STATE OF RHODE ISLAND
Department of Environmental Management

Rhode Island's Comprehensive Climate Action Plan

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Contacts:

Elizabeth Stone (elizabeth.stone@dem.ri.gov) and Rachel Calabro (rachel.calabro@dem.ri.gov)

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Acronym Definitions

Acronym	Definition
ACPs	Alternative Compliance Payments
Acronym	Alternative Compliance Payments
AMC	Advanced Metering Functionality
ARPA	American Rescue Plan Act
BAU	Business-as-usual
BIL	Bipartisan Infrastructure Law
BPS	Building Performance Standards
CamSys	Cambridge Systematics
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
CHS	Clean Heat Standard
CPRG	Climate Pollution Reduction Grant
CH_4	Methane
Co_2	Carbon dioxide
CPRG	Climate Pollution Reduction Grant
CTs	Combustion Turbines
DCAMM	Division of Capital Asset Management & Maintenance
DEEP	Connecticut Department of Environmental Protection
DOA	Department of Administration
EC4	Executive Climate Change Coordinating Council
E3	Energy and Environmental Economics
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
EVs	Electric Vehicles
GGRF	Greenhouse Gas Reduction Fund
GHG	Greenhouse Gas Emissions
GHHI	Green & Healthy Homes Initiative
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 Plans
LDCs	Local Distribution Companies
LIHEAP	Low-Income Home Energy Assistance Program
LMI	Low- and Moderate- Income
LRTP	Long Range Transportation Plan
LT	Long-term
MHDVs	Medium- and Heavy- Duty Vehicles
NECEC	New England Clean Energy Connect
MMT	Million Metric Tons
N_2O	Nitrous oxide
NEEP	Northeast Energy Efficiency Partnership
NCS	Natural Climate Solutions
NEVI	National Electric Vehicle Infrastructure
NREL	National Renewable Energy Laboratory
NWA	Non-Wire Alternative
NWL	Natural & Working Lands
O&M	Operations and Maintenance
OER	Rhode Island's Office of Energy Resources
PUC	Public Utilities Commission
PHEVs	Plug-in Hybrid Electric Vehicle
RECs	Renewable Energy Certificates
RES	Renewable Energy Standard
RIDE	Rhode Island Department of Education
RIDEM	Rhode Island Department of Environmental Management
RIDOT	Rhode Island Department of Transportation
RIIB	Rhode Island Infrastructure Bank
RIEC4	Executive Climate Change Coordinating Council
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
TMP	Transit Master Plan
T&D	Transmission and Distribution
TBtu	Trillion British Thermal Unit
VMT	Vehicle Miles Traveled
WAP	Weatherization Assistance Program

ZEVs	Zero Emission Vehicles
ACCII	Advanced Clean Cars II

Executive Summary

The Rhode Island Comprehensive Climate Action Plan (CCAP) fulfills the state's requirements under the Environmental Protection Agency's (EPA) Climate Pollution Reduction Grant (CPRG) Program and advances the goals established by Rhode Island's *Act on Climate*. Building on the 2024 Priority Climate Action Plan (PCAP), this document provides a comprehensive roadmap for achieving economy-wide greenhouse gas (GHG) reductions through 2050. It presents detailed analyses of current and projected emissions, evaluates potential reduction measures across all major sectors, and identifies implementation, funding, and workforce strategies to meet the state's statutory targets of a 45% reduction in GHG emissions below 1990 levels by 2030, 80% by 2040, and net-zero by 2050.

Approach and Methodology

Development of the CCAP was led by RIDEM in collaboration with the Rhode Island Executive Climate Change Coordinating Council (RIEC4). The process involved comprehensive stakeholder engagement between January and December 2025 to inform community priorities and GHG reduction measures of interest. Emissions trajectories were created using the E3 Pathways model, incorporating assumptions about electrification, energy efficiency, technology adoption, and policy implementation. Complementary analyses included transportation-sector modeling by the Rhode Island Department of Transportation (RIDOT) and electric resource planning using ISO New England's (ISO-NE) PLEXOS long-term (LT) capacity expansion model. BW Research used the outputs from the Pathways and PLEXOS models to conduct a workforce analysis.

Emissions Projections and Scenarios

Two scenarios were modeled to assess future emissions trajectories:

+ **Current Policy scenario** reflects existing state, such as the Renewable Energy Standard (RES), Advanced Clean Cars II (ACCII), and Advanced Clean Trucks (ACT). Under the Current Policy scenario, Rhode Island is on track to achieve its 2030 target but would fall short of the 2040 and 2050 goals, reaching approximately a 71% reduction by 2050. (Note: For the purposes on this report, business-as-usual and Current Policy Scenario are one and the same). [1]

+ **Act on Climate scenario (equivalent to Plan Implementation)** assumes full implementation of the measures in this CCAP. Under this scenario, Rhode Island achieves an 80% reduction in GHG emissions by 2040 and net-zero emissions by 2050.

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[1] RI acknowledges that ACCII and ACT are being actively litigated; the implementation status of ACCII and ACT beginning in 2027 is unclear.

RIDEM acknowledges the ongoing legal challenges to the ACCII and ACT programs as adopted by Rhode Island in 2023. The Status Report Due in 2027 will appropriately reflect the outcome of these challenges and incorporate amendments as needed at that time.

Key sectoral findings include:

+ **Electricity:** Emissions fall to near zero by 2033 under the state's 100% RES, even as total electricity demand grows due to electrification.
+ **Transportation:** Deep reductions are driven by the adoption of zero-emission vehicles (ZEVs), supported by ACCII, ACT, and expanded EV charging infrastructure.
+ **Buildings:** Widespread electrification of heating systems through programs such as the Clean Heat Standard, New England Heat Pump Accelerator, and enhanced energy efficiency incentives delivers large-scale decarbonization.
+ **Industry and Waste:** Emissions decline through efficiency improvements, fuel switching, and increased organic waste diversion.
+ **Natural and Working Lands:** Carbon sequestration from forests and natural lands is maintained, supporting net-zero achievement.

Key GHG Reduction Measures

Eighteen GHG reduction measures were analyzed across sectors, representing both existing and new policy opportunities. The most impactful for reducing GHG emissions include Advanced Clean Cars II/Advanced Clean Trucks, a potential Clean Heat Standard, Building Performance Standards, and the New England Heat Pump Accelerator Program.

Together, all the measures address emissions from electricity consumption, transportation, buildings, and industrial sources, and collectively help RI progress toward meeting the Act on Climate targets.

Economic, Environmental, and Workforce Impacts

Upfront capital investment in the electric and building sectors is projected to increase in the near term as decarbonization progresses, but these costs are projected to be offset by long-term fuel savings, avoided costs of gasoline-powered vehicles, improved air quality, and avoided climate damages. By 2050, total system costs under the Act on Climate Scenario are projected to be lower than under Current Policy.

Due to lower fossil fuel combustion, both the Current Policy and Act on Climate scenarios lead to reductions in criteria air pollutants alongside the GHG. These improvements in air quality produce measurable public health benefits, including reductions in premature mortality and decreases in respiratory and cardiovascular illnesses. When monetized, the value of these avoided health impacts is substantial – reaching as much as $250 million annually by 2050 under the Act on Climate scenario.

