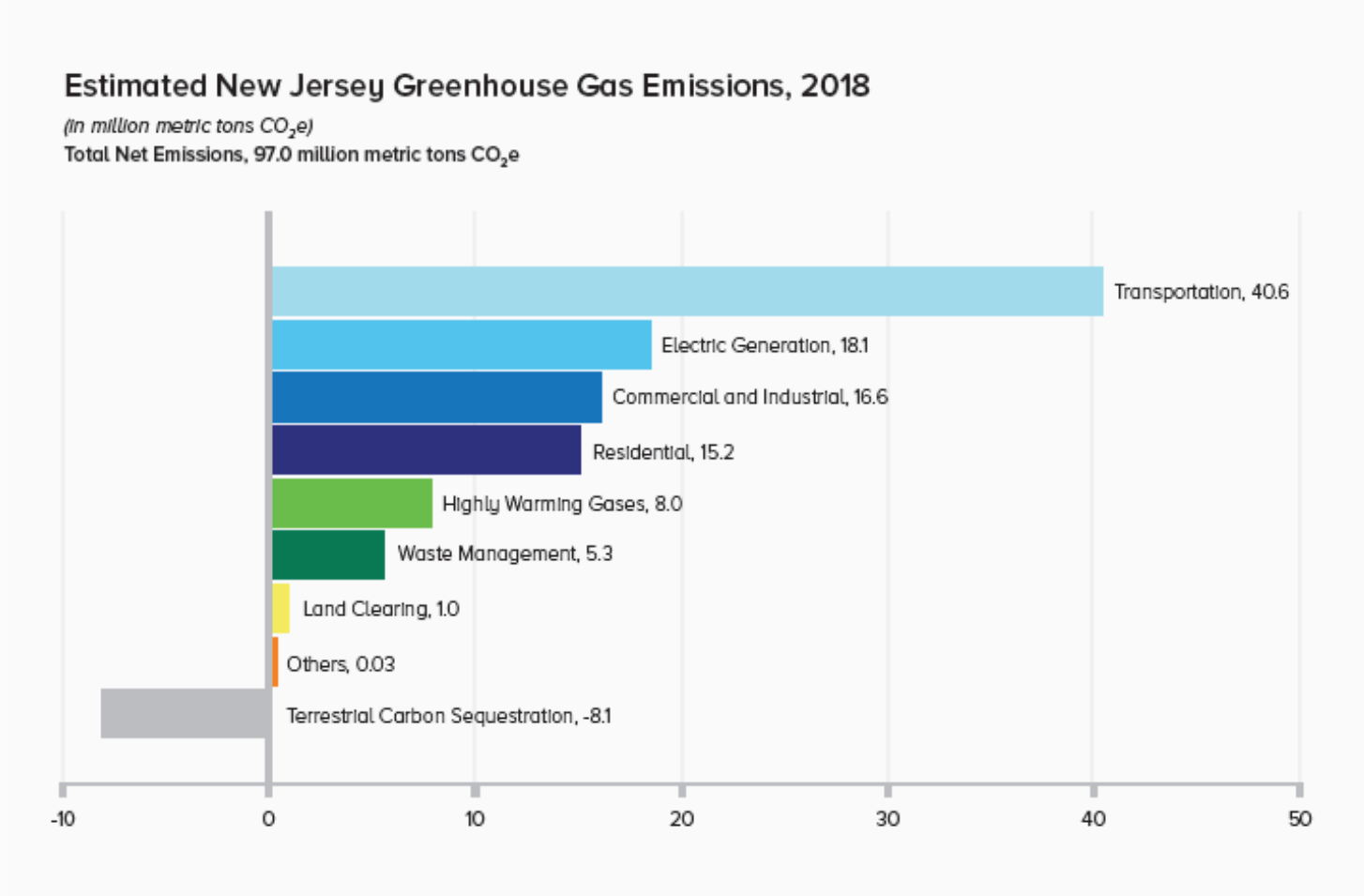
Agenda

1. High Level Overview of the 2019 Energy Master Plan
2. Modeling New Jersey's Energy System and Greenhouse Gas Emissions
3. The Case for Building Electrification
4. EMP Strategy 4: Reduce Energy Consumption and Emissions from the Building Sector

New Jersey Energy Master Plan

- New Jersey's latest Energy Master Plan was released on January 27, 2020
- The EMP is built on three pillars:
  - ✓ 100% clean energy by 2050
  - ✓ 80% reduction in emissions by 2050 relative to 2006 levels
  - ✓ Stronger and Fairer New Jersey

