Creating a Clean, Affordable and Resilient Energy Future for the Commonwealth

DOER
Massachusetts Department of Energy Resources

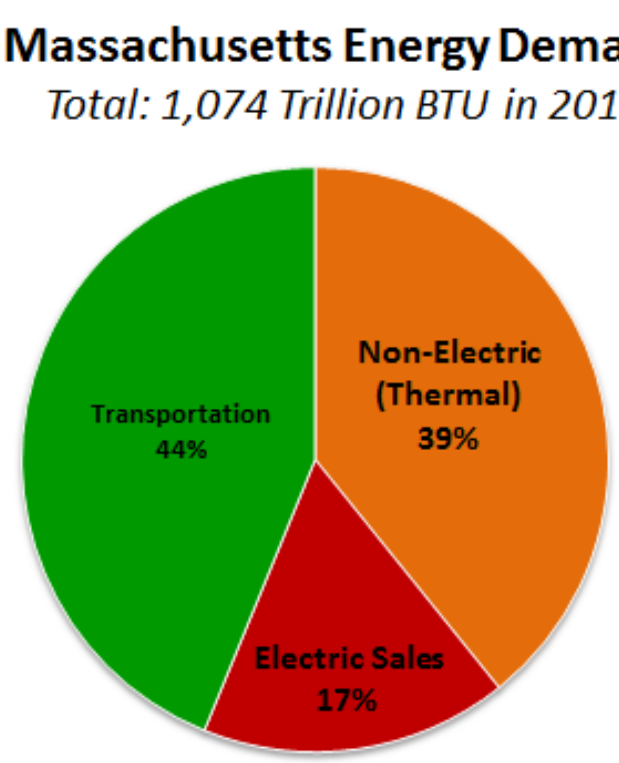
Comprehensive Energy Plan

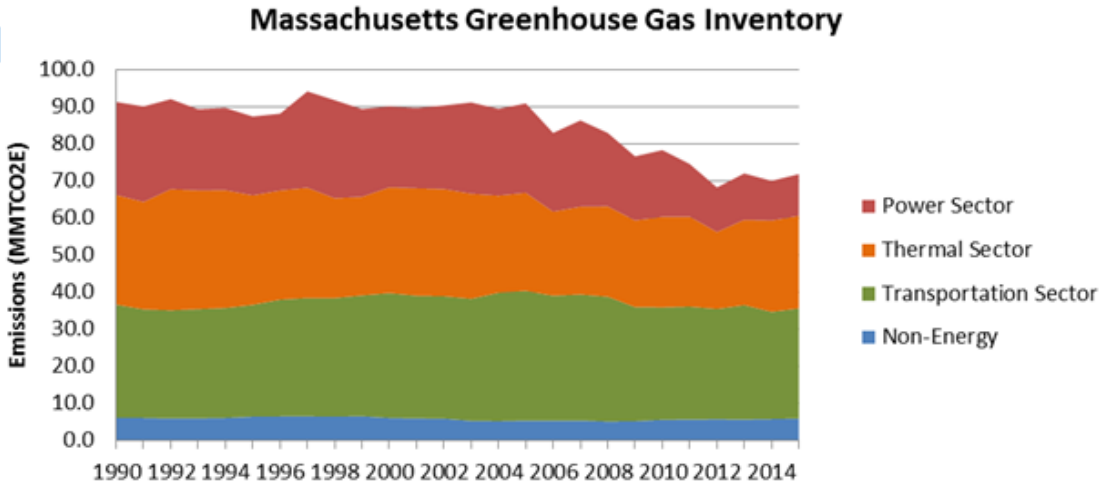
Executive Summary

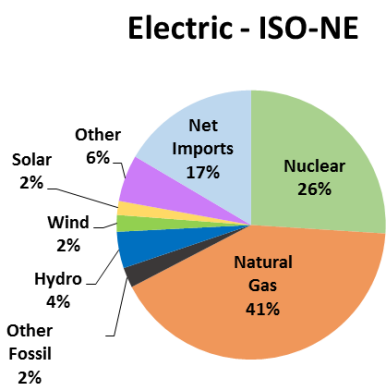
Comprehensive Energy Plan (CEP) Overview