In addition to environmental and health benefits, implementing the Act on Climate is expected to support the state's workforce. The investments required to achieve the Act on Climate targets are projected to drive strong demand for clean-energy jobs in the state, resulting in a net gain of

approximately 6,600 jobs through 2035. Construction and maintenance occupations are expected to see the largest growth.

Stakeholder Engagement

Extensive stakeholder engagement shaped every phase of the CCAP, including approximately 20 public meetings, targeted focus discussions with students, webinars, and open comment periods. Attendance at these stakeholder engagement sessions totaled over 1,110 participants between January and November 2025. Equally, there was cross-pollination on outreach and engagement with the Providence-Fall River-Warwick, RI-MA Metropolitan Statistical Area's CPRG planning grant as administered by the Southeastern Regional Planning & Economic Development District. The Providence-Fall River-Warwick, RI-MA Metropolitan Statistical Area covers all of the State of Rhode Island and efforts were made to share and align data for both CCAP deliverables.

Input from environmental justice communities, municipalities, businesses, and residents emphasized the need for equitable, actionable, and coordinated climate solutions. Core themes included affordability, access to clean technologies, and ensuring benefits for overburdened and underserved populations. Six RI based community organizations coordinated engagement with hundreds of additional stakeholders in support of the development of this CCAP.

Introduction

CPRG Overview

The Rhode Island Department of Environmental Management (RIDEM) has been awarded a planning grant through the Environmental Protection Agency (EPA)'s Climate Pollution Reduction Grant (CPRG) Program to conduct greenhouse gas (GHG) emission reduction planning. The CPRG program is a two-phase initiative that provides $250M for noncompetitive planning grants and about $4.5B for competitive implementation grants. Rhode Island was awarded a planning grant from CPRG in 2023, each planning grant requires three deliverables across four years. The first step was to develop the Priority Climate Action Plan (PCAP), which included a list of near-term and high priority projects to reduce GHG emissions.[2] Rhode Island submitted the PCAP in March 2024. The next deliverable is a Comprehensive Climate Action Plan (CCAP), due no later than December 1, 2025. The final step will be for RI to submit a Status Report in 2027, that includes updated analyses and plans as well as progress and next steps for key metrics.

CCAP Purpose and Scope

The CCAP builds on the foundation of the PCAP, expanding to include additional components and covering all sectors and carbon sinks with potential for GHG reductions. The key components of the CCAP include:

1. **GHG inventory:** A comprehensive inventory for all GHG emissions and sinks by emission source
2. **GHG projections:** Near-term and long-term projections of GHG emissions
3. **GHG targets:** Economywide near- and long-term GHG targets
4. **Quantified GHG measures:** Full suite of implementation measures to help reach GHG reduction targets covering key emissions sectors – industry, electricity, transportation, buildings, agriculture/waste, industry, and natural and working lands
5. **Authority to implement**: Indication of statutory or regulatory authority to implement the measure
6. **Funding availability:** Identification of other funding programs available to the state
7. **Workforce analysis:** Analysis of anticipated workforce shortages and identify potential solutions
8. **Benefits analysis:** Quantified estimates of co-pollutant reductions, plus optional additional discussion on air quality improvements, improved public health, climate resilience, etc.

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[2] PCAP: https://climatechange.ri.gov/media/1551/download?language=en

Near-Term and Long-Term GHG Reduction Targets

Rhode Island enacted the Act on Climate which established GHG reduction mandates of:

+ 45% below 1990 levels by 2030
+ 80% by 2040 (below 1990 levels)
+ Net-zero by 2050 (below 1990 levels)[3]

The Executive Climate Change Coordinating Council (RIEC4), originally created in 2014 under the Resilient Rhode Island Act, brings together leaders from across state agencies to coordinate implementation of strategies that achieve these GHG reduction goals.[4] Under the Act on Climate, the RIEC4 is required to regularly update the state's core GHG reduction planning document. The first milestone was the 2022 update to the 2016 Greenhouse Gas Emissions Reduction Plan, submitted to the Governor and General Assembly in December 2022.[5] The next step is the development and submission of the 2025 Rhode Island Climate Action Strategy by December 31, 2025. This Strategy will then be updated every 5 years thereafter. The CCAP and the 2025 Climate Action Strategy were developed together so modeling and projections would align.

Approach to Developing the CCAP

The development of the RI Comprehensive Climate Action Plan extended over an approximate 14-month period between late 2024 and December 2025 (Figure 1). RIEC4 worked with the consultant team to conduct stakeholder engagement, qualitative research on potential GHG reduction measure options, and quantitative analysis (GHG reduction, jobs, and public health impacts).

Figure 1: RI CCAP Process Overview

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[3] https://webserver.rilegislature.gov/BillText/BillText21/SenateText21/S0078A.pdf

[4] https://climatechange.ri.gov/ri-executive-climate-change-coordinating-council-ec4-overview
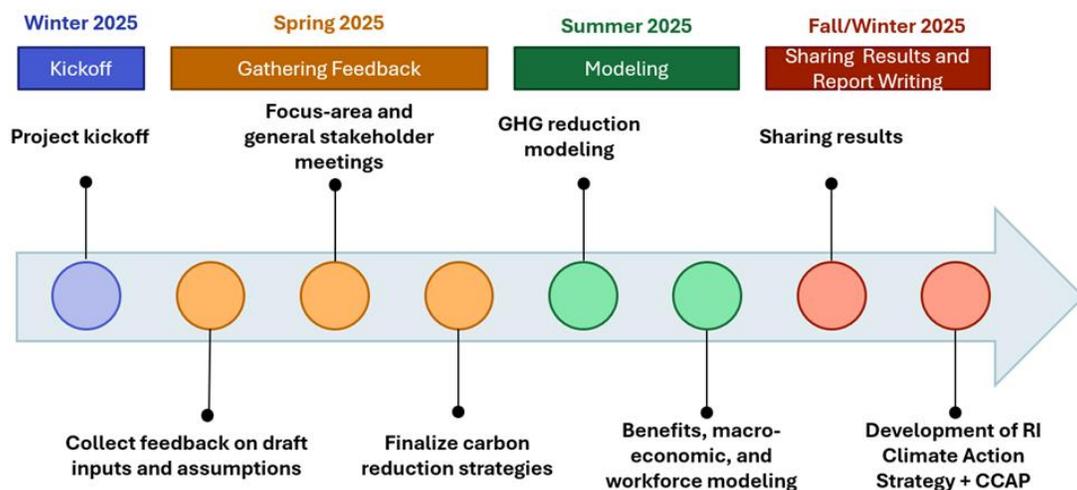
[5] 2022 Update available at https://climatechange.ri.gov/ri-executive-climate-change-coordinating-council-ec4/publications-reports

To evaluate the key components of the RI CCAP, a comprehensive quantitative modeling exercise was undertaken. The E3 Pathways model was used to simulate the adoption of decarbonized technologies and changes in energy demand across sectors. The Pathways model produces outputs including total energy demand, technology stocks and sales, economy-wide costs, and GHG emissions. These outputs capture how different policy and technology pathways influence the economy-wide energy system over time. The Pathways model was also use to estimate the impacts of individual carbon reduction measures.