Estimated NJ GHG Emissions



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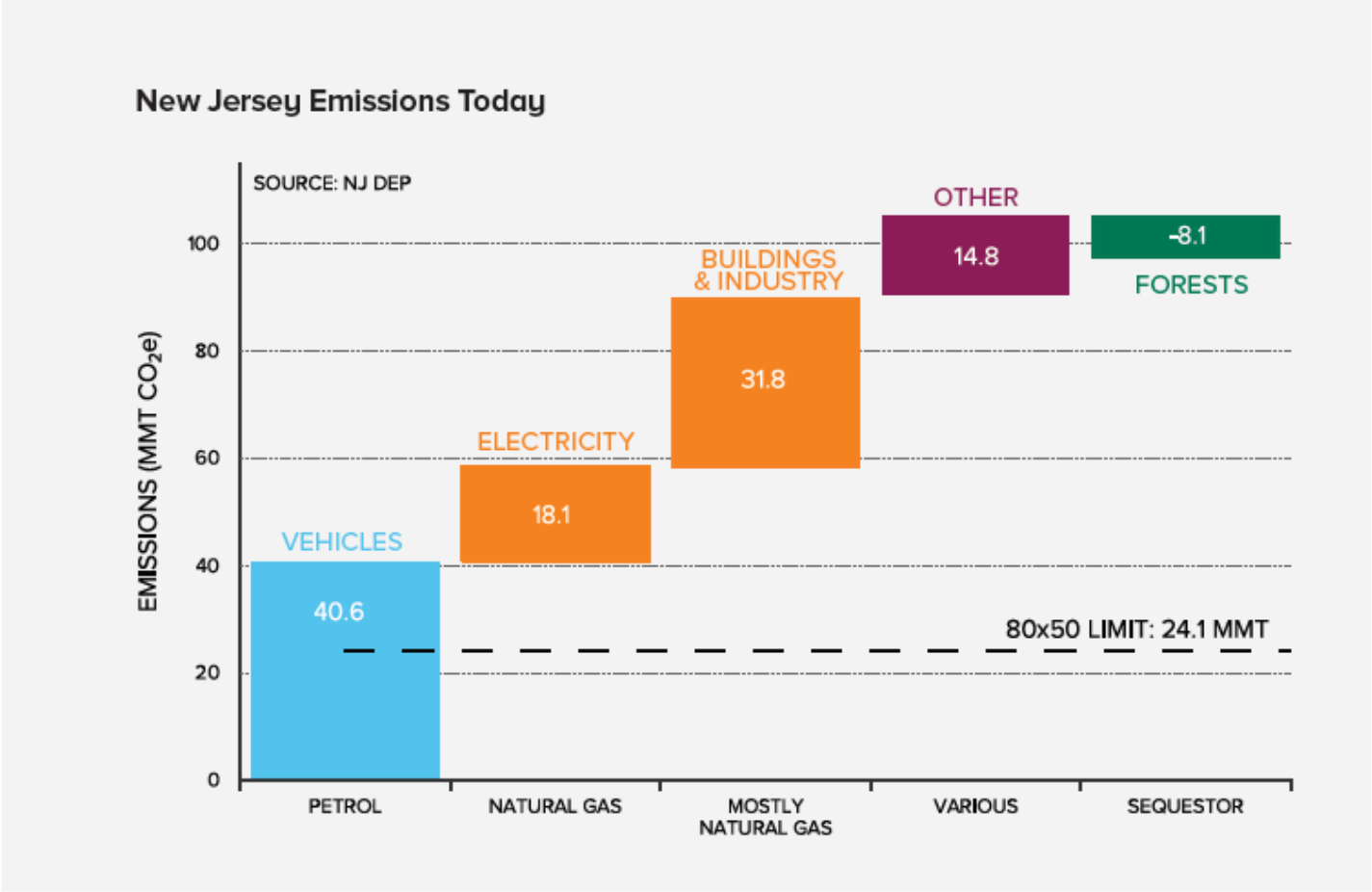
NJ Emissions Today



