Rhode Island Climate Action Strategy

Technical Appendices

December 2025

Version V2

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Acronym Definitions

Acronym	Definition
ACC II	Advanced Clean Cars II
ACT	Advanced Clean Trucks
ACPs	Alternative Compliance Payments
AMC	Advanced Metering Functionality
ARPA	American Rescue Plan Act
BIL	Bipartisan Infrastructure Law
BPS	Building Performance Standards
Btu	British Thermal Unit
CAP	Community Action Program
CARB	California Air Resource Board
CBECS	Commercial Building Energy Consumption Survey
CCAP	Comprehensive Climate Action Plan
ccASHP	Cold-Climate Air Source Heat Pump
CH_4	Methane
CHS	Clean Heat Standard
CO_2	Carbon dioxide
CPRG	Climate Pollution Reduction Grant
CT	Combustion Turbines
DCAMM	Division of Capital Asset Management
DEEP	Connecticut Department of Environmental Protection
DOA	Rhode Island Department of Administration
E3	Energy and Environmental Economics
EC4	Executive Climate Change Coordinating Council
EECBG	Energy Efficiency and Conservation Block Grant Program
EERMC	Energy Efficiency and Resource Management Council
EIA	US Energy Information Agency
ELCC	Effective Load Carrying Capacity
EPCA	Energy Policy and Conservation Act
EV	Electric Vehicle
GGRF	Greenhouse Gas Reduction Fund
GHG	Greenhouse gas
GHHI	Green & Healthy Homes Initiative
HEAR	Home Electrification and Appliance Rebates
HER	Home Efficiency Rebates
HVAC	Heating, Ventilating and Air Conditioning
ICCT	International Council on Clean Transportation
ICE	Internal Combustion Engine
IIJA	Infrastructure Investment and Jobs Act
IRA	Inflation Reduction Act

ISO-NE	ISO New England
ISR	Infrastructure, Safety, and Reliability
LDCs	Local Distribution Companies
LIHEAP	Low-Income Home Energy Assistance Program
LMI	Low- and Moderate- Income
LRTP	Long Range Transportation Plan
MHDVs	Medium- and Heavy- Duty Vehicles
MMT	Million Metric Tons
N_2O	Nitrous oxide
NECEC	New England Clean Energy Connect
NEEP	Northeast Energy Efficiency Partnership
NEVI	National Electric Vehicle Infrastructure
NREL	National Renewable Energy Laboratory
NWA	Non-Wire Alternative
NYSERDA	New York State Energy Research and Development Authority
O&M	Operations and Maintenance
OER	Rhode Island Office of Energy Resources
PHEVs	Plug-in Hybrid Electric Vehicle
PUC	Public Utilities Commission
RECs	Renewable Energy Certificates
REPS	Connecticut's Residential Energy Preparation Services
RES	Renewable Energy Standard
RIDE	Rhode Island Department of Education
RIDEM	Rhode Island Department of Environmental Management
RIDOT	Rhode Island Department of Transportation
RIEC4	Executive Climate Change Coordinating Council
RIIB	Rhode Island Infrastructure Bank
RIOER	Rhode Island Office of Energy Resources
RIPTA	Rhode Island Public Transit Authority
RIPUC	Rhode Island Public Utilities Commission
RIRRC	Rhode Island Resource Recovery Corporation
RPS	Renewable Portfolio Standard
SBC	System Benefit Charge
SEP	State Energy Program
SWIFR	Solid Waste and Infrastructure for Recycling
T&D	Transmission and Distribution
TBtu	Trillion British Thermal Units
TMP	Transit Master Plan
VMT	Vehicle Miles Traveled
WAP	Weatherization Assistance Program
ZEVs	Zero Emission Vehicles

Appendix A: Technical Appendix

Stakeholder Engagement

Summary of Meetings

A summary of public meetings held for development of the RI Climate Action Strategy are summarized in Table 1 below, along with attendance for each meeting.

Table 1: Summary of Public Stakeholder Meetings for RI Climate Action Strategy

Project Stage	Meeting	Date	Attendance
Kickoff	Stakeholder Kickoff Meeting	January 9th, 2025	175
Plan Development	Transportation Focus Area Meeting	March 13th, 2025	58
	EJ and Equity Focus Area Meeting	March 19th, 2025	51
	Buildings Focus Area Meeting	March 27th, 2025	60
	General Meeting (Woonsocket, RI in-person)	March 31st, 2025	20
	Municipalities Focus Area Meeting	April 4th, 2025	58
	Workforce Focus Area Meeting	April 8th, 2025	43
	General Meeting (Providence, RI in-person)	April 17th, 2025	18
	General Meeting (Virtual)	April 29th, 2025	45
	General Meeting (Newport, RI in-person)	May 5th, 2025	45
	Energy Focus Area Meeting	May 9th, 2025	96
Sharing Results and Rollout of Plan	Carbon Reduction Strategies Public Webinar	October 16th, 2025	103
	Pathways to Decarbonization	October 31st, 2025	133
	Workforce and the Green Economy	November 17th, 2025	86
	RI Acts on Climate: Key Outcomes of the 2025 Climate Action Strategy	December 19, 2025	

Technical Review and Online Public Comment

In addition to meeting attendance, Rhode Islanders were also able to review documents, data, and assumptions online, and submit comments at any time. This open review process allowed RI stakeholders to provide detailed technical feedback and ensured transparency throughout the project. This approach also ensured that all stakeholders could make their voices heard, even if they were not able to attend virtual or in-person meetings.

In Spring 2025, the project team posted key data inputs and assumptions online for public comment prior to the start of modeling. Stakeholder feedback was carefully evaluated, resulting in updates to several data inputs and assumptions. A formal Response to Comments document was published to summarize feedback received and describe how it was addressed in the quantitative modeling inputs. After the modeling was completed in Fall 2025, the project team posted Excel spreadsheets with the modeling results and data visualizations for public review and comment. These documents can be found on the Climate Change webpage under Technical Documentation & Materials.

Additionally, throughout the process, an online SmartComment portal remained open to collect ongoing input and maintain transparent communication with all interested stakeholders.

How Feedback Was Used

Table 2: Detailed Overview of How Stakeholder Feedback Was Used

Category	Interagency Coordination and/or Changes Made Based on Feedback
Model inputs and assumptions	• Updated energy efficiency and building shell data • Updated building device costs to align with Clean Heat RI • Updated the building code to align with IECC 2024 • Updated sources from the RI Future of Gas Technical Analysis Appendix to public and/or RI-specific sources • Updated heat pump coefficient of performance (COP) and cost projections • Published a Response to Comments document to maintain transparency on how feedback was addressed • The ISO-NE PLEXOS LT model is a public model that has been stakeholder vetted. It can be downloaded from ISO-NE's webpage and inputs and assumptions are available to review. • Direct engagement with ISO-NE to confirm model functionality and data for the publicly available PLEXOS LT model. • Direct engagement with RIE on electric sector assumptions.
Stakeholder engagement process	• Scheduled meeting dates (i.e., send "save-the-dates") far in advance for participants to have ample time to schedule and plan for attendance • Updated timelines to ensure materials could be sent to participants before the meeting • Building partnership with Commerce RI to hold conversations focused on business • Led additional conversations about RI worker impacts with interested groups
Carbon reduction strategies	• Prioritization of carbon reduction strategy development and modeling due to stakeholder support for an actionable plan • Added pre-weatherization strategy • Explored the impact of all-electric new construction for just affordable/low-income housing • Deep engagement across transportation and building state agencies, such as RIDOT, RIPTA, DOA, DOH • Explored equity impacts of all carbon reduction strategies

Economy-wide Modeling Methodology and Results

Model Overview

Pathways is an economy-wide energy and greenhouse gas (GHG) emissions accounting model. Energy and Environmental Economics (E3) created the Pathways model to help policymakers, businesses, and other stakeholders analyze paths to achieving deep decarbonization of the economy. Pathways is not an optimization or general equilibrium model but instead allows for comparison of user-defined scenarios of future energy demand and emissions to explore the impacts and implications of potential climate and energy policies. Variables that impact final energy demand in the model (e.g., customer adoption of electric vehicles, amount of space heating demanded per household), are specified by the user. The Pathways model accounts for annual energy demand and greenhouse gas emissions from the following final energy demand and non-energy and/or non-combustion sources:

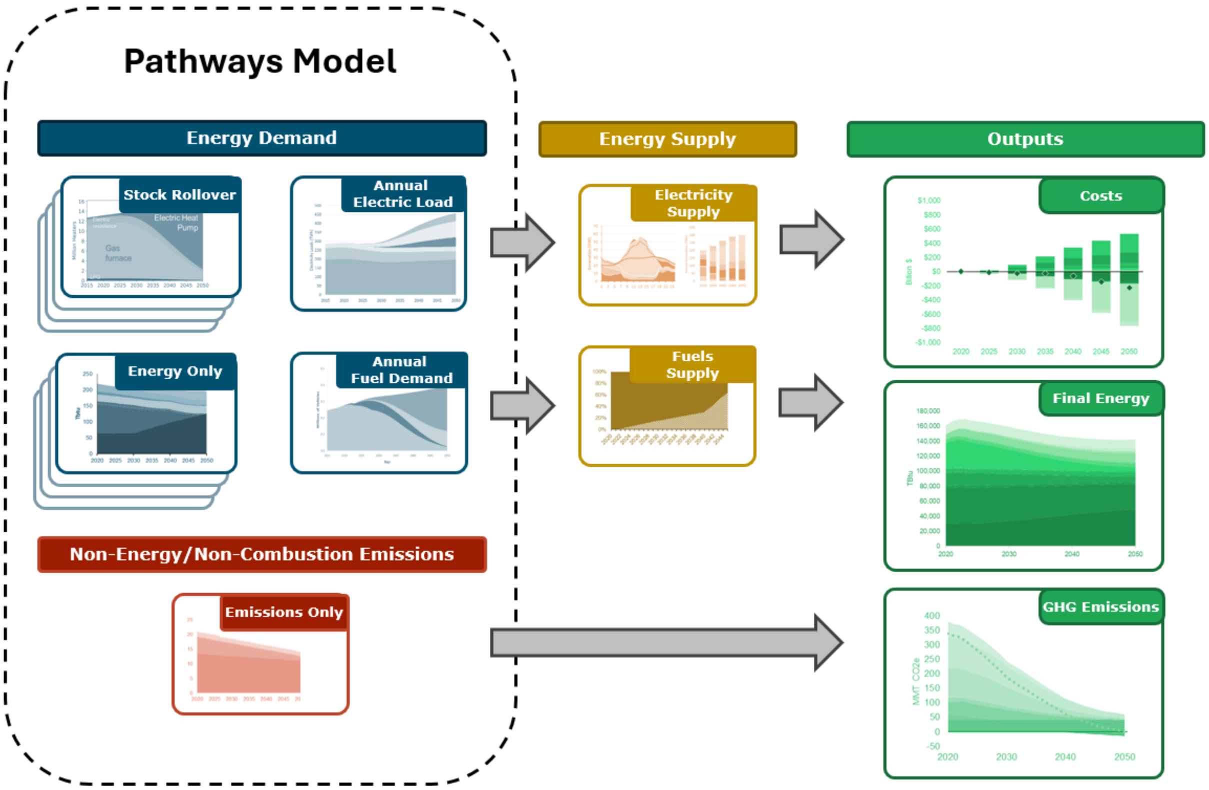
- Energy Demand Sectors
  - Residential
  - Commercial
  - Industrial
  - Transportation
- Non-Energy, Non-Combustion Sectors
  - Agriculture
  - Coal Mining
  - Natural Gas & Oil Systems
  - Industrial Processes & Product Use (IPPU)
  - Waste
  - Land-use, Land-use Change, & Forestry (LULUCF)

The sources from these sectors are categorized into one of three subsector types:

1. **Stock Rollover** – Subsectors where Pathways accounts for the stock rollover of energy-consuming devices in the economy. Here, final energy demands and direct emissions are calculated based on the total number of devices, demand for energy services (e.g., vehicle miles travelled, delivered heat), the fuel type of devices, and the efficiency of devices.
2. **Energy Only** – Subsectors where Pathways accounts for annual energy demands and direct emissions, but does not model stock rollover of devices due to a lack of high-quality, comprehensive data on device stocks, service demands, and efficiencies (e.g., industrial process heat).
3. **Emissions Only** – Subsectors where emissions are generated from sources other than energy demand and/or fuel combustion, so only the annual direct emissions are tracked (e.g., landfill methane leakage).

For this analysis, the final energy demand results from Pathways were combined with energy supply outputs of the PLEXOS electricity sector model and a biofuel supply optimization to determine final economy-wide emissions and costs. The outputs of the ISO New England PLEXOS model were used to determine the electricity generation costs and the emissions intensity of electricity consumed in Rhode Island in all scenarios. The biofuels supply optimization was only used for the Act on Climate scenario and was used to allocate Rhode Island's population-weighted share of national waste and residue feedstocks (no dedicated energy crops) to residual fuel demands after energy efficiency and electrification measures are applied.

Figure 1: Flow chart of Pathways model used in conjunction with energy supply tools



Stock Rollover Subsectors

Overview

Pathways models 30 distinct stock rollover subsectors across the Residential, Commercial, and Transportation sectors. For each subsector, the total stock of devices and the share for each technology type is benchmarked in the base year using historical data.[1] For future years, the total stock is determined using growth rates for various key indicators (e.g., population). Table 3 below shows the default stock rollover subsectors in Pathways and the key drivers used to determine total device stocks in future years. The model takes as an input the average number of devices per key driver and uses that to calculate total device stocks (e.g., how many refrigerators per household).

[1] The base year is typically the last year of available historical data.

Table 3: Stock rollover subsectors in Pathways

Subsector	Key Driver
Residential Clothes Drying	Households
Residential Clothes Washing	Households
Residential Cooking	Households
Residential Dishwashing	Households
Residential Freezing	Households
Residential Exterior Lighting	Households
Residential General Service Lighting	Households
Residential Linear Fluorescent Lighting	Households
Residential Reflector Lighting	Households
Residential Refrigeration	Households
Residential Single Family Air Conditioning	Households
Residential Multi Family Air Conditioning	Households
Residential Single Family Space Heating	Households
Residential Multi Family Space Heating	Households
Residential Water Heating	Households
Commercial Air Conditioning	Commercial Square Footage
Commercial Cooking	Commercial Square Footage
Commercial General Service Lighting	Commercial Square Footage
Commercial HID Lighting	Commercial Square Footage
Commercial Linear Fluorescent Lighting	Commercial Square Footage
Commercial Refrigeration	Commercial Square Footage
Commercial Space Heating	Commercial Square Footage
Commercial Ventilation	Commercial Square Footage
Commercial Water Heating	Commercial Square Footage
Transportation Light Duty Vehicles	Population
Transportation Light Medium Duty Trucks	Population
Transportation Medium Duty Trucks	Population
Transportation Heavy Duty Trucks (Short-haul)	Population
Transportation Heavy Duty Trucks (Long-haul)	Population
Transportation Buses	Population

The final energy demand from stock rollover subsectors is a function of the total number of devices, the service demands per device, the share of various technologies among the total number of devices, and the average efficiencies of these devices. Each year, the model retires devices based on survival profiles that determine the fraction of devices retired from year to year, and then sells new devices so that the total number of devices equals the amount calculated using the base year stocks and top down growth rates.

Users have the option of changing the market share for new device sales as a scenario input. Examples of user inputs are measures that lead to an increase in sales of more efficient devices with the same fuel type or measures that lead to an increase in sales of devices with a different fuel type (e.g., shifting sales of gasoline vehicles to battery electric vehicles). In addition, users can input service demand modifiers that change the underlying amount of energy services required, which in turn change the final energy demand (e.g., reducing vehicle miles travelled). One unique service demand modifier available for buildings is the deployment of more efficient building shells that reduce space heating and cooling needs. Unlike other service demand modifiers like behavioral conservation or VMT reductions, the model accounts for the capital costs of building shell measures that reduce service demands, although the user must specify the cost and percent reduction in heating and/or cooling demand associated with each efficient shell type. The section below walks through the calculations for stock rollover and energy demand.

Calculations

Stock Rollover Calculations

Stock rollover calculations are performed for each stock rollover subsector. The goal of the stock rollover calculations is to calculate the 3-dimensional stock array, A_{ijk}, which represents the number of devices that exist in year i of vintage j and device type k (e.g. for the light duty vehicles subsector in the year 2024, how many 2002 vintage gasoline internal combustion engine cars are on the road).

Key model inputs for the calculation of the stock array, A_{ijk}, include:

- A_{0jk}, the base year stock share
- r_i, the total number of devices that exist in year i across the entire subsector
- S_{ijk}, the survival profile matrix, which represents the percentage of devices that will survive from year $(i-1)$ to year i
- B_{ijk}, the natural retirement sales share, which represents the fraction of natural retirements in year i of vintage j that will be replaced with device type k. The value is typically the same across all vintages for a given year i.
- D_{ijk}, the early retirement sales share, which represents the fraction of early retirements in year i of vintage j that will be replaced with device type k. The value is typically the same across all vintages for a given year i.
- X_{ik}, the early retirement stock fraction, which represents the fraction of devices of type k that will be retired early in year i. Note: the vintage is not specified. The calculations assume that the oldest devices will be retired first.

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Key intermediate calculated quantities include:

- P_{ijk}, the array of natural retirements occurring in year i of vintage j and device type k
- Q_{ijk}, the array of early retirements occurring in year i of vintage j and device type k
- Y_{ijk}, the array of sales occurring in year i of vintage j and device type k
- $\hat{A}_{ijk}$, the stock array in year i of vintage j and device type k after accounting for natural retirements, but **before** accounting for early retirements and sales
- $\tilde{A}_{ijk}$, the stock array in year i of vintage j and device type k after accounting for both natural and early retirements but **before** accounting for sales

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The stock rollover calculations occur iteratively from years $(i = 1 \dots n)$, assuming that stocks in year 0, A_{0jk}, are known. The following steps are performed for each successive year:

Step 1: subtract natural retirements

The first step is calculating the number of devices that will naturally retire given the starting stocks and the survival profile. The number of natural retirements, P_{ijk}, and the intermediate stock array, $\hat{A}_{ijk}$, are calculated as shown in Equations 2.1 and 2.2 below:

$$P_{ijk} = A_{(i-1)jk} * S_{ijk} \qquad 0.1$$

$$\hat{A}_{ijk} = A_{(i-1)jk} - P_{ijk} \qquad 0.2$$

Step 2: subtract early retirements

The second step is calculating the number of early retirements. Devices are retired from oldest to youngest, until the specified early retirement fraction, X_{ik}, is reached. The number of early retirements, Q_{ijk}, are thus calculated such that Equation 2.3 is satisfied:

$$\sum_{j} Q_{ijk} = X_{ik} * \sum_{j} \hat{A}_{ijk} \qquad 0.3$$

Intermediate stock array, $\tilde{A}_{ijk}$, represents the stock array **after** accounting for both natural and early retirements but **before** accounting for sales. $\tilde{A}_{ijk}$ is calculated as shown in Equation 2.4:

$$\tilde{A}_{ijk} = \hat{A}_{ijk} - Q_{ijk} \qquad 0.4$$

Step 3: add sales

After both natural and early retirements have been accounted for to produce the intermediate stock array, $\tilde{A}_{ijk}$, the third and final step in the calculation of the final stock array, A_{ijk}, is to add the anticipated sales. This is achieved by replacing natural and early retirements, as well as adding new devices to meet the total number of devices specified for the subsector, r_i. The sales, Y_{ijk}, are calculated as shown in Equation 2.5:

$$Y_{ijk} = (P_{ijk} * B_{ijk}) + (Q_{ijk} * D_{ijk}) + \left(r_i - \sum_{jk} \tilde{A}_{ijk}\right) * B_{ijk} \qquad 0.5$$

where

- P_{ijk} is the array of natural retirements occurring in year i of vintage j and device type k,
- B_{ijk} is the natural retirement sales share, which represents the fraction of natural retirements in year i of vintage j that will be replaced with device type k,
- Q_{ijk} is the array of early retirements occurring in year i of vintage j and device type k,
- D_{ijk} is the early retirement sales share, which represents the fraction of early retirements in year i of vintage j that will be replaced with device type k, and

- r_i is the total number of devices that exist in year i across the entire subsector.

The final stock array, A_{ijk}, is calculated by adding the sales, Y_{ijk}, to $\tilde{A}_{ijk}$ (the intermediate stock array coming out of the previous step), as shown in Equation 2.6:

$$A_{ijk} = \tilde{A}_{ijk} + Y_{ijk} \qquad 0.6$$

Energy Demand Calculations for Stock Rollover Subsectors

Once the stock rollover has been calculated, energy demands are calculated for each year i, device type k, and fuel type f. Key inputs for the energy demand calculations include:

- A_{ijk}, the final stock array defining the number of devices that exist in year i of vintage j and device type k. This is the main output of the stock rollover calculations.
- X_{ijkf}, the fuel share of service demand for fuel type f for devices in year i of vintage j and device type k. This represents the percentage of service demand that is served by a particular fuel type.
- F_{ijkf}, the efficiency of devices in year i of vintage j and device type k and fuel type f (in units of (MMBtu out)/(MMBtu in)).
- d_{ik}, the service demand in year i for device type k (in units of MMBtu/year)

The resulting energy demand, E^s_{ikf}, represents the energy demand year i for device type k and fuel type f. E^s_{ikf} is calculated as shown in Equation 2.7:

$$E^s_{ikf} = d_{ik} * \sum_j X_{ijkf} * (A_{ijk} \div F_{ijkf}) \qquad 0.7$$

The final energy demands are aggregated over all devices in the subsector to yield E^s_{if}, the total final energy demand for each year i and fuel type f as shown in Equation 2.8:

$$E^s_{if} = \sum_k E^s_{ikf} \qquad 0.8$$

Emissions resulting from these energy demands are dependent on the energy supply and are described in section 5.

Costs for Stock Rollover Subsectors

Three types of costs are calculated for devices within a stock rollover subsector:

1. **Device costs:** capital costs to purchase new devices. Overnight capital costs are calculated by multiplying annual device sales by the capital cost for each device. Annual levelized costs are calculated from the overnight costs assuming a financing rate and financing lifetime specified for each subsector.

2. **Operation and maintenance (O&M) costs:** annual costs associated with O&M for a specified device type. O&M costs are calculated by multiplying the total number of devices operating in a given year by the annual O&M cost for each individual device type.
3. **Fuel costs:** annual costs associated with fuel consumption for each device. Fuel costs are calculated by multiplying the energy demand for each device by the fuel price per MMBtu for the fuel it consumes.

Data Sources

Table 4 below lists the default data sources for key inputs to the stock rollover subsectors.

Table 4: Stock rollover default data sources

Subsector	Stocks	Service Demands	Device Efficiency	Device Costs
Residential Clothes Drying	EIA RECS[2]	EIA NEMS[3]	EIA NEMS, Martin et al., 2016[4]	E3 2024
Residential Clothes Washing	EIA RECS	EIA NEMS	EIA NEMS	EIA NEMS
Residential Cooking	EIA RECS	EIA NEMS	EIA NEMS, Sweeney et al., 2014[5]	EIA NEMS
Residential Dishwashing	EIA RECS	EIA NEMS	EIA NEMS	EIA NEMS
Residential Freezing	EIA RECS	EIA NEMS	EIA NEMS	EIA NEMS
Residential Exterior Lighting	DOE 2020[6]	EIA NEMS	EIA NEMS	EIA NEMS
Residential General Service Lighting	DOE 2020	EIA NEMS	EIA NEMS	EIA NEMS
Residential Linear Fluorescent Lighting	DOE 2020	EIA NEMS	EIA NEMS	EIA NEMS
Residential Reflector Lighting	DOE 2020	EIA NEMS	EIA NEMS	EIA NEMS
Residential Refrigeration	EIA RECS	EIA NEMS	EIA NEMS	EIA NEMS
Residential Single Family Air Conditioning	EIA RECS	EIA NEMS	EIA NEMS	E3 2024
Residential Multi Family Air Conditioning	EIA RECS	EIA NEMS	EIA NEMS	E3 2024
Residential Single Family Space Heating	EIA RECS	EIA NEMS	EIA NEMS, NREL ResStock for	Clean Heat Rhode Island

[2] U.S. Department of Energy, Energy Information Administration. (2023). *Residential Energy Consumption Survey 2020*; https://www.eia.gov/consumption/residential/data/2020/
[3] U.S. Department of Energy, Energy Information Administration. (2023). *National Energy Modeling System*; https://www.eia.gov/outlooks/aeo/nems/documentation/
[4] Martin et al. (2016). *Measured Performance of Heat Pump Clothes Dryers*. https://www.aceee.org/files/proceedings/2016/data/papers/1_160.pdf
[5] Sweeney et al. (2014). *Induction Cooking Technology Design and Assessment*. https://www.aceee.org/files/proceedings/2014/data/papers/9-702.pdf
[6] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy. (2020). *Adoption of Light-Emitting Diodes in Common Lighting Applications*; https://www.energy.gov/sites/default/files/2020/09/f78/ssl-led-adoption-aug2020.pdf

			current heat pumps[7], NREL EFS for heat pump improvement trend[8]	Project Data for current heat pump costs[9], NREL EFS for heat pump cost decline trends
Residential Multi Family Space Heating	EIA RECS	EIA NEMS	EIA NEMS, NREL ResStock, NREL EFS	Clean Heat Rhode Island Project Data, NREL EFS
Residential Water Heating	EIA RECS	EIA NEMS	EIA NEMS	EIA NEMS
Commercial Air Conditioning	EIA CBECS 2018[10]	EIA NEMS	EIA NEMS	EIA NEMS
Commercial Cooking	EIA CBECS 2018	EIA NEMS	EIA NEMS, Sweeney et al., 2014	EIA NEMS
Commercial General Service Lighting	DOE 2020	EIA NEMS	EIA NEMS	EIA NEMS
Commercial HID Lighting	DOE 2020	EIA NEMS	EIA NEMS	EIA NEMS
Commercial Linear Fluorescent Lighting	DOE 2020	EIA NEMS	EIA NEMS	EIA NEMS
Commercial Refrigeration	EIA CBECS 2018	EIA NEMS	EIA NEMS	EIA NEMS
Commercial Ventilation	EIA CBECS 2018	EIA NEMS	EIA NEMS	EIA NEMS
Commercial Space Heating	EIA CBECS 2018	EIA NEMS	EIA NEMS	EIA NEMS
Commercial Water Heating	EIA CBECS 2018	EIA NEMS	EIA NEMS	EIA NEMS
Transportation Light Duty Vehicles	RI MOVES[11]	RI MOVES	BTS and VIUS for existing vehicles[12], EIA AEO 2023 for future year ICE vehicles[13], Slowik	Slowik et al., 2022, Edmunds 2024[15]

[7] National Renewable Energy Laboratory. (2024). *ResStock Dataset 2024.2*; https://resstock.nrel.gov/datasets
[8] National Renewable Energy Laboratory. (2018). *Electrification Futures Study: End-Use Electric Technology Cost and Performance Projections through 2050;* https://docs.nrel.gov/docs/fy18osti/70485.pdf
[9] Provided by Rhode Island Office of Energy Resources to E3 via email on 3/24/2025
[10] U.S. Department of Energy, Energy Information Administration. (2022). *Commercial Building Energy Consumption Survey 2018*; https://www.eia.gov/consumption/commercial/data/2018/
[11] MOVES model outputs used in development of the *2022 Rhode Island Greenhouse Gas Inventory*, provided by Rhode Island Department of Environmental Management via email on December 30, 2024
[12] U.S. Department of Transportation, Bureau of Transportation Statistics. (2023). *National Transportation Statistics 2021*; https://www.bts.gov/topics/national-transportation-statistics
U.S. Census Bureau. (2024). *Vehicle Inventory and Use Survey 2021;* https://www.census.gov/programs-surveys/vius.html
[13] U.S. Department of Energy, Energy Information Administration. (2023). *Annual Energy Outlook 2023*; https://www.eia.gov/outlooks/aeo/
[15] Edmunds. (2024). *Big Gap Remains in Average Price of Electric Car vs. Gas Car*; https://www.edmunds.com/car-buying/average-price-electric-car-vs-gas-car.html

			et al., 2022 for EVs [14]	
Transportation Light Medium Duty Trucks	RI MOVES	RI MOVES	VIUS for existing vehicles, EIA AEO 2023 for future year vehicles	Mullholland, 2022[16]
Transportation Medium Duty Trucks	RI MOVES	RI MOVES	VIUS for existing vehicles, EIA AEO 2023 for future year vehicles	Slowik et al., 2023[17]
Transportation Heavy Duty Trucks (Short-haul)	RI MOVES	RI MOVES	VIUS for existing vehicles, EIA AEO 2023 for future year vehicles	Slowik et al., 2023
Transportation Heavy Duty Trucks (Long-haul)	RI MOVES	RI MOVES	VIUS for existing vehicles, EIA AEO 2023 for future year vehicles	Slowik et al., 2023
Transportation Buses	RI MOVES	RI MOVES	ANL 2021[18]	Slowik et al., 2023

[14] Slowik, P., Isenstadt, A., Pierce, L., Searle, S. (2022). *Assessment of Light-Duty Electric Vehicle Costs and Consumer Benefits in the United States in the 2022-2035 Time Frame*; https://theicct.org/wp-content/uploads/2022/10/ev-cost-benefits-2035-oct22.pdf

[16] Mulholland, E. (2022). *Cost of Electric Commercial Vans and Pickup Trucks in the United States Through 2040*; https://theicct.org/wp-content/uploads/2022/01/cost-ev-vans-pickups-us-2040-jan22.pdf

[17] Slowik et al. (2023). *Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the United States*; https://theicct.org/wp-content/uploads/2023/01/ira-impact-evs-us-jan23-2.pdf

[18] U.S. Department of Energy, Argonne National Laboratory. (2023). *Vehicle Technologies and Hydrogen and Fuel Cell Technologies Research and Development Benefits Analysis*; https://vms.taps.anl.gov/reports/u-s-doe-vto-hfto-r-d-benefits-analysis-mdhd/

Energy Only Subsectors

Overview

Energy only subsectors represent the final energy demands and direct GHG emissions for categories where comprehensive data on equipment stock, efficiencies, and service demands are not readily available. These include manufacturing and non-manufacturing industrial sectors, off-road transportation and aviation, and miscellaneous energy end-uses in residential and commercial buildings. For all energy only subsectors, starting year energy demands are benchmarked to historical consumption. For industrial subsectors, business-as-usual changes in future year energy demand are applied by subsector and fuel type based on changes forecasted in EIA Annual Energy Outlook 2023. Changes in future year aviation energy demand are also taken from Annual Energy Outlook, while energy demand growth for miscellaneous residential and commercial end-uses is projected using the households and commercial square footage growth rates, respectively. Table 5 below lists the default energy only subsectors used in Pathways.

Table 5: Energy only subsectors in Pathways

Subsector	Growth Rate
Residential Other	Households
Commercial Other	Commercial Square Footage
Transportation Aviation	EIA AEO23 Demand Growth for Jet Fuel
Transportation Other	N/A
Industry Aluminum	Based on a review of historical industrial energy consumption in Rhode Island from 2012-2022, underlying energy demand in industry is assumed to hold constant through 2050, as natural gas demand has been relatively stable over the past decade, and electricity demand saw declines through 2020 but has remained flat since then. This assumption does not preclude the use of energy efficiency or fuel-switching measures to reduce energy demand and emissions in the analysis.
Industry Cement and Lime	
Industry Chemicals	
Industry Food	
Industry Glass	
Industry Iron and Steel	
Industry Metal Based Durables	
Industry Other	
Industry Paper	
Industry Plastics	
Industry Refining	
Industry Wood Products	
Industry Agriculture	
Industry Construction	
Industry Mining and Upstream Oil and Gas	

Once the baseline growth in energy demand is determined, users can specify either energy efficiency measures to reduce final energy consumption or fuel-switching measures to convert energy demand from one fuel to another. A third option for some stationary sources of CO_2 emissions is to apply CCS. The share of final emissions from a specific fuel and subsector that will be captured annually is specified by the user along with the technical characteristics of the CCS equipment like capital and operating costs, capture rate, and energy demands. The section below walks through the calculations for final energy demands in the energy only subsectors.

Calculations

Energy Demand Calculations for Energy Only Subsectors

As mentioned in the overview, the final energy demands in energy only subsectors account for both fuel-switching measures to convert energy demand from one fuel to another, and energy efficiency measures to reduce the final energy consumption. The final result is E_{if}^{I}, the final energy demand in year i for fuel type f across the subsector.

Key inputs for the energy demand calculations in energy only subsectors include:

- E_{if}^{I0}, the default energy demand in year i for fuel type f
- W_{ifg}, the percentage of energy demand in year i to be converted from fuel type f to fuel type g
- V_{ifg}, the energy efficiency factor in year i when converting from fuel type f to fuel type g (e.g. if switching from a natural gas boiler to an electric heat pump that is 3X more efficient, this value would be 300%)
- R_{if}, the energy efficiency reduction fraction for energy efficiency measures. This represents the % of final energy demand that will be reduced as a result of the measure

Intermediate calculated values include:

- $\hat{E}_{if}^{I}$, the energy demand in year i for fuel type f **after** fuel switching has been accounted for but **before** energy efficiency measures have been applied

Step 1: account for fuel-switching

First, fuel-switching is applied to the default energy demand trajectories for each fuel. This calculation:

1. starts with the default energy demand trajectory, E_{if}^{I0},
2. subtracts energy demands that will be switching from fuel type f to other fuel types, and then
3. adds fuel demands that will be switching from other fuel types to fuel type f, accounting for the conversion efficiency.

The intermediate energy demand accounting for fuel switching, $\hat{E}_{if}^{I}$, is calculated as shown in Equation 3.1:

$$\hat{E}_{if}^{I}, = E_{if}^{I0} - \sum_{g} \left(E_{if}^{I0} * W_{ifg}\right) + \sum_{g} \left(E_{if}^{I0} * W_{igf} \div V_{igf}\right) \qquad 0.9$$

Step 2: account for energy-efficiency measures

After fuel-switching has been accounted for, energy efficiency measures are applied to the intermediate energy demands, $\hat{E}_{if}^{I}$, to produce the final energy demands, E_{if}^{I}. The energy efficiency reduction fraction, R_{if}, is applied to calculate the final energy demands, E^{I}_{if}, as shown in Equation 3.2:

$$E^{I}_{if}, = \hat{E}_{if} * (1 - R_{if}) \qquad 0.10$$

Emissions resulting from these energy demands are dependent on the energy supply and are described in section 5. In cases where CCS is applied within a subsector, energy demands associated with CCS operations are also accounted for.

Costs for Energy Only Subsectors

Although device stocks are not explicitly modeled for energy only subsectors, the capital costs that would be associated with equipment upgrades are represented as levelized annual costs on a dollars per MMBtu basis. These include:

- **Fuel-switching costs:** annual levelized costs representing capital investments needed to purchase equipment associated with fuel-switching (e.g. the levelized incremental capital cost of an industrial heat pump replacing a natural gas boiler).
- **Efficiency costs:** annual levelized costs representing capital investments needed to purchase equipment associated with energy efficiency measures (e.g. the levelized incremental capital cost of efficient boilers relative to conventional boilers).

Annual costs that are accounted for in energy only subsectors include:

- **Fuel costs:** annual costs associated with fuel consumption in the subsector. Fuel costs are calculated by multiplying the final energy demand by the fuel cost per MMBtu of the fuel consumed.

If CCS is applied in the subsector, additional CCS costs will also be accounted for. These are described further in section 5.

Data Sources

Table 6 below lists the default data sources for key inputs to the energy only subsectors.

Table 6: Energy only default data sources

Subsector	Base Year Energy Demand	Energy Efficiency Costs	Electrification Costs	CCS Costs
Residential Other	EIA SEDS[19], RIDEM[20]	Schiller et al., 2020[21] and Frick et al., 2021[22]	$20/MMBtu of fuel use electrified	N/A
Commercial Other	EIA SEDS, RIDEM			
Transportation Aviation	EIA SEDS, RIDEM	N/A	N/A	N/A
Transportation Other				
Industry Aluminum	NREL IEDB 2018[23], EIA SEDS, RIDEM	Schiller et al., 2020 and Frick et al., 2021	Zuberi et al., 2022[24] and DOE 2023[25]	NETL 2014[26]
Industry Cement and Lime				
Industry Chemicals				
Industry Food				
Industry Glass				
Industry Iron and Steel				
Industry Metal Based Durables				
Industry Other				
Industry Paper				
Industry Plastics				
Industry Refining				
Industry Wood Products				
Industry Agriculture		N/A	Levelized cost of electrification for heavy-duty trucking used as proxy for off-road industrial equipment	N/A
Industry Construction				N/A
Industry Mining and Upstream Oil and Gas				NETL 2014

[19] U.S. Department of Energy, Energy Information Administration. (2023). *State Energy Data System: 1960-2021 (complete)*; https://www.eia.gov/state/seds/seds-data-complete.php

[20] Rhode Island Department of Environmental Management. (2024). *2022 Rhode Island Greenhouse Gas Inventory*; https://dem.ri.gov/environmental-protection-bureau/air-resources/rhode-island-greenhouse-gas-inventory

[21] Schiller, S., Hoffman, I., Murphy, S., Leventis, G., Schwartz, L. (2020). *Cost of saving natural gas through efficiency programs funded by utility customers 2012-2017*; https://eta-publications.lbl.gov/sites/default/files/cose_natural_gas_final_report_20200513.pdf

[22] Frick, N., Murphy, S., Miller, C., Pigman, M. (2021). *Still the One: Efficiency Remains a Cost-Effective Electricity Resource*; https://eta-publications.lbl.gov/sites/default/files/cose_cspd_analysis_2021_final_v3.pdf

[23] U.S. Department of Energy, National Renewable Energy Laboratory. (2019). *2018 Industrial Energy Data Book*; https://data.nrel.gov/submissions/122

[24] Zuberi, M., Hasanbeigi, A., Morrow, W. (2022). *Electrification of U.S. Manufacturing with Industrial Heat Pumps*; https://eta-publications.lbl.gov/sites/default/files/us_industrial_heat_pump-final.pdf

[25] U.S. Department of Energy. (2023). *Pathways to Commercial Liftoff: Industrial Decarbonization*; https://liftoff.energy.gov/wp-content/uploads/2023/09/20230918-Pathways-to-Commercial-Liftoff-Industrial-Decarb.pdf

[26] U.S. Department of Energy, National Energy Technology Laboratory. (2014). *Cost of Capturing CO2 from Industrial Sources*; https://www.netl.doe.gov/projects/files/CostofCapturingCO2fromIndustrialSources_011014.pdf

Emissions Only Subsectors

Overview

Emissions only subsectors represent GHG emissions from non-energy and/or non-combustion related sources and emissions sinks from land use and forestry. For these sources, annual emissions are entered into the model directly as metric tons by pollutant type. The four pollutant types represented in Pathways are CO_2, CH_4, N_2O, and CO_2e (CO_2e is used for fluorinated gases like HFCs, PFCs, SF_6, and NF_3). Base year emissions sources and sinks are typically benchmarked to state-level data from EPA, but in this case are benchmarked directly to the 2022 Rhode Island Greenhouse Gas Inventory. Table 7 below lists the default emissions only sectors and subsectors used in Pathways.