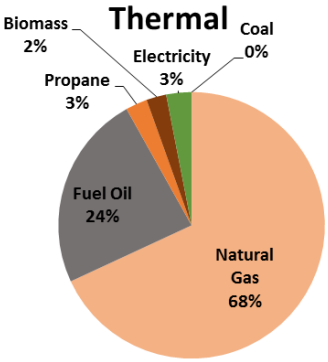
- Executive Order No. 569, *Establishing an Integrated Climate Change Strategy for the Commonwealth,* directed a **Comprehensive Energy Plan (CEP)** that includes*:*
  - Projections for energy demands for **electricity**, **transportation** and **thermal conditioning**
  - Strategies for meeting these demands in a regional context
  - Prioritizes meeting energy demand through conservation, energy efficiency, and other demand-reduction strategies
- CEP Modeling and Analysis
  - Examine impacts of policies to reduce GHG emissions on cost and reliability from now to 2030
  - Modeled under average conditions and extended cold weather conditions
- Provide policy guidance on which strategies will best balance costs, emissions and reliability

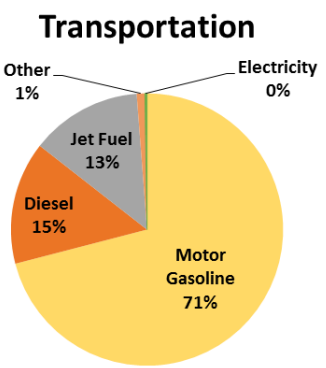
Massachusetts Energy Use and Emissions by Sector









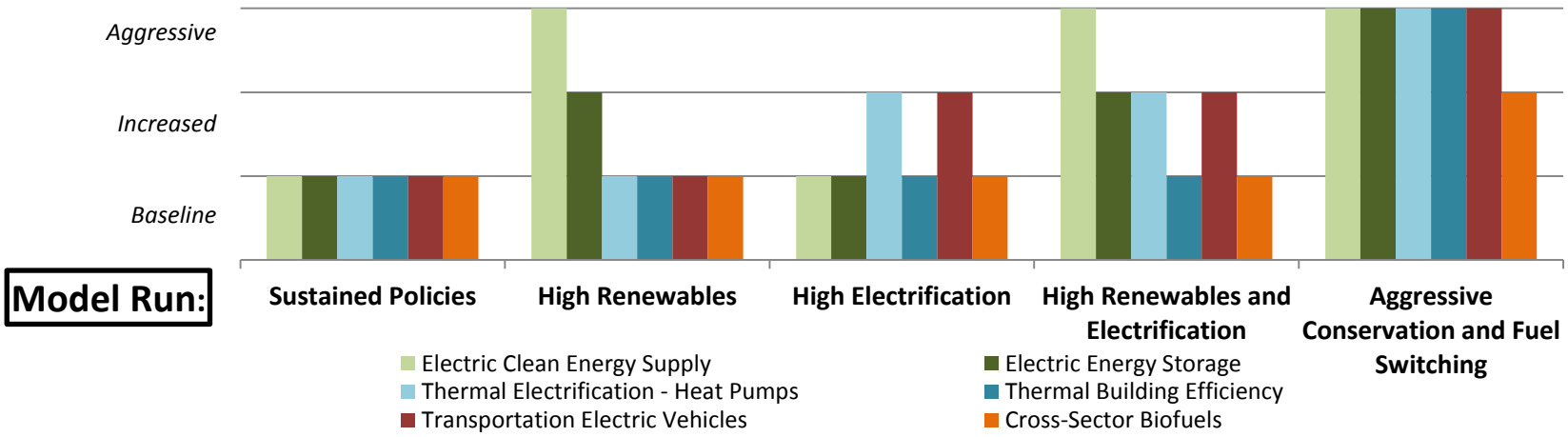


Electric generation is our smallest use of energy in the Commonwealth, but it is where we have made the greatest progress in reducing emissions