An addition, the RI Department of Transportation (RIDOT) and their consultant, Cambridge Systematics, conducted detailed measure-specific modeling for transportation strategies, such as mode shift and transit, pricing mechanisms, and EV charging infrastructure. The outputs from RIDOT's analysis were passed to the Pathways model and measure-specific results. (Note: funding to support this additional in-depth analysis on transportation strategies was supported with state funds, not CPRG funds).

Electric resource expansion needs were assessed at the regional level using the ISO New England (ISO-NE) PLEXOS LT model. This analysis quantified how the electric grid would evolve to meet future demand under each scenario, with key outputs including thermal electricity generation within Rhode Island and total electric sector costs. The outputs from both the Pathways and PLEXOS models informed final modeling results for GHG emissions and system-wide costs. In addition, these outputs were provided to BW Research to support their analyses of employment impacts associated with each scenario.

To estimate employment impacts, BW Research used both the IMPLAN model and NREL's JEDI (Jobs and Economic Development Impact) tool, each of which applies input-output (I/O) modeling to quantify how investments in specific sectors translate into job creation across the broader economy.

Figure 2 outlines the high-level modeling workflow.

Figure 2: RI CCAP Quantitative Modeling Workflow
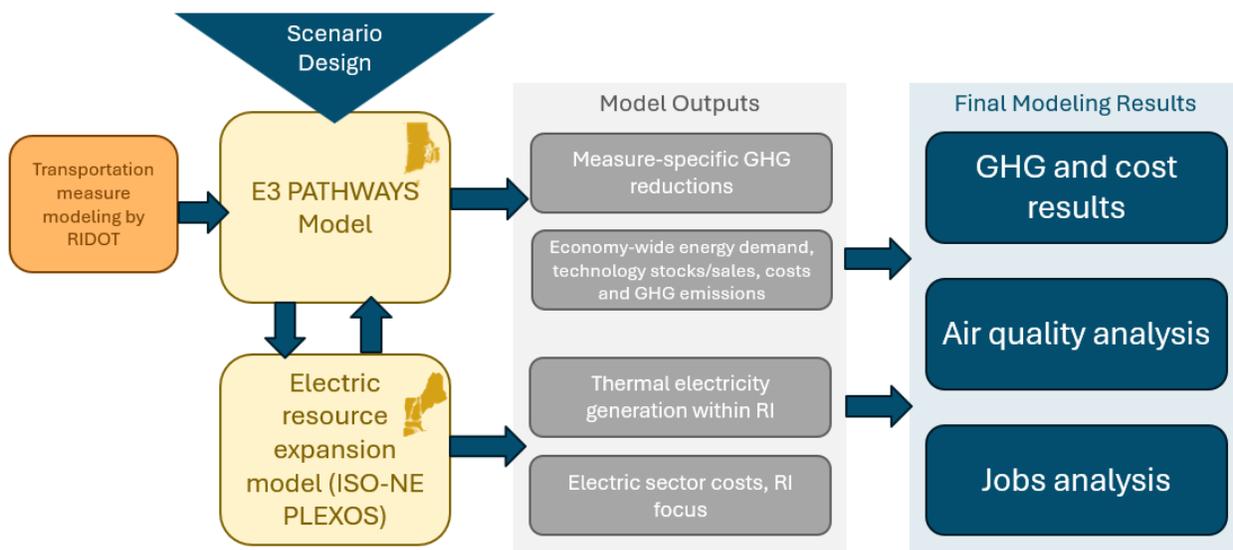
GHG Emissions Analysis

GHG Inventory

Methodology

The Rhode Island Department of Environmental Management has developed a statewide inventory of major sources of GHG emissions within Rhode Island, called the *Rhode Island Greenhouse Gas Inventory*. This inventory was prepared using the following data resource(s):

- State-level GHG inventories prepared by the EPA (see https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals)
- EPA's State Inventory Tool (SIT) (see https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool)
- Data reported to the EPA's Greenhouse Gas Reporting Program (see https://www.epa.gov/ghgreporting/data-sets)
- EPA's Motor Vehicle Emissions Simulator (MOVES) (see https://www.epa.gov/moves)
- Rhode Island Electricity Consumption Emissions Methodology (see https://dem.ri.gov/sites/g/files/xkgbur861/files/2022-11/Updates%20to%20Electricity%20Sector%20GHG%20Accounting.pdf)

Detailed methodology and quality assurance procedures for preparation of this inventory are in the '*RI Climate Pollution Reduction Grants Program Quality Assurance Project Plan 11/22/23*' as approved by EPA in Nov. 2023. This report can be found online at https://dem.ri.gov/data-maps/data.php#quapps

Please note that EPA Region 1 was notified of data source updates to RI's QAPP in October of 2024 & 2025.

Rhode Island regularly prepares robust annual GHG inventories and these inventories. They are the primary scientific tool used by Rhode Island to assess progress towards the economy-wide GHG emissions reduction mandates required by the Act on Climate. The inventory is an estimate of emissions sources and sinks and is recalculated each year based on the best science and data available. Methodologies evolve year-to-year, and emissions estimates from previous inventories should not be used as a direct comparison since adjustments have been made. The Technical Appendix of RI's annual inventories provide a full explanation of applicable adjustments to the 1990 baseline and subsequent year's data. Table 1 lists the sectors and gasses included in Rhode Island's inventory.

Table 1. Sectors and Greenhouse Gasses Included in Rhode Island's Inventory

Sectors	Greenhouse Gases (across all sectors)
Energy **Industrial Processes and Product Use** **Waste** **Agriculture** **Natural and Working Lands**	Carbon Dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O), Fluorinated gases (F-gases), including Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulfur Hexafluoride (SF_6), and Nitrogen Trifluoride (NF_3)

Inventory Results

Table 2, Table 3, and Figure 3 provide the detailed findings of Rhode Island's 2022 inventory. In this inventory, transportation, electricity, and buildings are captured under 'Energy.'

Table 2. Rhode Island GHG emissions in MMTCO$_2$e by Sector

Sector/Source	1990	2022
Energy	**11.93**	**9.60**
Transportation	4.63	3.78
Aviation	*0.33*	*0.23*
Highway Vehicles	*3.98*	*3.24*
Non-Road Sources	*0.33*	*0.32*
Electricity Consumption	2.82	1.92
Residential Buildings	2.38	2.12
Commercial Buildings	1.13	0.93
Industrial Buildings	0.65	0.59
Natural Gas Distribution	0.33	0.25
Industrial Processes and Product Use	**0.10**	**0.62**
Chemical Industry	0.02	0.02
Mineral Industry	0.01	0.003
Metal Industry	0.01	N/A
Electronics Industry	0.01	N/A
Product Use	0.06	0.60
Agriculture	**0.06**	**0.02**
Livestock	0.02	0.01
Soil Management	0.04	0.01
Waste	**0.28**	**0.11**
Solid Waste Disposal	0.18	0.005
Wastewater Treatment and Discharge	0.10	0.11
Natural and Working Lands	**-0.61**	**-0.75**
Total (Sources) Emissions	**12.37**	**10.35**
Total Net (Sources and Sinks) Emissions	**11.76**	**9.60**

Note: This table above details GHG emissions in million metric tons (MMT) of carbon dioxide equivalents (CO_2e) for all sectors. The Rhode Island Greenhouse Gas Inventory equates emissions of GHGs using the global warming potential metric from Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (see https://www.ipcc.ch/report/ar5/syr/).