Table 7: Emissions only subsectors in Pathways

Sector	Subsector	Pollutant
Agriculture	Liming	CO2
	Urea Fertilization	CO2
	Enteric Fermentation	CH4
	Manure Management CH4	CH4
	Rice Cultivation	CH4
	Residue Burning CH4	CH4
	Manure Management N2O	N2O
	Soil Management	N2O
	Residue Burning N2O	N2O
Coal Mining	Active Coal Mines	CH4
	Abandoned Coal Mines	CH4
Natural Gas and Oil Systems	Natural Gas Systems CO2	CO2
	Petroleum Systems CO2	CO2
	Abandoned Oil and Gas Wells CO2	CO2
	Natural Gas Systems CH4	CH4
	Petroleum Systems CH4	CH4
	Abandoned Oil and Gas Wells CH4	CH4
	Natural Gas Systems N2O	N2O
	Petroleum Systems N2O	N2O
Industrial Processes and Product Use (IPPU)	Cement Production	CO2
	Lime Production	CO2
	Other Process Uses of Carbonates	CO2
	Glass Production	CO2
	Soda Ash Production	CO2
	Carbon Dioxide Consumption	CO2
	Titanium Dioxide Production	CO2
	Aluminum Production CO2	CO2
	Iron and Steel Production CO2	CO2
	Ferroalloy Production CO2	CO2
	Ammonia Production	CO2

	Urea Consumption	CO_2
	Phosphoric Acid Production	CO_2
	Petrochemical Production CO2	CO_2
	Carbide Production and Consumption CO2	CO_2
	Lead Production	CO_2
	Zinc Production	CO_2
	Magnesium Production and Processing CO2	CO_2
	Petrochemical Production CH4	CH_4
	Carbide Production and Consumption CH4	CH_4
	Iron and Steel Production CH4	CH_4
	Ferroalloy Production CH4	CH_4
	Adipic Acid Production	N_2O
	Nitric Acid Production	N_2O
	N2O from Product Uses	N_2O
	Caprolactam and Others Production	N_2O
	Electronics Industry N2O	N_2O
	ODS Substitutes	CO_2e
	HCFC-22 Production	CO_2e
	Magnesium Production and Processing	CO_2e
	Aluminum Production	CO_2e
	Electronics Industry	CO_2e
	Electrical Transmission and Distribution	CO_2e
Waste	Waste Combustion CO2	CO_2
	Landfills	CH_4
	Wastewater Treatment CH4	CH_4
	Composting CH4	CH_4
	Anaerobic Digestion	CH_4
	Waste Combustion CH4	CH_4
	Wastewater Treatment N2O	N_2O
	Waste Combustion N2O	N_2O
	Composting N2O	N_2O
Land-Use, Land-Use Change, and Forestry (LULUCF)	LULUCF CH4 Sources	CH_4
	LULUCF N2O Sources	N_2O
	LULUCF Carbon Stock Change	CO_2

After the baseline trend for future year non-energy and/or non-combustion emissions has been determined, the user can specify annual emissions reductions as a percentage below the baseline trend for individual sources along with measure costs on a $/ton of pollutant basis.

Calculations

Emissions Calculations for Emissions Only Subsectors

The final emissions for an emissions only subsector, γ_{ip}, are calculated for each year i and pollutant p. Tracked pollutants typically include the most common greenhouse gases (i.e. CO_2, CH_4, and N_2O). The final emissions, γ_{ip}, are calculated as shown in Equation 4.1:

$$\gamma_{ip} = \gamma_{ip}^0 - \alpha_{ip} \qquad 0.11$$

where:

- γ_{ip}^0 is the default emission value for year i and pollutant p, and
- α_{ip} is the quantity of emissions to be reduced via mitigation measures for year i and pollutant p.

In some cases, CCS may be applied to an emissions only subsector (e.g. cement production). Impacts from CCS are described further in section 5.

Cost Calculations for Emissions Only Subsectors

Annual costs associated with emissions reductions in emissions only subsectors are tracked within the model. These **emissions only reduction costs** are calculated by multiplying the annual emissions reductions, α_{ip}, by the input cost on a $/ton basis.

If CCS is applied in the subsector, additional CCS costs will also be accounted for. These are described further in section 5.

Data Sources

Table 8 below lists the default data sources for key inputs to the emissions only subsectors.

Table 8: Emissions only default data sources

Sector	Sources	Base Year Emissions	Growth Rate	Mitigation Potential and Costs
Agriculture	*All agriculture sources*	RIDEM	EPA State-Level Non-CO2 Report[27]	EPA State-Level Non-CO2 Report
Coal Mining	*All coal mining sources*	RIDEM	EPA State-Level Non-CO2 Report	EPA State-Level Non-CO2 Report
Natural Gas and Oil Systems	*CH4 emissions sources*	RIDEM	EPA State Inventory Tool emission factors applied to pipeline mileage and material, services count and material[28]	E3 2024[29]

[27] U.S. Environmental Protection Agency. (2023). *U.S. State-level Non-CO_2 GHG Mitigation Report*; https://www.epa.gov/global-mitigation-non-co2-greenhouse-gases/us-state-level-non-co2-ghg-mitigation-report

[28] U.S. Environmental Protection Agency. (2025). *State Inventory and Projection Tool*. https://www.epa.gov/statelocalenergy/download-state-inventory-and-projection-tool

[29] Energy & Environmental Economics, Inc. (2024). *Rhode Island Investigation into the Future of the Regulated Gas Distribution Business, Technical Analysis Report*. https://www.ethree.com/wp-content/uploads/2024/06/Docket-22-01-NG-E3-Technical-Analysis-Report.pdf

Industrial Processes and Product Use (IPPU)	*ODS Substitutes*	RIDEM	BAU forecast from EPA regulatory impact analysis for HFC rulemaking[30]	Emissions reductions forecast from EPA HFC rulemaking
	All other IPPU sources	RIDEM	EPA State-Level Non-CO2 Report	EPA State-Level Non-CO2 Report
Waste	*CH4 emissions sources*	RIDEM	EPA State-Level Non-CO2 Report	EPA State-Level Non-CO2 Report
Land-Use, Land-Use Change, Forestry (LULUCF)	*Carbon sinks*	RIDEM	*TBD: will be determined pending input from state agencies and stakeholders on land sink trends*	Fargione et al., 2018[31]

Energy Supply

Pathways generates annual energy demands by fuel type, stocks and sales of energy consuming devices, and GHG emissions from non-energy/non-combustion sources. The ISO-New England PLEXOS model was used to determine the annual electricity generation costs and emissions intensity for electricity consumed in Rhode Island in all scenarios. The E3 biofuels optimization module was also used for the Act on Climate scenario to calculate what production and allocation of biofuels provides the lowest cost mix that meets final energy demands after energy efficiency and electrification measures have been applied.

Calculation of Economy-wide Emissions

Once the economy-wide energy supply has been determined for a scenario, economy-wide emissions can be calculated within the Pathways model. Economy-wide emissions include direct emissions from combusted fuels, indirect emissions from electricity, non-energy/non-combustion emissions, and any negative emissions that occur through CCS or negative emissions technologies (e.g. direct air capture). Emissions are calculated for each subsector that is modeled. Non-energy/non-combustion emissions are calculated as described in section 4. Other types of modeled emissions and their calculations are described in the subsequent sections.

Calculation of Emissions from Fuels

30 U.S. Environmental Protection Agency. (2022). *Regulatory Impact Analysis for Phasing Down Production and Consumption of Hydrofluorocarbons (HFCS)*; https://www.epa.gov/system/files/documents/2022-07/RIA%20for%20Phasing%20Down%20Production%20and%20Consumption%20of%20Hydrofluorocarbons%20%28HFCs%29.pdf

31 Fargione, J. et al. (2018). *Natural Climate Solutions for the United States*; https://www.science.org/doi/10.1126/sciadv.aat1869

The final energy demands for stock rollover subsectors and energy only subsectors are represented by E_{if}^{S} and E_{if}^{I} respectively for each year i for fuel type f. The final energy demand for a general subsector year i for fuel type f will henceforth be denoted by E_{if}.

Energy demands for each fuel type f can potentially be served by a number of different candidate fuels c (e.g. energy demands for the "Natural Gas" fuel type might be served by candidate fuels "Fossil Natural Gas" or "Renewable Natural Gas"). The share of fuel demand in year i for fuel type f that is served by each candidate fuel c is denoted by ρ_{ifc}, and may be determined by either the user directly as an input or by an optimization calculation in a subsequent energy supply tool. For many candidate fuels, ρ_{ifc} does not change over time. However, in some instances, it may vary with time (e.g. a declining emissions factors for grid electricity). The subsector energy demands for each final fuel are translated to subsector energy demands for each candidate fuel as shown in Equation 5.1:

$$E_{ic} = \sum_{f} (E_{if} * \rho_{ifc}) \qquad 0.12$$

The emissions factors, β_{icp}, are known for each year i, candidate fuel c, and pollutant p (i.e. each GHG modeled). The default emissions factors in Pathways come from the EPA Emission Factors Hub and use AR5, 100-year global warming potentials[32]. Subsector emissions, γ_{ip}, for each year i pollutant p are calculated as shown below:

$$\gamma_{ip} = \sum_{c} (E_{ic} * \beta_{icp}) \qquad 0.13$$

Captured Emissions from CCS and Negative Emissions Technologies

Final subsector emissions account for any negative emissions that are captured through CCS. CCS can be applied to both energy only subsectors and emissions only subsector as specified by the user. CCS is assumed to capture CO2. Key CCS inputs for energy only subsectors include:

- E_{if}, final energy demand for a general subsector year i for fuel type f (output of prior model calculations)
- τ_{if}, the percentage of operations that CCS will be applied to in year i for the combustion of fuel type f (e.g. for an energy only subsector, CCS might be applied to 90% of operations where coal is being combusted)
- μ_{if}, the capture rate for CCS applied to in year i for the combustion of fuel type f
- β_{f}, the gross CO2 emission factor for fuel type f (i.e. the metric tons of CO2 emitted per MMBtu of fuel type f consumed)

The emissions captured in year i, γ_{i}^{CCS}, are calculated as shown in Equation 5.3:

[32] U.S. Environmental Protection Agency. (2025). *Emission Factors for Greenhouse Gas Inventories*; https://www.epa.gov/system/files/documents/2025-01/ghg-emission-factors-hub-2025.pdf

$$\gamma_i^{CCS} = \sum_f (E_{if} * \beta_f * \tau_{if} * \mu_{if}) \quad 0.14$$

For emissions only subsectors, the CCS will be applied to a fraction of the subsector emissions. In this case, the CCS will not be capturing emissions from combusted fuels. The captured emissions are instead calculated as shown in Equation 5.4:

$$\gamma_i^{CCS} = \gamma_i * \tau_i * \mu_i \quad 0.15$$

where:

- γ_i are the CO2 emissions for the emissions only subsector in year i absent any CCS,
- τ_i is the percentage of operations that CCS will be applied to in year i, and
- μ_i is the capture rate for CCS applied to in year i

CCS equipment also demands energy to operate. Emissions associated with these energy demands are accounted for in the subsector where the CCS is applied.

In some cases, other negative emissions technologies (NETs) may also be represented (e.g. direct air capture). NETs are treated in the same way as CCS, except that the captured emissions from NETs are specified directly as a model input rather than being calculated, as they are not tied directly to emissions from other subsectors. Energy demands and costs for NETs are calculated using the same methodology as described for CCS.

Additional CCS Energy Demands

If CCS is applied in the subsector, then the additional energy demands associated with running the CCS equipment will also be accounted for. Key inputs to calculate these energy demands are:

- ε_{if}^{CCS}, the energy demand required to operate any CCS equipment in year i of fuel type f per metric ton of captured CO2
- γ_i^{CCS}, the metric tons of captured CO2 in year i across the subsector

The additional energy demand to run the CCS equipment, E_{if}^{CCS} is calculated as shown in Equation 5.5:

$$E_{if}^{CCS} = \varepsilon_{if}^{CCS} * \gamma_i^{CCS} \quad 0.16$$

Additional CCS Costs

If CCS is applied in the subsector, then the additional costs associated with purchasing and running the CCS equipment will also be accounted for. These include:

- **CCS capital costs:** the annual levelized cost of incremental CCS capacity. This is calculated by levelizing the overnight capital cost of the equipment based on an assumed financing rate and financing lifetime.

- **CCS operation and maintenance (O&M) costs:** the annual variable costs associated with operating and maintaining the CCS equipment.
- **Fuel costs:** annual costs associated with fuel consumption in the by the CCS equipment.

Stock Rollover Outputs

The figures below provide the sales share and stock shares by equipment and vehicle type for key end uses like residential and commercial space and water heating, residential building envelopes, and on-road vehicles for the two main economy-wide scenarios: Current Policy and Act on Climate.

Figure 2: Residential Space Heating Sales and Stocks by Equipment Type (%)

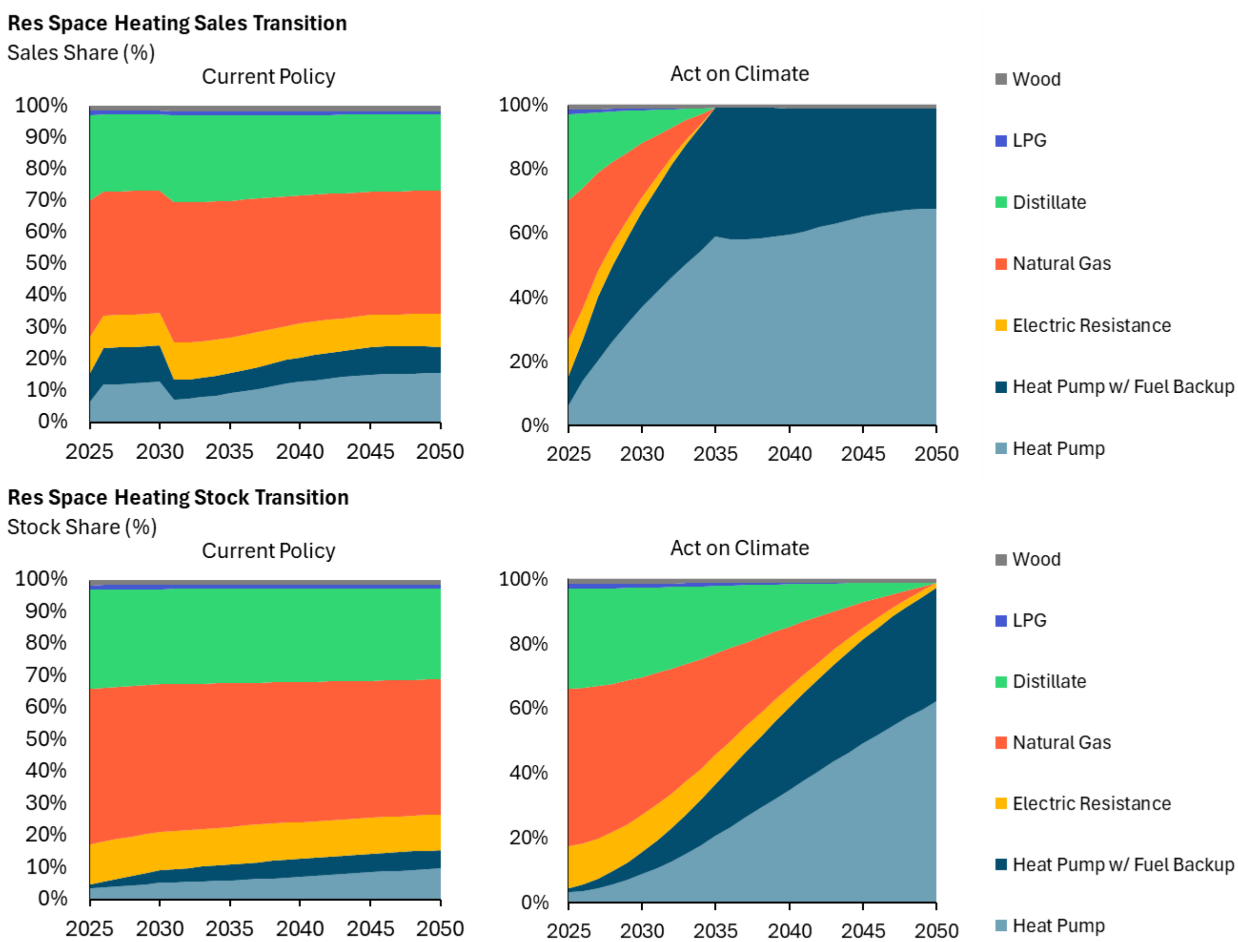


Figure 3: Residential Water Heating Sales and Stocks by Equipment Type (%)

Figure 4: Residential Buildings by Envelope Type (number of housing units)

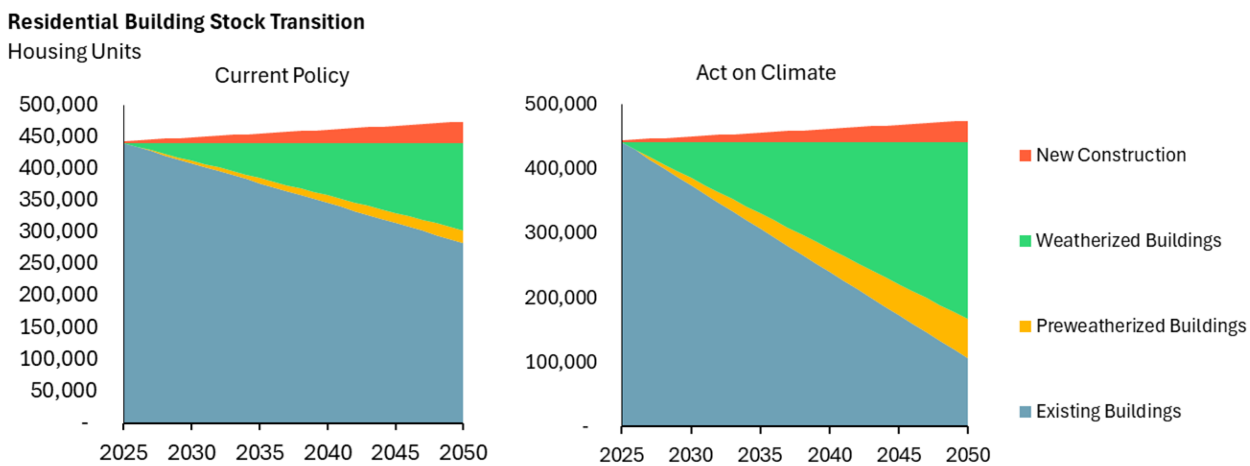


Figure 5: Commercial Space Heating Sales and Stocks by Equipment Type (%)

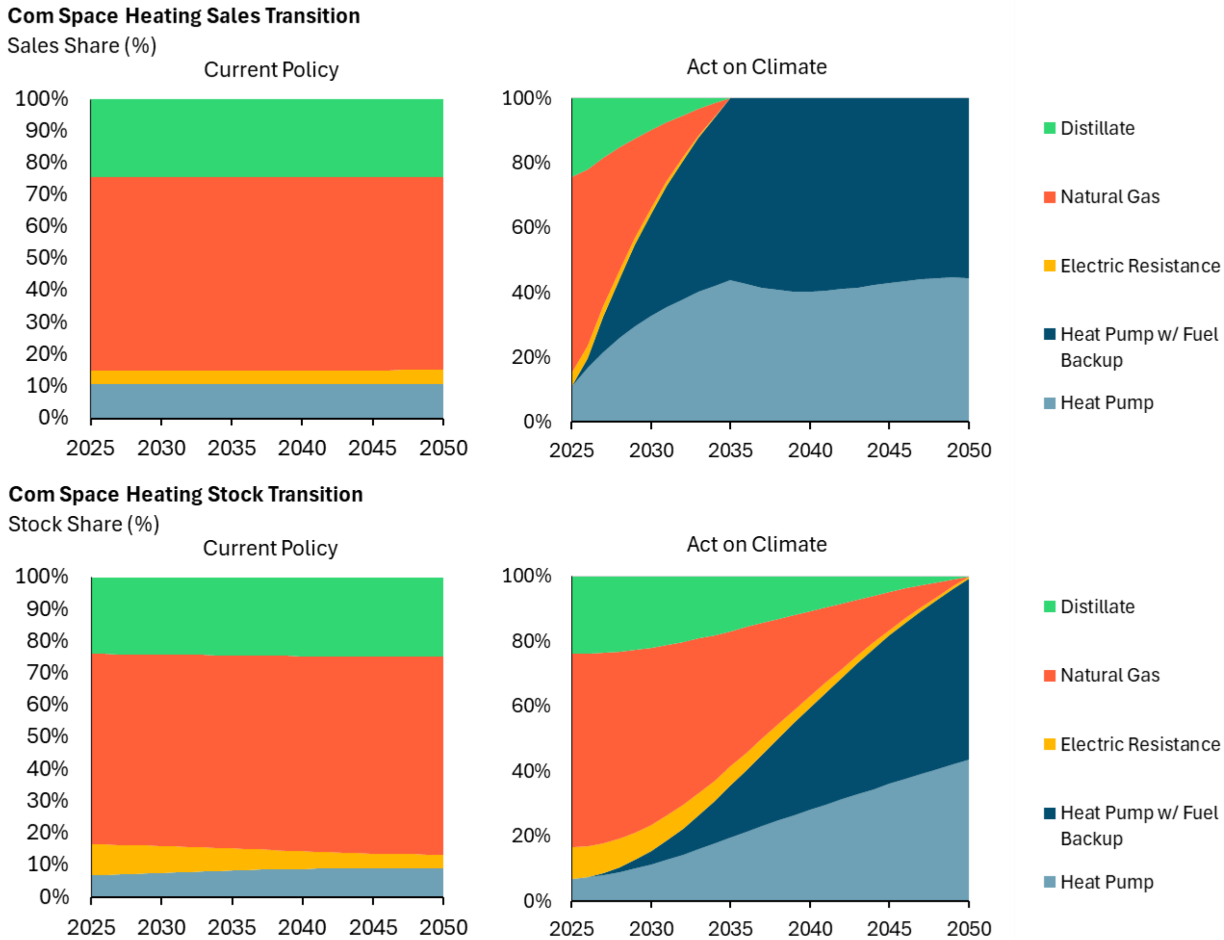


Figure 6: Commercial Water Heating Sales and Stocks by Equipment Type (%)

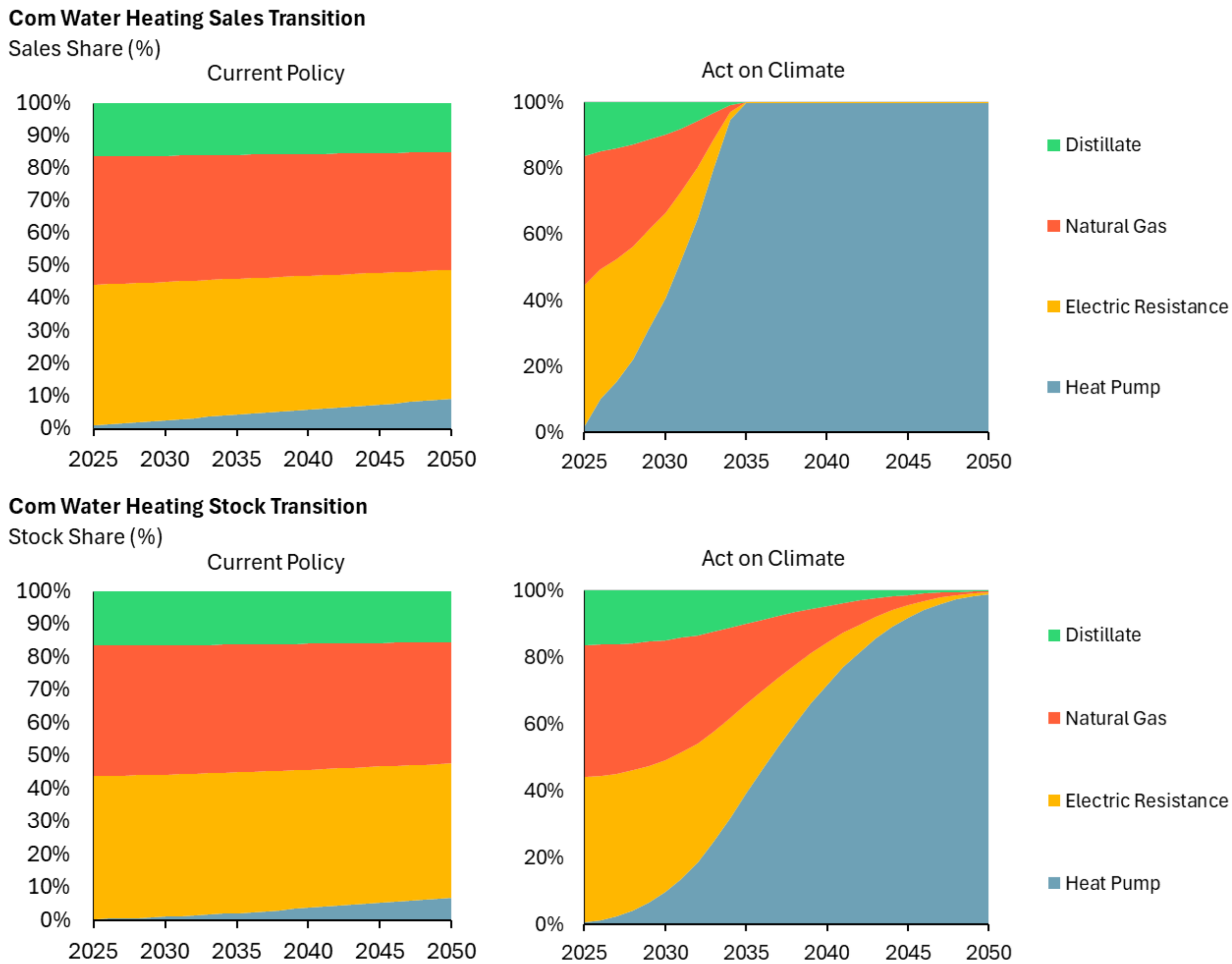


Figure 7: Light-Duty Vehicle Sales and Stocks by Vehicle Type (%)

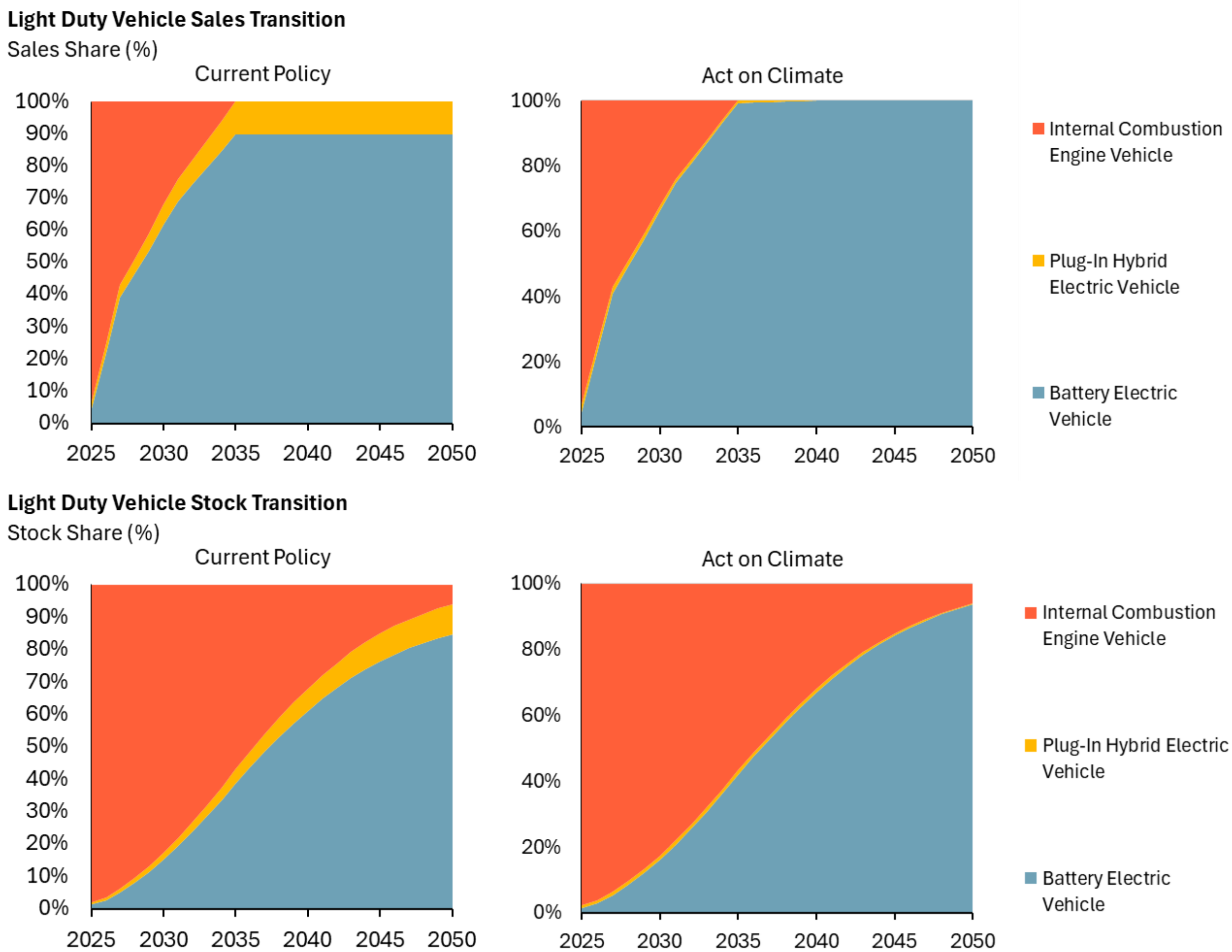


Figure 8: Medium- and Heavy-Duty Vehicle Sales by Vehicle Type (%)

Final Energy Demand Outputs

The figures below show final energy demand for the buildings, industry, and transportation sectors, along with a figure showing economy-wide final energy demand across all sectors by scenario.

Figure 9: Final Energy Demand in Buildings

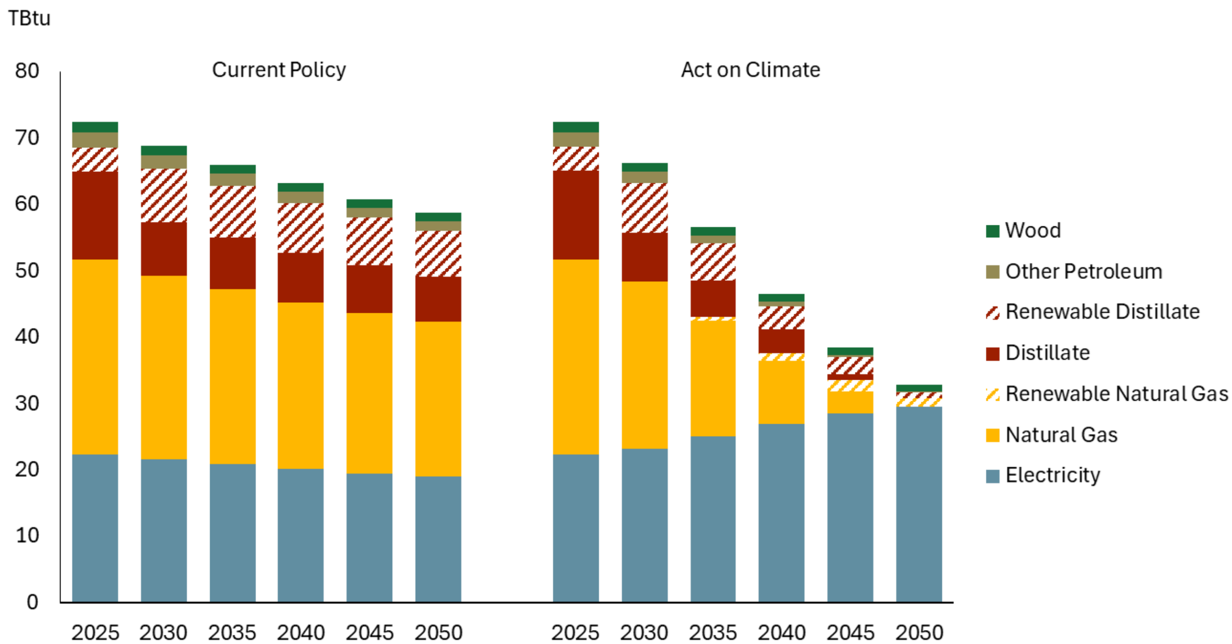


Figure 10: Final Energy Demand in Industry

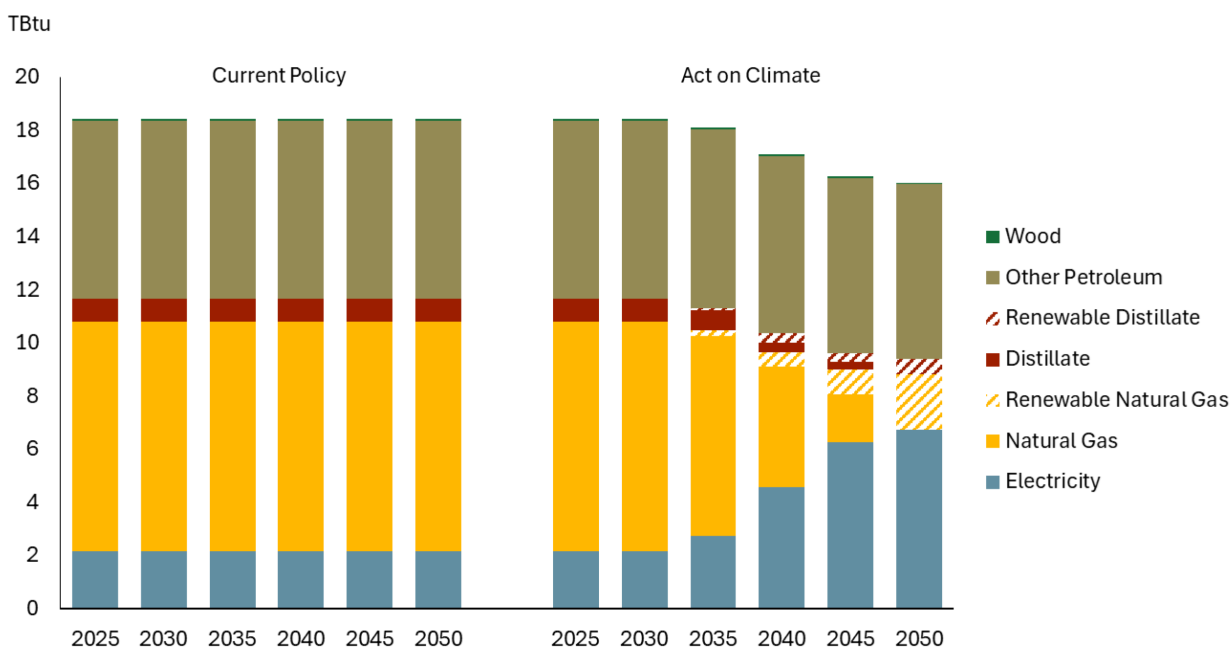


Figure 11: Final Energy Demand in Transportation

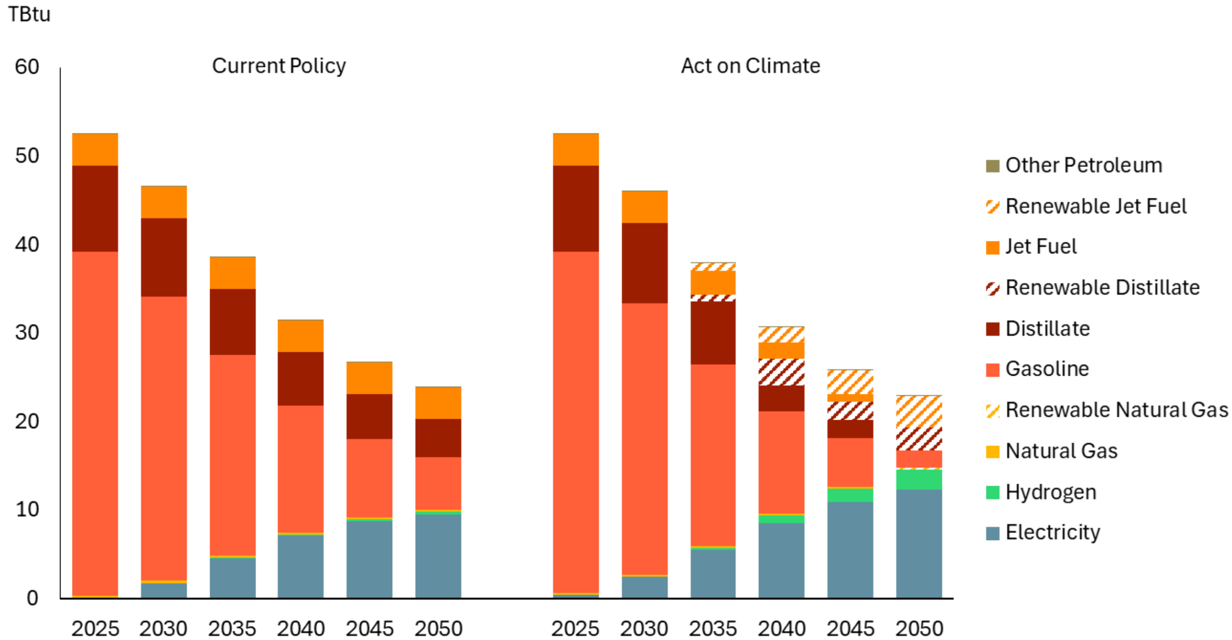
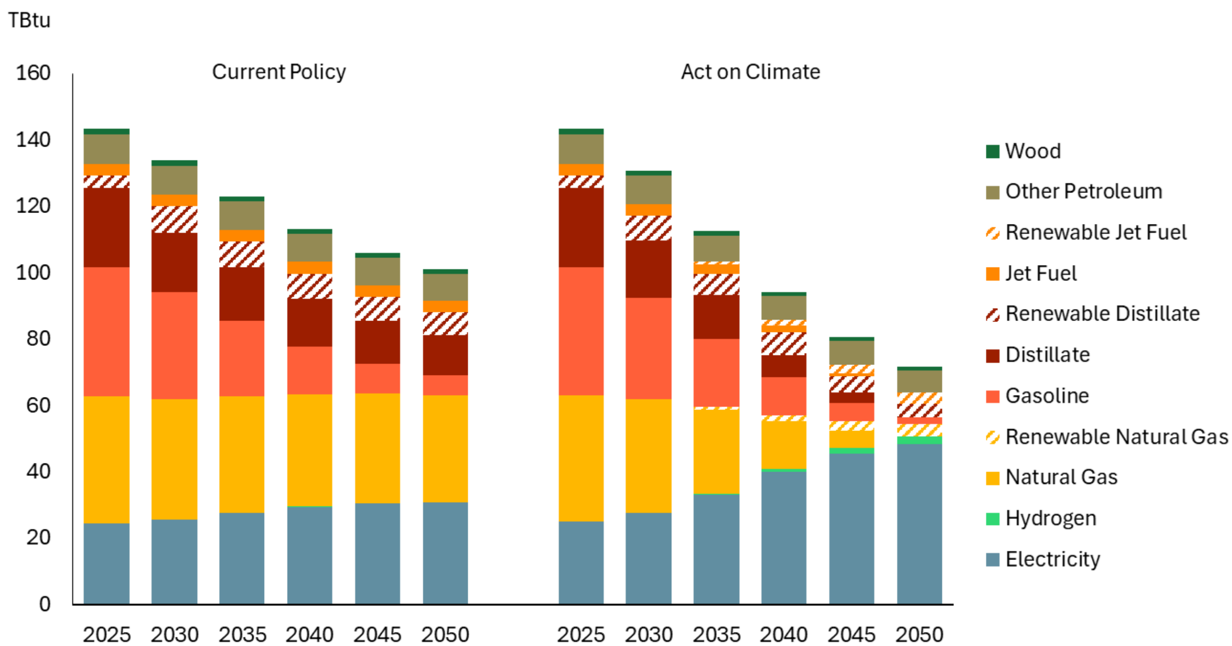


Figure 12: Final Energy Demand Across All Sectors

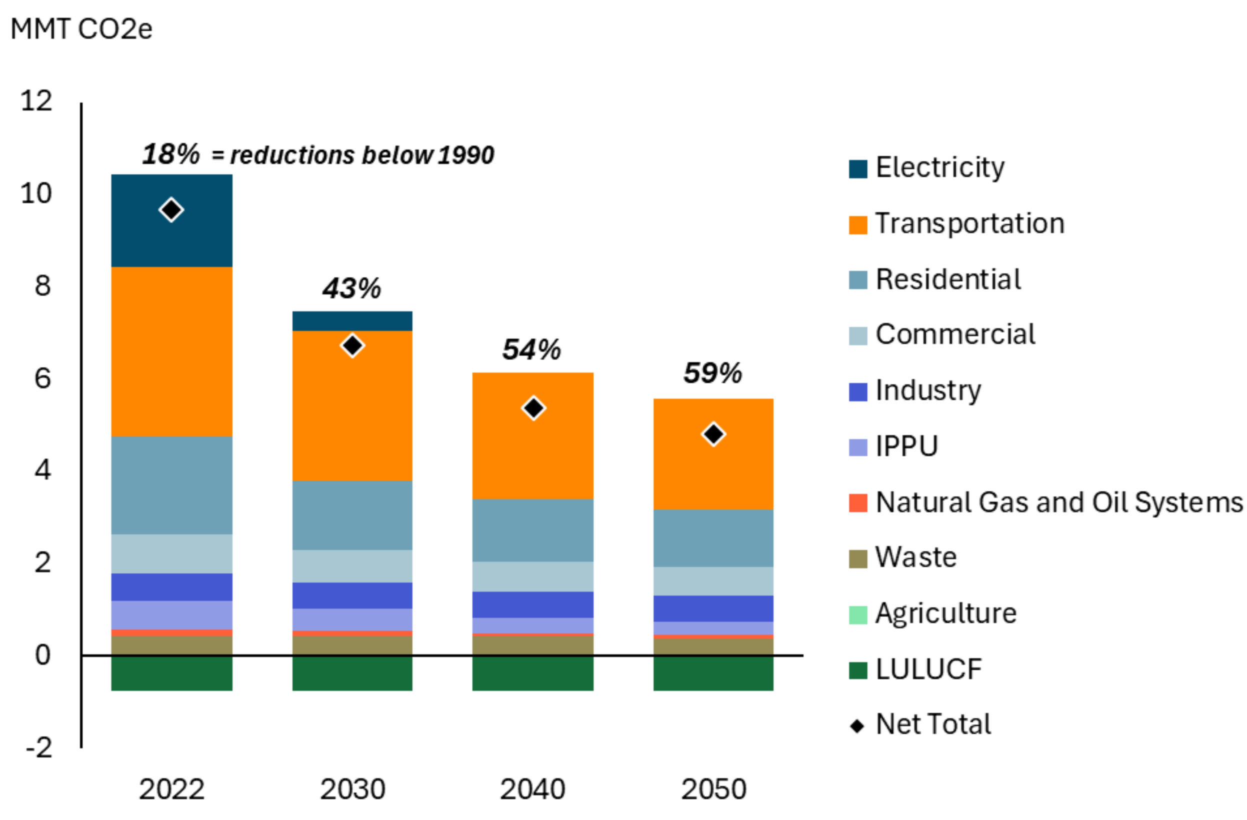


Current Policy without ZEV Waiver Scenario Sensitivity

The Advanced Clean Cars II (ACC II) and Advanced Clean Trucks (ACT) programs are made possible through California's Clean Air Act waiver granted by the U.S. Environmental Protection Agency (EPA), which allows the state to implement stronger vehicle emissions standards than federal regulations. However, Congress has recently attempted to revoke this authority, which could significantly impact state-level climate progress. These programs are critical for RI to meet its 2030 GHG reduction goals and to continue advancing toward its 2040 and 2050 climate targets.