Modeling Analysis

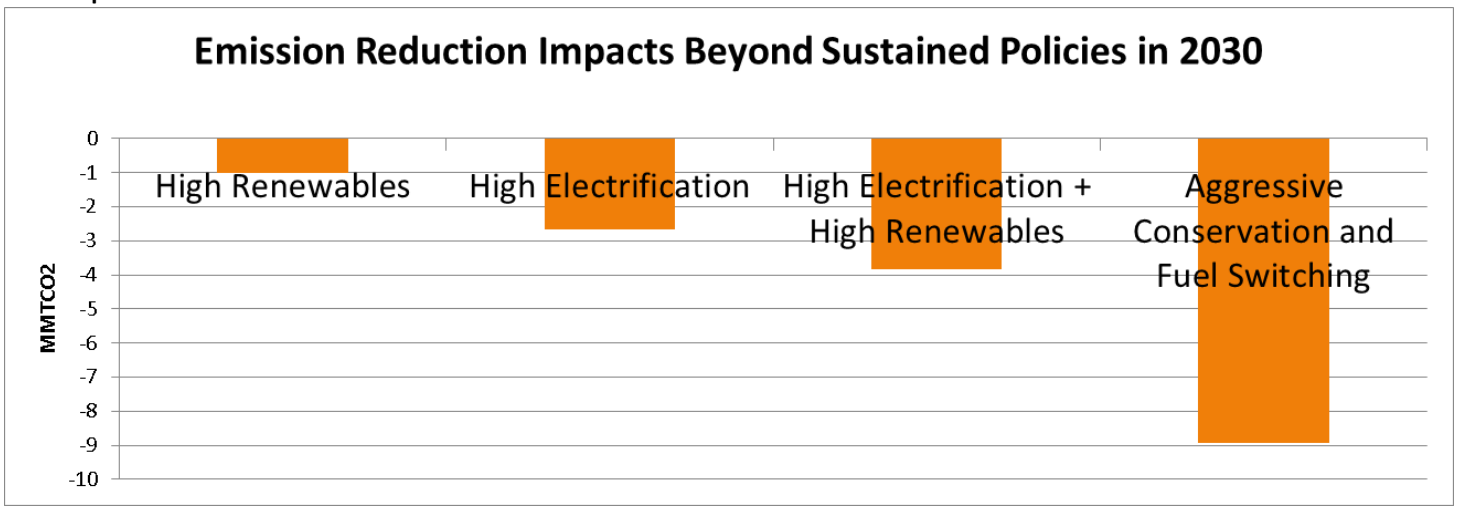
Modeled various hypothetical amounts of clean energy and demand between now and 2030 to see impact on cost, emissions and reliability:

Scenarios	Modeling Assumptions by 2030
Sustained Policies	*Assumption of what outcomes will be achieved by 2030 as a result of current policies (Pre-2018 Legislation)* 45% clean retail electricity; 500 MWh storage; 1.2 million EVs
High Renewables	*Sustained Policies with additional clean electricity:* + 16 TWh of Clean Electricity (4,000 – 7,000 MW), 65% clean retail electricity + 3x amount of energy storage (1800 MWh)
High Electrification	*Sustained Policies with increased electrification of Thermal and Transportation Sectors* + Accelerated growth in EVs (1.7 million LDV (36%) - by 2030) + 25% of oil-heated and 10% of gas-heated buildings switch to ASHP
High Renewables + Electrification	*Combine the High Renewables and High Electrification assumptions*
Aggressive Conservation + Fuel Switching	*High Renewables + Electrification scenario with:* + More aggressive fuel switching in the Thermal and Transportation sectors + 3x increase in pace of weatherization and building efficiency + 2 GW peak demand reduction