Table 3. Rhode Island GHG emissions in MMTCO$_2$e by Gas

Gas/Source	1990	2022
CO_2	**11.45**	9.29
CH_4	**0.66**	**0.38**
N_2O	**0.19**	**0.09**
F-Gases	**0.06**	**0.60**
PFCs and NF$_3$	*0.01*	*0.0002*
SF$_6$	*0.06*	*0.001*
HFCs	*0.001*	*0.60*
Total (Sources) Emissions	**12.37**	**10.35**
Total Net (Sources and Sinks) Emissions	**11.76**	**9.60**

Notes: 1) Total emissions presented without LULUCF; column totals may not agree with grand total due to rounding; and 2) net emissions include LULUCF; column totals may not agree with grand total due to rounding.

Figure 3. A Snapshot of Rhode Island's 2022 Inventory Findings

Rhode Island's complete 2022 Greenhouse Gas Inventory, including data sources, emission factors, historical trends from 1990-2022 by sector/gas, and all other supporting documentation can be accessed online at https://dem.ri.gov/environmental-protection-bureau/air-resources/rhode-island-greenhouse-gas-inventory. While the 2022 RI Greenhouse Inventory is the basis for this analysis, RI included minor adjustments to the inventory that were made in 2025 while preparing the 2023 RI Greenhouse Gas Inventory and this report.

Inventory Trends and Analysis

The 2022 Inventory includes the following key findings:

+ Rhode Island emitted 9.60 million metric tons of carbon dioxide equivalent (MMTCO2e) in 2022
+ The state's emissions decreased by 2.2% from 2021 levels
+ Emissions decreased by 18.3% since 1990

Transportation: Most of Rhode Island's emissions, 36.6%, continued to stem from the transportation sector (3.78 MMTCO2e) in 2022. Since 2021, emissions from transportation decreased 3.4%. A drop in highway vehicle emissions drove most of the annual change in the transportation sector's emissions. Highway vehicle emissions are strongly correlated with vehicle miles traveled (VMT), and a small shift in VMT can alter emissions.

Buildings (Residential, Commercial and Industrial): The building sector continues to be a large source of RI's emissions with combined emissions from residential, commercial, and industrial buildings comprising 3.64 MMTCO2e. Residential building emissions are correlated with winter weather through heating degree days. In 2022, Rhode Island accumulated 5.2% more heating degree days than in 2021. Despite the slightly cooler year, residential building emissions dropped by 1.2% due to small changes in petroleum and natural gas consumption. It is plausible 2022's decrease in residential building emissions is related to advances in energy efficiency, building weatherization, and the electrification of heating equipment.

Electricity Consumption: In 2022, electricity consumption was Rhode Island's third largest emissions source and contributed 18.6% (1.92 MMTCO2e) of the statewide total. Electricity consumption emissions originate from power plants connected to the regional electric grid that serves Rhode Island and New England customers. Since electricity flows freely across state lines, this sector includes emissions from outside of Rhode Island. Electricity consumption is the only sector that includes emissions from outside of Rhode Island's geographic borders. Between 2021 and 2022, emissions from electricity consumption slightly decreased by 1.2%. State law partially governs emissions from this sector; Rhode Island offset 19.3% of its total electricity use with renewable sources in 2022. This includes the 19% required by the Renewable Energy Standard (RES) in 2022 and an additional 0.3% from voluntary clean energy programs.

Longer term GHG trends since 1990 include:

+ Transportation emissions declined 18.3%
+ Electricity consumption emissions declined 31.7%
+ Residential heating emissions declined 10.9%

Additional information and details on trends and RI's 2022 GHG Inventory can be found at: https://dem.ri.gov/sites/g/files/xkgbur861/files/2024-12/ghg-inventory-2022-f_1.pdf

Future Emissions Projections

Methodology

Emissions projections under the two scenarios and for individual carbon reduction measures were modeled in Pathways, a stock rollover and emissions accounting tool developed by E3. 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 demands and greenhouse gas emissions by sector and is benchmarked to the most recent Rhode Island GHG inventory year of 2022 as the model base year.

For key end uses like building space heating and on-road vehicles, the Pathways model tracks the rollover of stocks each year by accounting for older devices retiring at the end of their lifetime, and new devices sold to replace them. This allows the model to account for the long lifetime of energy consuming devices like vehicles, furnaces, and boilers. For other energy demands in the industrial and off-road transportation sectors, the model accounts for total energy demand by fuel type within each sector and allows the user to apply energy efficiency or fuel-switching measures in the future. Finally, the model accounts for annual emissions from non-energy related sources (e.g., methane from landfills) and includes the option to apply mitigation measures to emissions from these sources.

Emissions Projections under Current Policy Scenario

The **Current Policy scenario** was designed to show projected emissions under current state-specific policies, such as the Renewable Energy Standard, existing heat pump incentives, etc. The projections demonstrate emissions reductions potential from existing policies and highlight the remaining gap to future GHG targets to guide in future policymaking. Current policies represented in Table 4.

Table 4: Policies Represented in Current Policy Scenario

Sector	Policy or Strategy	Description
Electricity	Renewable Energy Standard[6]	100% of electric retail sales met with renewable energy by 2033
Transportation	Advanced Clean Cars II (ACCII)[7]	
	Advanced Clean Trucks (ACT)[8]	Requires automakers to increase the share of ZEVs for the medium- and heavy-duty (MHDVs) vehicles delivered to RI, increasing to 40-75% by 2035 depending on weight class
	Existing DRIVE EV Incentives[9]	
Buildings	Existing Clean Heat RI Heat Pump Incentives[10]	Heat pump incentives offered by the Clean Heat RI Program
	Existing State Energy Efficiency Program Incentives[11]	
	Heating Oil Biofuel Blend Requirements[12]	Blend of biodiesel or renewable diesel for building heating oil increases from 10% in 2023 to 50% by 2030
Natural and Working Lands		

The analysis found that Rhode Island's 2030 emissions target is within reach – **under Current Policy, the state reaches the 45% reduction required by Act on Climate in 2030**. However, additional action will be required to reach the longer-term emissions reduction targets of 80% by 2040 and net zero by 2050. The analysis found that in the Current Policy scenario, emissions in Rhode Island reach a 63% reduction by 2040 and a 71% reduction by 2050 (Figure 14). These reductions in the Current Policy scenario are driven by a combination of measures across the economy:

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[6] https://ripuc.ri.gov/utility-information/electric/rhode-island-renewable-energy-standard-ri-res-program

[7] https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/advanced-clean-cars

[8] https://dem.ri.gov/environmental-protection-bureau/air-resources/mobile-sources/advanced-clean-cars-ii-advanced-clean