To evaluate the uncertainty surrounding the implementation of these programs, the modeling team conducted a sensitivity analysis examining the effects of current policy **without** the programs enabled by the California Zero Emission Vehicle (ZEV) waiver. In this alternative current policy scenario, ZEV adoption is driven by ongoing DRIVE EV incentives and market shifts, reaching approximately 7% of total vehicles on the road by 2030 and 30% by 2050 –equivalent to about 53,000 ZEVs in 2030 and 270,000 by 2050. Under these assumptions, emissions are reduced by 43% by 2030, falling short of the target by 2%, and by 54% and 59% in 2040 and 2050, respectively (Figure 13).

Figure 13: GHG Emissions by Sector for Current Policy without ZEV Waiver Scenario



Carbon Reduction Strategy Details

The following section describes the individual carbon reduction strategies modeled as part of the Climate Action Strategy, and provides a policy overview, modeling assumptions and quantified greenhouse gas (GHG) reductions for each. The regulatory authority or authorities responsible for implementing the strategy in Rhode Island are also identified, and there is a description of the funding availability, equity and justice considerations, and implementation timeline for each strategy.

Carbon reduction strategy GHG reduction potential was also modeled in Pathways. These individual strategies were run as sensitivities in the Pathways model as ***incremental*** to the Current Policy scenario.

Electricity

Policy Overview

Rhode Island has established a statutory target for achieving 100% of electricity sales from renewable energy sources by 2033. This target was set through legislation passed in 2022, which expanded the original 2004 Renewable Energy Standard (RES).[33] Under the updated RES, electricity providers are required to increase the share of renewable energy in their supply mix incrementally each year, with the goal of reaching 100% by 2033.[34,35]

The RES is one component of Rhode Island's broader policy framework to reduce GHG emissions. In 2022, electricity consumption accounted for approximately 20% of statewide gross GHG emissions. As building and transportation electrification increases, the carbon intensity of the electric grid will become critical to reducing overall economy-wide emissions. The RES is intended to help ensure that electricity sector emissions will continue to decline, even as electricity demand grows.

The RES does not mandate the development of a specific amount of renewable generation within Rhode Island. Instead, it requires electricity suppliers to procure a growing share of electricity for retail sales from eligible renewable sources. This requirement can be met either through the direct purchase of renewable electricity or through the acquisition of Renewable Energy Certificates (RECs), which represent proof that one megawatt-hour of electricity was generated from an eligible renewable resource, such as wind or solar.

GHG Reductions from the RES

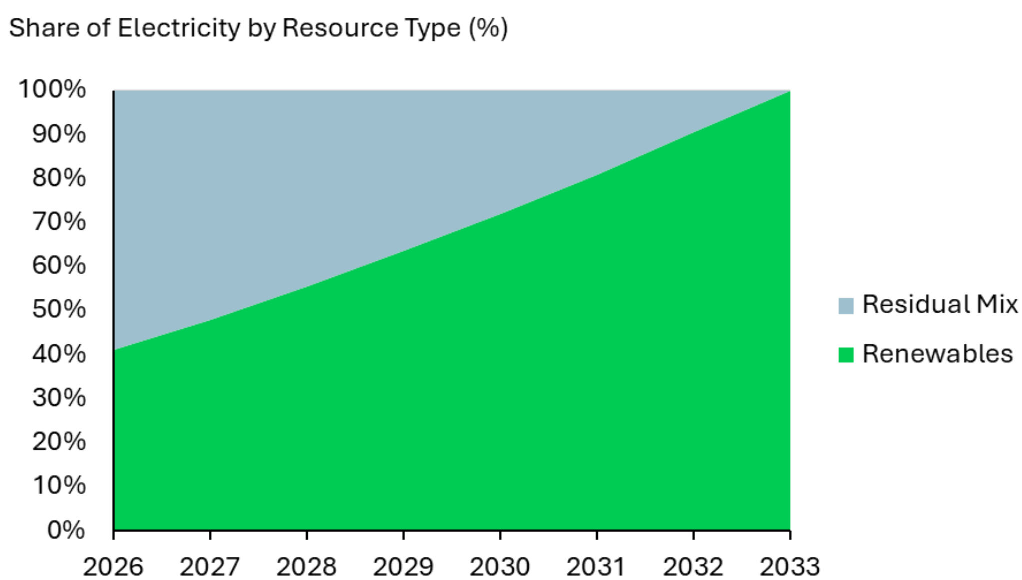
GHG emissions from the RES were modeled differently than the other carbon reduction strategies since these reductions are already included in the Current Policy scenario and are modeled in

[33] Rhode Island General Laws § 39-26-1–10 (2004).
[34] Rhode Island General Assembly, Senate Bill 2274Aaa, January Session (2022).
[35] Rhode Island General Assembly, House Bill 7277A, January Session (2022).

PLEXOS rather than Pathways. Thus, the emissions reductions from the RES were not modeled as incremental to the Current Policy scenario but rather are part of the Current Policy scenario assumptions.

The carbon emissions associated with electricity used in Rhode Island depend on the overall generation mix across New England.[36] Rhode Island's GHG accounting methodology dictates how electricity emissions are attributed to Rhode Island. In this methodology, any electricity that is not covered by the RES policy is assumed to come from a mix of ISO-NE system power, also referred to as the "residual mix." Figure 14 shows how Rhode Island's RES policy decreases the state's reliance on the ISO-NE residual mix between 2026 and 2033. It is worth noting that while Rhode Island's accounting methodology will drive emissions to near-zero levels by 2033 due to the RES, the ISO-NE system will continue to require thermal generation to maintain reliability for the foreseeable future, even after Rhode Island's RES reaches 100%.

Figure 14: Composition of Rhode Island Electricity while Meeting the Renewable Energy Standard



To calculate the emissions intensity of the residual mix, the GHG emissions from the ISO-NE grid are divided by the amount of "unclaimed" electricity. Other states and entities can "claim" electricity in Rhode Island's GHG accounting framework by retiring a Renewable Energy Certificate (REC), which represents proof that one megawatt-hour of electricity was generated from an eligible renewable or GHG-free resource. Other states in New England meet their renewable and clean energy policy targets by retiring RECs; Rhode Island's accounting methodology avoids double counting emissions reductions from these resources by removing their generation from the residual mix.

[36] Rhode Island Department of Environmental Management. (2025). *2023 Greenhouse Gas Inventory*; https://dem.ri.gov/sites/g/files/xkgbur861/files/2025-11/RIDEM-ghg-inventory-2023.pdf

An emissions factor for the electric sector was calculated using ISO-NE-wide generation mix results from PLEXOS. Consistent with the RI state GHG inventory methodology, emissions from the ISO-NE grid were divided by all "unclaimed" electricity generation.[37] All renewable energy generated within ISO-NE was considered "claimed" because other states are expected to use available renewable energy to comply with renewable policies. An additional amount of clean energy was "claimed" to reflect compliance with the Massachusetts clean energy standard.

Regulatory Authority

The implementation of the RES is led by the Office of Energy Resources (OER) and the Public Utilities Commission (PUC), with legislative authority provided by the General Assembly.

- OER supports statewide energy planning, renewable energy policy coordination, and stakeholder engagement efforts.
- The PUC oversees utility compliance, cost recovery processes, and integration of renewable procurement into electricity rates.
- Rhode Island Energy and other utilities are responsible for meeting procurement obligations and ensuring integration of renewable resources into the electricity system.

Adjustments to targets or compliance mechanisms remain within the purview of the General Assembly.

Funding Availability

Utilities recover the costs of renewable procurement and REC purchases through regulated rate structures, subject to PUC oversight.

Equity and Environmental Justice Considerations

As the RES is implemented, equity considerations could include:

- Improve access to renewable energy options for low- and moderate-income households.
- Expand participation in community solar and shared renewables, particularly for renters and residents in disadvantaged communities.
- Support resilience investments (such as battery storage and microgrids) in communities at greater risk of power disruptions.
- Promote workforce and contractor diversity within the clean energy sector.

Ratepayer impacts are monitored through regulatory proceedings, and cost-containment provisions are included in procurement processes to help mitigate potential burden on vulnerable households.

Implementation Strategy and Timeline

[37] *Ibid.*

The RES statute outlines a schedule of annual increases in renewable energy procurement obligations through 2033. Current implementation Pathways include:

- **Annual compliance milestones:** Utilities must demonstrate incremental progress each year to meet the 2033 target.
- **Offshore wind procurement:** Rhode Island is exploring the development of offshore wind resources to help meet long-term renewable energy needs.
- **Distributed energy expansion:** Continued investment in residential, commercial, and community-scale solar is supported through existing incentive programs and permitting improvements.
- **Grid modernization:** Updates to grid infrastructure including energy storage, smart grid technologies, and interconnection upgrades are being explored to accommodate higher levels of renewable generation.

Transportation

Figure 15: Transportation Sector Emissions by Strategy (ktCO2e)

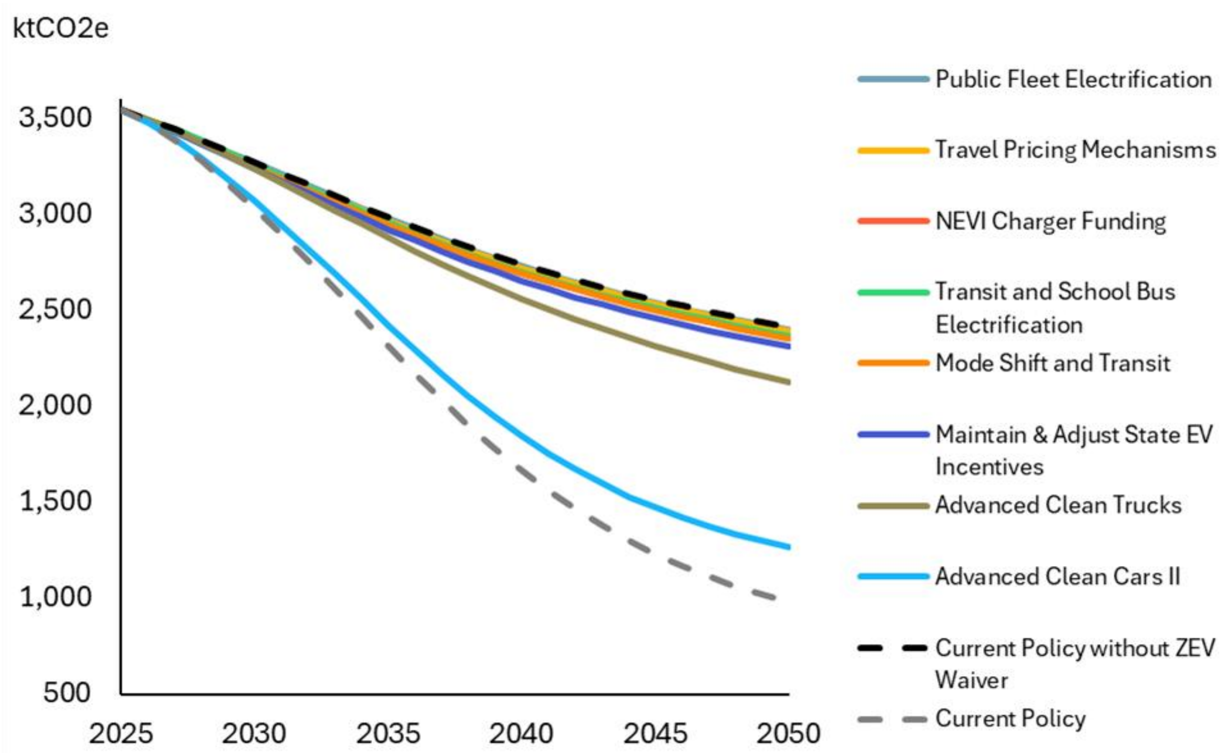


Table 9: Transportation Sector Emissions Reductions by Strategy (ktCO2e)

Strategy	2030	2040	2050	Cumulative
Public Fleet Electrification	0	10	20	200
Travel Pricing Mechanisms	20	20	20	500
NEVI Charger Funding	20	50	50	900

Strategy	2030	2040	2050	Cumulative
Transit and School Bus Electrification	10	40	40	700
Mode Shifting and Transit	20	50	60	1,000
Maintain and Adjust State EV Incentives	30	80	100	1,700
Advanced Clean Trucks (ACT)	40	180	290	3,700
Advanced Clean Cars II (ACCII)	200	890	1,140	17,200

Public Fleet Electrification

Policy Description

The electrification of public fleets operated by municipalities and state agencies is a potential strategy to support Rhode Island's climate and clean transportation goals. This strategy would require replacing internal combustion engine vehicles in state and municipal flees with battery electric vehicles (BEVs) or plug-in hybrid electric vehicles (PHEVs). The state would likely develop a fleet transition plan to prioritize the replacement of older or higher-mileage light-duty vehicles (LDVs), with the goal of eventually converting all vehicles including medium- and heavy-duty vehicles (MHDVs) where operationally feasible and when suitable electric models are available. Supportive charging infrastructure for the electrified public fleets would also be a component of this strategy.

Executive Order 23-06[38] already requires the transition of the state fleet to zero emission vehicles (ZEVs), and this strategy would continue the implementation of that order and expand to municipal fleets.

Modeling Assumptions and GHG Reductions

Detailed modeling for this strategy was conducted by the Rhode Island Department of Transportation (RIDOT) and Cambridge Systematics for the 2025 Rhode Island Climate Action Strategy transportation analysis. According to data from the Rhode Island Department of Administration Division of Capital Asset Management and Maintenance (DCAMM), the state currently operates 857 LDVs, 143 which have already been replaced with ZEVs, and roughly 50 MHDVs, mostly Class 3-4 trucks and vans. While municipal fleet data is unavailable, the EPA's MOtor Vehicle Emission Simulator (MOVES) model[39] input files indicate about 254 refuse trucks in Rhode Island, which are strong electrification candidates due to their stop-and-start patterns and predictable daily routes.

The public fleet vehicle replacements estimated by Cambridge Systematics were adjusted to determine the incremental electric vehicle market share in each year by dividing the annual public

[38] State of Rhode Island, Office of the Governor. Executive Order 23-06. https://governor.ri.gov/executive-orders/executive-order-23-06

[39] U.S. Environmental Protection Agency. Motor Vehicle Emission Simulator (MOVES). https://www.epa.gov/moves

fleet vehicle replacements by the annual sales for each vehicle class from the Pathways model. As a result, the annual sales share for electric vehicles is increased by 0.1% for light-duty vehicles, 0.2% for medium-duty vehicles (covering the Class 3-4 trucks and vans), and 5.9% for heavy-duty vehicles (covering the refuse trucks) for the period between 2026 and 2040 in the Pathways model. The study assumed that all vehicles would be fully electric BEVs and would not include plug-in hybrid or hydrogen fuel cell vehicles. The Pathways results indicate that under a public fleet electrification strategy, GHG emissions in the transportation sector could decline by around 600 ktCO2e between now and 2050 (Table 10).

Note that the detailed modeling for this strategy was conducted by the Rhode Island Department of Transportation (RIDOT) and Cambridge Systematics; additional information can be found on the RI climate change website.[40]

Table 10: Estimated GHG Reduction from Public Fleet Electrification (ktCO2e)

Strategy	2030	2040	2050	Cumulative
Public Fleet Electrification	0	10	20	200

Regulatory Authority

It is assumed that state fleet electrification would continue to be led by the RI Department of Administration Division of Capital Asset Management and Maintenance. Individual municipalities would need to lead the planning for the electrification of their own fleets. The OER and RIDOT may play supporting roles by offering planning guidance, developing technical resources, and helping connect local governments with funding opportunities.

- OER may assist with statewide strategy alignment, EV procurement planning, and the development of shared tools to support local transitions.
- RIDOT could provide input on infrastructure planning and support for specialized or heavy-duty fleet segments.
- Municipal governments retain authority over procurement decisions and fleet operations.

Additional legislative or executive guidance could be explored to enhance coordination, standardize procurement processes, or enable regional fleet collaboration.

Funding Availability

A range of federal and state funding mechanisms may be available to support public fleet electrification. These could include competitive grants under the Infrastructure Investment and Jobs Act (IIJA) or public-private financing tools.[41] Coordination across agencies may help ensure equitable access to these resources.

Equity and Environmental Justice Considerations

[40] Available on the RI Climate Change website at https://climatechange.ri.gov/act-climate/2025-climate-update under Technical Documentation & Materials.
[41] The state is monitoring the availability of federal funding.

Some equity considerations for public fleet electrification could include:

- Prioritizing fleet upgrades in overburdened communities, particularly for refuse trucks, school buses, and transit vehicles.
- Providing technical assistance to municipalities with limited staffing or administrative capacity.
- Supporting workforce development initiatives focused on EV maintenance, infrastructure installation, and clean transportation careers in underserved communities.
- Designing procurement strategies that promote equitable vendor participation, including from minority- and women-owned businesses.

Implementation Strategy and Timeline

Rhode Island will continue to replace state fleet vehicles following the Governor's Lead By Example Executive Order, reaching 25% zero-emission vehicles by 2030. We can explore working with municipalities to address fleet transition on a city and town level beginning in 2026.

Best Practices from Other Jurisdictions

Rhode Island may draw from models implemented in other states to inform potential next steps. For example, Massachusetts has supported municipal fleet transitions through grant programs and centralized planning tools,[42,43] while California has paired statewide mandates[44] with workforce development and technical support.[45] Adapting these strategies to Rhode Island's governance structure, resource landscape, and equity priorities could help advance public fleet electrification in a way that is coordinated, inclusive, and responsive to local needs.

Travel Pricing Mechanisms

Policy Overview

Travel pricing mechanisms seek to reduce vehicle miles traveled (VMT) and support a shift toward more sustainable transportation modes to reduce GHG and criteria air pollutant (CAP) emissions. These mechanisms could potentially include:

- **Mileage-based user fees**, which would replace lost fuel tax revenue by charging light-duty electric and plug-in hybrid vehicles annually based on miles driven, at a rate equivalent to the lost motor fuel tax.

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[42] Massachusetts Department of Environmental Protection (MassDEP). *MassEVIP Fleets Incentives Program*. https://www.mass.gov/how-to/apply-for-massevip-fleet-vehicles-incentives

[43] Massachusetts Clean Energy Center (MassCEC). *Mass Fleet Advisor Program*. https://www.massfleetadvisor.org/the-program/

[44] California Air Resources Board (CARB). *Advanced Clean Fleets Regulation – State and Local Government Agency Fleet Requirements*. https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-fleets-regulation-state-local-government-agency-fleet

[45] Metropolitan Transportation Commission (MTC). *Public Fleet Electrification Planning Assistance Program*. https://mtc.ca.gov/planning/transportation/transportation-electrification/public-fleet-electrification-planning-assistance-program

- **Congestion pricing**, which would charge drivers higher fees during peak travel times or in congested areas to reduce traffic and encourage use of other travel modes or off-peak trips. It can take forms such as cordon pricing (e.g., Manhattan, London, Singapore) or time-varying tolls on express or high-occupancy/toll (HOT) lanes to maintain free-flow traffic.
- **Cap-and-invest programs**, which would set a declining limit on GHG emissions from vehicles, auctions allowances, and then invest the proceeds into decarbonization initiatives, which would result in an implied carbon price for fossil transportation fuels.

All travel pricing mechanisms can encourage behavioral shifts, reduce vehicle miles traveled, manage congestion, and raise revenue for transit and emission-reduction investments. While each strategy varies in design and impact, all aim to internalize the societal costs of driving, particularly GHG emissions and traffic congestion.

Modeling Assumptions and GHG Reductions

The travel pricing mechanisms modeling effort was conducted by RIDOT and Cambridge Systematics as part of the 2025 Rhode Island Climate Action Strategy transportation analysis. Travel pricing mechanisms lead to emissions reductions by reducing VMT over time. The VMT reductions estimated by Cambridge Systematics are:

- Mileage-based user fees: 8.5 million VMT in 2030, up to 45.6 million VMT in 2050
- Congestion pricing: 12.6 million VMT in 2030, up to 12.9 million VMT in 2050
- Cap-and-invest: 37.5 million VMT in 2030, 7.3 million VMT in 2050 (assuming ACC II and ACT are in place; VMT reductions decrease over time because only fossil fueled vehicles are impacted by the carbon price)

Outputs from the Cambridge Systematics modeling were incorporated into the state's broader Pathways emissions modeling framework. For this analysis, only the VMT reductions from congestion pricing are included in the GHG reduction results. The total annual VMT reductions from congestion pricing estimated by Cambridge Systematics were applied to the total annual VMT for light-duty vehicles in the Current Policy scenario. The result is a steadily increasing reduction in total annual VMT for light-duty vehicles that starts at a 0.8% reduction in 2028 and increases to 1.6% by 2050, with an average reduction of 1.2% over the period. Based on this reduction in VMT, it is estimated that congestion pricing could reduce transportation GHG emissions by 500 ktCO2e by 2050 (Table 11).

Table 11: Estimated GHG Reduction from Travel Pricing Mechanisms (ktCO2e)

Strategy	2030	2040	2050	Cumulative
Travel Pricing Mechanisms	20	20	20	500

It's important to note that these results reflect planning-level estimates based on assumptions about pricing elasticity, time-of-day travel behavior, and regional VMT patterns. The modeling also does not account for potential reductions from avoided trips or wider adoption of transit if paired with complementary investments.

Note that the detailed modeling for this strategy was conducted by the Rhode Island Department of Transportation (RIDOT) and Cambridge Systematics; additional information can be found on the RI climate change website.[46]

Regulatory Authority

Implementation would likely involve multiple agencies depending on the mechanism. Mileage-based user fees could be administered by the Rhode Island Division of Taxation in partnership with RIDOT. Congestion pricing would likely require enabling legislation from the General Assembly and would be implemented by RIDOT, potentially in collaboration with regional transportation authorities. A cap-and-invest program would require administrative action (e.g., a rulemaking to establish the program) and legislative approval for spending authority, with the program itself potentially administered by the OER and RI Division of Taxation.

Funding Availability

Each of these mechanisms serves not only as a pricing signal but also as a potential revenue source. Mileage-based user fees are designed to replace lost fuel tax revenues and ensure that all drivers contribute equitably to infrastructure costs, particularly as EV adoption increases. Congestion pricing would generate ongoing revenue that could be reinvested in public transit, road maintenance, and other mitigation strategies. Cap-and-invest programs could generate approximately $34 million annually by 2030, with proceeds available to fund a wide range of decarbonization and equity-focused transportation projects. While these programs would generate revenues, there would be some annual administration costs for implementation. Federal funding from the Infrastructure Investment and Jobs Act (IIJA) may support initial implementation and planning efforts, especially pilot programs.[47]

Equity and Environmental Justice Considerations

While travel pricing strategies can support decarbonization, they also raise important equity considerations. Lower-income households and environmental justice communities may be disproportionately impacted if pricing mechanisms are not carefully designed. To mitigate these effects, revenues should be reinvested in ways that directly benefit overburdened communities, such as into affordable public transit, active transportation infrastructure, and EV incentives for low-income drivers. Transparent engagement processes and tailored exemptions (for example, essential workers or low-income commuters) may help reduce burdens and build public trust. Special attention should be paid to ensuring that rural and transit-poor areas are not unfairly disadvantaged.

Key equity considerations and potential mitigation strategies include:

- Discounts or exemptions for low-income drivers, residents living in pricing zones, and people with disabilities.

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[46] Available on the RI Climate Change website at https://climatechange.ri.gov/act-climate/2025-climate-update under Technical Documentation & Materials.
[47] The state is monitoring the availability of federal funding.

- Targeted reinvestment of program revenues into frontline communities for example, through fare-free or reduced-fare transit, improved bus service, and first-/last-mile connections.
- Public engagement that centers community voices, with outreach materials in multiple languages and formats.
- Data disaggregation and evaluation to monitor who pays, who benefits, and how outcomes differ across populations.

Implementation Strategy and Timeline

Legislative and/or regulatory authority will need to be obtained to move this type of measure ahead in 2026 or future years. While this matter is under discussion and consideration, RIDEM and the RIEC4 can continue to address/discuss the benefits such a proposal will bring to Rhode Island. Best practices from other jurisdictions will be examined.

Best Practices from Other Jurisdictions

Rhode Island can draw on lessons from a range of jurisdictions that have piloted or implemented similar programs. Oregon's OReGO program[48] and Utah's pilot[49] demonstrate how mileage-based user fees can be used to sustain road funding as fuel tax revenues decline, while also encouraging more thoughtful driving behavior. New York's implementation of congestion pricing in Manhattan[50] offers valuable insights into potential applications in dense urban areas of Rhode Island, such as downtown Providence, where peak-period congestion is most acute. California and Quebec's participation in the Western Climate Initiative[51] highlights the operational viability of cap-and-invest programs, while Vermont's ongoing program design[52] offers a useful peer example for Rhode Island. In all cases, phased implementation, strong public engagement, and equitable reinvestment of revenues have proven essential to success.

NEVI Charger Funding

Policy Overview

Rhode Island is exploring the potential to expand its EV charging infrastructure through continued implementation of the federal National Electric Vehicle Infrastructure (NEVI) program and related federal grant opportunities, such as the Charging and Fueling Infrastructure (CFI) discretionary grant program. This strategy would support the buildout of direct current fast charging (DCFC) stations

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[48] Oregon Department of Transportation. OReGO: Oregon's Road Usage Charge Program. https://www.oregon.gov/odot/programs/pages/orego.aspx
[49] Utah Department of Transportation. Road Usage Charge Program. https://www.roadusagechargeutah.org/
[50] Metropolitan Transportation Authority (MTA). Central Business District Tolling Program (New York City). https://www.mta.info/project/CBDTP
[51] Western Climate Initiative, Inc. (California & Québec). Linking Agreement: Québec–California Carbon-Markets Integration. https://www.environnement.gouv.qc.ca/communiques_en/2013/c20131105-carbon.htm
[52] Vermont Department of Motor Vehicles / Vermont Agency of Transportation. Mileage-Based Fee Program (in design) – Vermont EV User Fee Transition Briefing. https://afdc.energy.gov/laws/13265

and Level 2 chargers along key travel corridors and in underserved areas to enable longer-distance EV travel, reduce range anxiety, and help accelerate statewide EV adoption.

By coordinating siting, installation, and long-term maintenance of EV charging stations, this strategy aims to improve the accessibility, reliability, and equity of charging infrastructure across the state. As part of Rhode Island's broader decarbonization efforts, continued investment in public charging could provide foundational support for meeting transportation sector emissions targets, particularly when combined with complementary vehicle-side policies and incentives.

Modeling Assumptions and GHG Reductions

The Rhode Island Department of Transportation (RIDOT), in collaboration with Cambridge Systematics, conducted detailed modeling of the NEVI and related programs to assess their potential impact on EV uptake and GHG reductions. Additional information can be found on the RI climate change website.[53]

The modeling for this strategy assumes the full implementation of the NEVI and CFI programs. Cambridge Systematics modeled that the NEVI funds would lead to the installation of around 280 150 kW DCFC chargers and the CFI funds could support about 3,100 new charging ports with an 80/20 split between Level 2 and 50 kW DCFC chargers. All chargers were assumed to be operational by 2028.

The impact of NEVI funding and charger deployment on EV sales was estimated primarily using estimates from Buckberg & Cole, 2025,[54] who found that NEVI would be responsible for increasing EV market share around 3% by 2030 for the United States. As a result, the annual sales share for light-duty EVs was increased by this amount through 2050 in the Pathways model, with the assumption that all incremental sales would be fully electric BEVs. This leads to around 1,600 incremental EV sales each year, with ongoing GHG emissions reductions of about 20 ktCO2e per year. If implemented as modeled, this strategy is estimated to result in an estimated 900 ktCO2e of cumulative GHG reductions by 2050 from increased EV adoption and reduced gasoline consumption (Table 12). While this increased charging infrastructure alone will not achieve the state's full EV adoption goals, it is considered a necessary foundation that can be paired with vehicle-based strategies such as manufacturer sales requirements and purchase incentives.

Table 12: Estimated GHG Reduction from NEVI Charger Funding (ktCO2e)

Strategy	2030	2040	2050	Cumulative
NEVI Charger Funding	20	50	50	900

Regulatory Authority

[53] Available on the RI Climate Change website at https://climatechange.ri.gov/act-climate/2025-climate-update under Technical Documentation & Materials.

[54] Salata Institute (Harvard). Quantifying Trump's Impacts on EV Adoption. https://salatainstitute.harvard.edu/quantifying-trumps-impacts-on-ev-adoption/

Implementation of the EV infrastructure strategy would likely continue under the leadership of the OER, in collaboration with RIDOT, municipalities, and private sector charging providers. OER has overseen past programs such as Electrify RI [55] and PowerUpRI [56] and would likely continue administering grant programs and disbursing funds from NEVI and related sources.

Funding Availability

The primary funding ($54M total) for this strategy comes from two federal sources[57]:

- NEVI Program: Rhode Island has been allocated $28.5 million in NEVI funds through 2026, with an additional round of $8M open for application.
- CFI Program: RIDOT was awarded $15 million in August 2024, requiring a 20% local match.

Together, these programs could support over 3,400 new charging ports by 2028. The implementation of this program is contingent on the disbursement of funding from these federal programs. Additional funding may be needed to sustain growth beyond 2030 or to replace delayed or discontinued federal funds.

Equity and Environmental Justice Considerations

It is important that EV infrastructure is equitable to ensure all communities benefit from transportation decarbonization. Some considerations to ensure the equitable implementation of charging infrastructure include:

- The prioritization of siting in historically underserved neighborhoods, rural areas, and environmental justice communities.
- Exploring workforce development partnerships to expand job opportunities in infrastructure installation, maintenance, and site operations, particularly for residents of frontline communities.
- Considering equitable access to charging stations for renters, multifamily buildings, and low-income drivers.

Implementation Strategy and Timeline

RI's NEVI program continues to invest in local charging infrastructure opportunities. NEVI Phase 2A has accepted applications for funding and expects to make awards in coming months (late 2025/early 2026). This program is contingent upon the availability of continued federal funding.

Best Practices from Other Jurisdictions

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[55] Rhode Island Office of Energy Resources (RI OER). Electrify RI Program. https://energy.ri.gov/transportation/electric-vehicles/electrify-ri

[56] Rhode Island Office of Energy Resources & Rhode Island Infrastructure Bank. PowerUpRI Rebate Program. https://drive.ri.gov/powerupri

[57] Federal climate and infrastructure funding programs are subject to periodic reauthorization, budget appropriations, and administrative priorities. As a result, future funding availability and program criteria may change.

Several states offer useful models for Rhode Island as the state expands EV charging infrastructure under the NEVI program. For example, California[58] and New York[59] have integrated equity into their strategies by prioritizing charger deployment in disadvantaged and historically underserved communities. These efforts help ensure that low-income drivers and frontline neighborhoods benefit from the transition to electric vehicles. Colorado[60] and Washington[61] have adopted reliability standards to ensure that chargers funded with public dollars remain functional, accessible, and easy to use over time, key principles that align with NEVI requirements. In addition, many states are using competitive grant processes and public-private partnerships to deploy infrastructure efficiently while leveraging private investment and technical expertise. These examples demonstrate how thoughtful program design and oversight can help states meet both transportation decarbonization and equity goals. Rhode Island can continue building on these best practices by tailoring implementation to the state's unique geographic, utility, and community contexts.

Transit & School Bus Electrification

Policy Overview

This strategy focuses on replacing Rhode Island Public Transit Authority (RIPTA) transit buses and school buses statewide with electric buses to reduce GHG emissions and increase co-benefits – like improved air quality. A fleet transition plan could prioritize older and higher-mileage vehicles for replacement first, with the goal of eventually converting the entire fleet as vehicles reach the natural end of their service life depending on the age of the fleet and program target years. The transition would be supported by investments in charging infrastructure, such as including depot-based chargers for overnight charging. According to the National Transit Database, the RIPTA service fleet consists of approximately 360 vehicles, including 243 fixed-route buses, 89 demand response vehicles, and 28 vans.

In addition to the transit fleet, the strategy includes electrification of approximately 1,439 school buses operating across the state, as estimated from the EPA MOVES model. The state could play an important role by providing funding, incentives, or technical assistance to help school districts plan and implement their fleet transitions.

Modeling Assumptions and GHG Reductions

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[58] California Energy Commission (CEC). California Opens $55 Million Incentive Program to Expand Public Electric Vehicle Fast Charging. August 5, 2025. https://www.energy.ca.gov/news/2025-08/california-opens-55-million-incentive-program-expand-public-electric-vehicle

[59] Governor Kathy Hochul. Advancement of Program to Deploy More Than 50,000 New EV Charging Ports Across the State. November 18, 2021. https://www.governor.ny.gov/news/governor-hochul-announces-advancement-program-deploy-more-50000-new-ev-charging-ports-across

[60] Colorado Senate Democrats. Legislation to Protect Consumers, Improve EV Charging Oversight Passes Committee. April 28, 2025. https://www.senatedems.co/newsroom/legislation-to-protect-consumers-improve-ev-charging-oversight-passes-committee

[61] Washington State Department of Commerce. Electric Vehicle Charging – Reliability and Accessibility Accelerator. January 2025.

RIDOT, in collaboration with Cambridge Systematics, conducted detailed modeling of transit and school bus electrification; additional information can be found on the RI climate change website.[62]

Cambridge Systematics used the Transportation Efficiency and Carbon Reduction Tool (TEA-CART) to model the transit and school bus replacement.

For modeling purposes, it was assumed that both transit and school bus fleets begin electrification in 2028 and achieve full conversion by 2040, with as many vehicles replaced on a natural "burnout" schedule as possible. By 2040, the modeling assumes full replacement of 360 transit buses and 1,439 school buses with electric models, representing a complete transition to zero-emission public transit and school buses in Rhode Island. To achieve this replacement, the annual share of electric vehicles for new bus sales increases to 85% in the Pathways model, and a small share (~3%) of existing diesel buses must be replaced before their natural burnout due to the long lifetime of buses.

Transitioning to electric transit and school buses is estimated to yield cumulative reductions of approximately 700 ktCO_2e by 2050 (Table 13).

Table 13: Estimated GHG Reduction from Transit & School Bus Electrification (ktCO2e)

Strategy	2030	2040	2050	Cumulative
Transit and School Bus Electrification	10	40	40	700

Regulatory Authority

Responsibility for advancing transit and school bus electrification may be shared among several agencies:

+ RIPTA oversees procurement and operation of the state's public transit fleet.
+ Rhode Island Department of Education (RIDE) supports school districts in managing student transportation and may assist in the transition to electric school buses.
+ OER provides technical assistance and/or funding programs for school districts.

Funding Availability

This strategy currently does not have existing funding available. However, RIPTA and school districts could see net operating cost savings due to the lower cost of electricity compared to gasoline and diesel.

Equity and Environmental Justice Considerations

Potential equity considerations for designing and implementing a transit and school bus electrification strategy include:

[62] Available on the RI Climate Change website at https://climatechange.ri.gov/act-climate/2025-climate-update under Technical Documentation & Materials.

- **Pollution burden relief:** Prioritizing vehicle deployment in communities near highways, transit hubs, and schools in overburdened areas may help address long-standing air quality and public health disparities.
- **Job creation and workforce access:** Transitioning to electric buses may generate new employment opportunities in EV maintenance, charging infrastructure, and related sectors. Workforce development programs could focus on engaging historically underserved populations.
- **Access to clean transportation:** As fleets are upgraded, it will be important to maintain or improve the quality and reliability of transit services in overburdened communities.

Implementation Strategy and Timeline

The RI Public Transit Authority (RIPTA) recently was awarded a $25M grant from the No-Low emission grant program to purchase up to 25 new hybrid electric busses for its fleet. As funding becomes available, RIPTA will continue to add electric busses to its fleet as well. RIDEM continues to act as a resource for distribution of Diesel Emission Reduction Act (DERA) funds which can support new electric school buses for RI communities. Future DERA funding, if awarded, can continue to support future electric school bus purchases in RI.

Best Practices from Other Jurisdictions

Rhode Island may benefit from drawing on the experiences of other jurisdictions that have already begun transitioning to electric transit and school bus fleets. In California, agencies such as Los Angeles Metro and Alameda County Transit have implemented hybrid depot and on-route charging systems to enhance operational efficiency,[63,64] pairing these efforts with workforce training programs and close coordination with utilities. New York State's Environmental Bond Act[65] provides an example of how policy mandates can be paired with dedicated funding streams, including a statewide requirement for school bus electrification by 2035. Maine's emphasis on early deployment of electric school buses in rural areas[66] highlights the importance of tailoring strategies to local conditions and engaging communities early in the planning process. In colder climates, testing conducted in cities such as Montreal[67] and Chicago offers valuable insights into maintaining battery performance and charging reliability during winter months, which may be particularly relevant for Rhode Island. Additionally, national initiatives such as the Electric School Bus Initiative[68] offer publicly available toolkits, procurement templates, and technical guidance that could support efficient and equitable implementation in Rhode Island.