Findings: Impact on Emissions

- With sustained policies, Massachusetts estimated to achieve 35% emission reduction from 1990 levels by 2030 (~61 $MMTCO_2$); key findings for additional reductions:
  - Focusing policies primarily on the electric sector has diminishing returns, increasing rates with while realizing only modest decreases in GHG emissions
  - Electrifying the thermal and transportation sector leverages investments made in a cleaner electric grid
  - Conservation and peak demand reduction important as use of electricity for heating and transportation grows
  - Improving building efficiency is important to achieving reduced emissions in thermal sector
  - Alternative fuels, such as biofuels, can assist in transition to cleaner heating and transportation

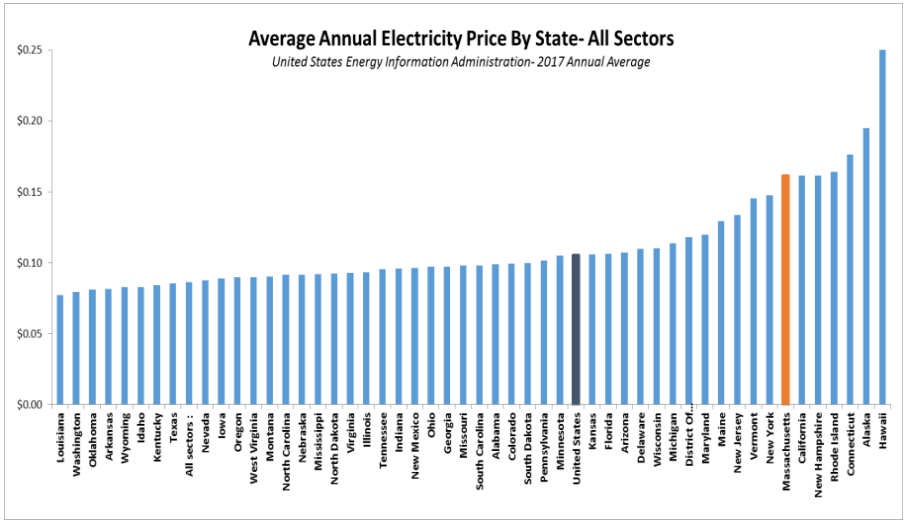


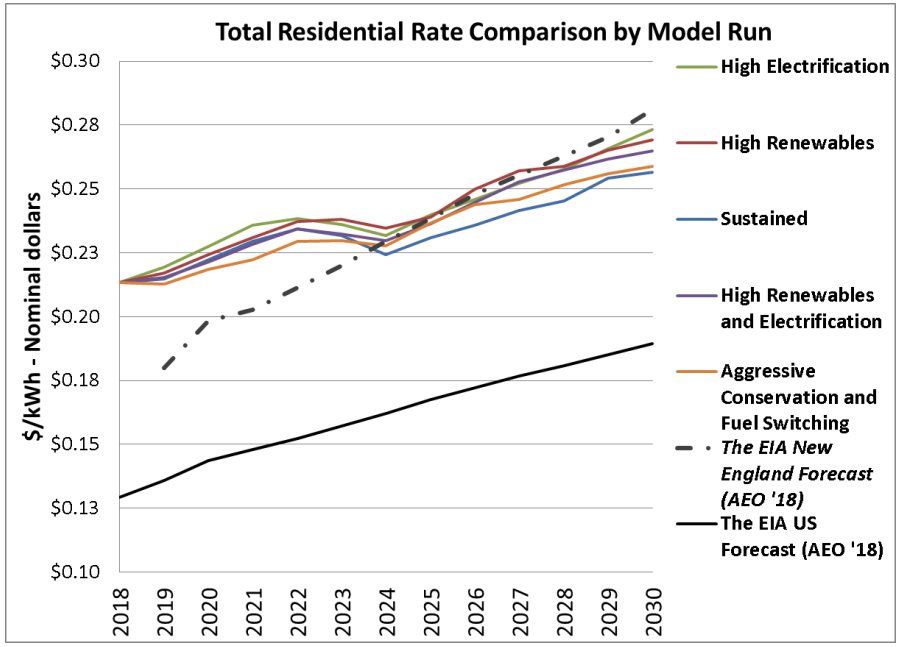
Greatest amount of emissions reductions are achieved by combining increased use of clean energy in all sectors while simultaneously decreasing overall energy consumption