[9] https://drive.ri.gov/drive-ev-project

[10] https://cleanheatri.com/resources/incentives/

[11] https://eec.ri.gov/wp-content/uploads/2025/06/Main-Text-Outline.pdf

[12] https://energy.ri.gov/heating-cooling/renewables/biofuel

+ **Transportation:** The transportation sector under current policies reaches a 45% reduction by 2030, 63% by 2040, and 78% by 2050 relative to 1990 levels. Reductions are primarily driven by zero-emission vehicle adoption in line with Advanced Clean Cars II and Advanced Clean Trucks.
+ **Buildings:** The buildings sector under current policies reach a 36% reduction by 2030, 41% by 2040, and 44% by 2050. Reductions are primarily driven by biofuel blending as required by the Biodiesel Heating Oil Act[13], heat pump adoption driven by Clean Heat RI incentives[14], and building efficiency incentives based on the First Draft of the 2026 Annual Energy Efficiency Plan.[15]
+ **Electricity:** The largest contribution to emissions reductions under current policy is the implementation of the Renewable Energy Standard (RES), which requires that 100% of electricity retails sales are met with renewable electricity by 2033, reducing emissions to near zero by that year.[16]

Figure 4: Annual Emissions by Sector in Current Policy Scenario

GHG Emissions (MMT CO2e)
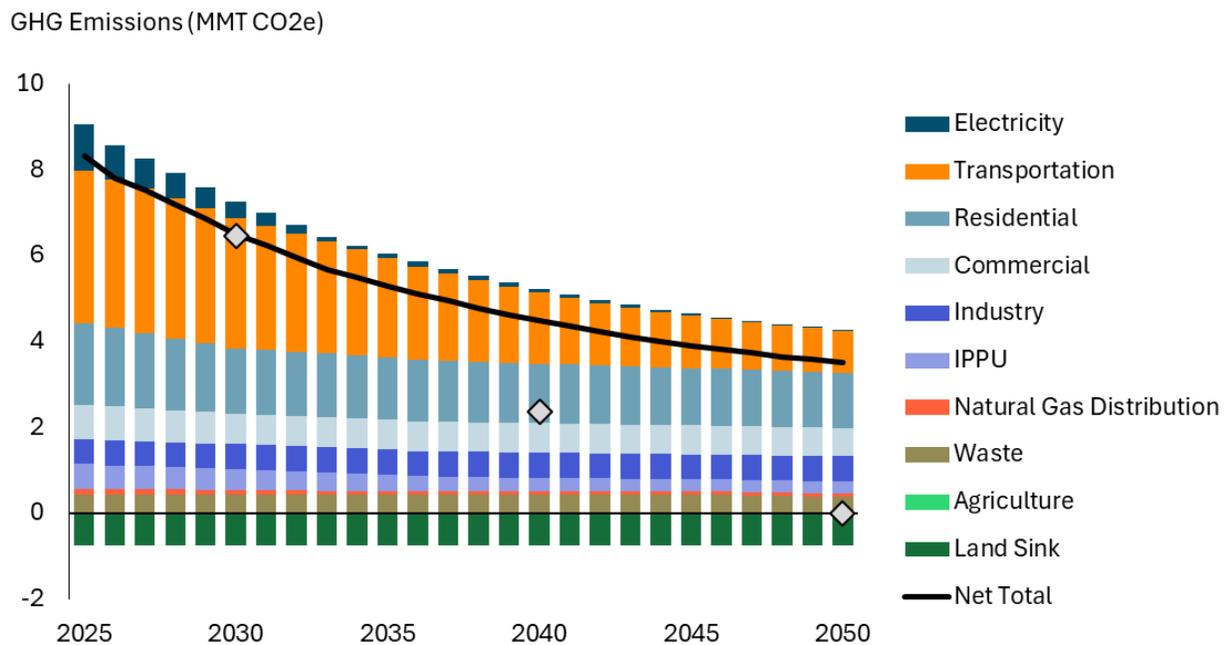
Notes:
- The net total represents the total gross emissions with the carbon sequestration from the land sink deducted
- All emissions projections use AR5 100-year global warming potential (GWP)

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[13] https://energy.ri.gov/heating-cooling/fossil-fuels/learn-about-natural-gas/biodiesel-heating-oil-act-2013-2013
[14] https://cleanheatri.com/
[15] https://eec.ri.gov/data-and-publications/
[16] Because the RES only applies to retail sales, the model can still select emitting generation resources for the portion of gross load lost during transmission and distribution (~7% of gross load), which is not included in retail sales. However, even this portion of load is mostly served by clean resources in the model. By 2050, electricity sector emissions are reduced 99.6% below 1990 levels.

Table 5: Emissions by Sector for Target Years in Current Policy Scenario

Sector	2030	2040	2050
Land Sink	-0.75	-0.75	-0.75
Agriculture	.02	.02	.02
Waste	.41	.40	.35
Natural Gas Distribution	.10	.08	.08
IPPU	.48	.32	.28
Industry	.59	.59	.59
Commercial	.72	.69	.67
Residential	1.52	1.39	1.28
Transportation	3.04	1.66	0.98
Electricity	.39	.09	.01
Net Total	**6.52**	**4.49**	**3.51**
% Reduction Below 1990 Levels	**45%**	**62%**	**70%**

Emissions Projections Under Act on Climate Scenario

The Act on Climate Scenario represents the emissions reductions that could be achieved in Rhode Island with the CCAP and Act on Climate fully implemented. It illustrates how comprehensive action across all sectors of the economy – buildings, transportation, industry, and electricity – would together drive the deep transformations needed to meet the state's statutory GHG reduction targets: 45% below 1990 levels by 2030, 80% below by 2040, and net zero by 2050.

Key findings for individual sectors in the Act on Climate Scenario are outlined below, with projections shown in Figure 5.

+ **Transportation:** The transportation sector under the Act on Climate Scenario reaches a 33% reduction by 2030, 74% by 2040, and 97% by 2050. Similar to the Current Policy scenario, reductions are primarily driven by Advanced Clean Cars II and Advanced Clean Trucks, but the Act on Climate scenario goes further than ACCII by assuming a faster transition to all-electric BEVs rather than PHEVs and goes further than ACT by assuming ZEV sales share continues increasing past the last year of ACT requirements in 2035 and reaches 100% by 2040 for MHDVs. Finally, all remaining diesel and jet fuel demand is met with renewable fuels by 2050.

+ **Buildings:** The buildings sector under the Act on Climate scenario reach a 42% reduction by 2030, 77% by 2040, and 100% by 2050. Reductions are primarily driven by widespread adoption of electric heat pumps, with all buildings in Rhode Island having a heat pump installed by 2050. Electric heat pumps provide all heating needs in around two-thirds of homes, while the remaining third use electric heat pumps as their primary heating source but retain their existing furnaces or boilers to provide backup heat during the coldest hours of the year. By 2050, all the gas and fuel oil consumed by these backup heaters is met with renewable fuels.