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[63] Alameda-Contra Costa Transit District (AC Transit). Zero Emission Program. https://www.actransit.org/zeb

[64] California Energy Commission (CEC). GTrans Zero-Emission Repower Bus Project. https://www.energy.ca.gov/publications/2020/gtrans-zero-emission-repower-bus-project

[65] New York State Energy Research and Development Authority (NYSERDA). Electric School Buses. https://www.nyserda.ny.gov/All-Programs/Electric-School-Buses

[66] Maine Department of Education / Maine Department of Environmental Protection. Maine Clean School Bus Program – "A Path Forward for Rural Maine." https://www.maine.gov/doe/schools/transportation/cleanbus

[67] Société de transport de Montréal (STM). Long-range electric bus passes winter conditions test! https://www.stm.info/en/press/news/2020/long-range-electric-bus-passes-winter-conditions-test-

[68] U.S. Environmental Protection Agency (EPA). Clean School Bus Program

Mode Shift and Transit

Policy Overview

Encouraging a shift in transportation modes represents another strategy to advance climate goals in Rhode Island and enhance equitable access to clean, efficient mobility. Mode shifting is transitioning daily travel from single occupancy vehicles to alternatives such as public transit, biking walking, and shared mobility, which can reduce emissions, improve public health, and support accessibility. The following mode shift and VMT reduction strategies were included in the detailed modeling for this strategy:

- Active transportation infrastructure
- Micromobility programs, services, and incentives
- Expanded public transit services
- Travel demand management (TDM) programs
- Transportation-efficient land-use patterns

Modeling Assumptions and GHG Reductions

RIDOT, in collaboration with Cambridge Systematics, conducted detailed modeling of mode shift and transit. High level modeling methodology for each of the sub-strategies are outlined below, with additional information on the RI climate change website.[69]

- **Active transportation infrastructure** used TEA-CART to explore new active transportation infrastructure, such as shared-use paths, bicycle lanes, and new/improved sidewalks
- **Micromobility programs** relied on geospatial data of bike share locations and population density
- **Expanded transit services** used ridership estimates from RIPTA to feed into TEA-CART
- **Travel demand management programs** used the TEA-CART tool for employer-based travel demand management
- **Transportation-efficient land use patterns** were evaluated using TEA-CART with inputs including the acreage of land rezoned for higher-density mixed use development and assumptions about VMT per capita for areas with mixed-use areas

Overall, mode shift and transit strategies help to reduce emissions by decreasing reliance on single-occupancy vehicles, the largest source of transportation-related emissions in the state. Similar to the methodology for travel pricing mechanisms, the total annual VMT reductions from the suite of mode shifting and transit measures estimated by Cambridge Systematics were applied to the total annual VMT for light-duty vehicles in the Current Policy scenario. The result is a steadily increasing reduction in total annual VMT for light-duty vehicles that starts at a 0.7% reduction in 2028 and increases to a 4.6% reduction by 2050, with an average reduction of 2.7% over the period. There is

[69] Available on the RI Climate Change website at https://climatechange.ri.gov/act-climate/2025-climate-update under Technical Documentation & Materials.

also a corresponding increase in bus VMT that starts at 0.8% in 2028 and rises to 7.3% by 2050, with an average increase of 4.1% over the period.

The cumulative GHG reduction potential mode shift and transit strategies is estimated to be 1,000 ktCO2e through 2050 (Table 14).

Table 14: Estimated GHG Reduction from Mode Shift and Transit (ktCO2e)

Strategy	2030	2040	2050	Cumulative
Mode Shift and Transit	20	50	60	1,000

Regulatory Authority

Authority to implement mode shift and transit strategies is shared across several entities in Rhode Island:

- RIDOT would oversee planning and investment in active transportation infrastructure.
- RIPTA would manage public transportation services and would be a central actor in any transit service expansion.
- The Rhode Island Department of Statewide Planning would likely support efficient land-use development changes
- Municipalities would play a key role in micromobility implementation

Funding Availability

Current funding availability is mixed. Some elements of mode shift, such as pedestrian and bicycle infrastructure, are supported through existing state transportation programs. Rhode Island also has an existing e-bike incentive program administered by the OER, which could complement broader micromobility efforts.

However, large-scale transit improvements, such as rapid bus or light rail, are not currently funded, and new revenue sources would likely be required. Federal funding opportunities, such as those offered through the Bipartisan Infrastructure Law (BIL), could be leveraged for future capital investments, planning efforts, and pilot projects. The 2025 BIL application rounds closed in June, but similar programs may offer future opportunities[70]. Green bonds or sector specific fees including congestion pricing or mileage-based user fees could provide potential financing solutions.

Equity and Environmental Justice Considerations

Mode shift and transit strategies offer many equity benefits, particularly for communities that have been historically underserved by transportation infrastructure or that experience high transportation cost burdens. Improved transit access and walkable environments can:

- Expand access to jobs, schools, and healthcare
- Reduce household transportation costs

[70] The state is monitoring the availability of federal funding sources.

- Improve local air quality and public health

To ensure equitable outcomes, planning processes should be inclusive and community driven, with attention to the needs of residents without access to a personal vehicle. Special care should be taken to avoid displacement that may result from transit-oriented development in historically marginalized communities.

Implementation Strategy and Timeline

Rhode Island's Long Range Transportation Plan, Transit Master Plan, and Bike Mobility Plan all include goals, objectives, policies, and strategies for transportation modes throughout the state and include an analysis of anticipated federal and state transportation funding resources.[71]

Best Practices from Other Jurisdictions

Several states and cities have demonstrated the effectiveness of coordinated mode shift strategies that Rhode Island could look to as models. Massachusetts[72], for example, has invested significantly in separated bike lanes. Multimodal transit corridors, particularly in Portland[73] and Minneapolis,[74] have advanced comprehensive land use changes alongside micromobility programs, contributing to high biking and walking mode shares. In Los Angeles County, rapid bus network expansion is paired with affordable housing development near transit stations to support equitable access.[75] Meanwhile, Washington DC's bikeshare and e-bike programs benefit from strong regional coordination and community driven outreach.[76] Rhode Island could draw from these examples while tailoring its approach to local needs such as prioritizing compact development, inclusive planning processes, and the expansion of transit services in key corridors.

Maintain and Adjust State EV Incentives

Policy Overview

This policy explores the potential adjustment of Rhode Island's existing electric vehicle incentive program in light of the expiration of federal Inflation Reduction Act (IRA) EV tax credits in September 2025. As federal support winds down, state-level incentives may play an increasingly important role in sustaining EV adoption, particularly for low- and moderate-income consumers.

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[71] Additional details can be found at https://planning.ri.gov/planning-areas/transportation-0

[72] Massachusetts Department of Transportation (MassDOT). MassDOT Celebrates 15 Miles of New Shared-Use Paths Opened in 2024. https://www.mass.gov/news/massdot-celebrates-15-miles-of-new-shared-use-paths-opened-in-2024/

[73] City of Portland, Oregon (Portland Bureau of Transportation). Transportation System Plan (TSP). https://www.portland.gov/transportation/planning/tsp

[74] City of Minneapolis. Complete Streets Policy. https://www.minneapolismn.gov/government/departments/public-works/tpp/complete-streets/

[75] Los Angeles City Planning. Transit Oriented Communities Incentive Program. https://planning.lacity.gov/plans-policies/transit-oriented-communities-incentive-program

[76] District Department of Transportation (DDOT). District E-Bike Incentive Program. https://ddot.dc.gov/page/district-e-bike-incentive-program

Rhode Island's DRIVE EV program currently offers rebates of up to $1,500 per vehicle, funded through an annual allocation of approximately $2 million. However, to encourage higher levels of EV adoption, the program could be maintained or adjusted. Potential adjustments could include:

- Increasing rebate amounts to narrow the cost gap between EVs and internal combustion engine vehicles
- Providing point-of-sale rebates, rather than post-purchase reimbursements or tax credits
- Expanding eligibility to include used EVs or light commercial electric vehicles

Such adjustments could enhance Rhode Island's ability to increase EV adoption, reduce GHG emissions, and provide benefits to households historically underserved by clean mobility programs.

Modeling Assumptions and GHG Reductions

The strategy modeling assumes that the state would replace the recently expired federal EV tax credit, which was available up to a $7,500 per vehicle maximum depending on vehicle price and customer income qualifications. The federal EV tax credit was also available as a direct rebate via transfer to dealerships. Similar to the modeling of NEVI funding for EV charger installation, the impacts of increased EV incentives were estimated based on Buckberg & Cole, 2025, who found that the federal tax credits were responsible for increasing EV market share 6% by 2030 for the United States. Because of the income and vehicle price requirements for qualification, the authors estimated that the effective average credit was $4,317 per vehicle. To reflect the impact of the state replacing the lost federal incentives, the study assumed an increase in the annual sales share of EVs by 6% for light-duty vehicles in each year and assumed all incremental sales would be fully electric BEVs. As a result of these increased EV sales, there are cumulative GHG reductions of approximately 1,700 ktCO2e through 2050 (Table 15).

Table 15: Estimated GHG Reduction from Maintaining and Adjusting State EV Incentives (ktCO2e)

Strategy	2030	2040	2050	Cumulative
Maintain & Adjust State EV Incentives	30	80	100	1,700

Regulatory Authority

OER currently administers the DRIVE EV program and would likely remain the lead agency for any expansion or redesign of the state's electric vehicle incentives. To implement changes effectively, OER would need to coordinate with several partners, such as the Division of Taxation, if incentives were to be given as tax credits. Adjustments to the size, structure, or funding of the program would likely require collaboration with the Governor's Office and the General Assembly and may involve new or expanded appropriations.

Funding Availability

Rhode Island currently allocates approximately $2 million annually to the DRIVE EV program, which provides rebates of up to $1,500 per vehicle. In the absence of federal tax credits, this funding level may need to increase to maintain or accelerate EV adoption.

Potential funding mechanisms could include state budget appropriations, pricing mechanisms (such as GHG surcharges or fees on high-emission vehicles), federal grants and other programmatic or public-private partnerships.

Equity and Environmental Justice Considerations

Designing EV incentive programs with equity in mind can expand access to clean transportation for households that have historically faced barriers to participation. Many income-qualified consumers are unable to take advantage of traditional tax-based incentives due to limited up-front capital, lack of access to affordable financing, or ineligibility based on income thresholds. To improve accessibility, Rhode Island could explore offering larger or targeted rebates based on income, household size, or geographic priority areas. Providing incentives directly at the point of sale rather than post-purchase reimbursements can help remove liquidity constraints that prevent participation. Expanding eligibility to include used EVs, often more affordable for cost-sensitive buyers can also support a more inclusive market. Complementary efforts, such as targeted outreach and education for underserved communities, may further improve uptake and align the program with Rhode Island's broader equity goals.

Implementation Strategy and Timeline

The RI Office of Energy Resources can continue to implement its existing rebate program into 2026 and beyond. If additional funding becomes available in FY2026, the program can adjust to offer higher rebate amounts.

Best Practices from Other Jurisdictions

Across the country, several states and localities have refined their EV incentive programs to respond to evolving market conditions and equity goals. California's Clean Vehicle Rebate Project (CVRP)[77] introduced income caps and increased rebates for lower-income households, helping to expand access among underserved populations. New Jersey's Charge Up Program[78] provides up to $4,000 per vehicle and delivers the incentive at the point of sale, which has improved program visibility and ease of use. Colorado has implemented a tiered rebate structure offering larger incentives to low-income residents and has expanded eligibility to include used EVs.[79] Similarly, New York's Drive Clean Rebate[80] complements federal programs with up to $2,000 per eligible vehicle and works directly with dealers to simplify the process. Rhode Island may consider adapting elements from these successful models while tailoring implementation to local income levels, dealership networks, and administrative resources.

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[77] California Air Resources Board (CARB). Clean Vehicle Rebate Project (CVRP). https://ww2.arb.ca.gov/our-work/programs/clean-vehicle-rebate-project
[78] U.S. Department of Energy. Electric Vehicle (EV) and EV Charger Rebate. https://afdc.energy.gov/laws/409
[79] Colorado Energy Office. Vehicle Exchange Colorado (VXC) Program. https://energyoffice.colorado.gov/vehicle-exchange-colorado
[80] New York State Energy Research and Development Authority (NYSERDA). Drive Clean Rebate for Electric Cars Program. https://www.nyserda.ny.gov/All-Programs/Drive-Clean-Rebate-For-Electric-Cars-Program

Advanced Clean Trucks

Policy Overview

Adopted by the Rhode Island Department of Environmental Management (RIDEM) in December 2023, Advanced Clean Trucks (ACT) sets phased targets for manufacturers to increase the share of medium- and heavy-duty ZEV sales beginning with model year 2027. These requirements, which vary by vehicle class, are designed to grow ZEV availability in the state over time, with sales targets reaching between 40% and 75% by 2035.

The ACT rule is aligned with the California Air Resources Board (CARB) program. Rhode Island is able to adopt the California program through Section 177 of the federal Clean Air Act, which allows states to adopt more stringent vehicle emission standards than those of the federal government if they are align with California's standards. However, there are multiple ongoing challenges to California's vehicle emissions standards including U.S. Supreme Court cases, Congressional Review Act resolutions, and administrative actions by the current EPA[81].

While the policy framework has been established, implementation of the ACT rule will likely require additional support to be successful. Programs and investments such as enhanced incentives/rebates and widespread EV charging infrastructure could be provided by the state to support the transition.

Modeling Assumptions and GHG Reductions

The ACT regulation is estimated to result in substantial reductions in GHG emissions from Rhode Island's medium- and heavy-duty vehicle (MHDV) sector. These reductions are driven primarily by the increasing share of zero-emission vehicle (ZEV) sales required by the rule between model years 2027 and 2035, replacing diesel-powered trucks with electric or fuel cell alternatives. Table 16 below shows the ZEV sales modeled each year by vehicle class to comply with ACT. ZEV sales were assumed to be fully electric BEVs for all vehicle classes except Heavy Duty Trucks (Long-Haul), where it was assumed there would be a 75/25 split between electric and hydrogen fuel cell vehicles.

Table 16: Advanced Clean Trucks ZEV Sales Requirements

Pathways Vehicle Class	ACT Regulatory Class	2027	2028	2029	2030	2031	2032	2033	2034	2035+
Light Medium Duty Trucks	Class 2b-3	15%	20%	25%	30%	35%	40%	45%	50%	55%
Medium Duty Trucks	Class 4-8	20%	30%	40%	50%	55%	60%	65%	70%	75%

[81] Holland & Knight LLP. Up in the Air: Challenges to California's Clean Air Act Preemption Waiver. April 30, 2025. https://www.hklaw.com/en/insights/publications/2025/04/up-in-the-air-challenges-to-californias-clean-air-act-preemption

Pathways Vehicle Class	ACT Regulatory Class	2027	2028	2029	2030	2031	2032	2033	2034	2035+
Heavy Duty Trucks (Short-Haul)	Class 4-8	20%	30%	40%	50%	55%	60%	65%	70%	75%
Heavy Duty Trucks (Long-Haul)	Class 7-8 Tractors	15%	20%	25%	30%	35%	40%	40%	40%	40%

The GHG reduction impacts from full ACT implementation are shown in Table 17 below.

Table 17: Estimated GHG Reduction Impacts of Advanced Clean Trucks (ktCO2e)

Strategy	2030	2040	2050	Cumulative
Advanced Clean Trucks	40	180	290	3,700

Regulatory Authority

Rhode Island adopted the ACT rule under its authority as a Section 177 state through the federal Clean Air Act, which allows states to adopt California's vehicle emission standards. RIDEM is responsible for administering the rule and monitoring compliance, but successful implementation will also rely on coordination across state agencies, including OER, RIDOT, and the state's utility providers. Cross-agency collaboration will be important to ensure that charging infrastructure, workforce readiness, and permitting systems are aligned with the ACT goals.

Funding Availability

The ACT regulation does not require direct state funding for implementation. However, additional funding for vehicle incentives, fleet transition support, and charging infrastructure will likely be needed to achieve the program's goals and ensure an equitable transition.

Rhode Island may consider leveraging existing and emerging federal, state, and private funding opportunities to reduce costs for fleet operators and encourage early adoption. Potential sources could include:

- **Clean vehicle infrastructure grants** for charging/fueling stations
- **Rhode Island's DRIVE EV rebate**: Up to **$2,500** for eligible ZEV purchases
- Potential use of green bonds, utility surcharges, or dedicated climate funds to subsidize MHDV conversions and charging infrastructure
- **Private financing:** Partnerships with commercial lenders and leasing companies can offer lower-cost financing options for fleet operators

As Rhode Island develops its ACT implementation plan, the state may evaluate which funding mechanisms are most appropriate to complement the rule and advance progress towards its climate and clean transportation objectives.

Equity and Environmental Justice Considerations

Diesel truck traffic has historically contributed to elevated pollution levels in environmental justice (EJ) communities located near industrial zones, freight corridors, and major highways. Shifting these trucks to ZEVs could benefit the communities that have been disproportionately burdened by pollution in the past. To ensure that the benefits of ACT are equitably distributed, Rhode Island could consider strategies such as prioritizing ZEV deployment in overburdened communities, expanding financial support for small and minority-owned fleet operators, and designing infrastructure investments with community input.

Implementation Strategy and Timeline

The trajectory for implementation of this program is contingent upon the outcome of federal litigation. If successful, RI will forge ahead and adjust the implementation deadline (if needed).

Best Practices from Other Jurisdictions

Several other states offer useful examples that Rhode Island may consider as it moves toward ACT implementation. California has paired ACT with a suite of support tools, including fleet transition planning resources, utility coordination, and dedicated funding to assist early adopters[82].

New Jersey has focused on equity by aligning ACT adoption with targeted incentives and technical assistance for communities with high truck pollution exposure[83]. Vermont combined its adoption of ACT and Advanced Clean Cars II into a single rulemaking process that incorporated stakeholder input and health impact assessments[84]. In Oregon[85] and Washington[86], ACT implementation has been integrated with broader workforce development and utility investment strategies to ensure a just transition.

Across these examples, key takeaways include the importance of early and ongoing engagement with affected stakeholders, cross-agency planning, and a strong focus on small fleet operators and frontline communities. Rhode Island may build on these lessons to guide implementation and ensure that the benefits of cleaner commercial transportation are widely and equitably shared.

Advanced Clean Cars II

Policy Overview

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[82] California Air Resources Board (CARB). Advanced Clean Trucks. https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks

[83] New Jersey – ACT Equity-Focused Incentives and Technical Assistance

[84] Vermont Agency of Natural Resources / Vermont Department of Environmental Conservation (DEC). Medium- and Heavy-Duty Zero Emission Vehicle (ZEV) Requirement (adoption of ACT). https://afdc.energy.gov/laws/13219

[85] Oregon Department of Environmental Quality (DEQ). Advanced Clean Trucks Reporting. https://www.oregon.gov/deq/aq/programs/pages/mdhdzev.aspx

[86] Washington State Department of Ecology. Vehicle emissions standards – including Advanced Clean Trucks and Heavy-Duty Low NOx Omnibus. https://ecology.wa.gov/air-climate/reducing-greenhouse-gas-emissions/vehicle-emissions-standards

In December 2023, Rhode Island adopted the Advanced Clean Cars II (ACC II) regulation, aligning with California's vehicle emissions standards for new light-duty vehicles through model year 2035. The rule establishes a phased schedule of ZEV sales requirements for vehicle manufacturers, with a goal of reaching 100% ZEV sales by 2035. This effort supports implementation of Rhode Island's 2021 Act on Climate, which sets a legally binding goal of achieving net-zero GHG emissions by 2050.

ACC II complements the state's adoption of the ACT rule, which targets medium- and heavy-duty vehicles. Together, these policies are designed to support a broader transition away from combustion vehicles within the state's transportation sector, a key source of GHG emissions.

Like ACT, ACCII rule is modeled after standards developed by the California Air Resource Board and enabled through Section 177 of the federal Clean Air Act, which allows other states to adopt California's more stringent vehicle emission standards. California's waiver authority under this provision is currently the subject of ongoing federal review and litigation.

Modeling Assumptions and GHG Reductions

ACCII is expected to deliver meaningful GHG emissions reductions from Rhode Island's on-road light-duty vehicle fleet over time, beginning with model year 2027. Emissions reductions result from the growing share of ZEVs entering the market each year, replacing conventional gasoline-powered vehicles and gradually transforming the statewide vehicle stock.

Table 18 below shows the ZEV sales requirements by year for ACC II. Under the ACC II rules, PHEVs that meet certain performance requirements can meet up to 20% of the total ZEV sales for a manufacturer each year. For this analysis, the study assumed that PHEVs would meet 10% of the total ZEV sales requirement, the average of the range between minimum (0%) and maximum (20%) potential PHEV share. It was assumed that all remaining ZEV sales would be fully electric BEVs.

Table 18: Advanced Clean Cars II ZEV Sales Requirements

Pathways Vehicle Class	2027	2028	2029	2030	2031	2032	2033	2034	2035+
Light Duty Vehicles	43%	51%	59%	68%	76%	82%	88%	94%	100%

The GHG reductions from ACC II accelerate through the 2030s as market uptake increases and older internal combustion vehicles are retired and replaced with ZEVs, with cumulative GHG reductions reaching 17.2 million metric tons of CO2e through 2050 as shown in Table 19 below.

Table 19: Estimated GHG Reductions of Advanced Clean Cars II (ktCO2e)

Strategy	2030	2040	2050	Cumulative
Advanced Clean Cars II	200	890	1,140	17,200

Regulatory Authority

Rhode Island adopted ACC II under the authority granted by Section 177 of the federal Clean Air Act (42 U.S.C. §7507), which allows states to implement California's motor vehicle emission standards in place of federal standards. RIDEM formally adopted the ACC II rule in December 2023, continuing the state's long-standing use of this legal mechanism to support transportation-sector emissions reductions.

This rule builds on prior adoptions of California's standards and aligns with Rhode Island's statutory climate requirements under the Act on Climate.

Funding Availability

While ACC II imposes requirements on vehicle manufacturers rather than directly on consumers or the state, its success will require complementary investments in incentives, infrastructure, and public education. Key funding streams include:

- Bipartisan Infrastructure Law (BIL) funding for EV charging corridors.
- OER and DRIVE EV program incentives, which may expand or evolve to better support low- and moderate-income households.
- Potential new state revenues, by leveraging federal dollars with targeted state investments, Rhode Island can accelerate equitable adoption and ensure widespread infrastructure availability.

Equity and Environmental Justice Considerations

Key equity considerations for implementing ACC II may include:

- Prioritizing incentive access for low- and moderate-income households
- Expanding EV charging infrastructure in underserved areas
- Supporting renters and residents of multifamily buildings who may face barriers to at-home charging

Implementation Strategy and Timeline

ACC II sets annual ZEV sales targets for vehicle manufacturers beginning with model year 2027, ramping up through 2035. Implementation will require continued coordination across agencies, the private sector, and local governments to ensure supportive conditions for consumer adoption. Key implementation needs include:

- Expanding EV charging infrastructure statewide.
- Supporting dealerships and vehicle sellers with up-to-date ZEV inventory and training.
- Strengthening vehicle purchase incentive programs and consumer outreach.
- Monitoring compliance and market trends to inform future program adjustments.

The trajectory for implementation of this program is contingent upon the outcome of federal litigation. If successful, RI will forge ahead and adjust the implementation deadline (if needed).

Practices from Other Jurisdictions

States that have adopted ACC II or similar standards have adopted a range of approaches to support successful implementation. California[87] offers a comprehensive regulatory and market framework,

[87] California Air Resources Board (CARB). Advanced Clean Cars – Drive Forward Light-Duty Vehicle Program. https://ww2.arb.ca.gov/our-work/programs/drive-forward-light-duty-vehicle-program/advanced-clean-cars

while states such as Massachusetts[88] and Vermont[89] have paired vehicle standards with equity-focused incentive programs and rural deployment initiatives. Colorado has introduced tiered rebates and support for used EV purchases,[90] and New Jersey[91] has partnered with utilities to expand public charging infrastructure and promote EV adoption.

These efforts highlight the importance of aligning vehicle regulations with supportive policy tools such as incentives, infrastructure investments, and targeted outreach strategies, to maximize the benefits of electrification and ensure smooth market transitions.

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[88] Massachusetts Executive Office of Energy and Environmental Affairs (EEA). Advanced Clean Cars II Adoption and Equity Initiatives.

[89] Vermont Department of Environmental Conservation (DEC). Recently Adopted and Proposed Regulations. https://dec.vermont.gov/air-quality/laws-and-regulations/recently-adopted-and-proposed-regulations

[90] Colorado Energy Office. Vehicle Exchange Colorado Program. https://energyoffice.colorado.gov/vehicle-exchange-colorado

[91] New Jersey Clean Cities Coalition. Drive Electric NJ Initiative. https://njcleancities.org/Drive_Electric

Buildings

Figure 16: Building Sector Emissions by Strategy (ktCO2e)

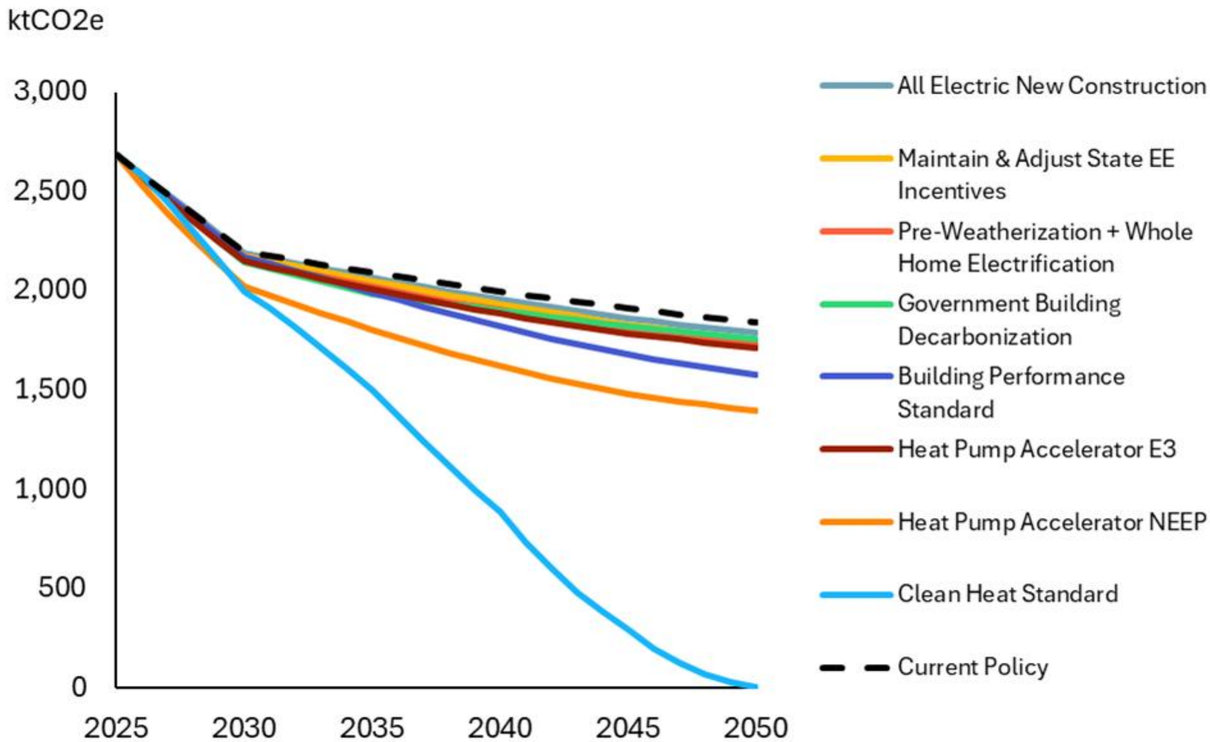

Table 20: Building Sector Emissions Reductions by Strategy (ktCO2e)

Strategy	2030	2040	2050	Cumulative
All Electric New Construction	10	40	50	800
Maintain & Adjust State Energy Efficiency Incentives	20	60	100	1,400
Pre-Weatherization + Whole Home Electrification	40	90	110	1,900
Government Building Decarbonization	50	100	80	2,000
Building Performance Standards	30	180	260	3,500
Heat Pump Accelerator (E3 estimate of Market Hub)	50	110	130	2,300
Heat Pump Accelerator (NEEP estimate of Market Hub + Innovation Hub)	170	380	440	7,800
Clean Heat Standard	200	1,110	1,840	23,300

All-Electric New Construction

Policy Overview

All-electric new construction codes require new buildings to be built with electric appliances and heating systems, rather than those powered by fossil fuels. These codes are intended to avoid the installation of fossil fuel infrastructure in new buildings, helping to reduce GHG emissions from the building sector over time. The policy would apply only to new buildings and would not impact existing structures.

Some versions of this policy focus specifically on low-income housing, where residents often face higher energy burdens and limited access to decarbonized technologies. Targeting new affordable housing developments can help deliver health and affordability benefits while ensuring new units are built to modern, efficient standards. Other approaches may extend all-electric requirements to all new construction statewide.

Exemptions may be provided for certain types of buildings or facilities, such as hospitals, industrial buildings, and agricultural operations. Temporary waivers may also be considered in areas where electric infrastructure is not yet sufficient to support full electrification.

Modeling Assumptions and GHG Reductions

For this analysis, the modeling considered two scenarios: one where the policy applies to low-income housing only, and another where it applies to all new residential units. The modeled policy assumes that all space heating, water heating, cooking, and clothes drying in new residential buildings must be electric beginning in 2029. This assumption is based on a similar policy adopted in New York.[92]

The study assumed that 1,174 new housing units are built each year based on the average of annual amount of housing units completed in 2023 and 2024 and that around 20% of these are affordable housing units based on reports from the Rhode Island Executive Office of Housing.[93] It was assumed that each new housing unit would be built with an electric heat pump space heater, heat pump water heater, induction cooktop, and electric clothes dryer. The annual sales of these electric devices were divided by the total annual sales for each end use in the Current Policy scenario to determine the incremental sales share for electric devices in the Pathways model. This results in an incremental market share of 5% in space heating, 4% in clothes drying, and 3% in water heating and cooking for all-electric devices.

The emissions reductions from an all-electric new construction policy increase over time as new construction post-2029 becomes a larger share of the overall housing stock. The cumulative GHG

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[92] New York State Assembly, All Electric Buildings. https://nyassembly.gov/all-electric-buildings/
[93] State of Rhode Island, Executive Office of Housing. https://housing.ri.gov/data-reports/departmental-reports

reduction impacts from the adoption of a potential all-electric new construction policy reach around 800 ktCO2e by 2050 and are shown in Table 21 below.

Table 21: Estimated GHG Reductions from All-Electric New Construction (ktCO2e)

Strategy	2030	2040	2050	Cumulative
All Electric New Construction (Low Income Only)	2	10	10	150
All Electric New Construction (All Homes)	10	40	50	800

Regulatory Authority

The Rhode Island Building Code Commission has authority to adopt and update statewide building codes, including provisions related to electrification. Local municipal building departments are responsible for code enforcement through the permitting process. Successful implementation will depend on effective coordination between state agencies, local governments, utilities, and developers.

Funding Availability

Implementation could be supported through a mix of federal, state, and private funding sources. Rhode Island's Clean Energy Fund may serve as a vehicle to provide rebates or other financial incentives to help developers meet all-electric requirements. Partnerships with utilities and private lenders could help expand access to financing, particularly for smaller developers and municipalities. Federal funding opportunities may also help support infrastructure upgrades and workforce development.

Equity and Environmental Justice Considerations

Rhode Island aims to ensure that the transition to all-electric new construction is equitable and inclusive. To help reduce disparities in energy access and cost, the state will consider the following strategies:

- Offering targeted financial incentives for developers of affordable housing to support cost-effective electrification.
- Safeguards for tenants or renters of new affordable housing to prevent/mitigate cost increases.
- Supporting appliance rebate programs that focus on underserved and low-income communities.
- Investing in clean energy workforce training programs with an emphasis on hiring from historically underrepresented groups.
- Incorporating structured public input into program design and implementation.
- Providing exemptions or waivers for buildings with essential public functions or those in areas where electric infrastructure is not yet sufficient.

Implementation Strategy and Timeline

This measure will require regulatory action by the State Building Code Commissioners Office. While this matter is under discussion and consideration, RIDEM and the RIEC4 can continue to address/discuss the benefits such a proposal will bring to Rhode Island. Best practices from other jurisdictions will be examined.

Best Practices from Other Jurisdictions

Rhode Island draws from a range of approaches implemented in other states and municipalities. For example, New York's[94] phased approach allows time for market adaptation while aligning building codes with emissions goals. Exemption structures in other jurisdictions help ensure flexibility for critical infrastructure and industrial uses. To support legal defensibility, states have increasingly relied on performance-based codes aligned with federal statutes such as the Energy Policy and Conservation Act (EPCA).[95,96]

Successful programs elsewhere have also emphasized transparency and public engagement, local enforcement through existing permitting systems, and close collaboration with utilities to plan for infrastructure capacity. Workforce development and stakeholder partnerships are also key enablers of a smooth transition.

Maintaining and Adjusting State Energy Efficiency Program Incentives

Policy Overview

Rhode Island is evaluating opportunities to maintain and enhance its existing energy efficiency programs by adjusting incentive structures for building envelope improvements such as insulation, air sealing, and high-performance windows. These refinements aim to increase participation in measures that reduce energy demand and save customers money on their energy bills.

This approach builds on the success of existing programs, such as EnergyWise, and is designed to advance long-term energy savings, thermal comfort, and emissions reductions in both residential and commercial buildings. A particular focus could be placed on older and inefficient structures, which typically present the greatest opportunities for performance improvements.

Adjustments under consideration include scaling up participation to reach approximately 16,000 homes per year, tripling current levels and targeting over 90% of the housing stock by 2050. These

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[94] New York State Energy Law § 11-104. State Energy Conservation Construction Code. 2024. https://newyork.public.law/laws/n.y._energy_law_section_11-104

[95] New York State Energy Research and Development Authority (NYSERDA). Low-to Moderate-Income (LMI) Energy Efficiency and Building Electrification Stakeholder Conferences. https://www.nyserda.ny.gov/ny/LMI-Implementation-Plan-Stakeholder-Engagement

[96] New York City Employment and Training Coalition (NYCETC). "NYC Energy Efficiency Companies Launch Employer-Led Coalition to Catalyze Green Workforce Development and Market Transformation." August 14, 2025. https://nycetc.org/2025/08/nyc-energy-efficiency-companies-launch-employer-led-coalition-to-catalyze-green-workforce-development-and-market-transformation/

envelope improvements are a foundational strategy for decarbonizing buildings, especially when paired with heat pump installations.

To ensure equitable access, the state aims to expand no-cost weatherization services for low- and moderate-income households, reaching roughly 1% of the housing stock annually. This incremental expansion aligns with Rhode Island's broader electrification and equity goals.

Modeling Assumptions and GHG Reductions

Maintaining and adjusting envelope-focused incentives is particularly important for homes and buildings transitioning to electric heat. Improved insulation and air sealing help reduce heating and cooling loads, enabling smaller, more efficient systems and delivering long-term energy savings. These upgrades also help manage peak electricity demand and improve grid resilience.

For this analysis, the study assumed that there is an increase in program funding that triples current participation rates from around 5,500 annual weatherization upgrades based on the Second Draft of the EEC 2026 Annual Energy Efficiency Plan[97] to 16,500. This means that by 2050, over 90% of the existing residential housing stock has a weatherization upgrade. In addition, the weatherization upgrades are assumed to reduce annual space heating demand by 17% per housing unit based on data from Rhode Island's EnergyWise single family program. The cumulative GHG emissions reductions of this strategy reach 1,400 ktCO2e by 2050 (Table 22).

Table 22: Estimated GHG Reductions from Maintaining and Adjusting State Energy Efficiency Program Incentives (ktCO2e)

Strategy	2030	2040	2050	Cumulative
Maintain & Adjust State Energy Efficiency Incentives	20	60	100	1,400

Regulatory Authority

Rhode Island has several regulatory Pathways to implement adjustments to energy efficiency programs. OER, in partnership with the Energy Efficiency and Resource Management Council (EERMC) and utility program administrators, can guide the design and delivery of envelope-focused measures. These programs are reviewed and approved by the PUC, which oversees the state's energy efficiency program portfolios and funding mechanisms. While this strategy does not introduce new mandates, it allows for programmatic enhancements such as setting performance targets, increasing incentive levels, or requiring a minimum share of program spending to be directed toward envelope improvements.

Funding Availability

[97] Rhode Island Energy Efficiency Council (EEC). Data & Publications. https://eec.ri.gov/data-and-publications/

Rhode Island has several potential funding opportunities to support the expansion of building envelope upgrade incentives. Primary sources include:

- **State Energy Program:** Offers formula and competitive grants that can support weatherization, energy efficiency, and building performance improvements at the state level.
- **Utility Partnerships:** Local utilities and system benefit funds can support insulation and envelope upgrades.
- **IRA rebates & federal grants:** Rhode Island has received funding allocations under the Home Electrification and Appliance Rebates (HEAR) and Home Efficiency Rebates (HER) programs. These rebates, which began to roll out in late 2024, are designed to lower costs for whole-home weatherization and electrification projects, particularly for income-eligible households. RI will continue to monitor the availability of these federal funding sources.
- **System Benefit Charge (SBC) funds**: Charges on utility bills used to support existing weatherization and energy efficiency programs.

To ensure equity and cost-effectiveness, the state can structure incentives on a sliding scale offering higher rebates or no-cost upgrades for low-income households and prioritizing outreach in environmental justice communities.

Equity and Environmental Justice Considerations

Maintaining and expanding access to building envelope improvements can deliver important public health, equity, and affordability benefits. Many low-income residents in Rhode Island live in poorly insulated homes, facing high energy burdens and exposure to temperature extremes. By strengthening support for no-cost weatherization services and prioritizing investments in EJ communities, the state can reduce energy insecurity, improve indoor air quality, and enhance resilience to climate-related risks. The policy also seeks to address historical barriers faced by renters and multifamily property owners by offering tailored program designs and tenant protections. To further promote equity, the state could consider investment in workforce development programs that hire and train residents from frontline communities, helping to build capacity while creating economic opportunities.

Implementation Strategy and Timeline

The role of energy efficiency programs in RI as a means of providing affordable energy to Rhode Islanders is a very active topic in 2025. It is anticipated that the RI General Assembly will debate a number of measures related to efficiency and buildings in 2026. While these matters are under discussion and consideration, RIDEM and RIEC4 can continue to address/discuss the benefits such proposals will bring to Rhode Island. Best practices from other jurisdictions will be examined.

Best Practices from Other Jurisdictions

Several states have demonstrated the effectiveness of targeted envelope incentive programs. Massachusetts, through MassSave, offers tiered incentives for insulation and air sealing, including enhanced rebates for income-eligible customers and whole home energy assessments.[98] Their approach integrates contractor networks, streamlined application processes, and contractor training to ensure quality and participation. Vermont, through Efficiency Vermont, has invested in deep energy retrofit pilots that combine envelope improvements with electrification measures, demonstrating up to 50% reductions in energy use in older housing stock.[99] New York offers integrated weatherization and heat pump programs through New York State Energy Research and Development Authority (NYSERDA),[100] helping to bundle envelope upgrades with clean heating technologies. In all three states, successful implementation has relied on sustained funding, contractor workforce development, and clear communication of benefits to consumers. Rhode Island can draw on these models to structure programs that are equitable, cost-effective, and scalable while tailoring implementation to local housing characteristics and workforce capacity.