Findings: Impact on Electric Rates

- All scenarios show lower retail electric rates in 2030 than projections by the U.S. Energy Information Agency (EIA), primarily due to large-scale hydro and off-shore wind procurements
- However, all other scenarios besides Sustained Policies show that additional policies aimed at the electric sector raises rates
- Energy efficiency and peak demand reduction are important for keeping electricity rates affordable, as demand for electricity in the thermal and transportation sector increases
- Finding low cost sources of clean electricity that can deliver in winter improves costs

Comparison of Current Massachusetts Electric Rates with projections for 2030



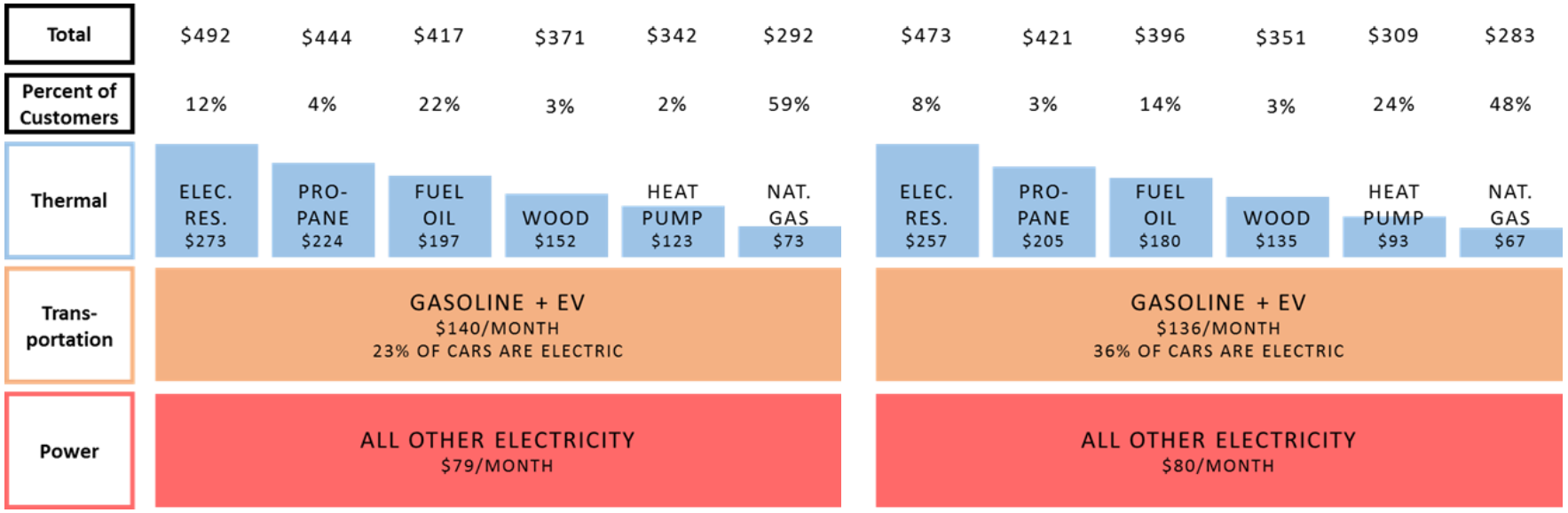


New England states have some of the highest electric rates in the nation, however Massachusetts on path to become more competitive

Findings: Impacts on Consumer Energy Bills

Sustained Policies
Average Monthly Expenditures in 2030* = **$351**

Aggressive Conservation and Fuel Switching
Average Monthly Expenditures in 2030* = **$326**