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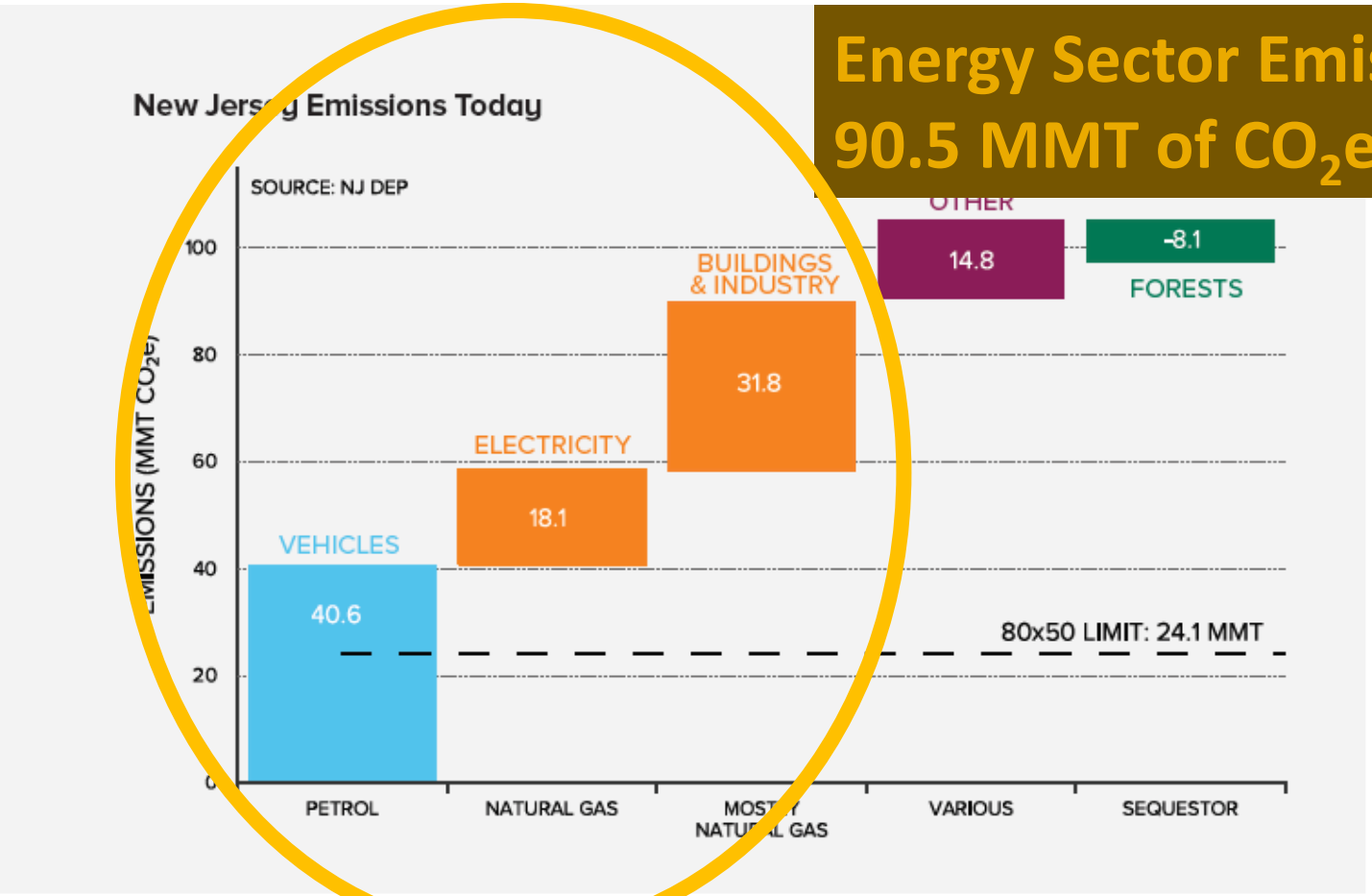
NJ Emissions Today



Energy Sector Emissions: 90.5 MMT of CO_2e

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New Jersey Energy Master Plan

- Comprehensive roadmap that considers the entirety of New Jersey's energy system
- Establishes seven strategies to dramatically lower New Jersey's carbon emissions and reach Governor Murphy's goal of 100% clean energy by 2050
- Incorporates the Integrated Energy Plan, a 30-year, full energy system model
- Received significant stakeholder engagement throughout the drafting process