Pre-Weatherization + Whole Home Electrification

Policy Overview

Rhode Island is exploring the development of a Pre-Weatherization and Whole Home Electrification program to address persistent barriers to building energy upgrades and electrification particularly in low-income and underserved communities. Pre-weatherization efforts aim to remediate health and safety issues such as mold, lead, asbestos, moisture damage, roof leaks, and outdated wiring that must be resolved before traditional weatherization or energy efficiency measures can be implemented. Whole home electrification refers to the electrification of all end uses, such as space heating, water heating, cooking, and clothes drying.

Rhode Island Energy (RIE) already offers funding to remediate some pre-weatherization barriers,[101] and OER is piloting a Whole Home + Electrification Pilot with the Green & Healthy Homes Initiative (GHHI). The pre-weatherization + whole home electrification strategy would likely be an expansion of this pilot and the existing RIE existing incentives to encompass more homes.

Modeling Assumptions and GHG Reductions

Many homes in Rhode Island face health, safety, or structural barriers to weatherization and electrification upgrades like mold, asbestos, and outdated knob-and-tube wiring. Pre-weatherization interventions remove these barriers, unlocking access to efficient heat pumps, insulation, and clean energy systems that would otherwise be deferred.

The modeled policy assumes 60,000[102] homes with knob and tube wiring receive pre-weatherization upgrades by 2050 at an average cost of $13,000 per home. This represents a tripling of current

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[98] Mass Save. Deep Energy Retrofit. Mass Save | Deep Energy Retrofit

[99] Efficiency Vermont. Industrialized Weatherization: Comprehensive Deep Energy Retrofits with Prefabricated Panel Block Wall Insulation. Industrialized Weatherization: Comprehensive Deep Energy Retrofits with Prefabricated Panel Block Wall Insulation | Efficiency Vermont

[100] New York State Energy Research and Development Authority (NYSERDA). Comfort Home Program. https://www.nyserda.ny.gov/All-Programs/Comfort-Home-Program

[101] Rhode Island Energy. Three-Year Energy Efficiency Plan. (2024-2026). https://ripuc.ri.gov/Docket-23-35-EE

[102] Rhode Island Office of Energy Resources (OER). Estimate shared with E3.

intervention rates, increasing from roughly 800 homes per year in the Second Draft of the EEC 2026 Annual Energy Efficiency Plan to approximately 2,400 homes per year. All upgraded homes are also assumed to receive whole home electrification of space heating, water heating, and cooking.

States that have adopted this approach have shown major uptake when insulation, wiring, and panel upgrades are bundled with electrification incentives. Maine's 2024 pivot to whole-home systems led to 3,530 rebates in just one quarter, more than in the prior nine months combined[103]. Similarly, Connecticut and Massachusetts report[104] energy savings of hundreds of thousands of MWh per year and large increases in heat pump installations when programs address barrier remediation upfront[105].

This program is estimated to reduce GHG emissions by 1,900 ktCO2e by 2050 (Table 23).

Table 23: Estimated GHG Reductions from Pre-Weatherization + Whole Home Electrification (ktCO2e)

Strategy	2030	2040	2050	Cumulative
Pre-Weatherization + Whole Home Electrification	40	90	110	1,900

Regulatory Authority

The Department of Human Services (DHS) oversees the Rhode Island Weatherization Assistance Program (WAP) and currently coordinates with Community Action Program (CAP) agencies for implementation. This program already includes some flexibility for health and safety improvements and could serve as the foundation for a scaled-up pre-weatherization initiative.

An expanded version of this program would likely involve coordination with OER, in addition to DHS and CAP agencies.

Funding Availability

Rhode Island can draw on several active and emerging funding sources to support pre-weatherization and whole-home electrification initiatives, particularly where programs align energy, health, and housing outcomes:

+ **Low Income Home Energy Assistance Program (LIHEAP):** Provides ongoing support for energy affordability and may fund limited health and safety repairs that enable subsequent weatherization and electrification upgrades.

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[103] Efficiency Maine Trust. FY2024 Annual Report. (2024). https://www.efficiencymaine.com/docs/FY2024-Annual-Report.pdf

[104] Massachusetts Energy Efficiency Advisory Council (EEAC) & Connecticut Energy Efficiency Board. Massachusetts and Connecticut Heat Pump Metering Study – Final Report. August 2024. https://ma-eeac.org/wp-content/uploads/MA-HPMS-CT-R2246-Heat-Pump-Metering-Study-Final-Report_August_2024.pdf

[105] Massachusetts Energy Efficiency Advisory Council (EEAC). Massachusetts 2025-2027 Energy Efficiency and Decarbonization Plan. April 1, 2024. https://ma-eeac.org/wp-content/uploads/Final-Draft-MA-2025-2027-Plan-04-01-24.pdf

- **State Energy Program:** Offers formula and competitive grants that can support weatherization, energy efficiency, and building performance improvements at the state level.
- **Utility Partnerships:** Local utilities and system benefit funds can support insulation, envelope upgrades, and pre-electrification readiness.
- **IRA rebates & federal grants:** Rhode Island has received funding allocations under the HEAR and HER programs. These rebates, which began to roll out in late 2024, are designed to lower costs for whole-home weatherization and electrification projects, particularly for income-eligible households. RI will continue to monitor the availability of these federal funding sources.

As demonstrated by programs in Connecticut and Massachusetts, per-home costs typically range from $1,000 to $5,000 for health and safety remediation, with deeper upgrades unlocking downstream energy and cost savings.

Equity and Environmental Justice Considerations

This policy is rooted in equity and environmental justice, as it removes the structural barriers that often prevent vulnerable households from participating in energy programs. Many low-income homes are disqualified from weatherization or electrification due to conditions beyond residents' control. If implemented, this strategy could prioritize:

- Households with elderly residents, children, or health conditions affected by poor indoor air quality.
- Frontline and environmental justice communities that face disproportionate exposure to pollutants and substandard housing.
- No-cost delivery for income-qualified households to eliminate financial barriers.
- Community engagement and outreach to ensure services are responsive to community needs and are distributed equitably across geographies and housing types.

This approach supports not just climate goals but also public health, energy affordability, and housing quality in historically underserved communities.

Implementation Strategy and Timeline

The role of weatherization and pre-weatherization in RI as a means of providing affordable energy to Rhode Islanders is a very active topic in 2025. It is anticipated that the RI General Assembly will debate a number of measures related to efficiency, weatherization and buildings in 2026. While these matters are under discussion and consideration, RIDEM and the RIEC4 can continue to address/discuss the benefits such proposals will bring to Rhode Island. Best practices from other jurisdictions can be examined.

Best Practices from Other Jurisdictions

States like Connecticut[106], Massachusetts[107], and Maine[108] offer clear models for Rhode Island to follow. Connecticut's Residential Energy Preparation Services (REPS) program integrates pre-weatherization barrier removal with access to existing weatherization and efficiency services an approach that Rhode Island could replicate through coordination between DHS, community action agencies, and housing stakeholders. Massachusetts' Enhanced Barrier Mitigation Incentives [109] demonstrate the value of dedicated funding for issues like knob-and-tube wiring, while Maine's shift to bundled, whole-home upgrades including insulation, wiring, and panel upgrades has dramatically increased program uptake. Rhode Island can build on these best practices by streamlining services across agencies, aligning funding streams, and expanding its weatherization infrastructure to deliver holistic upgrades, especially in underserved communities.

Government Building Decarbonization

Policy Overview

Rhode Island is considering a strategy to support the decarbonization of state and municipal buildings, building on existing efforts to electrify and retrofit public facilities such as schools, town halls, libraries, and public works buildings. This policy aims to continue existing efforts to decarbonization state buildings, and position municipalities as leaders in climate action by prioritizing energy efficiency and electrification in government buildings. These upgrades will reduce GHG emissions and can demonstrate leadership in communities throughout Rhode Island.

Modeling Assumptions and GHG Reductions

Emissions abatement potential from decarbonizing public buildings in Rhode Island was estimated using data from the Energy Information Agency Commercial Building Energy Consumption Survey (CBECS)[110] Because only census division level data are available in CBECS, the commercial sector energy consumption patterns for New England as a whole were applied to Rhode Island. According to the CBECS data, state and local government buildings accounted for 21% of natural gas emissions and 28% of fuel oil emissions in the commercial sector. The study assumed that the government building decarbonization measure would lead to complete abatement of these emissions by 2040 through electrification of space heating, water heating, and other end uses. The estimated emissions reductions from government building decarbonization are shown in Table 24 below.

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[106] Partnership for Strong Communities. Residential Energy Preparation Services. https://pschousing.org/ahdr/residential-energy-preparation-services/

[107] Mass Save. Enhanced Weatherization Incentive. https://www.masssave.com/residential/rebates-offers-services/income-based-offers/save-with-enhanced-incentives

[108] Maine Housing. Weatherization Program. https://www.mainehousing.org/programs-services/HomeImprovement/homeimprovementdetail/weatherization

[109] Mass Save. Pre-Weatherization Barrier Mitigation. https://www.masssave.com/business/rebates-offers-services/building-insulation-and-weatherization/pre-weatherization-barrier-mitigation

[110] U.S. Energy Information Administration (EIA). 2018 Commercial Buildings Energy Consumption Survey (CBECS). September 21 2021 (revised December 21, 2022). https://www.eia.gov/consumption/commercial/data/2018/

Table 24: Estimated GHG Reductions from Government Building Decarbonization (ktCO2e)

Strategy	2030	2040	2050	Cumulative
Government Building Decarbonization	50	100	80	2,000

Regulatory Authority

OER, in collaboration with the Department of Administration (DOA), would likely lead the coordination and delivery of this initiative, with support from the Division of Capital Asset Management and Maintenance and the Rhode Island Infrastructure Bank (RIIB). The program may be structured under existing executive authority, leveraging statewide energy performance targets and procurement standards for public buildings.

Incentive structures and program requirements can be codified through interagency agreements, executive orders, or legislative directives encouraging or requiring local governments to assess and reduce emissions from their building portfolios. Technical support may also be delivered through OER's Municipal Technical Assistance Program or through regional planning agencies.

Funding Availability

Rhode Island can leverage multiple funding sources to support municipal building decarbonization, including:

- Programs such as the **Energy Efficiency and Conservation Block Grant Program (EECBG)** and the **Regional Greenhouse Gas Initiative (RGGI)**
- Financing through the **RI Infrastructure Bank (RIIB) Efficient Buildings Fund**,[111] including green bonds and energy efficiency loans tailored for public sector projects.
- **State capital budget allocations**, which may be directed toward energy retrofits and clean energy upgrades in critical public infrastructure.
- **Utility energy efficiency programs**, which may offer incentives for equipment upgrades and envelope improvements.

Equity and Environmental Justice Considerations

Municipal building decarbonization creates opportunities to promote equity and environmental justice by improving the quality and resilience of buildings that serve all residents, particularly in overburdened communities. Public schools, community centers, and libraries are essential service providers and often serve as emergency shelters during extreme weather events. Upgrading these facilities to be more energy efficient and climate resilient ensures that vulnerable populations are better protected.

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[111] Rhode Island Infrastructure Bank. Efficient Buildings Fund. https://www.riib.org/solutions/programs/efficient-buildings-fund/

Additional equity considerations could include:

- Prioritizing projects in municipalities with high energy burdens or in designated environmental justice areas
- Workforce training and procurement requirements can help ensure that local labor and diverse contractors benefit from public investments
- Targeted technical assistance to under-resourced municipalities that may lack in-house capacity to plan and execute decarbonization projects

Implementation Strategy and Timeline

This measure can be implemented via existing programs and initiatives within the RI Office of Energy Resources. Continued interest in benchmarking building performance in 2026 and beyond will continue to result in emissions reductions. OERs Lead by Example Program provides important technical, procurement, and financial assistance to the public sector, enabling them to implement clean energy projects and lead the way to meeting the greenhouse gas emission reduction mandates established in the Act on Climate.

Best Practices from Other Jurisdictions

Several states and municipalities have established successful programs to decarbonize public buildings. Massachusetts, through its Green Communities Program,[112] provides grants and technical support to municipalities for clean energy projects, including heat pump installations, lighting upgrades, and building envelope improvements. New York City has committed to retrofitting thousands of public buildings under its Local Law 97[113] implementation strategy, with clear timelines, funding, and performance requirements.

Vermont has supported municipal decarbonization through Efficiency Vermont and the Vermont Climate Action Commission,[114] including community-scale energy planning and public building upgrades. Washington State recently passed legislation requiring state and local government buildings to phase out fossil fuel systems and implement energy efficiency improvements as part of their capital planning process.[115]

These programs emphasize the importance of centralized technical support, dedicated funding for municipal needs, and strong accountability mechanisms. Rhode Island can draw on these lessons to design a scalable, equitable, and cost-effective program that empowers municipalities to lead by example in the clean energy transition.

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[112] Massachusetts Department of Energy Resources. Green Communities Program. https://www.mass.gov/orgs/green-communities-division

[113] New York City Department of Buildings. Local Law 97 Greenhouse Gas Emissions Reduction. https://www.nyc.gov/site/buildings/codes/ll97-greenhouse-gas-emissions-reductions.page

[114] Central Vermont Regional Planning Commission. Municipal Energy Resilience Grant Program. https://centralvtplanning.org/programs/energy/municipal-energy-resilience-grant-program/

[115] Washington State Department of Commerce. Clean Buildings Performance Standard. https://www.commerce.wa.gov/cbps/

New England Heat Pump Accelerator Program

Policy Overview

Rhode Island is participating in the development of a Midstream Heat Pump Accelerator Program to increase adoption of high-efficiency, electric heat pump systems statewide. This initiative is part of the New England Heat Pump Accelerator, a five-year, federally funded effort designed to drive market transformation for cold-climate heat pumps and heat pump water heaters across the region.[116] The program is supported by the U.S. EPA's CPRG, with Connecticut serving as the lead state and program administrator in partnership with the Northeast Energy Efficiency Partnerships (NEEP).

The centerpiece of the regional effort is the Market Hub, a coordinated midstream incentive program designed to work with heat pump distributors and manufacturers to increase product availability, visibility, and adoption. By reducing upfront costs for installers and aligning market activity across participating states (RI, CT, MA, ME, and NH), the program aims to accelerate deployment of high-efficiency electric heating technologies and streamline the clean heating supply chain.

Rhode Island's implementation will complement upstream (manufacturer-level) and downstream (consumer-level) programs already in place, offering a comprehensive strategy that supports electrification at all points of the supply chain. Rhode Island will also engage with the Accelerator's Innovation Hub, which focuses on improving access in low-income and disadvantaged communities, and the Resource Hub, which provides data, training, and technical support for market actors.

The state's approach will incorporate workforce development for HVAC professionals and electricians, contractor training, and targeted outreach. Rhode Island's program will be tailored to its unique housing stock, labor market, and regulatory landscape, while leveraging regional collaboration and federal funding to scale deployment efficiently and equitably.

Modeling Assumptions and GHG Reductions

The study included two estimates of GHG reductions from the New England Heat Pump Accelerator Program. The first estimate was calculated using information on the Market Hub from the program Request for Information (RFI) and Notice of Technical Conference.[117] According to the RFI, the total amount of funding for the Market Hub will be $270 million and midstream incentives would range between $500-$1,000 per heat pump. It was estimated that Rhode Island would receive Market Hub funding proportional to its share of households among states participating in the program. This was estimated at 7.5% based on household data from the Energy Information Agency Residential Energy

[116] Connecticut Department of Energy & Environmental Protection. New England Heat Pump Accelerator. https://portal.ct.gov/deep/energy/new-england-heat-pump-accelerator

[117] Connecticut Department of Energy & Environmental Protection. New England Heat Pump Accelerator: Request for Information (RFI) – January 7, 2025. https://portal.ct.gov/-/media/deep/energy/new-england-heat-pump-accelerator/ne-heat-pump-accelerator-request-for-information-172025.pdf?rev=38945042f6544ff6a26dee9595662915&hash=4480B91D87C382D99D942CD46B257470

Consumption Survey[118], resulting in around $20 million of total Market Hub funding for Rhode Island. The study team assumed that around a third of the funding would be devoted to program administration based on a review of similar state energy efficiency and electrification programs in the Northeast, leaving around $13.75 million in funding for incentives. With an incentive of $750 per heat pump, the average of the range cited by the RFI, this would lead to around 18,000 incremental heat pump installations as a result of the Market Hub between 2026 and 2030. It was assumed that incremental heat pump installations would be split 50/50 between whole home electric heat pumps and hybrid heat pumps retaining existing fuel combustion systems for backup heat, consistent with the trends seen in historical Clean Heat Rhode Island installations. Because the RFI contained less information that could be used to quantify the impact of the Resource Hub and Innovation Hub, the study did not estimate the impact of these programs on heat pump sales.

In addition the above estimate of the Market Hub impacts, OER also provided an estimate of the combined impacts of the Market Hub and Innovation Hub from NEEP via email correspondence. This estimate reached 67,535 homes with a heat pump installed over the course of the grant. It is important to note that this estimate was from draft modeling and is subject to change based on final modeling from NEEP. Again, the study assumed that these heat pump installations would be split 50/50 between whole home electric heat pumps and hybrid heat pumps retaining existing fuel combustion systems for backup heat. In both cases, the study assumed that the market share reached in the final year of the program would be maintained past 2030, as the intention of the program is to transform HVAC market in the Northeast to build and sustain market share for heat pumps. The estimated GHG reductions from both approaches are shown in Table 25 below.

Table 25: Estimated GHG Reductions from New England Heat Pump Accelerator Program (ktCO2e)

Strategy	2030	2040	2050	Cumulative
Heat Pump Accelerator (E3 estimate of Market Hub)	50	110	130	2,300
Heat Pump Accelerator (NEEP estimate of Market Hub + Innovation Hub)	170	380	440	7,800

Regulatory Authority

OER has the authority to develop and administer programs that support energy efficiency and building electrification. OER can coordinate this effort with the Public Utilities Commission (PUC) and utility program administrators such as Rhode Island Energy. The state's Energy Efficiency Program Plan (EEPP), approved by the PUC, may serve as a mechanism to integrate midstream incentives into Rhode Island's existing efficiency portfolios.

[118] U.S. Energy Information Administration (EIA). 2020 Residential Energy Consumption Survey (RECS). https://www.eia.gov/consumption/residential/data/2020/

Implementation may also be supported through additional authority granted by executive action under the Act on Climate, or through legislative changes that establish new funding mechanisms or expand the scope of eligible incentive programs. Coordination with workforce development initiatives and appliance efficiency standards will further support implementation.

Funding Availability

Rhode Island can pursue a diversified funding approach to support this program. The EPA's CPRG funding will support the planning or implementation activities, and SEP funds could help support early-stage design or pilot deployments.

Utility-administered energy efficiency funds such as those collected via the System Benefit Charge could also represent an ongoing source of support, particularly if midstream measures are integrated into existing efficiency portfolios. Additionally, the state could explore green bond financing, public-private partnerships, or dedicated revenue from sector-specific fees. Over a three-year period, Maine invested approximately $61 million in heat pump rebates; Rhode Island can tailor funding levels to its population size, housing stock, and program scope.

Equity and Environmental Justice Considerations

Ensuring equitable access to clean heating technologies is a key objective of the Midstream Heat Pump Accelerator Program. Rhode Island will prioritize support for low-income households and environmental justice communities by:

- Offering enhanced midstream incentives to distributors and contractors serving disadvantaged populations.
- Coordinating with the Innovation Hub to promote installations in underserved areas.
- Supporting income-qualified downstream rebates (up to approximately $8,000 or as established under current or future federal guidance) to maximize access for eligible households
- Developing workforce training programs in partnership with unions, technical schools, and community-based organizations, with a focus on expanding opportunities for women and people of color.
- Conducting targeted outreach campaigns with multilingual materials to ensure awareness and accessibility.
- Implementing progressive funding strategies to minimize regressive ratepayer impacts.

These measures aim to ensure that clean heating is not only widely adopted, but also equitably deployed.

Implementation Strategy and Timeline

The RI Office of Energy Resources continues to be the lead agency on this program for Rhode Island. In collaboration with the Coalition leading the Accelerator, RI will aim to tackle barriers to affordable heat pump adoption and promote development of heat pump skill sets in the heating, ventilation, and air conditioning (HVAC), plumbing, and electrical workforce in 2026 and throughout the life of the program.

Best Practices from Other Jurisdictions

Several states have implemented successful midstream heat pump incentive programs that can inform Rhode Island's design. Maine provides a compelling model, having surpassed its target of installing 100,000 heat pumps two years ahead of schedule.[119] This success was due in large part to its coordinated approach across the supply chain, strong public-private partnerships, and a robust training infrastructure for installers. Maine's program includes both midstream and downstream incentives, along with active engagement of distributors to influence stocking and sales practices. Similarly, New York's NYSERDA has implemented a midstream incentive program that offers rebates to distributors and contractors, while also maintaining rigorous quality assurance standards to ensure system performance.[120] Vermont's Efficiency Vermont program also blends midstream and downstream support and has demonstrated success in contractor engagement and training.[121] British Columbia has also invested in contractor and retailer education as part of its heat pump market transformation efforts.[122] Across all these examples, key themes emerge aligning incentives across the supply chain, investing in workforce development, and conducting public outreach are critical to success. Rhode Island can draw from these best practices while tailoring its approach to the state's housing stock, labor market, and climate policy goals.

Building Performance Standard

Policy Overview

Building Performance Standards (BPS) are a phased, enforceable policy tool designed to reduce GHG emissions from existing buildings by setting energy and/or emissions performance targets. These targets are often an energy or emissions intensity (e.g., kg CO2 emitted per square foot) that declines over time, with varying requirements based on primary building use and size. The size thresholds used for existing BPS programs typically include large commercial and multifamily residential buildings. BPS programs also include non-compliance penalties for buildings that fail to meet annual requirements.

These standards are intended to drive long-term market transformation in the built environment while providing building owners with clear expectations, support Pathways, and ample time to plan and invest in energy-saving improvements.

Modeling Assumptions and GHG Reductions

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[119] Maine Department of Energy Resources. Energy Efficiency. https://www.maine.gov/energy/initiatives/energy-efficiency
[120] New York State Energy Research and Development Authority (NYSERDA). Heat Pump Program. https://www.nyserda.ny.gov/All-Programs/Heat-Pump-Program
[121] Efficiency Vermont. Heat Pumps. https://www.efficiencyvermont.com/products-technologies/heating-cooling-ventilation/heat-pumps
[122] British Columbia Ministry of Energy & Climate Solutions. "B.C. makes heat pumps more affordable for people with low incomes." April 9, 2025. https://news.gov.bc.ca/releases/2025ECS0014-000309

The impact of a potential BPS program in Rhode Island was modeled based on two existing near- and long-term BPS programs in Colorado and Seattle. The statewide Colorado program requires a 30% reduction in emissions by 2030 for all buildings over 50,000 square feet[123], while the Seattle program requires a 100% reduction in emissions by 2050 for all buildings over 20,000 square feet.[124] The analysis used the NREL ResStock[125] and ComStock[126] datasets to estimate the share of residential and commercial sector emissions accounted for by buildings above these size thresholds. Table 26 below shows the share of on-site emissions by building size from the NREL datasets.

Table 26: Share of Residential and Commercial Sector Emissions by Building Size from NREL ResStock and ComStock

Building Size	Residential	Commercial
<20,000 square feet	98%	40%
20,000-50,000 square feet	1%	35%
>50,000 square feet	1%	25%
Share covered by 2030 Target (>50,000 square feet)	1%	25%
Share covered by 2050 Target (>20,000 square feet)	2%	60%

Because of the characteristics of Rhode Island's building stock, the example BPS programs would cover most commercial sector emissions by 2050 but only a small portion of the residential sector emissions. Table 27 below shows the percent emissions reductions required by sector for compliance with the example BPS programs, while Table 28 shows the final annual emissions reductions.

Table 27: Aggregate Sectoral Emissions Reduction Requirements for BPS Compliance

Sector	2030	2050
Residential	<1%	2%
Commercial	7%	60%

Table 28: Estimated GHG Reductions from Building Performance Standard (ktCO2e)

Strategy	2030	2040	2050	Cumulative
Building Performance Standards	30	180	260	3,500

Regulatory Authority

[123] Colorado Energy Office. Building Performance Colorado (BPC). https://energyoffice.colorado.gov/bpc
[124] City of Seattle Office of Sustainability & Environment. Building Emissions Performance Standard (BEPS). https://www.seattle.gov/environment/climate-change/buildings-and-energy/building-emissions-performance-standard
[125] National Renewable Energy Laboratory (NREL). ResStock Dataset 2024.2. https://resstock.nrel.gov/datasets
[126] National Renewable Energy Laboratory (NREL). ComStock Dataset 2024.2. https://comstock.nrel.gov/page/datasets

OER will serve as the lead agency for the development and administration of the BPS program. In coordination with:

- Municipalities, which may assist with enforcement, local outreach, and permitting
- The Rhode Island Building Code Commission, which may support integration of standards into code frameworks.
- RIDEM, should emission-based enforcement or reporting be required.

Statutory authority to implement BPS will be established through enabling legislation, authorizing OER to set performance standards, administer benchmark and reporting programs, and oversee enforcement.

Funding Availability

Rhode Island recognizes the importance of providing building owners, particularly those in underserved communities, with resources and incentives to support compliance. The following funding streams are available or are under consideration:

- U.S. Department of Energy Programs: Better Buildings Challenge, State Energy Program block grants.
- Expand access to C-PACE financing for commercial and multifamily buildings
- Utilize Rhode Island Infrastructure Bank programs for deep energy retrofits
- Consider modest non-compliance or reporting fees to seed a retrofit incentive fund, as recommended by the 2025 EC4 Benchmarking and Performance Standards Report
- Strengthen coordination with RIE's existing demand reduction programs.

Equity and Environmental Justice Considerations

When implementing a BPS policy, some strategies that can be considered to ensure equitable implementation include:

- **Tailored Compliance Support:** Offer technical assistance and financial incentives to small property owners, affordable housing providers, and nonprofit institutions
- **Alternative Compliance Pathways:** Consider exemptions, delayed compliance, or adjusted targets for buildings serving low-income or frontline communities
- **Preventing Tenant Displacement:** Establish safeguards to ensure that building upgrades do not result in unjust rent increases or evictions
- **Community Engagement:** Center community input in rulemaking and implementation processes, particularly from historically marginalized groups

Implementation Strategy and Timeline

This measure will require statutory or regulatory action by the State. While this matter is under discussion and consideration in 2026, RIDEM and the RIEC4 can continue to address/discuss the benefits such a proposal will bring to Rhode Island. Best practices from other jurisdictions will be examined.

Best Practices from Other Jurisdictions

Rhode Island's approach to Building Performance Standards draws on successful models from cities and states such as New York City,[127] Boston,[128] Washington D.C.,[129] and Colorado.[130] These jurisdictions have demonstrated the value of phased implementation timelines, flexible compliance Pathways, and targeted support for affordable housing and underserved communities. Rhode Island will adapt these best practices to fit the state's unique building stock and policy landscape. Prioritizing transparency, aligning with existing energy efficiency programs, and integrating equity into every stage of policy design and enforcement. This approach will ensure that the BPS framework is both ambitious and achievable, while maximizing benefits for residents, building owners, and the environment.

Clean Heat Standard

Policy Overview

A Clean Heat Standard (CHS) is a policy framework designed to encourage reductions in GHG emissions from heating fuels by requiring energy providers to lower the emissions intensity of their services. Rather than prescribing specific actions, a CHS typically sets performance-based goals for energy providers and allows flexibility in how those goals are met. In general, a CHS establishes GHG reduction benchmarks for local distribution companies (LDCs), electricity utilities, or other fuel suppliers and provides a range of compliance pathways. These can include:

- Electrification of fossil fuel end uses, such as the adoption of electric heat pumps for space heating
- Renewable thermal solutions, including networked geothermal and district heat systems
- Energy efficiency improvements that reduce overall heating demand
- Low carbon liquid and gaseous fuels

CHS programs are often designed with consumer protections in mind, such as cost controls and mechanisms to ensure equitable access to clean heating technologies. They may also seek to leverage available federal and state funding to minimize ratepayer impacts and expand participation across income levels and building types.

Modeling Assumptions and GHG Reductions

The emissions reduction trajectory of the modeled CHS is based on the Massachusetts Draft Framework for a Clean Heat Standard, which requires annual emissions reductions leading to near zero in 2050.[131] The study assumed that the vast majority of emissions reductions would come from efficiency and electrification, with only a limited role for biofuels. The Massachusetts Draft

[127] New York City Department of Buildings. Local Law 97 (LL97), Greenhouse Gas Emissions Reduction. https://www.nyc.gov/site/buildings/codes/ll97-greenhouse-gas-emissions-reductions.page
[128] City of Boston. BERDO Regulations Development. https://www.boston.gov/departments/environment/berdo-regulations-development
[129] District Department of Energy & Environment (DC). Building Energy Performance Standards (BEPS). https://doee.dc.gov/service/building-energy-performance-standards-beps
[130] Commercial Property Assessed Clean Energy (C-PACE) – Colorado. C-PACE. https://energyoffice.colorado.gov/c-pace
[131] Massachusetts Department of Environmental Protection. Clean Heat Standard (CHS) Draft Program Framework. November 2023. https://www.mass.gov/doc/chs-draft-program-framework/download

Framework initially only allows liquid biofuels to generate credit at program startup, with a scheduled program review in 2028 to evaluate revising fuel eligibility. In the CHS modeled for this analysis, renewable natural gas and fuel oil only provide around 5% of the total reductions by 2050, illustrating that efficiency and electrification are the primary source of reductions.

Table 29: Estimated GHG Reductions from Clean Heat Standard (ktCO2e)

Strategy	2030	2040	2050	Cumulative
Clean Heat Standard	200	1,110	1,840	23,300

Regulatory Authority

To implement a Clean Heat Standard, enabling legislation would be required. Once authorized, regulatory and administrative responsibilities would be shared by:

+ RIDEM: Lead agency for rulemaking, enforcement, and emissions tracking
+ OER: Provides technical assistance, modeling support, and guidance on eligible clean heat strategies
+ PUC: Oversees utility cost recovery, ratepayer protections, and plan approvals

This collaborative governance model ensures both environmental integrity and affordability are upheld throughout program implementation.

Funding Availability

Implementing a CHS will require upfront investments in infrastructure, incentives, and outreach. Rhode Island will seek to minimize costs for consumers by coordinating funding across multiple sources:

+ U.S. Department of Energy clean energy and building decarbonization grants
+ EPA's Greenhouse Gas Reduction Fund for community-scale investments
+ Dedicating a portion of RGGI auction proceeds to support clean heat adoption, especially in overburdened communities
+ Potential expansion of Rhode Island Infrastructure Bank loan and grant programs for building retrofits

Equity and Environmental Justice Considerations

Equity is integral to the design of a successful Clean Heat Standard. The program should be structured to ensure that historically underserved and frontline communities are prioritized in funding, outreach, and program benefits. Key equity measures include:

+ Targeted program investments in communities with high energy burdens or pollution exposure
+ Subsidies or rebates for low- and moderate-income households to support electrification and weatherization
+ Workforce development programs to ensure clean heat investments generate local jobs

- Community engagement requirements, ensuring affected residents shape program design and delivery
- Anti-displacement protections to prevent unintended consequences of building upgrades on renters or vulnerable households

Implementation Strategy and Timeline

This measure will likely require statutory or regulatory action by the State in close coordination with the Public Utilities Commission (PUC). The recent Future of Gas Docket in RI will lend some insights on this issue in coming months and help identify a path forward. While this matter is under discussion and consideration in 2026, RIDEM and the RIEC4 can continue to address/discuss the benefits such a proposal will bring to Rhode Island. Best practices from other jurisdictions will be examined.

Best Practices from Other States

Rhode Island's proposed CHS is modeled on Massachusetts' draft CHS framework[132], which requires a straight-line trajectory to zero building emissions by 2050. This framework mandates that energy providers, such as gas utilities and fuel oil distributors, reduce emissions over time through a mix of primarily energy efficiency and electrification, with a smaller role envisioned for low carbon fuels.

Building on leading examples from Colorado[133], which pairs emissions targets with flexible compliance pathways, equity protections, and utility coordination. Rhode Island will tailor these best practices to its own energy landscape by prioritizing low-income households, leveraging regional funding streams like RGGI, and coordinating closely with utilities to ensure affordability and consumer choice. Early stakeholder engagement and robust technical modeling will be critical to successful implementation.

[132] Massachusetts Department of Environmental Protection (MassDEP). Massachusetts Clean Heat Standard (CHS). https://www.mass.gov/massachusetts-clean-heat-standard

[133] Colorado General Assembly. Senate Bill 21-264: Adopt Programs to Reduce Greenhouse Gas Emissions – Utilities. (2021). https://leg.colorado.gov/bills/sb21-264

Industry and Waste

Figure 17: Industry and Waste Sector Emissions by Strategy (ktCO2e)

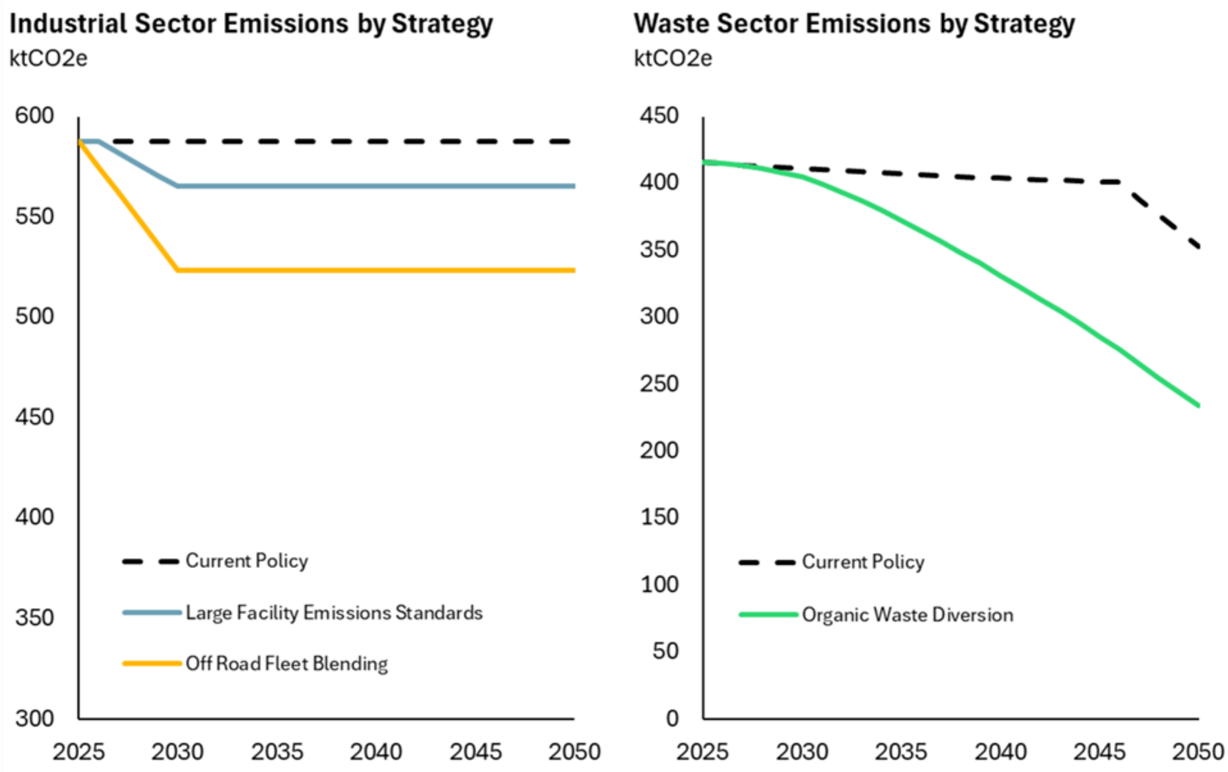

Table 30: Industry and Waste Sector Emissions Reductions by Strategy (ktCO2e)

Strategy	2030	2040	2050	Cumulative
Industrial Facility Emissions Standards	20	20	20	500
Off Road Fleet Renewable Fuel Blending	60	60	60	1,400
Organic Waste Diversion	10	70	120	1,500

Industrial Facility Standards

Policy Overview

This strategy considers the establishment of GHG emissions limits for large industrial emissions sources, based on a similar program established in Colorado. As part of the Greenhouse Gas Emissions and Energy Management for Manufacturing 2 (GEMM 2) rule, manufacturing facilities in Colorado that emit more than 25,000 metric tons of CO2e per year are required to reduce their emissions 20% by 2030[134]. An earlier complimentary rule, GEMM 1, regulates emissions for energy-intensive, trade-exposed (EITE) industries like iron and steel and cement[135], but there are no large facilities in the designated EITE sectors in Rhode Island. The GEMM 2 rule requires industrial emitters to submit compliance plans and achieve annual emissions reductions through a combination of energy efficiency, electrification, alternative fuels, fuel switching, and participation in approved credit or offset mechanisms. The goal of adopting a similar rule in Rhode Island would be to better align the industrial sector with statewide climate targets while maintaining competitiveness, protecting public health, and encouraging investments in next generation clean technologies.

Modeling Assumptions and GHG Reductions

The modeled industrial facility limits are based on those of the Colorado GEMM program and leverage facility-specific emissions data from the EPA Greenhouse Gas Reporting Program (GHGRP), which requires all facilities and fuel suppliers with annual emissions exceeding 25 ktCO2e per year to report their emissions to the EPA. According to the most recent EPA data, industrial facilities that report to GHGRP accounted for around 100 ktCO2e of emissions in Rhode Island, around 16% of total industrial sector emissions. As shown in Table 31, reaching a 20% emissions reduction by 2030 for these covered emissions would result in a 20 ktCO2e per year reduction, a 4% reduction for total annual industrial sector emissions.

Table 31: Estimated GHG Reductions from Industrial Facility Emissions Standards

Strategy	2030	2040	2050	Cumulative
Industrial Facility Emissions Standards	20	20	20	500

Regulatory Authority

RIDEM has existing authority to regulate industrial air emissions under state air pollution control statutes and the state's GHG reduction law. RIDEM would lead rulemaking, emissions tracking, compliance monitoring, and enforcement. Additional enabling legislation may be necessary to establish emissions thresholds, credit mechanisms, and technical compliance Pathways. The policy would also benefit from coordination with the OER, especially in aligning industrial decarbonization efforts with statewide energy planning and economic development initiatives.

Funding Availability

The compliance cost for facility emissions standards would largely be borne by facility owners, although a portion of these costs could be passed on to consumers.

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[134] Colorado Department of Public Health and Environment. (2025). Greenhouse Gas Emissions and Energy Management for Manufacturing 2 (GEMM 2) Rule; https://cdphe.colorado.gov/apcd/GEMM-phase-2-rule

[135] Colorado Department of Public Health and Environment. (2021). Greenhouse Gas Emissions and Energy Management for Manufacturing in Colorado (GEMM 1); https://cdphe.colorado.gov/apcd/GEMM-phase-1-rule

Some potential funding streams to support compliance with industrial emissions standards could include:

+ RGGI revenues
+ State financing tools: green bonds, revolving loan funds, and public-private partnerships could provide capital for industrial upgrades
+ Academic and research collaborations: Partnerships with local universities and National Labs may be able to provide technical support and innovation funding.

Equity and Environmental Justice Considerations

As Rhode Island designs industrial emissions requirements, environmental justice must remain a core focus. Communities already overburdened by industrial activity must not be exposed to worsening localized pollution. The policy should include:

+ Air quality co-benefit requirements to ensure reductions in local pollutants alongside GHGs.
+ Cumulative impact analyses to prevent concentration of emissions in disadvantaged areas.
+ Community engagement mandates to ensure public input from impacted neighborhoods during facility transition planning.
+ Workforce transition support to prepare workers in affected sectors for clean economy jobs, with particular attention to frontline communities.

Implementation Strategy and Timeline

This measure will require statutory or regulatory action by the State. While this matter is under discussion and consideration in 2026, RIDEM and the RIEC4 can continue to address/discuss the benefits such a proposal will bring to Rhode Island. Best practices from other jurisdictions will be examined.