- **Electricity:** Similar to the Current Policy scenario, the RES drives electricity sector emissions to near zero in the Act on Climate scenario, although even more clean electricity resources are needed due to the higher electrification loads from buildings, transportation, and industry.
- **Industry:** The industrial sector under the Act on Climate scenario reaches a 1% reduction by 2030, 45% by 2040, and 92% by 2050. These reductions are primarily driven energy efficiency and electrification for manufacturing, with state-of-the-art energy efficiency reductions identified by ACEEE and the DOE achieved by 2050 along with electrification of all low temperature heat (<200C) supply.
- **Other Sectors:** Beyond emissions from fuel combustion in buildings, transportation, industry, and electricity generation, additional reductions are needed to close the gap to the state's climate targets. These reductions mostly come from the waste and natural gas distribution sectors. In the waste sector, emissions reduce 48% by 2050 due to diversion of organic waste away from landfills, while in the natural gas distribution sector, emissions reduce 80% by 2050 due to a decline in the number of buildings connected to the gas system and increased focus on mitigation fugitive emission leaks.

Figure 5: Annual Emissions by Sector in Act on Climate Scenario

GHG Emissions (MMT CO2e)
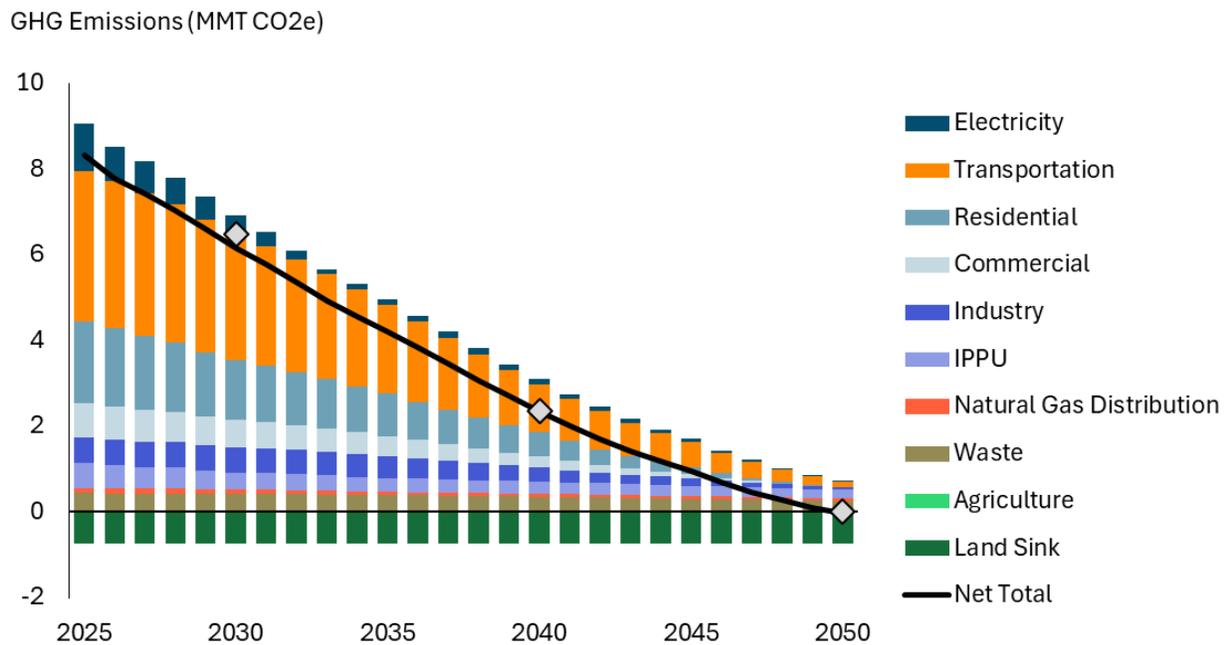
Notes: 1) The net total represents the total gross emissions with the carbon sequestration from the land sink deducted; 2) All emissions projections use AR5 100-year GWP

Table 6: Emissions by Sector for Target Years in Act on Climate Scenario

Sector	2030	2040	2050
LULUCF	-0.75	-0.75	-0.75
Agriculture	0.02	0.02	0.02
Waste	0.41	0.33	0.23
Natural Gas and Oil Systems	0.10	0.07	0.07
IPPU	0.39	0.28	0.20
Industry	0.59	0.32	0.05
Commercial	0.64	0.26	0.00
Residential	1.39	0.56	0.00
Transportation	3.00	1.15	0.14
Electricity	0.42	0.12	*0.01*
Net Total	**6.21**	**2.38**	**-0.03**
% Reduction Below 1990 Levels	**47%**	**80%**	**100%**

GHG Reduction Measures

To achieve the emissions reductions outlined in the Act on Climate Scenario, Rhode Island analyzed 18 potential GHG reduction measures designed to help meet the emissions reduction requirements of the Act on Climate. These measures were developed in close coordination with multiple state agencies and refined through several rounds of public stakeholder feedback. Each GHG Reduction Measure represents a policy, program, or initiative aimed at reducing emissions from key sectors such as transportation, buildings, and industry. Together, they illustrate the range of actions that could be initiated in the near term to accelerate progress toward the state's 2030, 2040, and 2050 climate targets.

The analysis of these 18 GHG Reduction Measures complements the broader Act on Climate Scenario by providing a focused look at specific actions that, when implemented, would contribute significantly to meeting Rhode Island's statutory greenhouse gas reduction goals. Existing policies, such as the Renewable Energy Standard and incentive programs already in place, were incorporated into the Current Policy Scenario described above. Most of the additional GHG Reduction Measures quantified in this section represent new, prospective actions for consideration. However, certain key measures critical to achieving the Act on Climate targets, including the Advanced Clean Cars II (ACCII) and Advanced Clean Trucks (ACT) rules, were incorporated into the Current Policy Scenario and also analyzed individually for their potential emissions impact.

See Table 7 for additional details on the full list of GHG Reduction Measures analyzed and distinctions between those quantified individually versus those included in the Current Policy Scenario.

Table 7: List of GHG Reduction Measures Analyzed

Sector	Measure	Included in Current Policy Scenario	Individually Quantified
Electricity	Renewable Energy Standard	X	
Transportation	Advanced Clean Cars II	X	X
	Advanced Clean Trucks	X	X
	Existing DRIVE EV incentives	X	
	Maintain and Adjust State EV Incentives		X
	NEVI Charger Funding		X
	Public Fleet Electrification		X
	Transit and School Bus Electrification		X
	Travel Pricing Mechanisms		X
	Mode Shifting and Transit		X
Buildings	Existing Clean Heat RI Heat Pump Incentive	X	
	Existing Building Weatherization Incentives	X	
	Biodiesel Heating Oil Act	X	
	All-Electric New Construction		X
	Pre-weatherization + Whole Home Electrification Program		X
	Maintain & Adjust State EE Incentives		X
	Government Building Decarbonization		X
	New England Heat Pump Accelerator Program		X
	Building Performance Standards		X
	Clean Heat Standard		X
Waste	Organic Waste Diversion		X
Industry	Large Facility Emissions Standards		X
	Off-Road Fleet Renewable Fuel Blending Requirement		X
Natural & Working Lands[17]	Maintained Carbon Sinks	X	

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[17] Includes agriculture sector. RI's agriculture sector only accounts for 0.2% of RI's emissions (2022 GHG Inventory).

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).[18] 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.[19,20]

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.

Modeling Assumptions and GHG Reductions

Electric resource expansion needs were assessed at the regional level using the ISO New England (ISO-NE) PLEXOS LT model. This analysis quantified how the electric grid would evolve to meet future demand under each scenario, with key outputs including thermal electricity generation within Rhode Island and total electric sector costs.