The Seven EMP Strategies

1. Reduce Energy Consumption and Emissions from the Transportation Sector
2. Accelerate Deployment of Renewable Energy and Distributed Energy Resources
3. Maximize Energy Efficiency and Conservation and Reduce Peak Demand
4. Reduce Energy Consumption and Emissions from the Building Sector
5. Decarbonize and Modernize New Jersey's Energy Systems
6. Support Community Energy Planning & Action with an Emphasis on Encouraging Participation by Low & Moderate Income and Environmental Justice Communities
7. Expand the Clean Energy Innovation Economy

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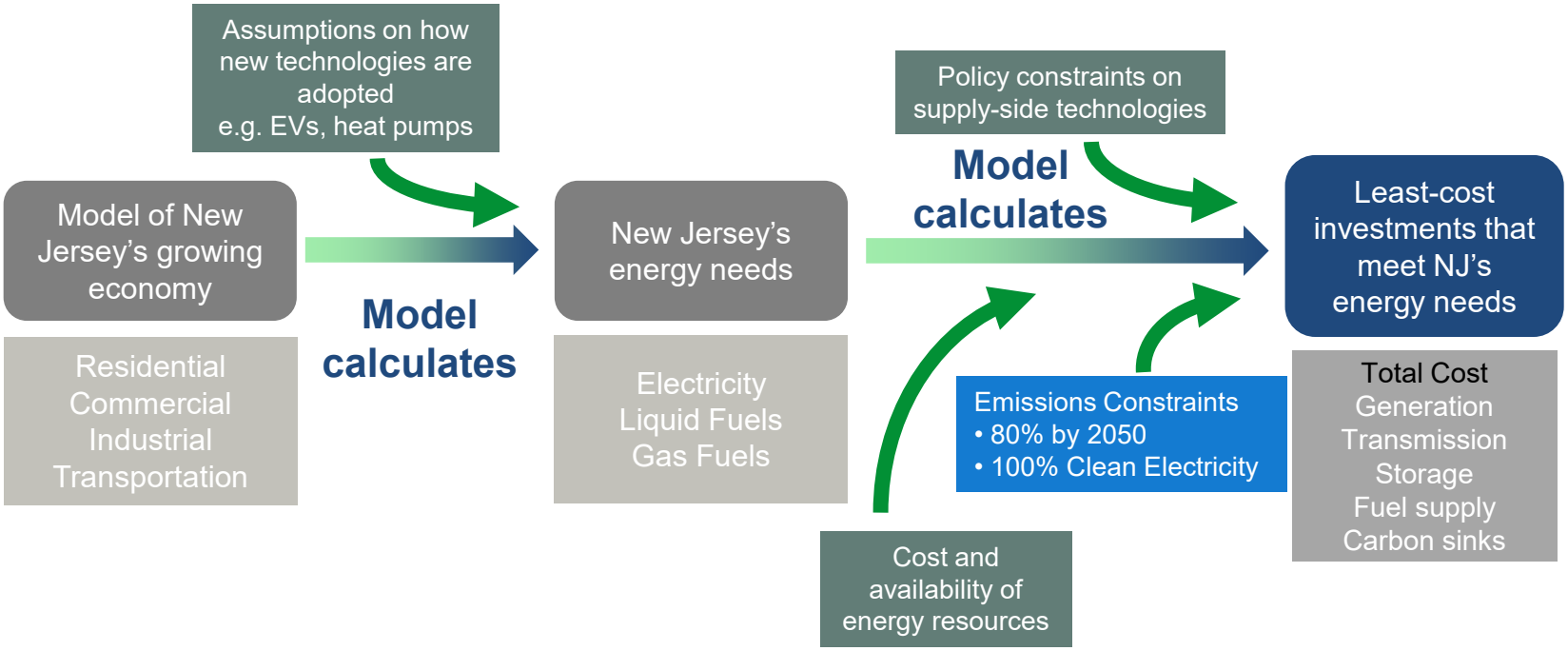
Integrated Energy Plan

- To inform the seven EMP strategies, NJBPU and NJDEP conducted a modeling study of New Jersey's entire energy system with Rocky Mountain Institute and Evolved Energy Research
- The Integrated Energy Plan (IEP) identified the most economically beneficial and least-cost pathways to achieve state goals
- The modeling analysis helped to prioritize the timing, pace, and scale of achieving state objectives