Best Practices from Other States

Colorado's GEMM 1 and GEMM 2 rules provide a successful model for Rhode Island to follow, demonstrating how enforceable emissions standards paired with flexible compliance tools can drive industrial decarbonization. Rhode Island can adapt these best practices by setting an emissions threshold appropriate for the state's industrial landscape, prioritizing on-site reductions, and incorporating transparent, facility-level emissions tracking. Early engagement with industry stakeholders and alignment with New England regional efforts will ensure consistency, competitiveness, and effective policy implementation.

Off Road Fleet Renewable Fuel Blending

Policy Overview

This policy would require the use of renewable diesel or similar low-carbon fuels in off-road fleets operating within Rhode Island, focusing on vehicles with engines greater than 25 horsepower, such as those used in construction, agriculture, and industrial applications. Renewable diesel can serve as a drop-in replacement for conventional diesel fuel and has been shown to deliver substantial lifecycle emissions reductions.

The policy is based on California's In-Use Off-Road Diesel-Fueled Fleets regulation, which mandates 100% renewable diesel use for certain off-road fleets.[136] By adapting this model to Rhode Island's regulatory environment and market conditions, the state could accelerate near-term emissions reductions from a sector where electric alternatives remain limited or cost prohibitive.

The regulation would apply primarily to larger fleet operators and public agencies but may include provisions to phase in requirements for smaller operators. The goal is to reduce fossil fuel dependence and promote cleaner air while setting the groundwork for longer-term electrification of the sector.

Modeling Assumptions and GHG Reductions

To model the off-road fleet renewable fuel blending requirements, this analysis assumed that all diesel use for non-manufacturing industries (e.g., construction and agricultural vehicle fleets) was converted to 100% renewable diesel by 2030. Estimates of diesel consumption for these industries came from diesel consumption data used for the 2022 Rhode Island GHG Inventory provided by RIDEM. It is important to note that the California policy used as the template has separate requirements based on fleet size and vehicle or equipment horsepower threshold. For simplicity, because a detailed inventory of off-road diesel combustion equipment was not available for this analysis, it was assumed that all diesel consumed by these industries would convert to renewable diesel when modeling the strategy.

Table 26: Estimated GHG Reductions from Off Road Fleet Renewable Fuel Blending (ktCO2e)

Strategy	2030	2040	2050	Cumulative
Off Road Fleet Renewable Fuel Blending	60	60	60	1,400

These reductions would contribute meaningfully to the state's broader climate targets, especially as other vehicle categories become subject to electrification mandates or clean fuel standards. While the off-road sector represents a smaller share of total transportation emissions, its emissions are concentrated and often located near communities already burdened by air pollution.

Regulatory Authority

RIDEM has primary authority to implement and enforce fuel-related standards for non-road mobile sources, including:

- Rulemaking to define applicable fleets, fuels, and timelines
- Monitoring and compliance enforcement
- Coordination with fuel suppliers and operators

[136] California Air Resources Board. (n.d.). In-Use Off-Road Diesel-Fueled Fleets Regulation; https://ww2.arb.ca.gov/our-work/programs/use-road-diesel-fueled-fleets-regulation

RIDEM may also coordinate with other state agencies such as OER and RIDOT, particularly for public sector fleets. Depending on the scope, enabling legislation may be required to authorize or expand RIDEM's regulatory authority over fuel blending requirements for private fleets.

Funding Availability

This policy is designed primarily as a compliance-based requirement, with fuel costs borne by fleet operators. While most renewable fuels have higher upfront costs, some studies show that renewable diesel offers lifecycle maintenance savings and operational benefits, which may offset costs over time. However, several funding mechanisms may be considered to support implementation and mitigate cost impacts:

- State and federal grant programs (EPA Diesel Emissions Reduction Act funding)
- Low-interest financing or rebates for small fleet operators
- Leveraging existing IRA and BIL programs that support clean fuels infrastructure (contingent on availability of these federal funding sources)
- Cost-sharing programs for public and municipal fleets

Equity and Environmental Justice Considerations

Implementing renewable fuel blending requirements for off-road fleets presents opportunities to reduce localized air pollution in communities already burdened by industrial activity, construction, and transportation-related emissions. However, the policy may also introduce financial challenges for smaller or minority-owned fleet operators, particularly in sectors such as construction and agriculture where profit margins can be narrowed. To promote equitable outcomes, the state may consider targeted support mechanisms such as subsidies, technical assistance, or grant programs to offset higher renewable fuel costs for smaller businesses. A tiered compliance schedule could offer additional time for smaller operators to transition, while stakeholder engagement efforts can help identify and address specific barriers to adoption. Embedding equity considerations in both program design and implementation will be essential to achieving both climate and justice goals.

Implementation Strategy and Timeline

This measure will require regulatory action by RIDEM. While this matter is under discussion and consideration in 2026, RIDEM and the RIEC4 can continue to address/discuss the benefits such a proposal will bring to Rhode Island. Best practices from other jurisdictions will be examined.

Best Practices from Other Jurisdictions

Several states and cities have implemented renewable fuel requirements for off-road fleets, offering practical models that could be adapted to Rhode Island's context. California's mandate for 100% renewable diesel in off-road equipment demonstrates the value of phasing requirements, targeting high-horsepower engines, and starting with public sector fleets, all strategies that align well with

Rhode Island's regulatory capacity and market scale.[137] Cities like San Francisco[138] and Oakland have integrated renewable fuel use into municipal procurement and construction contracts, a best practice Rhode Island could replicate through state-led purchasing and infrastructure projects.

Other jurisdictions, such as New York City[139,140], also use procurement standards to drive clean fuel adoption and aid smaller operators, an important equity consideration in Rhode Island, where many fleet owners are small businesses. These examples suggest that a phased approach, starting with public and large private fleets, combined with technical assistance and existing clean fuel policies, would offer a feasible and effective pathway for Rhode Island to reduce emissions from off-road vehicles while supporting a fair and orderly transition.

Organic Waste Diversion

Policy Overview

This policy supports the diversion of organic waste like food scraps and yard trimmings from Rhode Island's primary Central Landfill through the expansion of municipal organic waste collection programs. By promoting composting and anaerobic digestion, Rhode Island can significantly reduce methane emissions from landfills while creating useful products like soil amendments or biogas. The policy emphasizes technical assistance, funding pathways, and regional collaboration to build local government capacity for effective program implementation. It also aims to explore regulatory and market-based incentives to support the scaling of diversion programs.

Modeling Assumptions and GHG Reductions.

The impact of organic waste diversion on landfill methane emissions in Rhode Island was modeled using the First Order Decay (FOD) Model from the Solid Waste Module of the EPA State Inventory Tool.[141] The FOD model accounts for methane emissions based on the amount of waste landfilled annually and the variation in methane generation over time based on the how long the waste has been landfilled. In the Current Policy scenario, it was assumed that landfilled organic waste amounts would continue at recent levels (based on 5-year average between 2019-2023) until 2045, when the Central Landfill is assumed to reach capacity and stop receiving waste.[142] For the organic waste diversion measure, a 50% reduction in landfilled waste by 2035 and a 75% reduction by 2045

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[137] California Air Resources Board. (n.d.). In-Use Off-Road Diesel-Fueled Fleets Regulation; https://ww2.arb.ca.gov/our-work/programs/use-road-diesel-fueled-fleets-regulation

[138] Metropolitan Transportation Commission. (2025). Public Fleet Electrification Planning Assistance Program; https://mtc.ca.gov/planning/transportation/transportation-electrification/public-fleet-electrification-planning-assistance-program

[139] New York City Department of Citywide Administrative Services. (2024, October 3). Mayor Adams Announces Full City Fleet Has Completed Transition to Renewable Diesel; https://www.nyc.gov/site/dcas/news/019-24/mayor-adams-full-city-fleet-has-completed-transition-renewable-diesel

[140] New York State Office of General Services. (2024, December 17). NYS Office of General Services Commissioner Jeanette Moy Announces Availability of Renewable Diesel on State Contract; https://ogs.ny.gov/news/nys-office-general-services-commissioner-jeanette-moy-announces-availability-renewable-diesel

[141] U.S. Environmental Protection Agency. (2025, February 25). State Inventory and Projection Tool; https://www.epa.gov/statelocalenergy/download-state-inventory-and-projection-tool

[142] Smith, R. (2025, March 27). Rhode Island's Last Landfill Is Running Out of Room. ecoRI News; https://ecori.org/rhode-islands-last-landfill-is-running-out-of-room/

was modeled. This final value is similar to the high end of food waste recovery rates (72%) modeled by Rhode Island Resource Recovery Corporation (RIRRC) in a 2022 study analyzing municipal food waste collection alternatives.[143]

Table 27: Estimated GHG Reductions from Organic Waste Diversion (ktCO2e)

Strategy	2030	2040	2050	Cumulative
Organic Waste Diversion	10	70	120	1,500

Regulatory Authority

RIDEM would be the lead regulatory agency, with authority to set landfill diversion targets, update waste management regulations, and oversee facility permitting. Local governments play a central role in program administration, particularly for residential and commercial collection. RIDEM can also partner with RIRRC to integrate diversion goals with state waste planning and landfill operations. New mandates or thresholds may require legislative action for enforcement or funding authorization.

Funding Availability

Multiple funding Pathways are available to support food waste diversion, including:

- Federal Funding: EPA's Solid Waste Infrastructure for Recycling (SWIFR) grants and USDA's composting cooperative agreements under the Climate-Smart Commodities program.
- State Resources: Green bonds and targeted waste management surcharges could fund infrastructure, education, and pilot programs.
- Market-Based Mechanisms: Pay-as-you-throw (PAYT) pricing structures and tipping fee adjustments can create economic incentives for diversion.
- Public-Private Partnerships: Collaborations with composting facilities, farms, or anaerobic digestion developers can offset municipal costs and accelerate capacity-building.

Equity and Environmental Justice Considerations

Food waste diversion offers several equity co-benefits. If designed inclusively, programs can reduce pollution burdens in frontline communities near the landfill, lower waste disposal costs for low-income households, and create local green jobs. Outreach efforts must prioritize multilingual communication, culturally relevant education, and equitable access to curbside or drop-off programs. Careful siting of new organics processing facilities must avoid reinforcing environmental burdens in already overburdened areas. Diversion efforts can also reduce food insecurity if upstream strategies like food rescue are integrated.

Implementation Strategy and Timeline

[143] Rhode Island Resource Recovery Corporation. (2022, March). Analysis of Statewide Municipal Food Waste Collection Alternatives: Final Report; https://www.rirrc.org/sites/default/files/2022-05/Final%20Report%20Organics%20Collection%20Alternatives%20March%202022%20to%20RIRRC.pdf

New mandates for diversion will likely require statutory or regulatory action by the State. While this matter is under discussion and consideration in 2026, RIDEM and the RIEC4 can continue to address/discuss the benefits such a proposal will bring to Rhode Island. Best practices from other jurisdictions will be examined. RI's cities and towns can continue to play an active role in promoting voluntary diversion opportunities.

Best Practices from Other States

Rhode Island can draw on proven models from other states to inform the expansion of food waste diversion programs. Vermont's statewide ban on landfilling food scraps, [144] combined with phased implementation and investment in composting infrastructure, demonstrates the effectiveness of a coordinated state-led approach. San Francisco's mandatory separation and universal curbside collection program shows how regulatory mandates and public-private partnerships can achieve high diversion rates. Massachusetts' commercial organics disposal ban, supported by financial incentives through MassCEC, offers a compelling example of how to drive compliance and infrastructure growth.[145] New York City's renewed focus on curbside composting emphasizing equity, multilingual outreach, and accessibility underscores the importance of inclusive design, a priority Rhode Island shares as it considers scaling its own food waste strategies. [146]

Natural and Working Lands

Maintaining Natural Carbon Sinks

Policy Overview

Natural ecosystems are both sinks and sources of greenhouse gas emissions. Healthy forests, for example, absorb and store carbon dioxide (CO2) through photosynthesis, locking carbon in biomass and soils. In contrast, degraded or decaying forests release CO2 back into the atmosphere through decomposition. Globally, natural systems act as a net carbon sink, removing approximately half of the CO2 emitted by human activities.[147]

This policy proposes to prioritize protecting the health and integrity of Rhode Island's natural ecosystems and enhancing their carbon sequestration and storage through natural climate solutions (NCS). NCS, such as the conservation, sustainable management, restoration, and expansion of forests, wetlands, and agricultural lands, have the potential to significantly contribute to climate mitigation efforts in Rhode Island. NCS uniquely offer a wide range of co-benefits beyond

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[144] Vermont Department of Environmental Conservation. (n.d.). Vermont's Universal Recycling Law (Act 148); https://dec.vermont.gov/doc/waste-management/solid/universal-recycling

[145] Massachusetts Department of Environmental Protection. (n.d.). Commercial Food Material Disposal Ban; https://www.mass.gov/guides/commercial-food-material-disposal-ban

[146] New York City Council — Office of Council Member Shahana Hanif. (2024, December 21). New York City's Universal Residential Composting; https://council.nyc.gov/shahana-hanif/2024/12/21/new-york-citys-universal-residential-composting

[147] Copernicus Publications. (2023). *Earth System Science Data* — "Global Carbon Budget 2023"; https://essd.copernicus.org/articles/15/5301/2023/

carbon mitigation, such as improved air and water quality, enhanced recreational opportunities, biodiversity conservation, green job creation, support for sustainable local economies, and increased community resilience to climate impacts. This policy assumes a stable natural carbon sink through 2050, meaning that Rhode Island's natural and working lands will continue to store and sequester approximately the same amount of carbon as in recent years. At the core of this policy is a commitment to maintaining—at minimum—the current level of carbon storage and sequestration provided by its natural and working lands through 2050, with a goal to enhance this capacity wherever feasible. This "no net loss" approach to carbon sink capacity will be advanced through three core functions:

- **Conserve** forests, farms, and wetlands
- **Sustainably manage** forests and farms
- **Expand** greenery in cities and beyond

Modeling Assumptions and GHG Reductions

In 2022, Rhode Island's natural and working lands—its forests, wetlands, farms, and urban green spaces—sequestered 0.75 million metric tons of CO2, offsetting 7.2% of the state's gross greenhouse gas emissions (as measured by RI's 2022 GHG Inventory). Most of Rhode Island's natural carbon sequestration comes from its forests and urban trees. When considering the carbon impact of intact forest ecosystems, we consider both forests' ongoing ability to absorb CO2, as well as the amount of carbon already stored in the forest, which increases incrementally each year due to ongoing sequestration. The average acre of forest in Rhode Island is estimated to remove 1.3 metric tons of carbon every year and stores between 75 and 91 metric tons of carbon.[148]

Rhode Island assumes a stable natural carbon sink through 2050, meaning that Rhode Island's natural and working lands will continue to store and sequester approximately the same amount of carbon as in recent years. This assumption is based on historical data showing a decline in total forest acreage—a loss of approximately 30,000 acres since 1990—alongside an apparent increase in annual carbon removals. This increase is attributed to carbon being temporarily transferred into other transient biomass pools, such as deadwood from invasive species outbreaks. However, Rhode Island's ability to sequester carbon will decline over time as forest land is converted to developed land. When an intact forest is converted to development, a substantial portion of the carbon stored in trees and soils is released into the atmosphere, and the land's future potential to sequester carbon is largely—and often permanently—lost.[149]

Estimated GHG Sequestration

This policy estimates a stable sequestration of carbon at 0.75 million metric tons of CO2 annually through 2050.

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[148] Note: These estimates and assumptions were not modeled specifically for this analysis and instead come from RI's 2022 GHG Inventory analysis of annal sequestration rates for RI. The 2022 Inventory available at https://dem.ri.gov/sites/g/files/xkgbur861/files/2024-12/ghg-inventory-2022-f_1.pdf provides further technical details on how this estimate was produced.

[149] The Value of Rhode Island Forests Report, 2019

Regulatory Authority

RIDEM, in collaboration with municipalities and key non-profit partners will likely lead the continued implementation, coordination and delivery of this initiative, with support from State Green Bonds and related funding. The program, while not regulatory in nature, may be structured under existing executive authority, leveraging longstanding statewide partnerships to secure necessary funding and identify new opportunities for land protection/sequestration. Multiple governmental (local/state) and non-profit partners will continue to implement the core elements of this policy.

Funding Availability

Rhode Island recognizes the importance of working collaboratively across municipalities and nonprofit partners to identify acquisition opportunities and secure resources to protect the health and integrity of its natural ecosystems so as to enhance their carbon sequestration and storage through natural climate solutions (NCS).

The following funding streams are available or are under consideration - not every source listed below applies to all aspects of land protection and conservation outlined in this policy:

- State Green Bond (RI)
- Federal Programs (US Forest Service's Forest Legacy Program, US Fish and Wildlife Service's Wildlife Restoration Program, the National Oceanic and Atmospheric Administration, the National Park Service Land and Water Conservation Fund, US Department of Agriculture Natural Resource Conservation Service)
- Rhode Island Infrastructure Bank
- RIDEM
- Agricultural Land Preservation Program (RI)
- Open Space Program (RI)
- The Nature Conservancy and other non-profits
- Local land trusts/ municipalities across RI
- Private philanthropy
- RIEC4 Funding
- Climate Resilience Fund (RI)
- Municipal Resilience Program (RI)
- SNEP Watershed Implementation Grants

Equity and Environmental Justice Considerations

When considering land use protection and conservation, understanding who uses the land and for what purpose is key. As RI establishes strategies to protect natural and working lands, it is of utmost importance to have people and Rhode Island communities in mind – holding equity and Rhode Island Comprehensive Climate Action Plan (CCAP) 74 thoughtfulness at the forefront. Partnerships with Rhode Island community-based organizations allow for the incorporation of community priorities.

Maintaining or expanding sequestration, especially in our urban core (Providence, Pawtucket, Central Falls and Woonsocket), remains a priority for the state. Rhode Island's continued work in urban forestry will prioritize participation by and benefits to these communities. Similarly, avoiding potential displacement or additional issues that may harm our most vulnerable populations needs to be prioritized.

Implementation Strategy and Timeline

RIDEM and municipalities have broad authority to implement key programs to promote the protection and conservation of natural working lands. Securing funds to support this measure will remain a critical focus of the state's efforts to maximize sequestration opportunities, including the RI 2026 Green Bond. RI can consider prioritizing the following in support of implementing carbon sequestration opportunities:

- Continuing to work with landowners throughout the state to acquire and protect priority lands throughout the state.
- Promoting a smart growth approach to development that prioritizes development on already degraded or developed lands.
- Integrating climate-smart forestry practices into the management on state lands.
- Promoting climate-smart agricultural practices that maximize carbon storage and sequestration.
- Prioritizing the planting, maintaining, and protecting of trees in urban and suburban areas.

Best Practices from Jurisdictions

- 30x30 Conservation Goals: Several states, including California, Maryland, and New York, have committed to conserving 30% of their land by 2030.
- Utilize the US Climate Alliance's 'Climate and Land Use Planning: A Policy Guide for U.S. States and Territories' (2025) which outlines a suite of policies states and territories can use to advance their sequestration and climate goals. Highlights include Massachusetts' Transit Oriented Development/MBTA requirements, Climate-Friendly and Equitable Communities in Oregon, and Massachusetts' Technical Potential of Solar Study (similar to a study conducted in RI on solar opportunities (2021).
- Locally, the Providence Tree Plan, is a community-driven initiative to develop an action plan for creating a healthy and equitable urban forest in Providence to address tree inequity – where trees are not distributed evenly nor equitably among neighborhoods.

Electric Sector Modeling Methodology

Overview and Study Framing

The electric sector plays a key role in Rhode Island's decarbonization strategy. Electricity powers homes, businesses, and increasingly, vehicles and heating systems. As the state transitions away from fossil fuels, the electric grid becomes both a key driver of direct emissions reductions and a critical enabler of broader decarbonization across transportation and buildings.

Rhode Island's electric system is part of the larger ISO New England (ISO-NE) grid. This means Rhode Island's progress is tied to developments across the region. Renewable energy generated in other states—such as wind, solar, biomass, and hydropower—can help meet Rhode Island's renewable energy targets, but the state also faces competition for renewable resources. Similarly, the carbon emissions associated with electricity used in Rhode Island depend on the overall generation mix across New England, since power flows freely within the ISO-NE grid.

Because Rhode Island is dependent on the ISO-NE system, the project team used a PLEXOS Long-Term (LT) electricity system model to create a least-cost investment and operational plan to meet future electricity needs across the entire New England region through 2050. The model considered the hourly operations of the ISO-NE electric system, as well as annual renewable and GHG goals, while also minimizing electricity costs over the entire time horizon. The capacity expansion modeling included a treatment of electric system reliability that used results from probabilistic reliability modeling. E3 used a publicly available PLEXOS LT model from ISO-NE as a starting point and made updates to the model for this study.

Regional results from PLEXOS were downscaled to Rhode Island for the following analyses:

- Electric cost-of-service: Electric sector costs were an important input into the economy-wide costs calculated in this study. The costs that Rhode Island electricity consumers pay largely fall into four buckets: electric energy costs, electric capacity costs, the cost of clean energy attributes such as Renewable Energy Certificates (RECs), and the cost of wires, i.e., the transmission and distribution system infrastructure needed to deliver electricity to consumers. Future investment costs and production costs (predominantly for natural gas fuel and imports) from the PLEXOS model were used to determine changes in future energy and capacity costs. The level of renewable generation on the ISO-NE system from the PLEXOS model was used when calculating incremental costs of achieving Rhode Island's RES policy. Transmission and distribution upgrade cost calculations did not use PLEXOS results. Additional information is available in the Electric Cost-of-Service and Rates section.
- GHG emissions: Electric-sector GHG emissions attributable to Rhode Island were calculated using ISO-NE-wide emissions and generation outputs from PLEXOS. Additional information is available in the Electricity sub-section of the Carbon Reduction Strategy Details section.
- Public Health Benefits: Generation from natural gas power plants within Rhode Island was determined by PLEXOS and was used as an input to air quality modeling.

- Employment: Rhode Island electric system cost and resource capacity values were used to as inputs to the jobs analysis.

The PLEXOS model developed for this study assumed policy compliance with an estimate of renewable policy requirements across the New England region. This is important to ensure that Rhode Island is allocated a share of electric sector costs and societal benefits consistent with the regional policy directives to increase the level of renewable generation and decarbonize the grid. As such, the PLEXOS scenario developed for this study (the New England RPS scenario) is not a projection of the resources that are *likely* to be developed for the ISO-NE system; rather, it represents a hypothetical scenario that portrays the electricity system cost and societal benefits to Rhode Island of an ISO-NE system that meets state renewable policy goals by building new generation. The scenario was also designed to progressively lower GHG emissions from electricity generation. Limits on the availability of new onshore and offshore wind resources over the next decade were included to reflect barriers to development; however, the modeling did not limit the rate at which utility-scale solar and batteries could be constructed to ensure that adequate renewable energy was available to the model to meet renewable targets. There is uncertainty about the level of renewable energy that will be economical at a given time under ISO-NE market conditions, and the rate at which resources can be built. It was not in the scope of this study to develop a detailed estimate of feasible near-term market procurement of renewables in Rhode Island or New England, which is recommended as a focus of future research. The state of Rhode Island will be undertaking a detailed study of renewable energy supply and procurement in 2026.[150]

PLEXOS Model

E3 began with a publicly available PLEXOS zonal capacity expansion model from ISO-NE,[151] released as part of the 2024 Economic Study.[152] The model covered all 6 New England states and included imports from Canada over a study horizon of 2035 to 2050. It included a representation of the existing resources in the ISO-NE system, as well as future candidate resources. For this analysis, E3 extended the study horizon to include years 2026 to 2050 and added renewable and reliability requirements. The capacity expansion model sampled 36 representative days per year, each modeled with full hourly chronology (24 hours per day). E3 retained transmission limits from the ISO-NE public PLEXOS model, which represented transmission interfaces corresponding to major corridors across New England. E3 did not model expansion of these limits in the capacity expansion modeling. The model solved for the entire 2026-2050 planning horizon at annual resolution in a single optimization step. For a full list of changes that E3 made to the ISO-NE model, see the section below "E3 Updates to ISO-NE PLEXOS LT Model."

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[150] State of Rhode Island Public Utilities Commission and Division of Public Utilities and Carriers. Docket No. 25-25-EL Integrated Clean and Renewable Energy Procurement Study; https://ripuc.ri.gov/Docket-25-25-EL

[151] ISO New England. (2024 August 21). PAC 2024 Economic Study: Capacity Expansion Methodology; https://www.iso-ne.com/static-assets/documents/100014/a08_pac_2024_economic_study.pdf

[152] ISO New England. (2025 June 10). Economic Studies: Capacity Expansion Model; https://www.iso-ne.com/system-planning/system-plans-studies/economic-studies

Resources that the model could select to meet future grid needs included:

- Onshore wind
- Offshore wind - both fixed and floating technologies
- Utility-scale solar
- 4- and 8-hour batteries
- 100-hour batteries
- Nuclear Small Modular Reactors (SMRs)
- Natural gas combustion turbines[153]

Solar energy from behind the meter (BTM) additions were included in the modeling. Over time, the amount of generation from BTM solar resources embedded in the load profiles in ISO-NE's PLEXOS model increases; this generation reduces the load that is required to be supplied by generation on the ISO-NE grid. Additional BTM solar above the level included by ISO-NE was not included as a candidate resource that the model could select.

Three key interrelated drivers of the evolution of the ISO-NE electric system were modeled in the PLEXOS capacity expansion analysis:

1. Renewable Portfolio Standard (RPS) requirements
2. Planning Reserve Margin (PRM) requirements to maintain reliability
3. GHG emissions limits

Renewable Portfolio Standard

Rhode Island's Renewable Energy Standard (RES) is an example of a type of policy that is commonly referred to as a Renewable Portfolio Standard (RPS). RPS polices require a certain percentage of a state's electric demand to be met by eligible renewable resources. All of the New England states have RPS policies, though the specifics of the policies vary from state to state. Table 32 depicts the state-level renewable targets used in 2030, which reflect state targets as of May 2025. Targets change year-on-year in the modeling based on state policy schedules.

[153] Gas combustion turbines, SMRs, and 100-hour batteries were not candidates in Rhode Island but could be selected elsewhere in ISO-NE. Gas combustion turbines and SMRs were not candidates in the Boston zone.

Table 32: Modeled State Renewable Targets in 2030

State	2030 RPS % modeled
Connecticut	40%[154]
Massachusetts	40%
Maine	50%
New Hampshire	15%[155]
Rhode Island	72%
Vermont	16%[156]

E3 modified ISO-NE's PLEXOS model by adding an annual RPS requirement, implemented as an aggregate target across New England. While RPS requirements are determined at the state level, the model enforced an aggregate of state RPS requirements at the ISO-NE level because RECs can be traded across state boundaries, and because most New England states have similar definitions of which renewable resources count towards their RPS requirements. The statewide targets were added together to create a region-wide RPS target.[157] As shown in the left panel of Figure 18, this approach yielded a steadily increasing demand for renewable energy over the study horizon. Between present day and 2035, much of the increase in the RPS target is a product of states increasing their percentage of demand covered by renewables, for example Rhode Island's increase to a 100% renewable requirement by 2033. After 2035, the annual energy requirements (GWh/yr) for renewable energy increase as electric demand increases, driven in large part by electrification. As shown in the right panel of Figure 18, the ISO-NE-wide percentage of retail sales covered by the RPS requirement does not increase much after 2035, which indicates that increase in the GWh/yr demand for renewables (left panel of Figure 18) is driven by load increases after 2035.

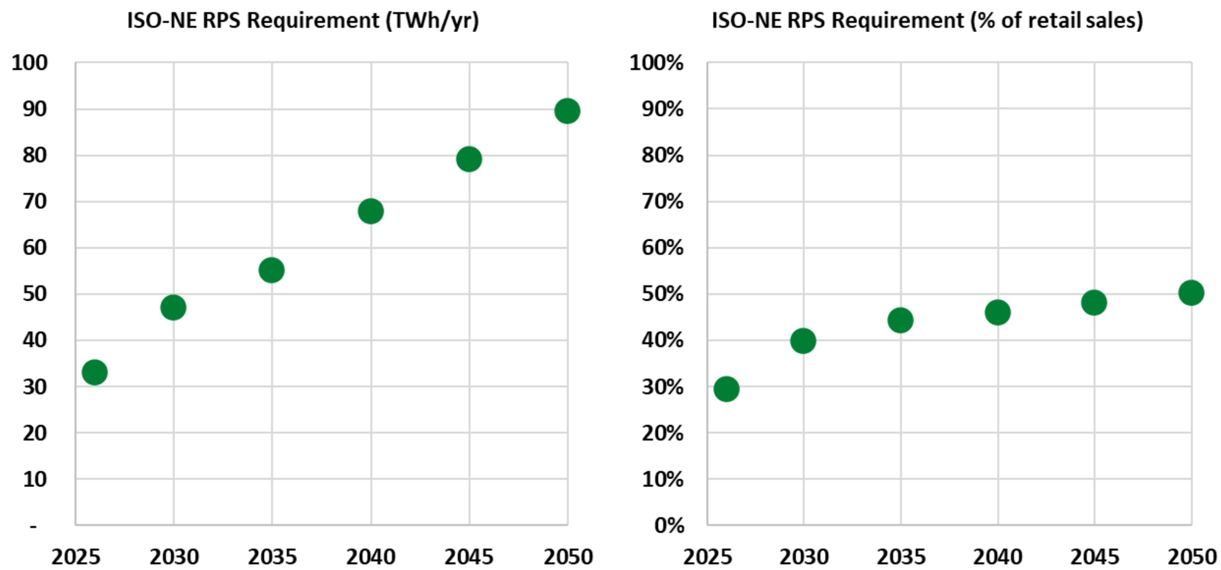
[154] E3 did not capture the 2025 revision of the Connecticut and Maine targets. Connecticut's update reduced the target for Class 1 RECs from 40% in 2030 to 29%, as well as lowering targets before 2030. The new target would reduce demand for renewables in 2030 by approximately 3 TWh/yr relative to what was modeled in PLEXOS. The 2025 revision of Maine's RPS target would increase the percentage of new renewables required after 2030 relative to what was modeled.

[155] Percentage indicates New Hampshire Class 1 requirement.

[156] Vermont's Renewable Energy Standard allows generation from large hydroelectric facilities to count towards a large portion of the requirement; other states do not allow this resource type to quality for their renewable requirements. To make Vermont's requirement more comparable to other state requirements, only the distributed generation portion of Vermont's requirement was included in the RPS requirement modeled in PLEXOS. Data source for Vermont percentage target: https://emp.lbl.gov/publications/us-state-renewables-portfolio-clean-0, RPS and CES Nominal Percentages Targets.

[157] The ISO-NE-wide renewable targets calculated by E3 are similar in magnitude to those in the Rhode Island 2023 RES compliance report (https://rhodeislandres.com/wp-content/uploads/2025/11/2023-RES-Annual-Compliance-Report.pdf, Table 9), differing by 9% in 2026 and 4% in 2030.

Figure 18: ISO-NE RPS Requirement Modeled in the New England RPS Scenario



The RPS was modeled as a firm constraint in the capacity expansion analysis, requiring the model to build sufficient renewable resources to meet the target each year. Alternative compliance payments (ACPs), which are a penalty paid in lieu of RPS compliance with RECs, were not modeled in this analysis. In PLEXOS, the resources modeled as qualifying for the RPS were utility scale solar, onshore wind, offshore wind, small hydroelectric, municipal solid waste, landfill gas, and wood combustion; imports of renewables from outside of ISO-NE were not quantified or included in the RPS constraint.

While state RPS targets as a percentage of demand do not increase quickly after 2035, it is expected that additional decarbonization initiatives and policies after 2035 will continue the transformation of the ISO-NE grid towards lower GHG emissions. E3 did not represent state-level clean energy requirements – such as the Massachusetts Clean Energy Standard – directly in the modeling, but did include a declining GHG emissions limit, which is described in the next section.

GHG Emissions Limit

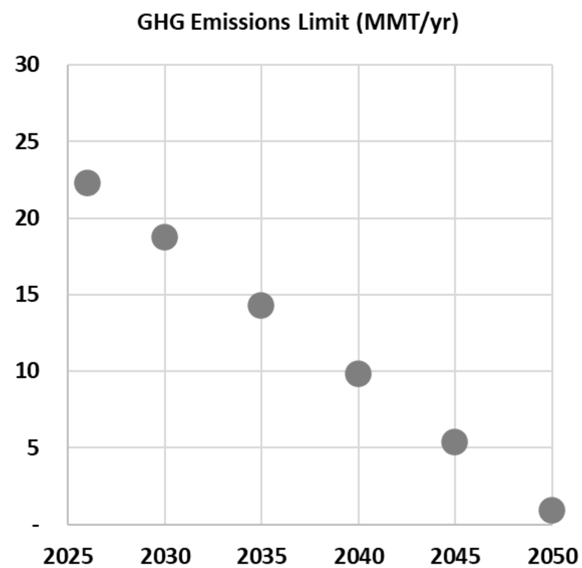
Consistent with the Policy Scenario in ISO-NE's recent Economic Study analysis,[158] E3 modeled a limit on GHG emissions from the ISO-NE electric system of 0.9 million metric tons (1 million short tons) by 2050, decreasing linearly from the 2024 historical value of 24 million metric tons.[159] The 2024 baseline excluded historical emissions from municipal solid waste, landfill gas, and wood

[158] ISO New England. (2025). 2024 Economic Study — Detailed Results (p. 28); https://www.iso-ne.com/static-assets/documents/100027/2024_economic_study_detailed_results.pdf

[159] Data from report: Monthly wholesale electricity prices and demand in New England for January 2024 through December 2024. Section: Estimated CO_2 emissions in New England, by fuel source. Summed for 2024 annually for emissions from natural gas, oil and coal. https://isonewswire.com/tag/monthly-prices/

combustion, which is aligned with ISO-NE's convention that only emissions from natural gas, oil, and coal are subject to the emissions limit.[160]

Figure 19: GHG Emissions Limit Modeled in the New England RPS Scenario



Planning Reserve Margin Requirement

While the PLEXOS capacity expansion simulation included a representation of many sample conditions across the 36 days per year that are represented with hourly resolution, meeting demand on these days alone does not determine whether the ISO-NE grid will have adequate supply in the most challenging conditions. To ensure that resource portfolios produced by the model will be reliable over a wide range of conditions, E3 included an annual ISO-NE-wide planning reserve margin (PRM) constraint, also referred to as a resource adequacy requirement. The PRM ensured that the grid can meet electricity demand, even during prolonged periods of high demand and low renewable generation output. The planning reserve margin modeled in PLEXOS was not meant to directly represent the ISO-NE forward capacity market.

The need for resource adequacy capacity, calculated as a planning reserve margin percentage multiplied by the 1-in-2 peak load, increased steadily over the study horizon (Figure 20). One of the main drivers of increased capacity requirements is the electrification of fossil fuel end uses such as transportation and heating. Of note, heating electrification shifts the periods of highest loss-of-load risk from summertime afternoons to cold winter mornings.[161] As a result, resource contributions to the planning reserve margin – Effective Load Carrying Capability values, or ELCCs – are expected to

[160] ISO New England. (2024). 2024 Economic Study — Preliminary Policy Scenario Results (p. 41); https://www.iso-ne.com/static-assets/documents/100017/a05_pac_2024_economic_study_preliminary_policy_scenario_results.pdf

[161] Massachusetts Executive Office of Energy and Environmental Affairs. (2024). Charging Forward: Energy Storage in a Net-Zero Commonwealth (pp. 107, 109); https://www.mass.gov/doc/charging-forward-energy-storage-in-a-net-zero-commonwealth/download

shift in future years in response to changes in the timing of the highest risk hours in New England. This shift is captured in PLEXOS by adjusting the ELCCs of energy-limited resources over time. While the PLEXOS modeling did not include a full reliability study, the resource ELCCs used in PLEXOS were derived from a recent study that performed probabilistic reliability modeling of the future New England electric system.[162]

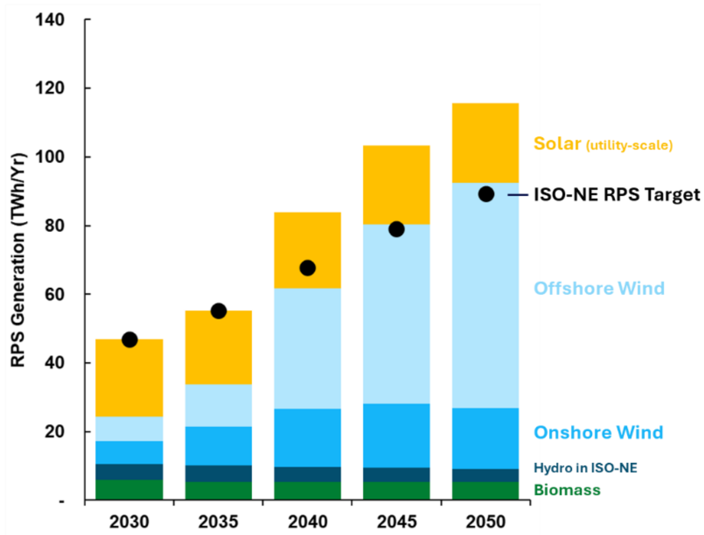
Figure 20: Planning Reserve Margin Reliability Target Modeled in the New England RPS Scenario

PLEXOS Model Results for the New England RPS Scenario

Over the next decade, renewable energy is added to meet rising New England state-based RPS requirements. Figure 21 shows an increase in electricity generation from utility-scale solar and land-based wind, along with the offshore wind projects that are assumed to come online—Vineyard and Revolution in 2026, and SouthCoast 1 in 2033. Additional short-duration battery storage capacity (Figure 22) helps to integrate renewable generation and provides capacity towards ISO-NE's reliability needs.

[162] Ibid.

Figure 21: ISO-NE RPS Target and Renewable Generation for the New England RPS scenario (TWh/yr)[163]



There is near-term uncertainty on both the level of future renewable deployments that are feasible, as well as future demand for renewables due to a changing state policy landscape. For the purpose of providing inputs to downstream analyses, we assumed that renewable generation will be added on schedule to meet state-based targets. Headwinds for renewable deployment over the course of 2025 have contributed to a reduction in the number of solar projects in the ISO-NE queue,[164] and as a result the 2030 solar deployment shown in Figure 22 will be challenging to achieve. Additional work should be done to explore the realistic near-term market deployment of renewables and implications for achievement of New England-wide renewable targets. Because state renewable policies across New England allow for ACPs, a shortfall in near-term renewable deployment across New England may result in an increase in ACPs for some states. Rhode Island's high ACP relative to other states makes it unlikely that Rhode Island would need to make ACPs instead of procuring RECs.

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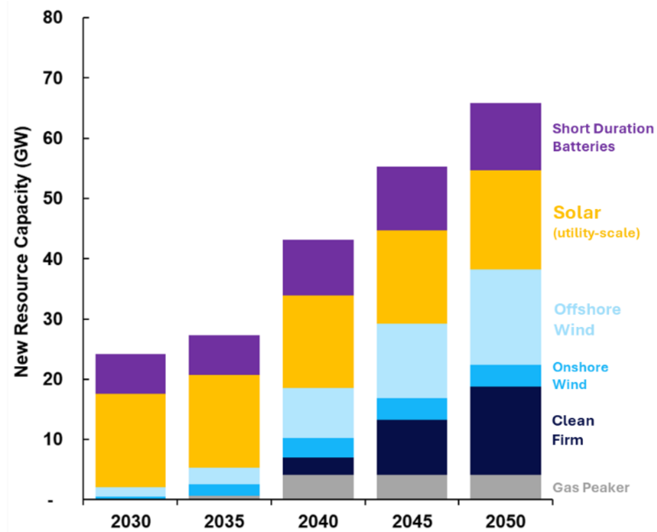
[163] In this and all subsequent PLEXOS results figures, energy from BTM and non-Forward Capacity Market solar resources embedded in the load profiles of ISO-NE's PLEXOS model are not shown because this energy is modeled as a reduction in demand.