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.

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[18] R.I. Gen. Laws § 39-26-1–10 (2004)
[19] R.I. S.B. 2274Aaa, Gen. Assemb., Jan. Sess. (2022).
[20] R.I. H.B. 7277A, Gen. Assemb., Jan. Sess. (2022).

- 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

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

In the transportation sector, the state explored 8 potential GHG Reduction Measures, summarized in Table 8 below, along with each strategy's annual GHG reductions in 2030, 2040, and 2050, and

cumulative reductions from 2025-2050. Figure 6 shows transportation sector emissions in RI under the implementation of each measure. Note that each line on this chart shows the individual impact of each measure, not the impact of multiple GHG reduction strategies added together.

Figure 6: Transportation Sector Emissions by Measure (ktCO2e)
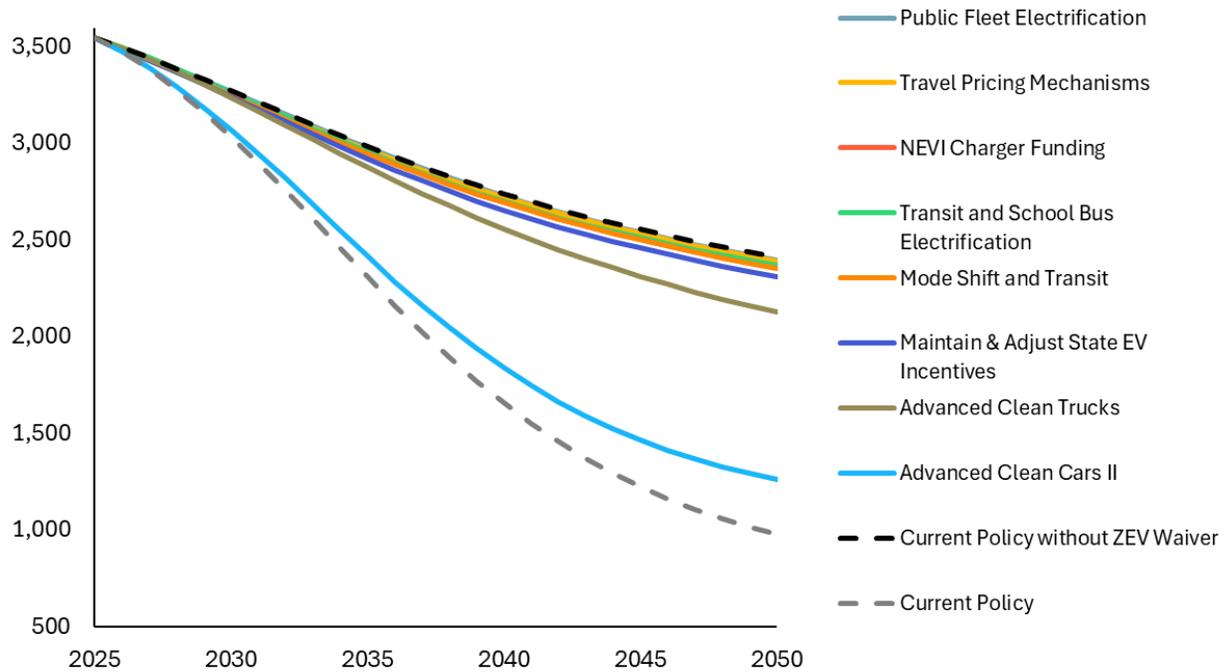
Table 8: Transportation Sector Emissions Reductions by Measure (ktCO2e)

Measure	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
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	900	1,150	17,300

Public Fleet Electrification

Policy Description

The electrification of public fleets operated by municipalities and state agencies is a potential measure to support Rhode Island's climate and clean transportation goals. This measure 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 measure.

Executive Order 23-06[21] already requires the transition of the state fleet to zero emission vehicles (ZEVs), and this measure would continue the implementation of that order and expand to municipal fleets.

Modeling Assumptions and GHG Reductions

Detailed modeling for this measure was conducted by the 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[22] 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 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 measure, GHG emissions in the transportation sector could decline by around 600 ktCO2e between now and 2050 (Table 9).

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[21] https://governor.ri.gov/executive-orders/executive-order-23-06
[22] https://www.epa.gov/moves

Table 9: Estimated GHG Reduction from Public Fleet Electrification (ktCO2e)

Measure	2030	2040	2050	Cumulative
Public Fleet Electrification	20	28	29	600

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 with support from OER's Lead by Example Program. Currently, 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. Education about the long-term maintenance cost benefits of electric vehicles could help guide decisions about future vehicle purchases.

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. [23] Coordination across agencies may help ensure equitable access to these resources.

Equity and Environmental Justice Considerations

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.

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

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,[24,25] while California has paired statewide mandates[26] with workforce development and technical support.[27] 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.
+ **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 measure varies in design and impact, all aim to internalize the societal costs of driving, particularly GHG emissions and traffic congestion.

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[24] Massachusetts Department of Environmental Protection (MassDEP). *MassEVIP Fleets Incentives Program.*

[25] Massachusetts Clean Energy Center (MassCEC). *Mass Fleet Advisor Program.*

[26] California Air Resources Board (CARB). *Advanced Clean Fleets Regulation – State and Local Government Agency Fleet Requirements.*

[27] Metropolitan Transportation Commission (MTC). *Public Fleet Electrification Planning Assistance Program.*

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 shared 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 10).

Table 10: Estimated GHG Reduction from Travel Pricing Mechanisms (ktCO2e)

Measure	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.

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.[28]

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.
+ 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[29] and Utah's pilot[30] demonstrate how mileage-based

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[28] The state is monitoring the availability of federal funding.
[29] OReGO (Oregon) – Oregon Department of Transportation, "OReGO: Oregon's Road Usage Charge Program."
[30] Utah Road Usage Charge Program (Utah) – Utah Department of Transportation, "Road Usage Charge" information.

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[31] 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[32] highlights the operational viability of cap-and-invest programs, while Vermont's ongoing program design[33] 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 measure would support the buildout of direct current fast charging (DCFC) stations 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 measure 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; results from that analysis were used to inform this policy assessment (see https://climatechange.ri.gov/act-climate/2025-climate-update for background on their analysis).

The modeling for this measure 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.

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[31] Central Business District Tolling Program (New York City) – Metropolitan Transportation Authority (MTA), "Central Business District Tolling Program."

[32] Western Climate Initiative Inc. (California & Québec) – Québec Ministry of Environnement press release and California linking agreement.

[33] Vermont Mileage-Based Fee Program (in design) (Vermont) – Vermont DMV/transportation briefing on EV user fee transition.

The impact of NEVI funding and charger deployment on EV sales was estimated primarily using estimates from Buckberg & Cole, 2025,[34] 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 measure is projected to result in an estimated 500 ktCO2e of cumulative GHG reductions by 2050 from increased EV adoption and reduced gasoline consumption (Table 11). 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 11: Estimated GHG Reduction from NEVI Charger Funding (ktCO2e)

Measure	2030	2040	2050	Cumulative
NEVI Charger Funding	20	20	20	500

Regulatory Authority

Implementation of the EV infrastructure measure 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 [35] and PowerUpRI [36] and would likely continue administering grant programs and disbursing funds from NEVI and related sources.