IEP modeling approach



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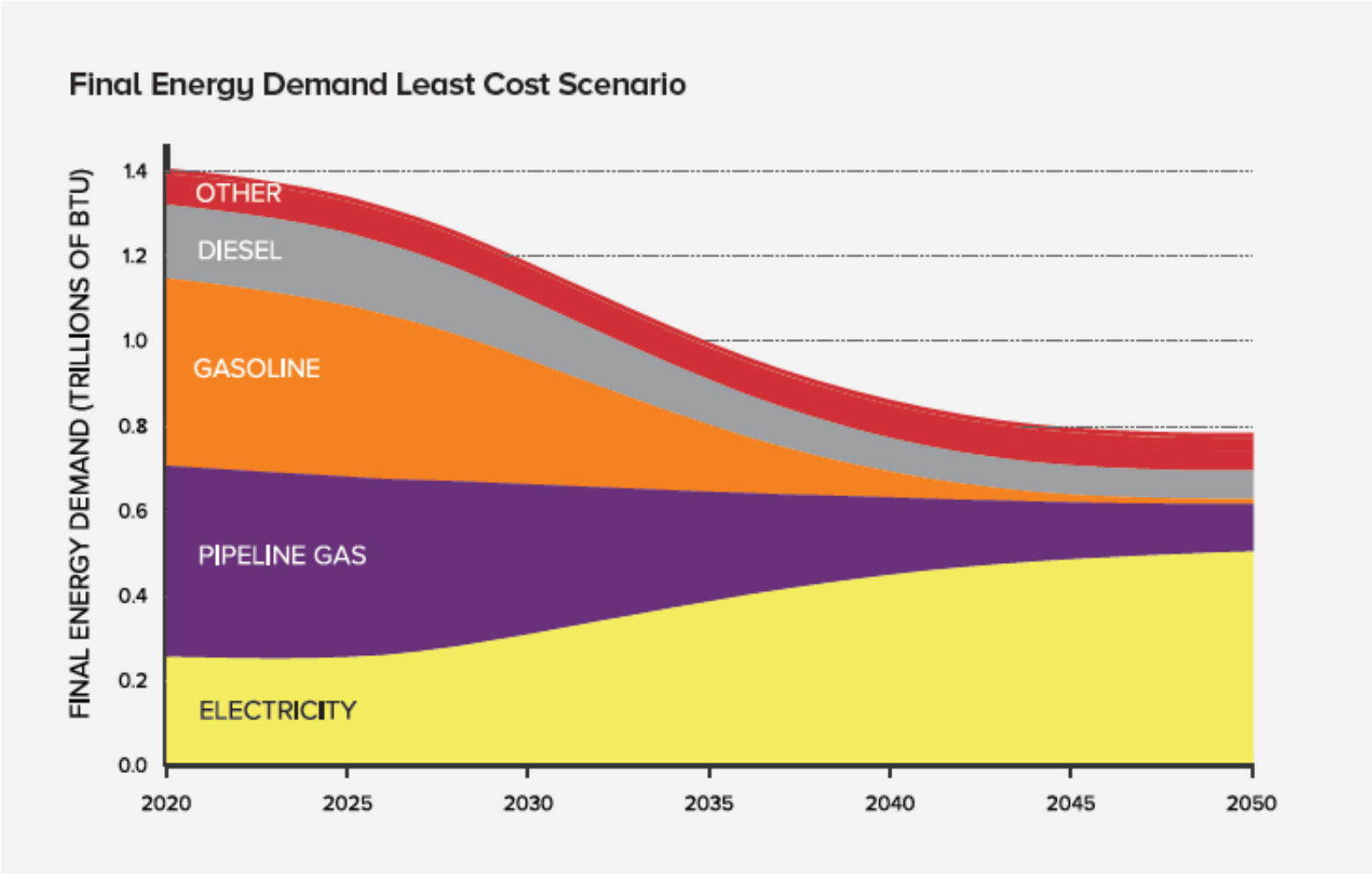
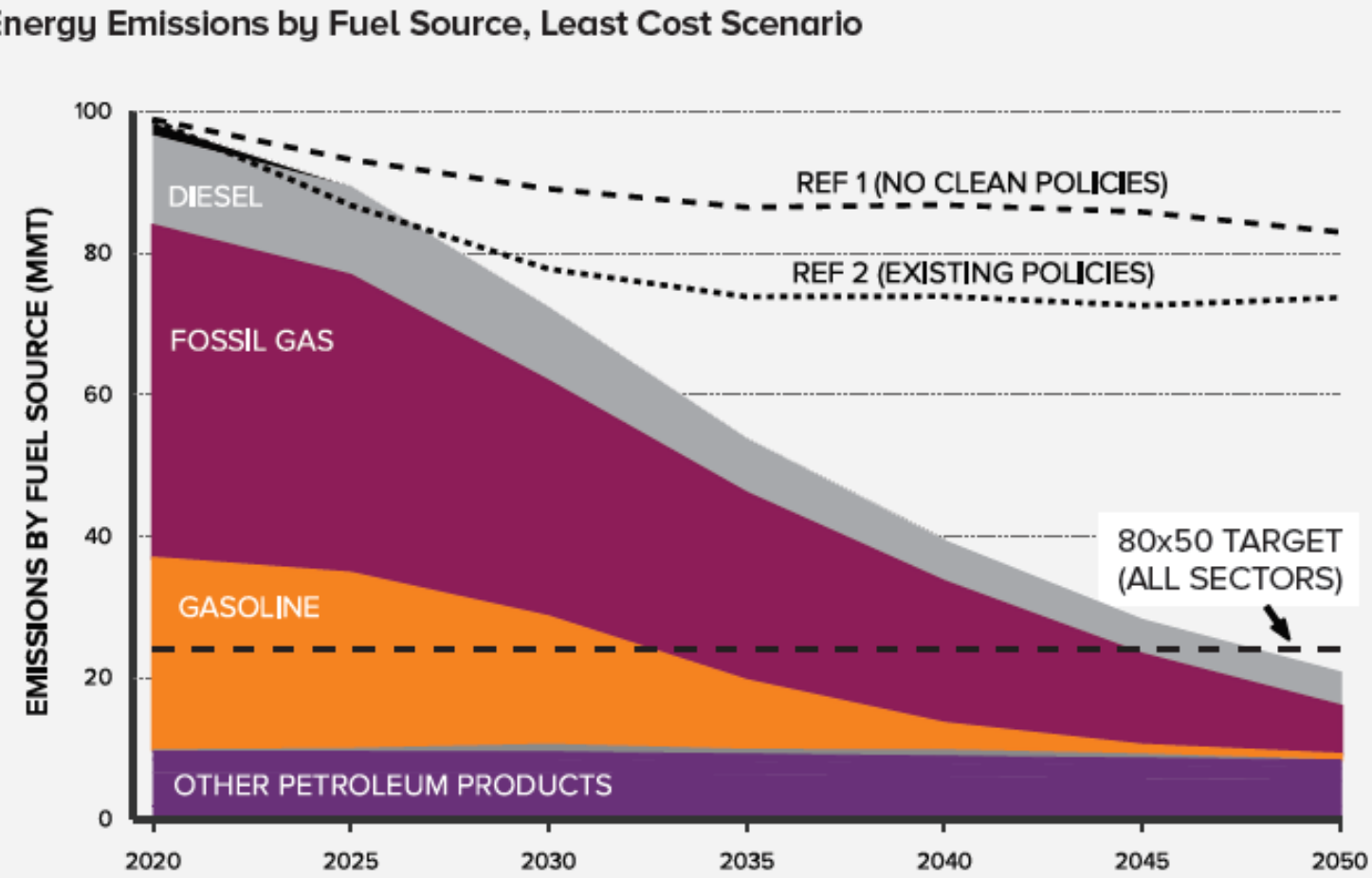
The IEP team worked with stakeholders to define nine scenarios to explore tradeoffs and implications of different external factors and policy decisions