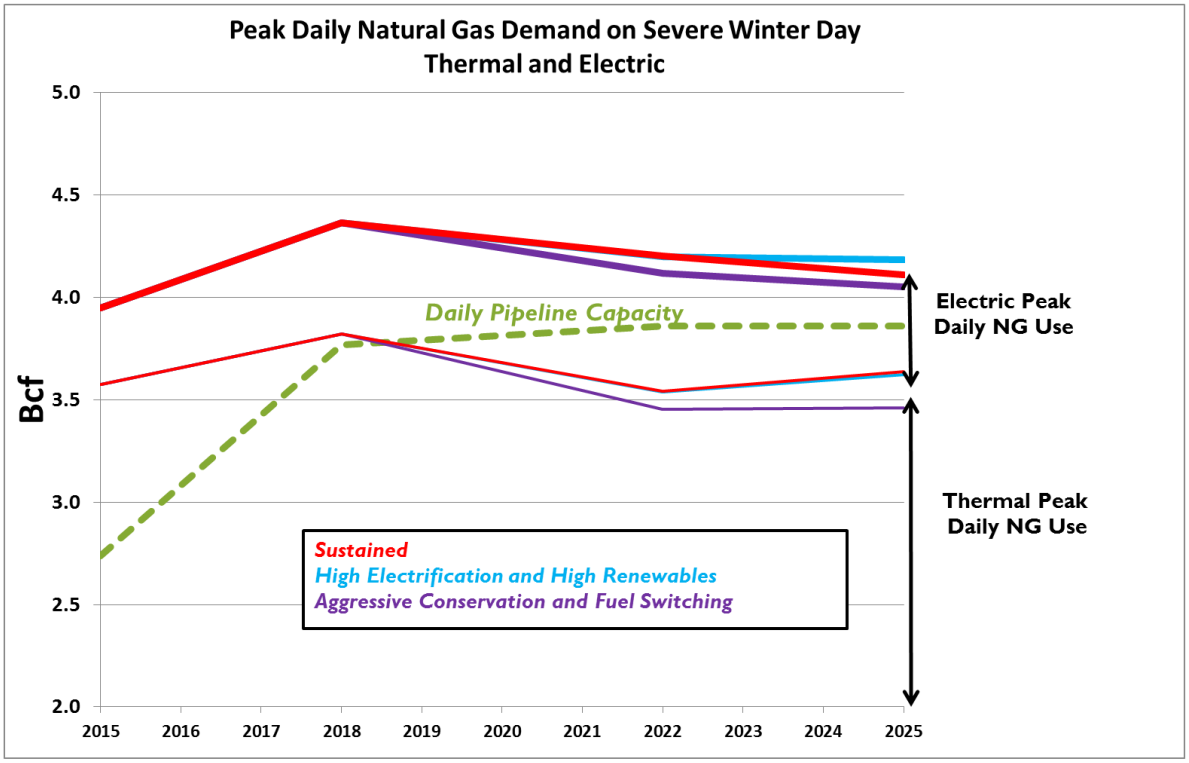


- Fuel switching from expensive fuels for heating such as electric resistance heat, propane and fuel oil to lower cost fuels, such as electric air source heat pumps and biofuels, can lower an average consumer's monthly energy bills
- Even with higher electric rates, monthly expenditures for energy are lower

Fuel switching and greater efficiency in the thermal and transportation sectors lowers consumers' monthly energy expenditures