[164] For example Table 3 of https://www.potomaceconomics.com/wp-content/uploads/2025/06/ISO-NE-2024-EMM-Annual-Report_Final.pdf describes 4.9 GW of solar and solar + battery projects in the queue at the end of May 2025. As of December 2025, only 1.4 GW of solar projects are listed as "Active" in the queue: https://irtt.iso-ne.com/reports/external

Figure 22: ISO-NE New Resource Capacity for the New England RPS Scenario, (GW) [165]



In the 2030s, offshore wind development, including the planned deployment of SouthCoast 1 wind in 2033, as well as additional offshore wind capacity selected by the model starting in 2035, helps to reduce GHG emissions from the electric sector. Onshore wind resources are added throughout the decade but are limited by a relatively low developable resource potential.

To meet reliability requirements under increasing levels of demand, natural gas resources are added in the mid-2030s, followed by clean firm resources. Clean firm resources are resources that do not produce GHG emissions and can produce electricity when it is needed, not just when the sun is shining or the wind is blowing.[166] They provide power that helps keep the grid running during critical reliability periods – periods when the grid is most likely to experience supply shortfalls. Natural gas resources continue to serve reliability needs and provide dispatchable energy in the region through 2050, though the study does not assume that new gas resources can be added within Rhode Island.

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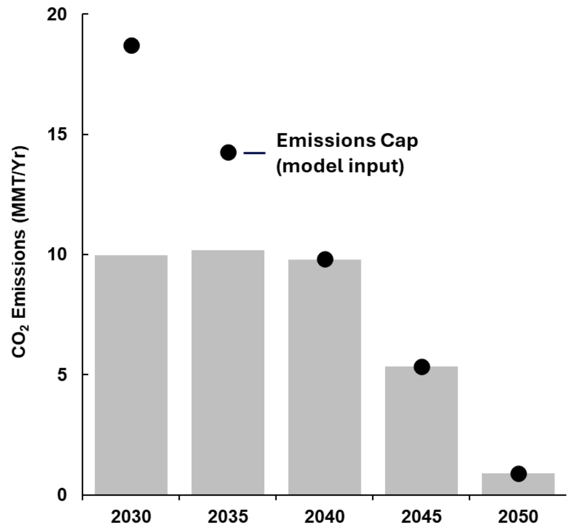
[165] "Short Duration Batteries" represent batteries with a duration between 2 and 8 hours, with the model predominantly selecting 4-hour batteries.

[166] Clean Firm resources include technologies such as 100-hour storage, renewable fuels, hydrogen, geothermal, carbon capture and sequestration (CCS), and nuclear SMR. The clean firm resources modeled in this analysis were 100-hour storage and nuclear SMRs because these were the clean firm resources that ISO-NE included in their Economic Studies. ISO-NE excluded synthetic natural gas from their analysis because of a lack of contracts in North America, and hydrogen and CCS due to a lack of appropriate geology. See p.5-6 here: https://www.iso-ne.com/static-assets/documents/100027/2024_economic_study_ne_evolving_grid.pdf

Figure 23: ISO-NE GHG emissions for the New England RPS Scenario (MMT/yr)



In the near-term, modeled emissions are lower than historical levels due to several assumptions about the ISO-NE system, including:

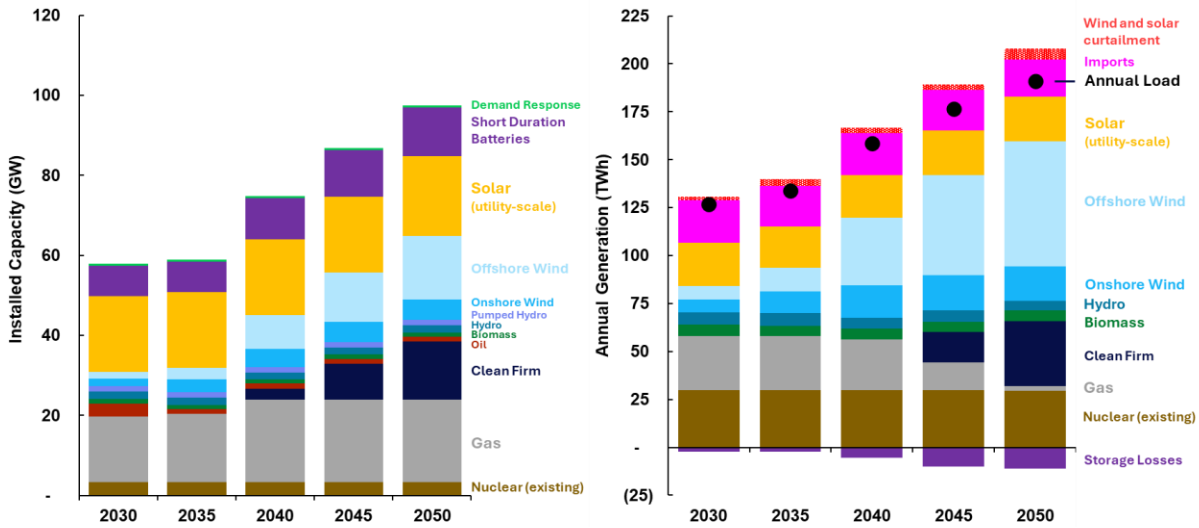
- Completion of the New England Clean Energy Connect (NECEC) transmission line by the start of 2026, which enables delivery of additional hydropower from Quebec.
- Completion of Revolution Wind and Vineyard Wind offshore projects, which are both assumed to be online at the start of the modeling horizon (2026).
- Recovery of hydro imports from Quebec on existing transmission lines. For this study, E3 used hydro import assumptions from ISO-NE's PLEXOS LT model, which included a level of hydro imports from Quebec on existing lines similar to pre-2023 levels. Recent reductions in imports from Quebec, in part driven by drought conditions, are assumed to increase back to higher levels.
- Deployment of renewable energy to meet state renewable policies.

By 2040, the GHG emissions limit increasingly influences the resource portfolio composition by incentivizing the buildout of renewable and clean firm resources to meet growing electricity demand under the tightening emissions trajectory. The influence of the emissions limit on renewable deployment can be seen in Figure 18 because generation from renewable resources exceeds state-based renewable requirements by 2040.

The left panel of Figure 24 presents the total installed resource capacity across ISO-NE, including existing and planned resources, as well as resources selected by the model.[167] The right panel of Figure 24 displays the total generation and curtailment. Sustained growth of capacity in the ISO-NE system is a theme across the modeling horizon.

[167] Short duration batteries include 2-, 4-, and 8-hr batteries; most battery capacity in this analysis has 4-hour duration.

Figure 24: ISO-NE Total Installed Capacity, left (GW), and ISO-NE Generation and Curtailment, right (TWh) for the New England RPS Scenario



E3 Updates to ISO-NE PLEXOS LT Model

E3 modified the publicly available ISO-NE PLEXOS LT model to explore a scenario that complies with state-based renewable policy requirements. For this analysis, E3 made the following updates:

+ Updated the model start year to 2026. ISO-NE's public model started in 2035. E3 kept the same end year as ISO-NE (2050).
+ Added a first available year of 2030 for Maine land-based wind to approximate the time required to construct large Maine wind resources and associated transmission. ISO-NE's model started in 2035 and did not limit when land-based wind could be built. E3 retained ISO-NE's assumption that a total of 3.6 GW of Maine land-based wind can be developed; E3 assumed that an incremental 1.2 GW is available starting in 2030, 2031, and 2032. E3 also retained ISO-NE's assumption that no land-based wind resources are available outside of Maine.
+ Set a pre-defined online schedule for three offshore wind projects: Revolution - 2026, Vineyard - 2026, SouthCoast 1 - 2033. Given the expected near-term challenges to offshore wind development, no other resources were assumed to come online in New England before 2035. In 2035, additional offshore wind resources were available for selection by the model. While the modeling assumes that SouthCoast 1 will be online in 2033, uncertainty remains about this and other earlier-stage offshore wind projects in the area.
+ Added an ISO-NE-wide RPS requirement.
+ Added an annual planning reserve margin requirement and associated resource accreditation (resource ELCCs).

- Added gas combustion turbine candidate resources in all regions except Rhode Island and Boston. Gas turbine resource costs were from the 2024 Annual Technology Baseline (ATB).[168] The F Class moderate cost trajectory was used.
- Added nuclear SMR and 100-hr battery candidate resources in all regions except Rhode Island and Boston. Note that many of the ISO-NE 2024 Economic Study cases included these resources as candidates but the PLEXOS LT model that ISO-NE released publicly did not, so they were added back to be consistent with the set of resources typically available in ISO-NE's 2024 Economic Study.[169]
- Calibrated biomass and utility-scale solar generation from existing resources to align with 2024 historical generation values.[170]
- Updated the Regional Greenhouse Gas Initiative (RGGI) price to the Case B Policy Scenario from the RGGI Program Review IPM Results.[171]
- Adjusted the GHG target from 5 million to 1 million short tons by 2050. The PLEXOS model released publicly included a 5 million short tons target in 2050 but ISO-NE frequently used 1 million short tons by 2050 in their 2024 Economic Study. The 1 million short tons by 2050 target was used in E3's modeling.[172]
- Added a daily gas consumption constraint, calculated by averaging daily limits across each month.[173]
- Upgraded to a newer PLEXOS software version (PLEXOS v11 R03). ISO-NE's public model used PLEXOS v9.2.
- Increased the number of dispatch days to 36 days per year from the ISO-NE model's 10 days per year.
- Solved the full modeling horizon simultaneously, instead of solving each year sequentially.
- Removed integer/binary investment decisions to improve model runtime.
- Costs: E3 did not update resource capital costs in the model, which were based on the 2024 ATB.[174] E3 updated variable and fixed O&M charges to increase with inflation. As a post-processing step, E3 added investment and production tax credits consistent with July 2025 tax code updates.

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[168] NREL (2025). Annual Technology Baseline (ATB). https://atb.nrel.gov/
[169] For 100-hour storage costs, E3 used publicly available costs from the California Public Utilities Integrated Resource Plan inputs and assumptions: https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/integrated-resource-plan-and-long-term-procurement-plan-irp-ltpp/2024-2026-irp-cycle-events-and-materials/2025_draft_inputs_and_assumptions_public_slides.pdf, p.189. For SMR costs, E3 used the 2024 ATB conservative cost trajectory, consistent with costs used in the 2024 Economic study: a05_pac_2024_economic_study_preliminary_policy_scenario_results.pdf, p.16.
[170] ISO New England. (2025). Resource Mix – Key Grid & Market Stats; https://www.iso-ne.com/about/key-stats/resource-mix
[171] RGGI, Inc. (2025). Program Review – Program Overview & Design; https://www.rggi.org/program-overview-and-design/program-review
[172] ISO New England. (2024). 2024 Economic Study — Preliminary Policy Scenario Results; https://www.iso-ne.com/static-assets/documents/100017/a05_pac_2024_economic_study_preliminary_policy_scenario_results.pdf
[173] Daily gas consumption data from 2024 Economic Study: Public Benchmark PLEXOS Model, available at https://www.iso-ne.com/system-planning/system-plans-studies/economic-studies/
[174] NREL (2025). Annual Technology Baseline (ATB). https://atb.nrel.gov/

Cost Methodology and Results

Economy-wide Costs and Benefits

The cost and benefits analysis evaluates the economic implications of decarbonization in Rhode Island by quantifying both the direct investments required and the resulting societal benefits. Costs reflect expenditures across energy systems, buildings, transportation, and other mitigation measures, while benefits capture avoided damages from climate change and improved air quality. For some cost categories, the results may appear as net benefits when cost savings are realized, such as avoided fuel costs or reduced operating expenses from efficiency improvements. The analysis is structured around accounting categories that include all major capital, operational, and fuel-related components, as well as monetized climate and health benefits. These categories are summarized in Table 33 below. Specific cost inputs, such as capital costs and fuel prices can be found in the inputs and assumptions posted online at 2025 Climate Action Strategy - Pathways Model Draft Data Inputs.

Table 33: Cost and Benefit Categories

Category	Description
Electricity Generation	All incremental capital costs, operations & maintenance (O&M), and fuel costs for electricity generation
Electricity T&D	All incremental capital costs and O&M for electricity transmission and distribution infrastructure
Building Equipment	All incremental capital costs and O&M for building equipment (e.g., furnaces, heat pumps, water heaters) and investment costs for building envelope upgrades
Vehicles	All incremental capital costs and O&M for all on-road vehicle types (e.g., EV, ICE vehicles, hydrogen fuel cell) and investment costs for EV charging infrastructure
Fuel Costs	All non-electric fuel costs (e.g., gasoline, natural gas, biodiesel, wood, jet fuel)
Other	All other mitigation measure costs, including investment costs for industrial efficiency and electrification and non-energy related mitigation (e.g., waste sector measures)
Social Cost of GHGs	Social cost of GHG emissions using SCC from 2023 EPA Report, increases from $258 to $375 per ton between 2025 and 2050 (2% discount rate)[1]
Air Quality	Monetized costs of criteria air pollution from fuel combustions using EPA COBRA model

Sector-Level Costs and Benefits

In addition to the economy-wide costs shown in the body of the report, the analysis also explored the cost breakdown for each major sector of energy demand in the economy – residential buildings, commercial buildings, industry, and transportation. The figures below show the net costs by four spending categories (capital investment, maintenance, electricity, and fuels) for the residential, commercial, industry, and transportation sectors. The below figures only include direct spending on equipment and fuels and exclude the climate and health benefits of decarbonizing each sector.

Figure 25 below shows the annual spending for the residential buildings sector. In both the Current Policy and Act on Climate scenarios, annual incremental costs are made up of capital investment for building appliances and the electricity to power those alliances. These incremental costs reach about $290M annually by 2050 in the Current Policy scenario and about $1.1B annually by 2050 in the Act on Climate scenario. There are also annual cost savings for conventional fuels like natural gas and distillate, as well as for avoided maintenance expenses. Cost savings from fuels and maintenance reach about $90M annually for the Current Policy Scenario, and about $520M annually by 2050 in the Act on Climate scenario. Net direct costs in the residential sector reach $200M annually in the Current Policy scenario and $580M annually in the Act on Climate scenario.

Figure 25: Net Incremental Costs vs. BAU for Residential Sector

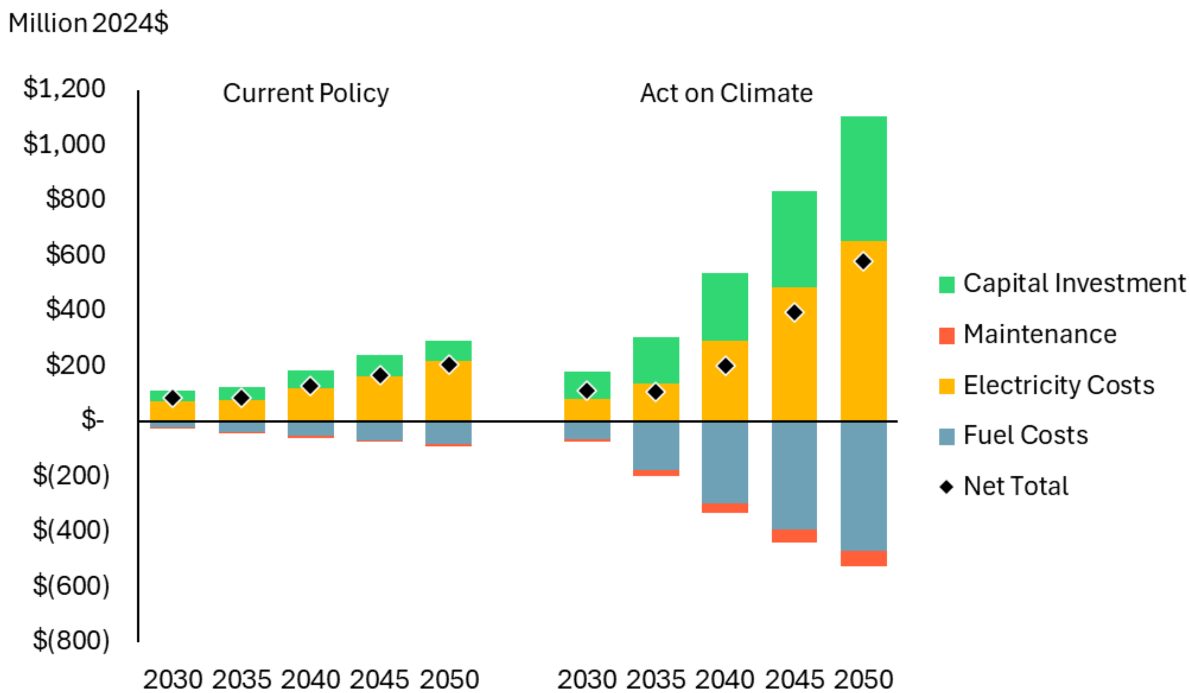


Figure 26 below shows the annual spending for the commercial buildings sector. Similar to the residential sector, capital investment and electricity are core components of incremental annual costs. These annual costs reach about $135M annually by 2050 in the Current Policy scenario, and about $600M annually by 2050 in the Act on Climate scenario. The residential sector also experiences cost savings from avoided spending on conventional fuels, such as natural gas and distillate. Cost savings reach about $1M annually in 2050 in the Current Policy Scenario, and about $120M annually by 2050 in the Act on Climate scenario. Net direct costs reach about $134M annually by 2050 in the Current Policy scenario and $480M annually by 2050 in the Act on Climate scenario.

Figure 26: Net Incremental Costs vs. BAU for Commercial Sector

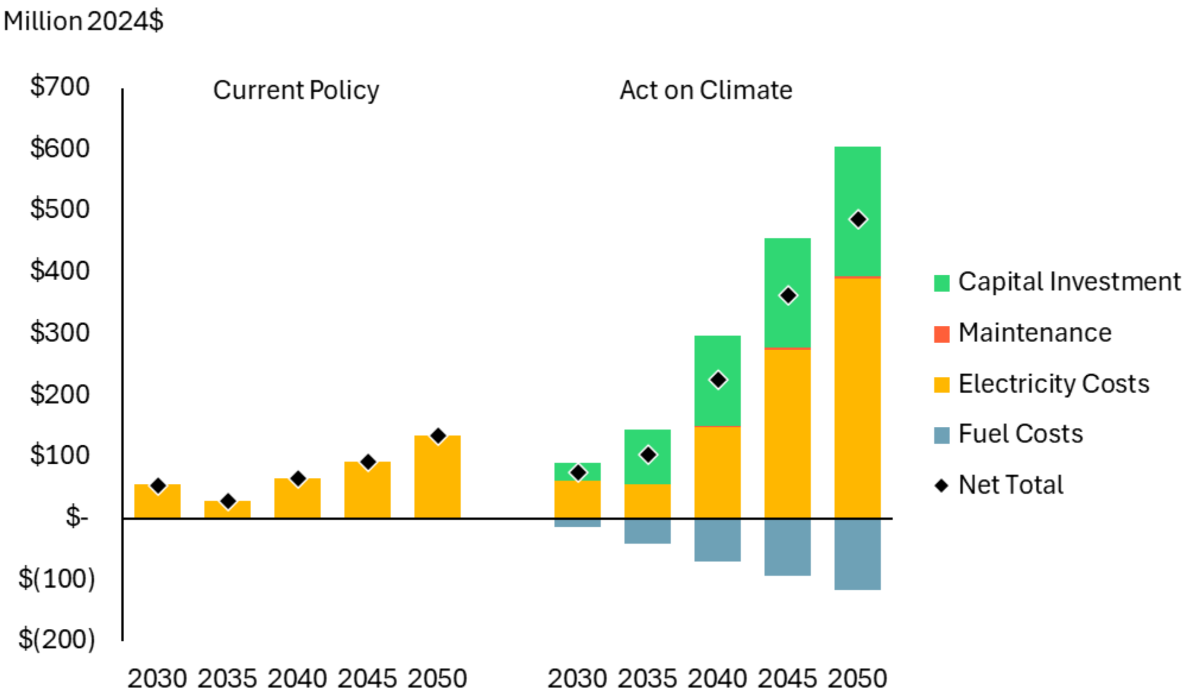


Figure 27 below shows the annual spending in the industrial sector. Direct costs in this sector are primarily from electricity spending due to increased levels of industrial electrification. Annual spending in the Current Policy scenario reaches $35M annually by 2050. In addition to electricity costs, in the Act on Climate scenario the industrial sector also sees spending on capital investment for increased electrified technologies, efficiency upgrades, and, in later years, renewable fuels. Total direct costs in the Act on Climate scenario reach $495M annually by 2050.

Figure 27: Net Incremental Costs vs. BAU for Industrial Sector

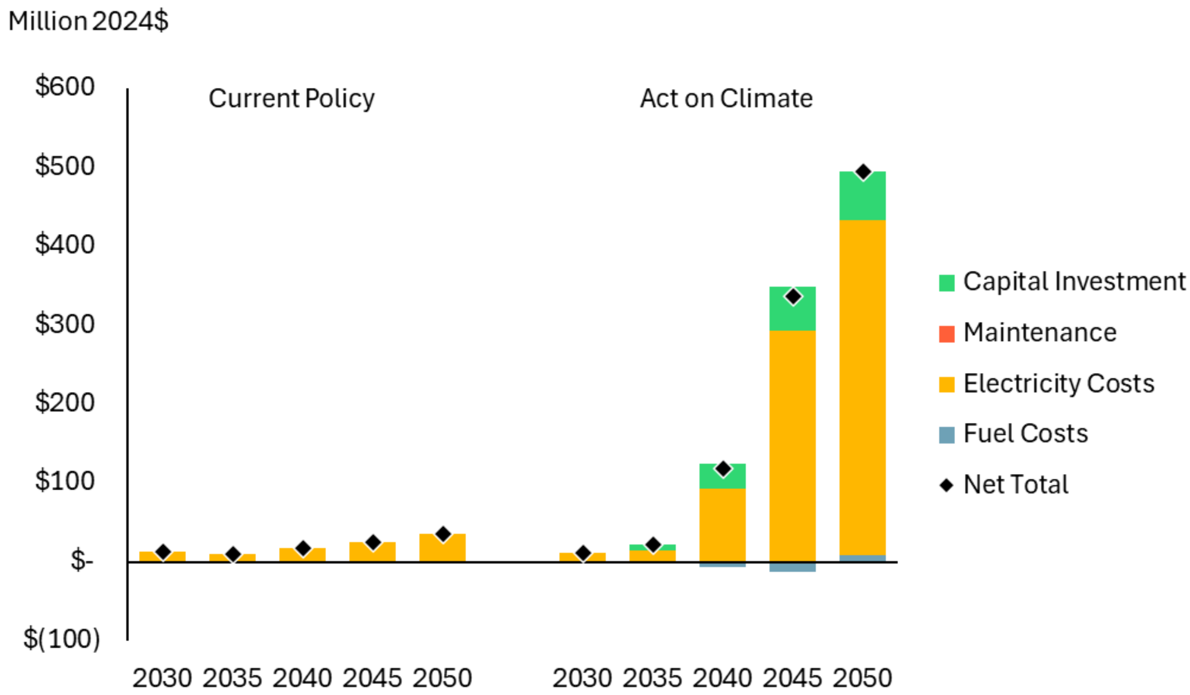


Figure 28 below shows annual spending in the transportation sector. Costs across the two scenarios look similar in this sector since both scenarios assume high levels of EV adoption in line with ACCII and ACT rules. In early years, spending includes capital investment on vehicle and charger purchases. However, in later years, once EVs are projected to become less expensive than internal combustion vehicles, capital investment becomes a cost saving. Due to high levels of vehicle electrification, electricity spending is the other major cost component in the transportation sector. By 2050, electricity spending reaches $920M annually in the Current Policy scenario and $1B in the Act on Climate scenario. The Act on Climate scenario sees slightly higher spending on electricity due to a higher focus on BEV adoption rather than PHEV. Besides vehicle costs, other cost savings in the transportation sector include avoided spending on conventional fuels, such as gasoline and diesel, and avoided maintenance costs – since EVs often require less maintenance than internal combustion engine vehicles. Cost savings in the Current Policy scenario reach $1.34B annually by 2050 in the Current Policy scenario and $1.5B annually by 2050 in the Act on Climate scenario. The transportation sector reaches a net benefit of $420M annually by 2050 in the Current Policy scenario and a net benefit of $500M annually by 2050 in the Act on Climate scenario.

Figure 28: Net Incremental Costs vs. BAU for Transportation Sector

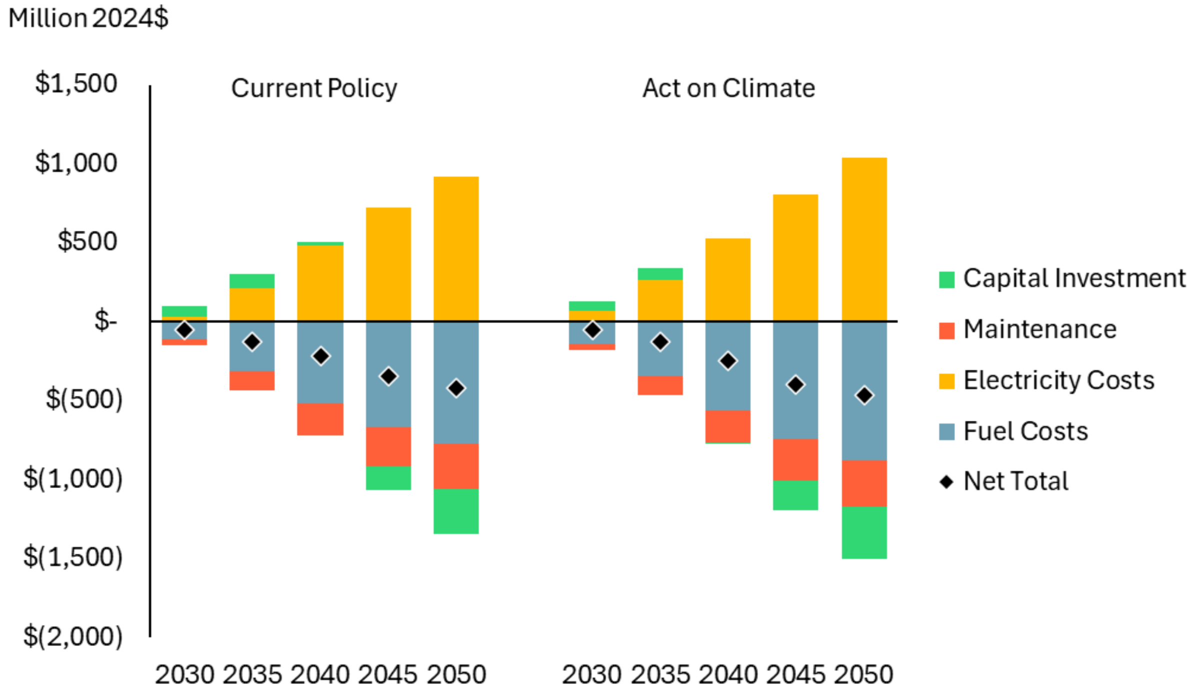
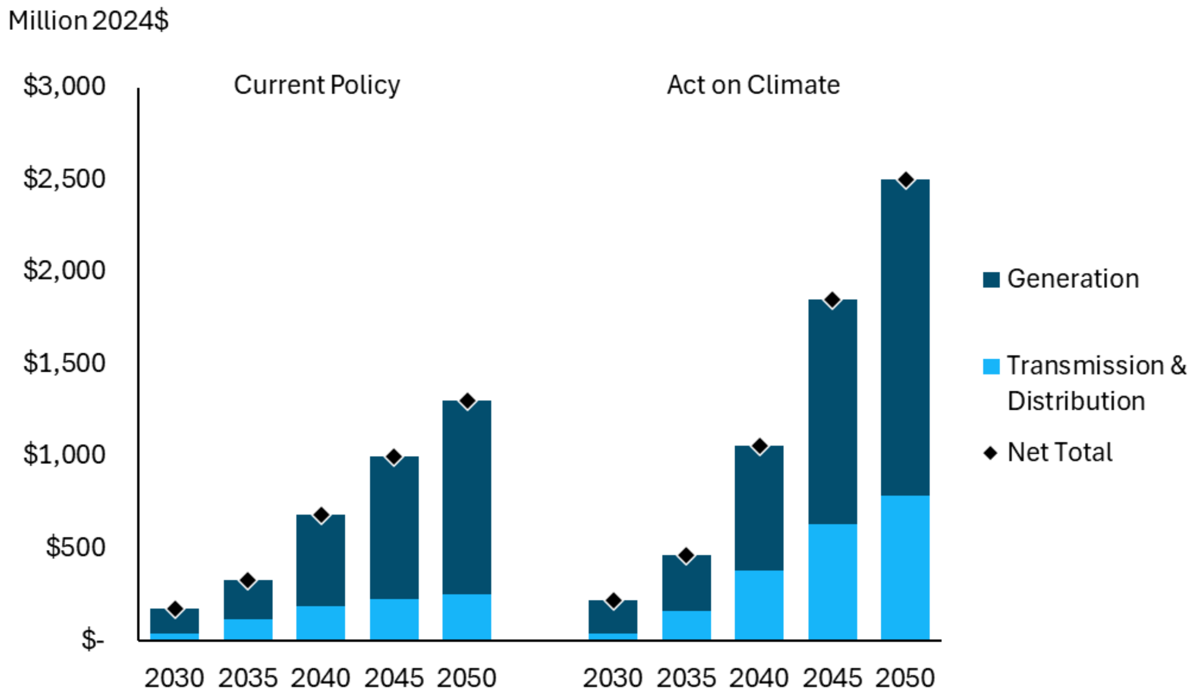


Figure 29 shows net costs for the electric sector broken out by spending on generation or transmission and distribution infrastructure. Increased spending on electricity is embedded in the costs for each demand sector shown above, so the electricity sector costs shown on their own are not additive to the other sectoral costs and are shown separately only to break out the components of increased spending on electricity. Net direct costs in the electric sector reach about $1.3B annually by 2050 in the Current Policy scenario and $2.5B annually by 2050 in the Act on Climate scenario. Electricity costs are greater in the Act on Climate scenario due to increased electricity demand from high levels of economy-wide electrification.

Figure 29: Net Incremental Costs vs. BAU for Electric Sector

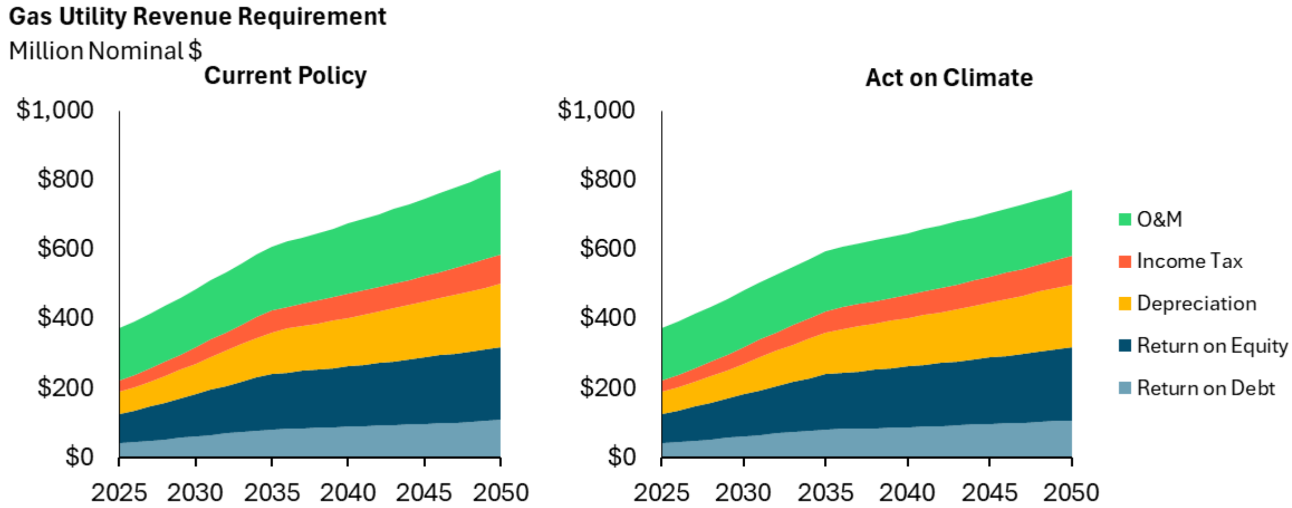


Natural Gas Cost-of-Service and Rates

Methodology

The study used E3's Natural Gas Utility Revenue Requirement tool to estimate natural gas delivery rates in Rhode Island under the Current Policy and Act on Climate scenarios. The tool uses a bottom-up approach and begins with historical data to calculate the rate base for the gas utility in Rhode Island, i.e. Rhode Island Energy (RIE). Rate base refers to the total value of a utility's assets on which they can earn a rate of return. Using RIE's 2016 Depreciation study and 2018-2022 capital spending by cost category, the 2022 rate base of the utility was calculated. Capital cost categories defined in the tool include gas mains, gas meters, gas services, and other investments. Then, planned capital investments for the following 5 years (2024-2029) were pulled from RIE's 2024 Gas Infrastructure, Safety, and Reliability (ISR) and leak prone pipe (LPP) filings, to estimate future rate base out to 2035. Using the estimated rate base trajectories, the regulated rate of return from RIE's latest rate case, and estimated operating expenses, the utility revenue requirement is calculated, out to 2050. Figure 30 below illustrates how utility revenue requirements are estimated in both scenarios. Since there is no managed drawdown of the natural gas system assumed in the Act on Climate scenario, the utility revenue requirement remains similar between scenarios. The only major difference is that the O&M component in the Act on Climate scenario decreases due to customer departures relative to the Current Policy Scenario.

Figure 30: Gas Utility Revenue Requirement by Component



Gas Rates

To allocate annual revenue requirement across customer classes (i.e. residential, commercial, and industrial), the tool references methodology from earlier RIE compliance filings. Finally, revenue requirement by customer class is divided by gas throughput in that class to get delivery rates on a dollar per therm basis.

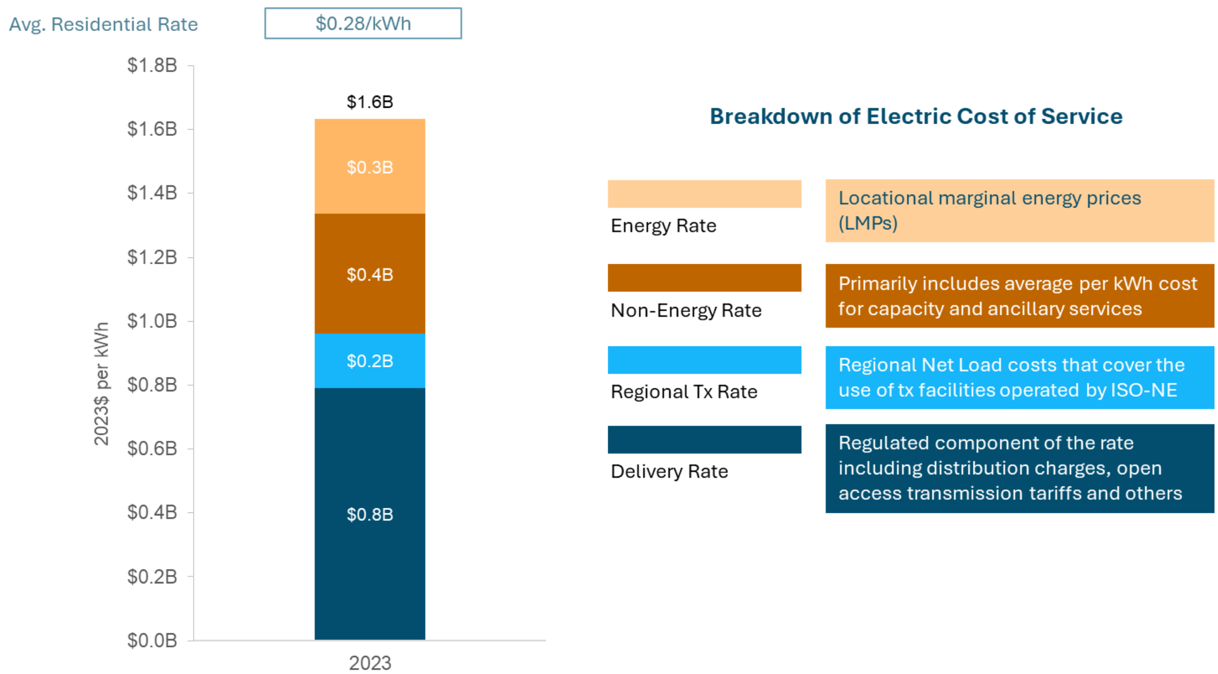
Electric Cost-of-Service and Rates

Methodology

Current Electric Cost-of-Service

In modeling the estimated electric cost of service for the Rhode Island system, E3 first analyzed the total cost of generation and non-generation services today and benchmarked the costs to current average electricity rates. As shown in Figure 31, total electric cost of service is approximately $1.6 billion in Rhode Island in 2023, estimated based on historical sales data from the US Energy Information Administration. About 40% of electric system costs are spent on generation, while 60% of the costs are on transmission and distribution to bring electricity to customers. E3 developed the breakdown of the cost into four cost components based on wholesale load prices reported by ISO New England, delivery rates based on Rhode Island Energy's rate case filings, and historical sales data. Wholesale load cost was broken into energy, non-energy, and regional transmission (Tx) costs based on locational marginal energy prices, capacity and ancillary services prices, and regional net load prices reported by ISO-NE in their annual report.

Figure 31. Breakdown of Current Electric System Revenue Requirement in Rhode Island

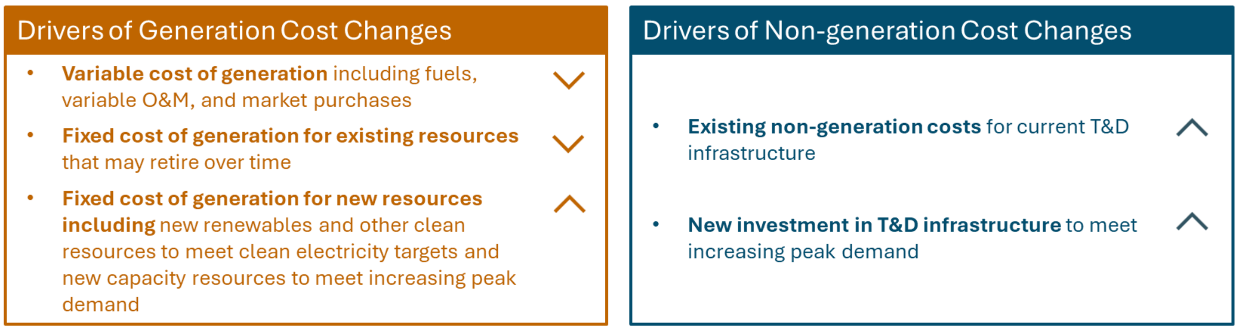


Future Electric Cost-of-Service

E3's Electric Cost-of-Service Model estimates future changes in the costs of electricity in Rhode Island considering both electric resource expansion and transmission and distribution investments. Figure 32 shows the main drivers of changes in revenue requirement cost components. Generation costs are modeled in PLEXOS considering variable cost of generation, fixed cost of generation for existing resources that may retire over time, and fixed cost of generation for new resources – primarily from building new renewables and clean firm resources. E3 models the entire New England electric system (ISO-NE) in PLEXOS and downscaled the results to Rhode Island based on the state's share of annual electricity demand relative to the entire region. E3 applies additional costs to account for Rhode Island's RES. Any gap between the achieved average RES in across New England and Rhode Island's higher RES standard is assumed to be met at a cost premium of $40/MWh today and increasing with inflation over time, based on historical REC market conditions and alternative compliance payment values from other states. Non-generation costs are modeled separately. Existing non-generation costs for current transmission and distribution infrastructure are assumed to increase based on historical trends from 2017 to 2023 at approximately 1.2% per year. This is to account for any non-load increase related upgrades, such as those related to grid modernization.