Name	Summary	Key question
Reference 1	No current or prospective energy policies	What are cost and emissions outcomes of "business as usual?"
Reference 2	Existing policy except GWRA & 100% Clean	What cost and emissions impact do existing policies have?
Least Cost	Fewest constraints. Meets emissions goals	If all options are open to New Jersey, what is the least cost pathway to meet goals?
Variation 1	Regional deep decarbonization	How does regional climate action affect New Jersey's cost to meet goals?
Variation 2	Reduced regional cooperation	How can NJ meet its goals internally?
Variation 3	Retain fuel use in buildings	How would NJ meet its goals if it kept gas in buildings, and at what cost?
Variation 4	Faster renewables & storage cost declines	How would cheaper clean energy affect costs and resource mix?
Variation 5	Nuclear retires and no new gas plants	How does minimizing thermal generation affect decarbonization costs?
Variation 6	Reduced transportation electrification	How would NJ meet its goals if it kept fossil fuels in vehicles, and at what cost?

2050 Energy Demand



2050 GHG Emissions



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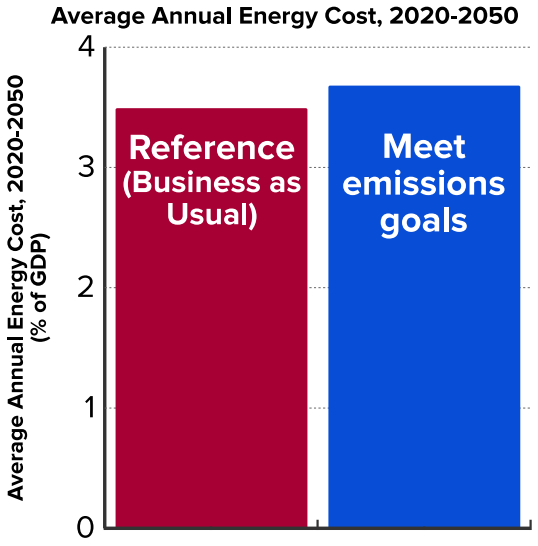
2050 Costs and Benefits

Meeting emissions targets increases the average costs of NJ's total annual energy system from 3.5% to 3.7% of GDP

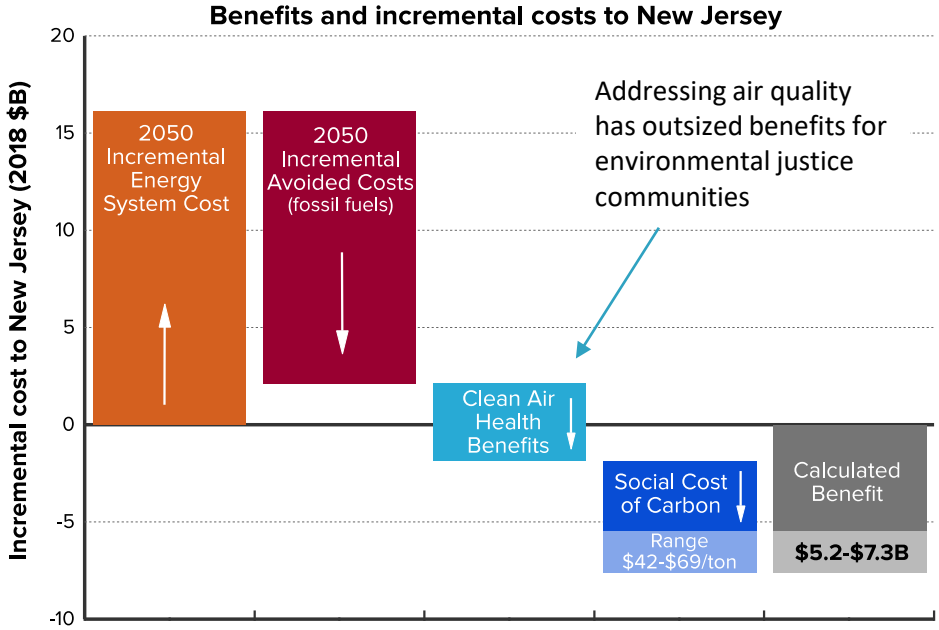


Modeled costs include annualized supply-side capital costs, incremental demand-side equipment, fuel costs, and O&M.

Total 2050 energy system spending (not ratepayer cost or impact):

- Reference: $30.2B/year (2018 dollars)
- Meet emissions goals: $32.4B/year (2018 dollars)

Incremental costs of meeting emissions targets are offset by fossil fuel cost savings and cost savings associated with reduced pollution



Clean air benefits estimated from American Lung Association. Social cost of carbon from U.S. Environmental Protection Agency (3% discount rate)

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IEP Building Sector Modeling