**all values in 2018 equivalent dollars*

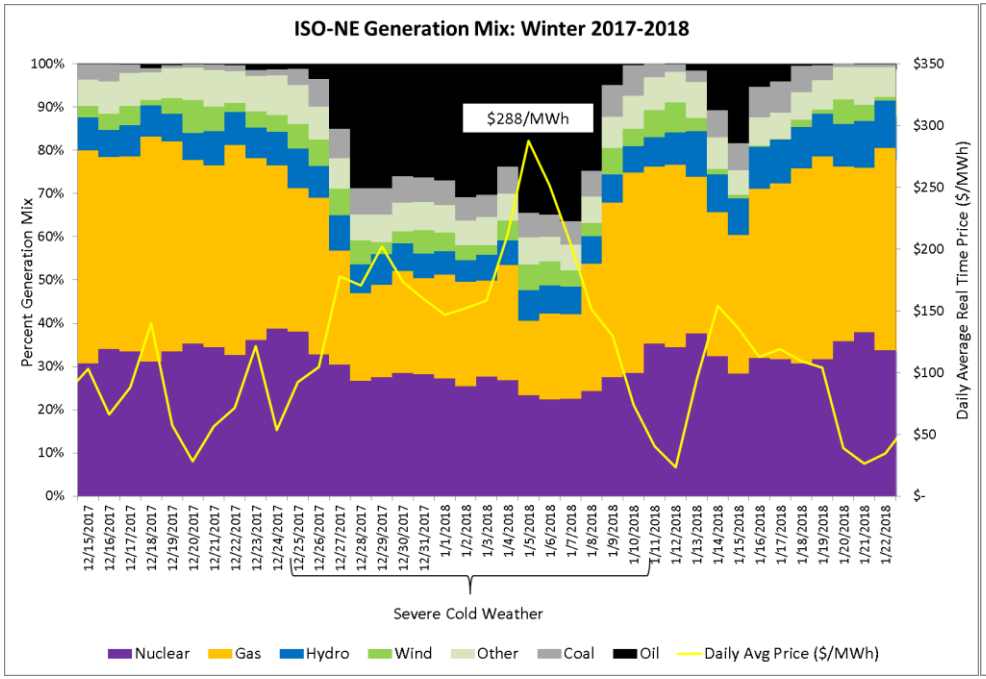
Findings: Winter Reliability and Affordability

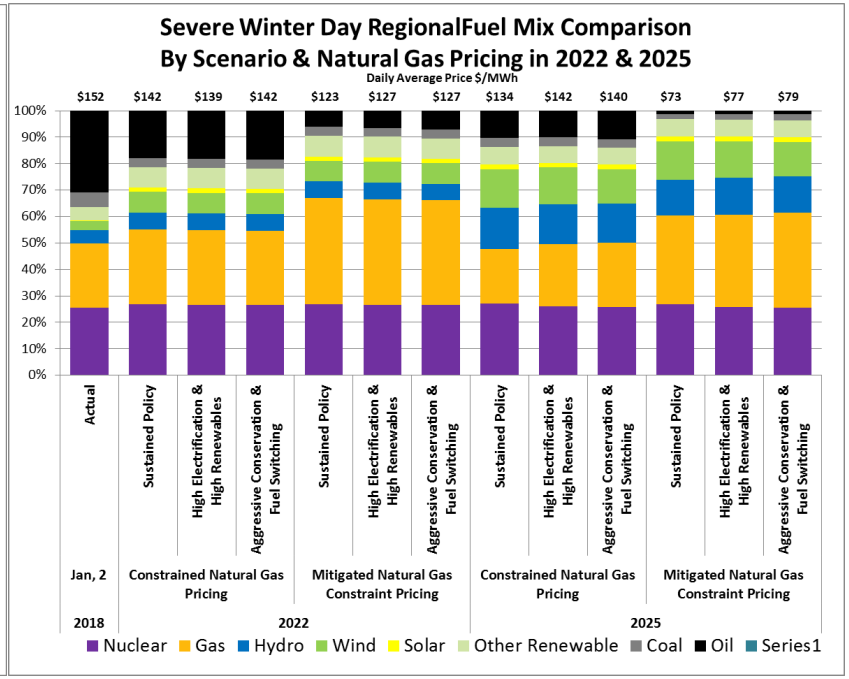


- In all scenarios modeled, the region will continue to rely on higher cost stored fuels such as liquefied natural gas (LNG) and high emission fuel oil.
- State policies that reduce natural gas demand, such as increasing clean energy supply and reducing thermal sector demand, reduces but does not eliminate reliance on oil and LNG