New transmission and distribution system upgrade costs were modeled at ~$54/kW-yr today, increasing over time to ~$250/kW-yr by 2040. This upward trend reflects the increasing cost to build new transmission and distribution capacity as current system head rooms are depleted as electrification levels increase. Specifically, new transmission and distribution system upgrade costs were informed by RIE's Grid Modernization Plan[175], RIE's Non-Wire Alternative (NWA) study, and previous E3's modeling of the ISO New England system supporting the study "Rhode Island Investigation into the Future of the Regulated Gas Distribution Business".[176]

Figure 32: Drivers of Changes in Revenue Requirement Cost Components. Arrows Showing Directions of the Changes across All Scenarios.



Electric Rates

Electric rates are calculated by dividing the total cost of service by the total electric load. The total cost of service is determined using the methodology outlined above and is primarily driven by RES requirements, the ongoing decarbonization of the ISO-NE grid, and estimated load growth by scenario. The total load is derived from the Pathways model outputs and is directly influenced by assumed levels of electrification across sectors within each scenario.

Key drivers for electric rates include total annual electric sales and the system's peak demand. Under the Act on Climate scenario, total annual electricity demand increases over time; however, peak demand grows more gradually. Energy efficiency plays an important role in moderating the growth of peak demand. These trends reflect system-wide (i.e., statewide) conditions and are not indicative of potential localized impacts.

Because most of the additional electricity demand between 2025 and 2030 in the Act on Climate scenario occurs outside of the summer peaking period, total system peak load in this scenario increases by only about 2%, which mitigates the near-term impact of electrification on rates. Overall, from 2025 to 2030, residential electric rates are estimated to increase by approximately 9% under the Act on Climate scenario compared to today's rates (Figure 33).

[175] Rhode Island Public Utilities Commission. (2023). Investigation into the Future of the Regulated Gas Distribution Business — Book 1: Testimonies; https://www.ripuc.ri.gov/sites/g/files/xkgbur841/files/2023-01/2256-RIE-Book1-Testimonies.pdf

[176] Energy & Environmental Economics, Inc. (2024). Technical Analysis Report, Docket 22-01-NG; https://www.ethree.com/wp-content/uploads/2024/06/Docket-22-01-NG-E3-Technical-Analysis-Report.pdf

Figure 33: Residential Electricity Rates 2025 vs. 2030 (2024$/kWh)

Customer Costs

The RI Customer Affordability Model assesses how different decarbonization pathways affect customer energy bills and upfront appliance costs across various customer types (i.e., those using appliances powered by different fuels).

The RI Customer Affordability Model explores the cost impacts for various household and building types, such as:

- Single family
- Multifamily

The RI Customer Affordability Model analyzes cost impacts for different customers with various appliance adoption. The customer types specifically explored in this analysis include:

- **Reference Gas Customer:** gas furnace, gas water heater, gas stove, gas clothes dryer, electric air conditioner
- **Reference Fuel Oil Customer:** fuel oil furnace, fuel oil water heater, electric stove, electric clothes dryer, electric air conditioner
- **Hybrid + Gas Backup Customer:** electric ASHP + gas furnace backup, heat pump water heater, electric stove, electric clothes dryer, basic weatherization upgrades (optional)
- **Hybrid + Oil Backup Customer:** electric ASHP + oil furnace backup, heat pump water heater, electric stove, electric clothes dryer, basic weatherization upgrades (optional)
- **All-Electric Customer:** electric ASHP, heat pump water heater, electric stove, electric clothes dryer, basic weatherization upgrades (optional)

In the RI Customer Affordability Model, air sealing and insulation are referred to as a "basic weatherization upgrades" and their impacts are based on estimates from the Rhode Island EnergyWise program.

Energy Bills

To estimate the differences in customer energy bills, E3 calculates the existing energy demand for space heating, water heating, cooking, clothes drying, air conditioning, and other miscellaneous end uses for the reference gas or fuel oil customer using the NREL ResStock database. For space heating, water heating, and cooking, the average service demand (i.e., the actual heat output needed from a furnace rather than just the energy consumed by the furnace) is calculated based on the average efficiency of the gas or fuel oil equipment in ResStock. The average annual efficiency of the electrified equipment is then multiplied by the service demand to calculate the new electricity demand for these electrified end uses. Because the clothes dryers do not have efficiency values explicitly stated in the ResStock data, their existing energy demand is multiplied by the ratio in efficiencies of the electric equipment to the gas-powered equipment. Finally, energy demands for other miscellaneous end uses (e.g., plug loads for various electric appliances, already electric air conditioning), are assumed to remain the same after electrification. The appliance efficiencies used for these calculations have been shared in the Pathways inputs and assumptions workbook posted online at 2025 Climate Action Strategy - Pathways Model Draft Data Inputs. For customers adopting basic weatherization measures, space heating and cooling energy use is assumed to decrease based on efficiency improvements. The details of these energy reduction assumptions are also included in the Pathways inputs and assumptions workbook.

Once annual energy demand is calculated, the energy demand values are multiplied by the average residential rates for gas and electricity and the average residential fuel oil price to determine average annual energy bills. In addition, to reflect historical trends where electricity supply costs are higher during winter months than other times of the year, we include a 7% increase to the price of electricity for heat pump space heaters. This increase is based on historical monthly residential electricity prices for the past five years in Rhode Island from EIA Electric Power Monthly.[177] The annual energy bills are divided by twelve to produce an average monthly energy bill. Because energy demand and costs for end uses like space heating and air conditioning vary seasonally, winter or summer energy bills may be higher or lower than the reported monthly average, but these data are shown to indicate which households on average will pay higher or lower costs over the course of the year while showing a cost metric that is more familiar to customers.

Upfront Appliance Costs

Total upfront appliances and building shell costs for customers are determined based on what type of appliance or shell retrofit each customer is adopting. Appliance upfront costs (e.g., space heating, water heating, cooking, etc.) and building shell costs are detailed in the Pathways inputs and assumptions workbook posted online at 2025 Climate Action Strategy - Pathways Model Draft Data Inputs.

The tool has the option to toggle on or off customer incentives, such as tax credits and rebates for heat pumps and electric vehicles. Incentives vary by customer type and income level. These incentives reduce the upfront appliance costs for customers. The tool includes the ability to see

[177] U.S. Department of Energy, Energy Information Administration. (2025). *Electric Power Monthly*; https://www.eia.gov/electricity/monthly/

results for upfront costs with and without Inflation Reduction Act (IRA) tax credits[178] and RI state incentives.

Key Inputs

Key input categories and sources are listed in Table 34 below.

Table 34: Key Customer Affordability Model Inputs

Input	Source
Residential energy demand by end use and household type	NREL ResStock
Electricity rates	Calculated in E3's electric revenue requirement model (aka "Cost-of-Service" model), using outputs from PLEXOS
Gas rates	Calculated in E3's gas revenue requirement model, using outputs from Pathways
Upfront appliance and shell costs	See Pathways inputs and assumptions workbook
Appliance efficiencies	See Pathways inputs and assumptions workbook

Key Results

Key results from the E3 Customer Affordability Model include:

- Monthly/annual energy bills or fueling costs for different customer types (see Figure 34, Figure 35, and Figure 36 for examples)
- Upfront equipment costs for different customer types (see Figure 37 below for Single Family example)

[178] While the current administration has rolled back the IRA incentives, the tool is still capable of viewing results with the impact of those previously available discounts.

Figure 34: Example Monthly Energy Bills for Single Family Gas vs. Electric Customers in 2025 and 2030 (2024$)

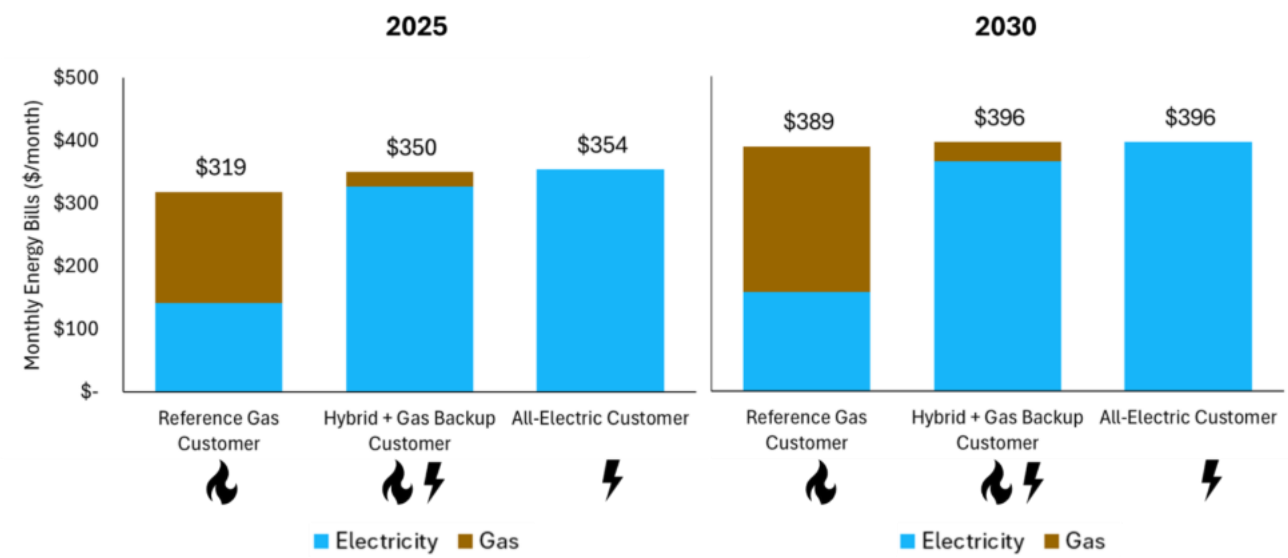


Figure 35: Example Monthly Energy Bills for Single Family Oil vs. Electric Customers in 2025 and 2030 (2024$)

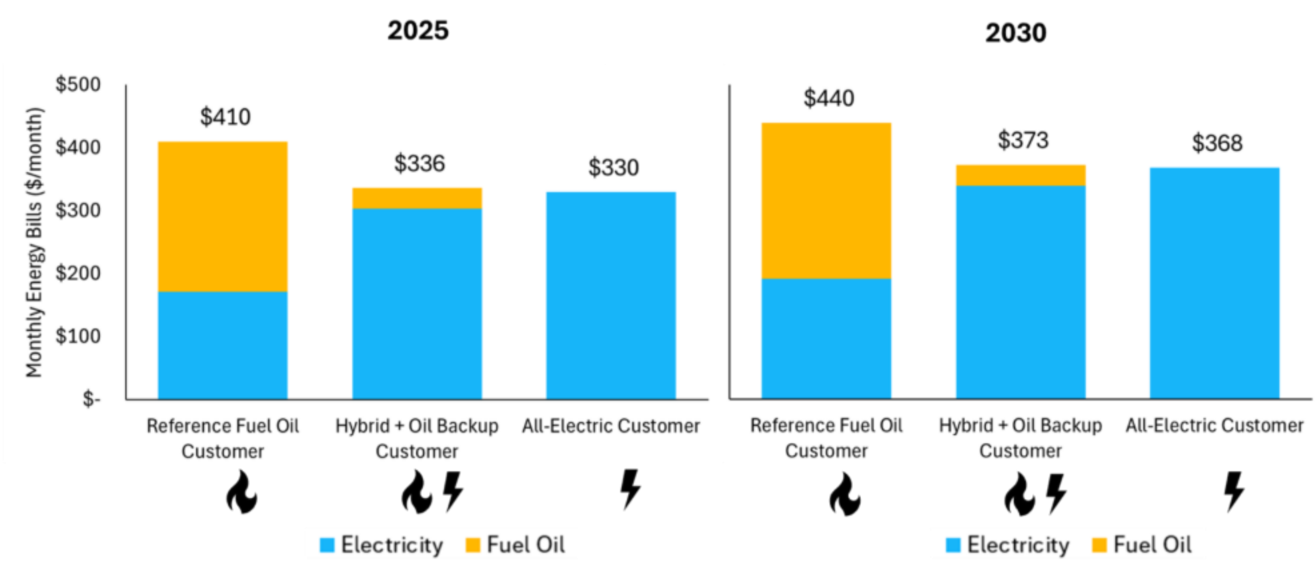


Figure 36: Example Monthly Vehicle Energy Costs for Gasoline vs. Electric Vehicle in 2025 and 2030 (2024$)

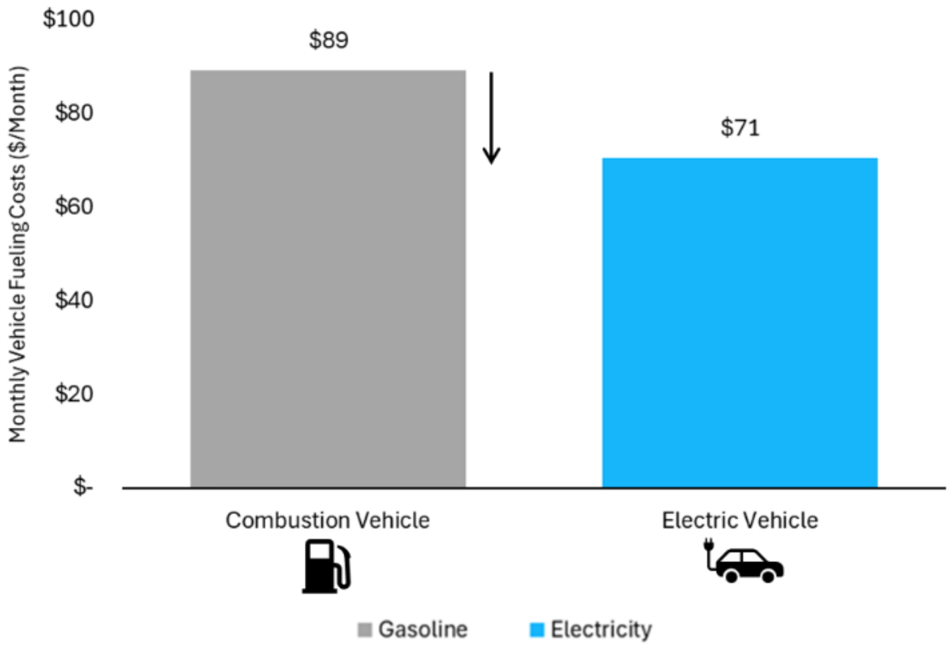
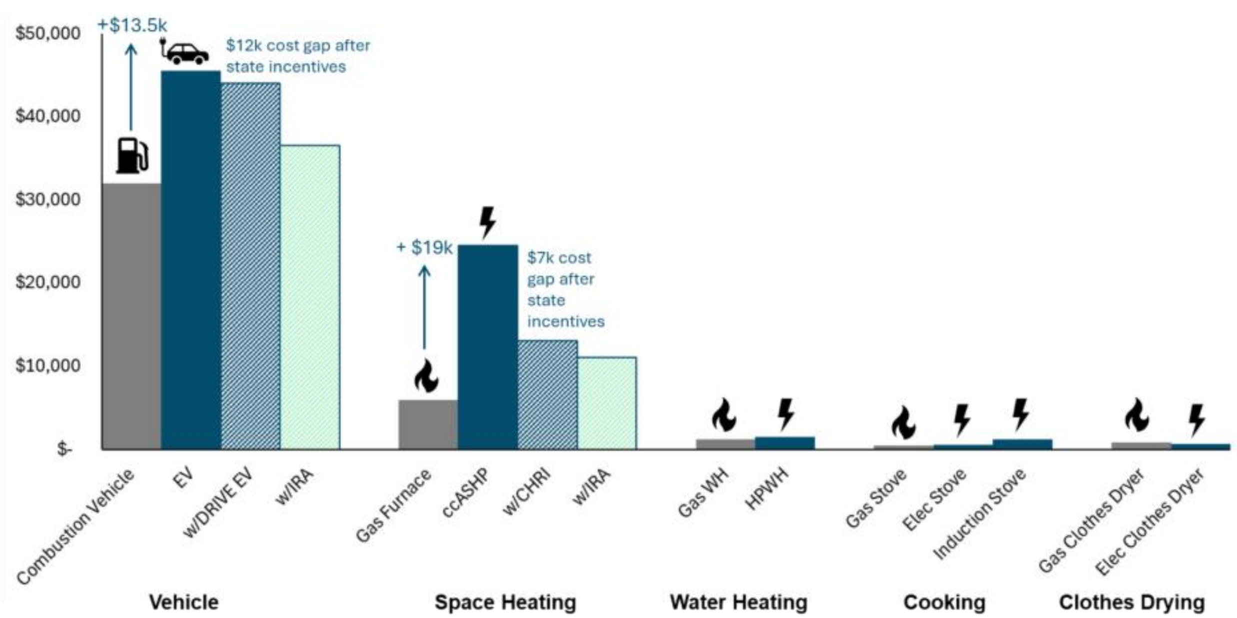


Figure 37: Upfront Equipment Costs for Single Family Home in 2025 (2024$)



Detailed Health Benefits Modeling Results

Table 35: Annual Health Benefits by Year and Scenario (2024$)

Scenario	Low vs. High	2030	2035	2040	2045	2050
Current Policy	Low Estimate	$10	$25	$38	$48	$57
	High Estimate	$18	$42	$63	$79	$91
Act on Climate	Low Estimate	$22	$57	$101	$136	$158
	High Estimate	$39	$99	$171	$226	$256

Appendix B: Additional Documentation

Comments from the EC4 Science and Technical Advisory Board (STAB)

Science and Technical Advisory Board

To: Members of the RI Executive Climate Change Coordinating Council (EC4)

From: Caitlin Chaffee, Chair, EC4 Science and Technical Advisory Board

Date: December 9, 2025

Re: Technical Review of 2025 Rhode Island Climate Action Strategy Development Process, Executive Summary, and Related Materials

Summary

Rhode Island's 2025 Climate Action Strategy (Climate Strategy), developed by the Executive Climate Change Coordinating Council (EC4) with support from their consultants as well as significant stakeholder input, represents a robust effort to chart a path to compliance with the Act on Climate's greenhouse gas emission reduction mandates. Throughout the development of the Climate Strategy, the Science and Technology Advisory Board (STAB) provided technical review and evaluated the application of high-quality modeling methods and up-to-date scientific foundations.

The STAB's technical review is meant to strengthen Rhode Island's ability to meet the mandates of the Act on Climate, whose targets are based on the scientific consensus on what needs to take place for humanity to avoid the worst impacts of climate change. The STAB recognizes that the EC4's long-standing efforts align with this objective, as evidenced by the draft Executive Summary for the Climate Strategy issued for public comment at the time this memo was written. The STAB appreciates EC4's references to both the changing federal climate and energy policy landscape and the uncertainties inherent to modeling efforts such as those for the Climate Strategy.

Within this context, the STAB emphasizes its full support for robust implementation of the existing policies considered in the Climate Strategy's Business-As-Usual (BAU) scenario. This memo identifies risks and recommendations that strongly suggest action *above and beyond* the BAU scenario is warranted. Specifically, the STAB has identified four categories of Act on Climate compliance risk for consideration as Rhode Island moves forward:

- **Historical Emissions:** The recently released 2023 Greenhouse Gas Inventory indicates that historical emissions may be trending higher than was assumed in Climate Strategy modeling. Consequently, the BAU scenario's assumed 2025 emissions may be lower than true 2025 emissions. If so, this would put the path to compliance in 2030 at risk, absent decarbonization actions beyond the policies in the BAU scenario.

- **Transportation Decarbonization:** The Climate Strategy relies heavily on Advanced Clean Cars II and Advanced Clean Trucks (ACCII & ACT) policies to drive decarbonization in transportation. However, the modeling fails to reflect significant implementation challenges for these policies, including ongoing legal proceedings that will likely, at minimum, delay implementation. Coupled with the lack of comprehensive modeling of potential emissions reductions from alternative transportation strategies, this approach leaves the path for decarbonizing the transportation sector, and achieving the Act on Climate mandates, at substantial risk.
- **Electricity Decarbonization:** The Climate Strategy shows Rhode Island's Renewable Energy Standard and the regulatory requirement to reach 100% clean electricity by 2033 as the primary decarbonization strategy for Rhode Island's electricity sector. The model assumes Rhode Island procures Renewable Energy Certificates (RECs) from the New England System Operator to meet this requirement. Relying heavily on RECs introduces risks related to regional market dynamics and REC costs, as well as risks related to potential evolutions in greenhouse gas accounting practices. There are also important economic development and job creation benefits to deploying renewables in state which buying RECs from elsewhere does not provide.
- **Building Decarbonization:** Modeled building sector decarbonization is heavily reliant on Rhode Island's requirement to blend increasing percentages of biodiesel into heating oil supplies, reaching 50% by 2030. The STAB underscores that reliance on this regulation introduces compliance risks for the BAU scenario, particularly given the scientific consensus that biodiesel has non-zero lifecycle emissions, which are not counted in Rhode Island's current methodology, and potential challenges enforcing the blending requirement. There are also potential limitations on feedstock supply as higher levels of biofuels are required.

The remainder of this memo describes the STAB's technical review process (Section 2), provides expanded descriptions of the risks identified above, along with a selection of additional potential risks (Section 3), and concludes with several recommendations for the transition to implementation actions to achieve compliance with the Act on Climate (Section 4).

Climate Strategy Development & STAB Technical Review

The STAB acknowledges the extensive, multi-year effort undertaken to develop the Climate Strategy. This process reflects strong technical foundations, thoughtful leadership by EC4 member agencies, and meaningful contributions from the public, private sector stakeholders, community organizations, the Advisory Board, and others throughout the development process.

The STAB also commends the Strategy's shift to emphasize the path to the Act on Climate's 2030 mandate, both in response to stakeholder input, and in recognition of the critical importance of near-term actions given the statutory requirements of the Act on Climate. The STAB further appreciates that the draft Executive Summary and accompanying materials explicitly acknowledge uncertainties and modeling limitations, which are essential to keep in mind for effective implementation, and which have been a theme of the STAB's ongoing input during Climate Strategy development.

Finally, the STAB recognizes that the Climate Strategy was developed during a period marked by several notable federal policy changes. These changes have the potential to impact the tools available to states like Rhode Island, and also present challenges for making informed scoping decisions for climate modeling that do not quickly become outdated. The STAB recognizes these evolving conditions and the need for adaptive planning to accommodate this dynamic environment.

Throughout the development of Rhode Island's 2025 Climate Strategy, the STAB provided a comprehensive review of all technical modeling, scrutinizing inputs and assumptions to evaluate the utilization of up-to-date science. This involved reviewing the modeling scope and draft inputs; engaging directly with the EC4's consultant team; providing real-time feedback and questions through a series of memos; representation at all EC4 and Advisory Board meetings once the STAB's consultant team, Dunsky Energy + Climate Advisors, was onboarded in July 2025; and participation in all public stakeholder engagement meetings, including webinars where draft results were shared publicly. Further, the STAB appreciated the opportunity to participate in inter-agency workshops where the list of specific decarbonization strategies to be considered was developed and refined.

This review process included the updated 2023 Greenhouse Gas inventory and the draft Executive Summary for the Climate Strategy. At the time this memo was submitted, the full Climate Strategy report was not yet released. Consequently, the STAB plans to conduct a comprehensive review of the full Climate Strategy, along with any appendices, to ensure a complete understanding of the scientific principles, modeling methodologies, inputs, assumptions, and results. This review will serve to meet the STAB's legislative mandate to "...make recommendations and provide policy advice to the [EC4] regarding research needs and priorities, resource allocation, and funding opportunities" (RIGL §42-6.2-5). The review will include an assessment of whether the concerns in this memo, as well as the sizeable list of technical questions submitted during the review process, are adequately addressed in the final report. Results from the STAB's comprehensive review will be reviewed during one or more public STAB meetings in 2026, submitted to the EC4, and made available to the public.

Top Takeaways from the STAB's Climate Strategy Technical Review

Transportation

In the Transportation sector, the STAB calls attention to two key modeling limitations that directly bear out as Act on Climate compliance risks.

- **Reliance on Advanced Clean Cars II and Advanced Clean Trucks (ACCII & ACT):** The Climate Strategy places a substantial emphasis on ACCII & ACT policies to decarbonize the transportation sector and achieve the 2030 Act on Climate mandate. The strategy's underlying modeling projects full implementation of these policies. While the STAB supports ACCII & ACT, it is concerning that the model does not consider the ongoing legal proceedings regarding these policies, which will likely delay implementation, at minimum, and may render these policies practically infeasible in the near future.
- **Limited Modeling of Other Transportation Decarbonization Strategies:** While a number of other strategies were nominally included in transportation sector modeling, the STAB finds that they were not fully explored. Many of these policies were modeled with constraining budget limits in place, resulting in the unsurprising outcome that they represent limited emissions reduction opportunities. This practice was not applied to

decarbonization strategies in other sectors, and contravenes the established practice used elsewhere, wherein the potential pathways to decarbonization are first explored based on feasibility, and costs are estimated subsequently. If modeled without arbitrary budget limits, these strategies could play an important role as supplements or alternatives to ACCII & ACT, especially given the uncertainties noted above.

These two transportation issues are the STAB's highest priority concerns with the Climate Strategy. The STAB believes that broadening the range of modeled transportation strategies would create a more resilient and flexible pathway to achieving the Act on Climate mandates, rather than placing undue reliance on a single set of policies that carry significant implementation risks.

Electricity

In the electricity sector, the STAB highlights Rhode Island's Renewable Energy Standard compliance strategy, utilizing Renewable Energy Certificates procured from the ISO New England (ISO-NE) marketplace to achieve compliance. While the STAB fully supports the RES, relying heavily on this approach exposes the state to several potential risks:

- **Regional Market Exposure:** Changes in neighboring states' policies, which are not in Rhode Island's control, could affect the availability and cost of RECs in the ISO-NE marketplace.
- **Emissions Leakage:** Procuring RECs can lead to emissions leakage under certain conditions. Because Rhode Island currently has a higher alternative compliance payment (ACP) for its RES than other states, it can act as a net buyer of RECs at prices around the level of other states' ACPs. However, this may mask reliance on ACPs and/or non-renewable energy in other parts of the region. Though Rhode Island would still achieve RES compliance, real-world decarbonization could be partially undermined if regional emissions do not fall in tandem.
- **Evolving GHG Protocols for Electricity Emissions:** Greenhouse gas protocols may be shifting toward more granular temporal and geographic matching of RECs and actual electricity consumption. This shift would add another layer of complexity and potential risk to Rhode Island's compliance strategy if such protocols are adopted here.
- **Gaining Public Support With Economic Development and Job Creation:** Relying solely on buying RECs from out of state eliminates important economic development and job creation benefits which come with deployment of renewable energy within Rhode Island. , Buying RECs from elsewhere removes this important benefit, potentially risking the enduring support of these important programs by the public and policymakers.

In addition, the STAB emphasizes that **limited emphasis was placed on in-state energy efficiency and distributed generation**, though tools and policies to increase deployment of these resources remain valuable emissions reduction strategies to decarbonize RI's electricity sector. These resources have the potential to save customers money, generate local economic benefits, and reduce emissions. Importantly, they will still produce real emissions reductions even when Rhode Island meets its formal compliance through RECs. This is because the grid will still carry electricity generated from fossil fuels, at least in the near future, so reducing local demand and increasing local clean generation directly lowers emissions. Such emissions reductions would also effectively reduce RI's RES compliance cost. Further, tools such as enhanced demand side management offerings, modernized rate designs, and novel funding models were not emphasized, though they have the potential to significantly reduce overall costs for decarbonization of the electricity sector, while delivering multiple benefits to the resilience and equity of our energy system.

Finally, the STAB notes that **the reduction in Rhode Island's energy efficiency budget for 2026 poses a material risk to Act on Climate compliance**. Energy efficiency is a foundational decarbonization resource for the BAU scenario as well as the Act on Climate scenario. In fact, the Climate Strategy model shows increased energy efficiency as a critical strategy, which means the proposed budget reduction is moving Rhode Island in the wrong direction. This worrying trend highlights the importance of continued support for independent, stakeholder-representative bodies such as the Energy Efficiency and Resource Management Council, the Advisory Board, and the STAB. These entities must be fully empowered to bring stakeholder perspectives to bear, and engaged for their expertise, as Rhode Island charts a path to Act on Climate compliance.

Buildings

The STAB highlights two key points raised in their technical review of the building sector to date:

- **Heat Pump Adoption Drivers are Unclear in the BAU Scenario:** The Climate Strategy emphasizes that accelerating heat pump adoption is a central component of meeting Rhode Island's climate mandates. However, the BAU scenario lacks clarity on the precise number of heat pumps required as well as which specific policies will drive projected heat pump adoption.
- **Biodiesel's Assumed Net-Zero Emissions:** Modeled building sector decarbonization is heavily reliant on Rhode Island's requirement to blend increasing percentages of biodiesel into heating oil supplies, reaching 50% by 2030. The modeling assumes that biodiesel represents net-zero emissions, even though scientific consensus indicates non-zero lifecycle emissions. While this is a fairly common practice in emissions inventory accounting, because the science is evolving and Act on Climate compliance will play out over many years, this is an important risk to consider. Additionally, biofuel supplies may become constrained in the future as multiple jurisdictions compete for this resource to meet clean energy and climate mandates. Finally, robust enforcement mechanisms are needed to ensure that all regulated entities in the heating oil sector comply with the biodiesel blending requirements.

Overall, the STAB highlights that uncertainties in both heat pump adoption policies and biodiesel implementation pose risks that should be addressed to ensure Rhode Island meets its climate goals.

Conclusion

The STAB offers the following recommendations for Rhode Island's successful transition into the implementation phase of the Climate Strategy, building on the technical review findings above:

> **Formulate a Clear Roadmap for Climate Strategy Implementation:** The climate strategy materials reviewed by the STAB at the time this memo was developed *do not lay out clear actions or timelines for implementation actions*. Particularly in light of the compliance risks noted during its technical review, the STAB strongly recommends that the State develop and adopt an *ambitious yet achievable* roadmap that clearly identifies specific implementation actions that should be undertaken; provides a recommended timeline; identifies an entity who will hold accountability for each action; and defines each action with measurable

outcomes that can be used to determine its successful completion. Without additional actions above and beyond the policies modeled in the business-as-usual scenario, the STAB's opinion is that there is an unacceptably high risk that Rhode Island will not meet the mandates of the Act on Climate.

Proactively Manage Risks: Recognize and address the compliance risks identified in this memo and the STAB's forthcoming comprehensive review, as well as input provided by other stakeholders. Account for these risks directly in the roadmap referenced above.

Develop RI-Specific Implementation Actions: Revisit specific quantitative estimates of emissions reductions and anticipated policy or program costs for decarbonization pathways at the time that RI-specific, detailed proposals are developed.

Consider Climate Model Strengths and Limits: Maintain awareness of the strengths, limitations, and assumptions used in the Climate Strategy's modeling when developing follow-on implementation actions or policies.

Engage Experts and Stakeholders During Implementation: Engage experts from agency staff, as well as boards like the STAB, Advisory Board, and Energy Efficiency & Resource Management Council, to support RI-specific implementation plans. This will help ensure stakeholder perspectives, through the membership and public nature of such boards, are fully represented throughout implementation.

Lay the Groundwork for Long-Term Strategies: Some decarbonization strategies require significant lead time to fully deliver emissions reductions, which may be particularly important for meeting the Act on Climate's 2040 and 2050 decarbonization mandates. Examples include increased investment in mass transit, changes to land use planning to shift away from personal vehicle travel, interconnection reform for renewable generation, enhanced grid flexibility and demand side management offerings, and investment in ZEV charging infrastructure.

The STAB emphasizes that the technical review findings contained in this memo, as well as the forward-looking implementation risks and recommendations identified, are meant to strengthen Rhode Island's path to Act on Climate compliance.

Once again, the STAB thanks the EC4 for their leadership and commitment to achieving the mandates of the Act on Climate, and appreciates the contributions from their consultant team, advisory boards, Rhode Island stakeholder organizations, and members of the public who participated in the development of the Climate Strategy. The STAB also thanks the EC4 for the opportunity to provide this memo for inclusion in the Climate Strategy, and for the continued commitment to engage with the STAB for scientific and technical input.

cc/ Members of the RIEC4 STAB

Elizabeth Stone, RIDEM

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Comments from EC4 Advisory Board

Rhode Island Executive Climate Change Coordinating Council Advisory Board

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To: Director Terry Gray, Chair of the Executive Climate Change Coordinating Council (EC4)

From: Sheila Dormody, Chair of the Executive Climate Change Coordinating Council Advisory Board

CC: Members of the EC4 Advisory Board

Date: December 10, 2025

RE: Rhode Island 2025 Climate Action Strategy

The Rhode Island 2025 Climate Action Strategy sends a clear message: Investing in climate solutions pays off. The projected benefits to Rhode Islanders will substantially outweigh the costs. Although implementation will require significant investment across multiple sectors, achieving the goals of the Act on Climate will deliver healthier communities, a stronger economy and workforce, and more resiliency to climate threats. The costs of inaction would impose far greater burdens on Rhode Island communities and our economy.

The Climate Action Strategy arrives at a critical moment. While the current federal administration has undermined, weakened or delayed action on the national level, it is more essential than ever that Rhode Island act with clarity, urgency and a sustained commitment to address the climate crisis. We must remain committed to the 2021 Act on Climate.

The Executive Climate Change Coordinating Council Advisory Board appreciates the EC4's leadership and robust community engagement in developing the Climate Action Strategy.

Successful implementation of the Climate Action Strategy will require sustained focus and political will. Though federal shifts may tempt us to scale back State action, our economic stability depends on making climate investments in a timely manner. The State will need to develop new strategies to fill the gap of federal inaction to maintain our climate commitments and legal responsibilities. Short term actions that are intended to reduce customer costs such as cutting investments in energy efficiency would undermine long term savings to ratepayers, undermine climate action, and reverse decades of progress. Each investment in energy efficiency brings benefits for every year to come.

Keeping our attention on the true, long-lasting benefits of climate investments will guide us toward achieving equitable outcomes for all Rhode Islanders.

The Advisory Board embraces our statutory obligation to advise the EC4, improve public access and support for the Climate Action Strategy, and assist the Council in meeting its transparency and accountability obligations and achieving the goals of the Act on Climate. As the EC4 continues to refine the key options for implementation, the Advisory Board will continue to be a conduit for providing public input and work in collaboration with the EC4 and the Science and Technical Advisory Board.

The deadline for the Advisory Board to submit this comment letter preceded the release of the EC4's priorities for implementation and is limited as such. The Advisory Board expects to provide additional comments as the State further refines sector-specific strategies, clarifies agency responsibilities, and develops detailed implementation pathways even after the 2025 Climate Action Strategy is released.

Key Considerations and Recommendations

Transparency, Accountability, and Further Refinement of the Strategy

- The Advisory Board has provided separate detailed recommendations for the State's Climate Action Dashboard. To engage Rhode Islanders from all walks of life, the State will need to set clear, measurable goals and track progress toward them. While the current dashboard notes progress on a wide range of important initiatives, it is not yet a clear tool that can help to inform whether we are on track or need to adjust course. The emission modeling and sector-specific targets developed as part of the 2025 Climate Action Strategy should guide the dashboard's representation of progress towards achieving the Act on Climate.
- The EC4 has provided several webinars to receive public feedback and an executive summary for public comment. Because the public has not had the opportunity to comment on a full draft plan or implementation priorities, the EC4 will need to continue to invest in public engagement to build buy-in to the Strategy and refine approaches to ensure they meet community needs. The Advisory Board is enthusiastic to partner in this role.
- A clear delineation of implementation priorities, responsibilities and timelines will be essential to evaluate the potential for the Strategy's success. Urgency and actionability was a key theme that emerged during stakeholder engagement but is not yet reflected in the summary.
- Workforce development needs are acknowledged in only a preliminary manner. The Strategy must articulate a clear path from current workforce capacity to projected future requirements. The Strategy must also acknowledge that workforce development is only one component of addressing the role of jobs, and workers, in the transition to a net-zero economy.
- The Strategy describes emissions by sector but does not clearly explain what will be required of households, businesses, municipalities, and other economic actors to meet the State's climate targets. This explanation is necessary for shared understanding and sustained participation in the transition.
- The Strategy must outline sector-specific emission reduction targets, to ensure action across all major sources of emissions and across all sectors in the state.
- A whole-of-government approach and a whole-of-economy approach will be required to achieve the mandate of the Act on Climate. State leadership will need to ensure that agencies coordinate closely, and municipalities and businesses must be provided with clear expectations and consistent support. All agency leaders should detail how their mandates and portfolios are aligned with the goals of the Act on Climate.
- State agencies must receive sufficient funding, staffing, and use their authority to implement the Strategy effectively.
- Based on the results of the Strategy, the EC4 must prioritize and task the legislature with which state legislation will be needed to implement the Climate Action Strategy.

Sector Specific Recommendations

The Advisory Board appreciates the technical and scientific findings of the Science and Technical Advisory Board's (STAB) review of the modeling for the Climate Action Strategy. The STAB noted that while the Strategy determined that Rhode Island is on track to meet our 2030 greenhouse gas reduction targets, there are still significant uncertainties on the implementation path. We offer the policy considerations below in the context of the limitations identified by the STAB and with an eye toward ensuring we move with urgency to lay the groundwork right now for decarbonization strategies that will take several years to reap the full benefits.

Buildings

- Existing financial incentives will not be sufficient to achieve the heat pump adoption levels described in the Strategy. A combination of new policies, including building performance standards and a clean heat standard, and expanding incentives will be required to meet the necessary adoption trajectory.
- The Climate Action Strategy should not rely on biofuels to decarbonize sectors of the economy that are relatively easy to electrify such as buildings or passenger transportation.
- The State's current assumption that biodiesel combustion does not generate greenhouse gas emissions introduces significant risk to not meeting future targets.

Electricity

- The Climate Action Strategy acknowledges that major progress toward the State's climate goals will come from the Renewable Energy Standard, the law which requires 100% of the state's electricity to come from renewable sources by 2033. As building heating systems and transportation systems increasingly become powered by electricity instead of internal combustion, the Renewable Energy Standard will ensure that the electricity is clean. Rhode Island must not roll back its nation-leading Renewable Energy Standard.
- As noted above, expansion of energy efficiency will be a central component of any successful strategy. The current direction of shrinking the energy efficiency program will cost Rhode Islanders more.
- The Climate Action Strategy should place greater emphasis on the value of in-state distributed renewable generation. While the benefits of in-state distributed renewable generation are noted in the section on workforce development, local generation also provides real benefits in emissions reductions and contributes to a more reliable and affordable electric grid.

Transportation

- The Climate Action Strategy assumes an ambitious rate of electric vehicle adoption through 2030. Because that changeover is fundamental to the plan's success, it will require substantial incentives, faster deployment of charging infrastructure, and targeted support for residents of multi-unit dwellings.
- Rhode Island must consider feasible alternatives to the Advanced Clean Cars II and Advanced Clean Trucks programs if those programs become unattainable. A feebate system that charges a fee to more polluting vehicles and a rebate to less polluting vehicles may serve as an appropriate alternative and market driver.
- In addition to electric vehicle adoption, the Climate Action Strategy must consider the equity and access implications of our future carbon-free transportation system. Improvements to public transit and bicycle and pedestrian infrastructure must continue to be a key component of the climate strategy.
- Additional strategies such as land use changes or congestion pricing could also provide measurable transportation emissions reductions.
- Development of the Climate Action Strategy relied on transportation modeling commissioned by the Rhode Island Department of Transportation that was limited by existing budget assumptions and did not fully capture these opportunities. The further development of the State's implementation plans

should more expansively consider the strategies that will be required to meet the needs to reduce emissions and serve Rhode Islanders with clean and convenient transportation options.

Rhode Island can meet its climate obligations only through a clear, robust, and equitable plan that is implemented with discipline and consistency. The State's environmental, economic, and social well-being depends upon action at the scale required by the climate crisis. We look forward to our continued partnership to work with the urgency and accountability this moment demands to deliver transformative and lasting benefits for all Rhode Islanders.