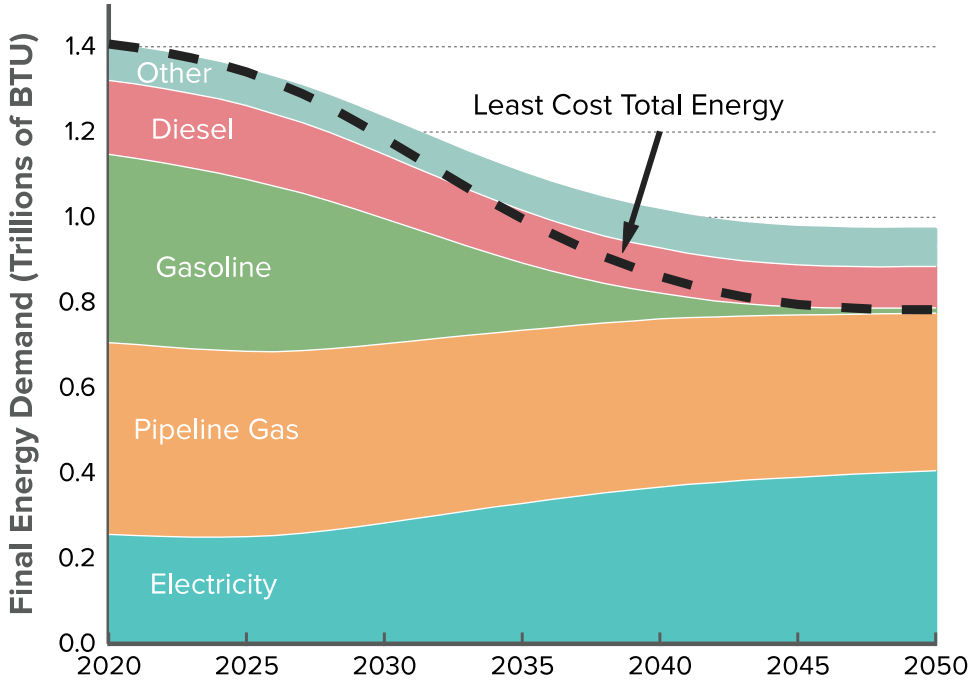
- Least Cost Scenario
  - Utilized a stock rollover model
  - Building electrification ramps up beginning in 2030, with a transition to a 90% electrified building sector by 2050
  - Gas fuel is retained for industrial processes and 10% of non-electrified space and water heating loads
- Variation 3: Retain Gas Use in Buildings
  - No electrification of residential & commercial buildings
  - Increased reliance on higher cost carbon-neutral fuels to achieve emissions goals

Variation 3: Retain Gas in Buildings

How would New Jersey meet its goals if it kept gas in buildings, and at what cost?

Major impacts

- The total energy required is 20% higher compared to the Least Cost Scenario
- Higher GHG emissions are offset by increased use of expensive biofuels in transportation
- Costs are 50% higher than the Least Cost Scenario relative to "Business As Usual"
- Expensive to further reduce emissions or accommodate failures in other sectors



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The Case for Building Electrification

- Reduced stranded assets
  - Infrastructure, including building appliances and the gas distribution pipelines, have lifespans that are decades long
  - Retaining or expanding natural gas infrastructure to accommodate building energy use and continued reliance on fossil fuels for heating will lock in decades of costs and continued emissions
- Increased energy efficiency
  - Electrified technologies such as heat pumps are often more efficient than fossil fuel technologies, reducing total energy use
  - Modeling showed that retaining fuel use in buildings requires 20% more total energy than the Least Cost scenario in 2050

The Case for Building Electrification

- Increased savings
  - Retaining fuel use in buildings cost $3.3B/yr more than the “Business As Usual” scenario, compared to $2.2/yr in the Least Cost Scenario, representing a cost increase of 50%
  - Relying on bio- or synthetic gas fuels adds significantly to system costs
  - Appliance costs are reduced, as heat pumps both heat and cool, reducing the need for separate HVAC systems
- Increased flexibility to achieve emissions goals
  - Building electrification is the most cost-effective path for emissions reductions beyond current goals because it adds fuel flexibility and reduces total energy use

Strategy 4: Building Sector

4.1: Start the transition for new construction to be net zero carbon

- 4.1.1: Electrify state facilities
- 4.1.2: Partner with private industry to establish electrified building demonstration projects
- 4.1.3: Expand and accelerate the current statewide net zero carbon homes incentive programs for both new construction and existing homes
- 4.1.4: Study and develop mechanisms and regulations to support net zero carbon new construction
- 4.1.5: Develop electric vehicle-ready and demand response-ready building codes for new multi-unit dwellings and commercial construction

Strategy 4: Building Sector

4.2: Start the transition to electrify existing oil- and propane-fueled buildings

- 4.2.1: Incentivize transition to electrified heat pumps, hot water heaters and other appliances
- 4.2.2: Develop a transition plan to a fully electrified building sector

Conclusion

- Building electrification is a cost-effective measure to reduce energy demand and greenhouse gas emissions
- In combination with broad transportation electrification and decarbonization of the electricity system, states can reasonably and affordably meet their climate goals


THANK YOU