Region remains at risk for price spikes and emission increases during extended cold periods

Findings: Winter Reliability and Costs





- The added costs from a winter event **increase retail rates in subsequent years** across all classes of ratepayers
- The **combination** of the current large-scale **procurements** (83D and 83C) and **mitigating natural gas constraints** reduces reliance on stored fuels in a winter event, which could save 2 cents/kWh in all hours, or approximately $900 million annually if extended cold weather occurs
- **Mitigating natural gas constraints could decrease emissions 5-8%** during a winter event
- **Reducing demand in the thermal sector** (heating and cooling) reduces cost and emissions for consumers, while improving winter reliability

Mitigating natural gas constraints to lessen reliance on oil generation in the electric sector reduces the cost and emission impacts from an extended cold period

Policy Priorities and Strategies

for a clean, affordable, resilient energy future

Thermal Sector

- Leverage investments made in the clean energy sector through **electrification**
- **Promote fuel switching** in the thermal sector from more expensive, higher carbon intensive fuels to lower cost, lower carbon fuels such as electric air source heat pumps and biofuels
  - Reduce use of expensive and high emission heating fuels such as fuel oil, propane, and electric resistance heat
- Reduce thermal sector consumption
  - Explore possible ways to strengthen **building codes** to drive additional efficiency in new construction
  - Increase **weatherization** measures to improve building shell efficiencies and targeted **winter gas savings** through the MassSave efficiency programs
  - Promote high efficiency building construction, such as **passive houses**, to further reduce energy demand from the thermal sector
- Drive market/consumer demand for energy efficiency measures and fuel switching
  - Educate consumers about the benefits of energy efficiency and create a market **incentive for consumers to invest** in energy efficiency improvements through a "**Home Energy Scorecard**"
  - Address the **split incentive** between landlords and renters for investments in energy efficiency
- Invest in R&D for **clean heating fuels**, such as renewable gas and biofuels, that can utilize investments already made in heating infrastructure

Policy Priorities and Strategies

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Electric Sector

- Prioritize electric energy efficiency and peak demand reductions
  - Implement policies and programs, including the **Clean Peak Standard**, that incentivize energy conservation during peak periods.
  - Develop policies to **align new demand** from the charging of EVs and heating/cooling with the production of clean, low-cost energy.
  - Include cost-effective **demand reduction** and **additional energy efficiency initiatives** in our nation-leading energy efficiency programs and plans
  - Utilize our successful **Green Communities** programs and **Leading By Example** programs to continue to make state and municipal infrastructure clean and efficient
- Continue to increase cost-effective renewable energy supply
  - Investigate policies and programs that support **cost-effective clean resources** that are **available in winter** to provide both cost and emission benefits to customers
  - Evaluate or expand **continued policies to support distributed resources,** including distributed solar and storage development in the Commonwealth after the SMART program concludes, to continue lowering costs while providing benefits to ratepayers

Policy Priorities and Strategies

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Electric Sector

- Support grid modernization and advanced technologies
  - Promote cost effective **microgrids** to provide greater overall grid resiliency and reduce transmission and distribution costs from building out the grid to meet new demand
  - Review existing and possible new policies to **support new technologies**, including energy storage, that can **align supply and demand** and provide grid flexibility
- Examine potential strategies to lower the price of natural gas and **mitigate natural gas constraints**
  - Encourage **contracting with LNG supply ahead of the winter** to ensure LNG supplies are available to be used by gas-fired generation
  - Work with federal officials to explore modifying the **Jones Act** to facilitate shipping of LNG from domestic sources
  - **Reduce thermal and electric sector demand** to reduce the region's demand for natural gas

Policy Priorities and Strategies

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Transportation Sector

- Increase the **deployment of EVs** and charging infrastructure.

- Support development of **liquid renewable fuels** to provide alternative transportation fuels.

Awaiting policy recommendations from the Commission on the Future of Transportation – Dec 2018