Funding Availability

The primary funding ($54M total) for this measure comes from two federal sources[37]:

+ 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.

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[34] https://salatainstitute.harvard.edu/quantifying-trumps-impacts-on-ev-adoption/
[35] https://energy.ri.gov/transportation/ev-charging/electrify-ri-program
[36] https://drive.ri.gov/powerupri
[37] 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.

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

Several states offer useful models for Rhode Island as the state expands EV charging infrastructure under the NEVI program. For example, California[38] and New York[39] 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[40] and Washington[41] 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.

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[38] California's equity-focused EV-charging incentive program: California Energy Commission, "California Opens $55 Million Incentive Program to Expand Public Electric Vehicle Fast Charging"

[39] New York's charger-deployment program prioritizing disadvantaged communities: Governor Kathy Hochul, *"Advancement of Program to Deploy More Than 50,000 New EV Charging Ports Across the State"*, November 18 2021

[40] Colorado's reliability/oversight measures for EV charging: Colorado Senate Democrats, *"Legislation to Protect Consumers, Improve EV Charging Oversight Passes Committee"*, April 28 2025.

[41] Washington's reliability & interoperability standards for EV charging infrastructure: Washington State Department of Commerce, *"Electric Vehicle Charging – Reliability and Accessibility Accelerator"*, January 2025.

Transit & School Bus Electrification

Policy Overview

This measure 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 measure 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

RIDOT conducted detailed modeling of transit and school bus electrification; results from that analysis were used to inform this policy assessment. The analysis 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 projected to yield cumulative reductions of approximately 700 ktCO$_2$e by 2050 (Table 12).

Table 12: Estimated GHG Reduction from Transit & School Bus Electrification (ktCO2e)

Measure	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 and DEM provides technical assistance and/or funding programs for school districts.

Funding Availability

This measure 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 measure include:

+ **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, [42] , [43] pairing these efforts with workforce training programs and close coordination with utilities. New York State's Environmental Bond Act[44] provides an example of how policy mandates can be paired with dedicated funding streams, including a

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[42] AC Transit (California) – Zero-Emission Bus Program with workforce training: Zero Emission Program | Alameda-Contra Costa Transit District.

[43] LA Metro / California transit agencies – On-route and depot charging plus training efforts: GTrans Zero-Emission Repower Bus Project | California Energy Commission.

[44] New York State Environmental Bond Act – State policy enabling school bus electrification by 2035: Electric School Buses | NYSERDA (requires fleet electrification by 2035).

statewide requirement for school bus electrification by 2035. Maine's emphasis on early deployment of electric school buses in rural areas[45] 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[46] 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[47] offer publicly available toolkits, procurement templates, and technical guidance that could support efficient and equitable implementation in Rhode Island.

Mode Shift and Transit

Policy Overview

Encouraging a shift in transportation modes represents another measure 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 measure:

+ 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 conducted detailed modeling of mode shift and transit; results from that analysis were used to inform this policy assessment. High level modeling methodology for each of the sub-strategies are outlined below, with more details available at https://climatechange.ri.gov/act-climate/2025-climate-update

+ **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

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[45] Maine – Early electric school bus deployment in rural areas: Maine Clean School Bus Program – "A Path Forward for Rural Maine".

[46] Cold-climate testing (Société de transport de Montréal) – Winter performance testing of electric buses.

[47] Electric School Bus Initiative (national) – Publicly-available toolkits, procurement templates and technical guidance: U.S. EPA Clean School Bus Program overview.

+ **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 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 13).

Table 13: Estimated GHG Reduction from Mode Shift and Transit (ktCO2e)

Measure	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 and planning needs
+ 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[48]. 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
+ 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. [49]

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[50], for example, has invested significantly in separated bike lanes. Multimodal transit corridors, particularly in Portland[51] and Minneapolis,[52] 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.[53] Meanwhile, Washington DC's bikeshare and e-bike programs benefit from strong regional coordination and community driven outreach.[54] Rhode Island could draw from these examples while tailoring its

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

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

[50] Massachusetts – Separated bike lanes and multimodal corridors: Massachusetts Department of Transportation celebrates 15 miles of new shared-use paths opened in 2024, expanding multimodal connectivity and bike/walk access.

[51] Portland, Oregon – Comprehensive land-use changes and micromobility / separated bike lanes: The city's Transportation System Plan calls for corridors with separated bicycle facilities, sidewalks and transit priority treatments

[52] Minneapolis, Minnesota – Micromobility programs and mode-shift strategy: The city's "Complete Streets" policy.

[53] Los Angeles City Planning – Transit Oriented Communities Incentive Program

[54] Washington, D.C. – The District Department of Transportation (DDOT)Bikeshare and e-bike programs with regional coordination & outreach.

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.

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 measure 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 1,800 ktCO2e through 2050 (Table 14).

Table 14: Estimated GHG Reduction from Maintaining and Adjusting State EV Incentives (ktCO2e)

Measure	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)[55] introduced income caps and increased rebates for lower-income households, helping to expand access among underserved populations. New Jersey's Charge Up Program[56] 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-

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[55] California Air Resources Board, "Clean Vehicle Rebate Project".
[56] U.S. Department of Energy, "Electric Vehicle (EV) and EV Charger Rebate," https://afdc.energy.gov/laws/12832

income residents and has expanded eligibility to include used EVs.[57] Similarly, New York's Drive Clean Rebate[58] 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.

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[59].

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 projected 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 15 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.

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[57] Colorado Energy Office - https://energyoffice.colorado.gov/vehicle-exchange-colorado

[58] NYSERDA - https://www.nyserda.ny.gov/All-Programs/Drive-Clean-Rebate-For-Electric-Cars-Program

[59] https://www.hklaw.com/en/insights/publications/2025/04/up-in-the-air-challenges-to-californias-clean-air-act-preemption

Table 15: 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%
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 16 below.

Table 16: Estimated GHG Reduction Impacts of Advanced Clean Trucks (ktCO2e)

Measure	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. As noted above, ongoing litigation concerning this program will impact program results beginning in 2027.

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 may 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[60].

New Jersey has focused on equity by aligning ACT adoption with targeted incentives and technical assistance for communities with high truck pollution exposure[61]. Vermont combined its adoption of ACT and Advanced Clean Cars II into a single rulemaking process that incorporated stakeholder input and health impact assessments[62]. In Oregon[63] and Washington[64], 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

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[60] California Air Resources Board - https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks
[61] New Jersey – ACT Equity-Focused Incentives and Technical Assistance
[62] Agency of Natural Resources – Department of Environmental Conservation: https://dec.vermont.gov/src/air-quality/mobile-sources/zero-emission-vehicles/ACT
[63] Oregon, Department of Environmental Quality - https://www.oregon.gov/deq/aq/programs/Pages/mdhdZev.aspx
[64] Washington Department of Ecology: Advanced Clean Trucks and Heavy-Duty Low NOx Omnibus

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

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 17 below shows the ZEV sales requirement 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 17: 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 17.8 million metric tons of CO2e through 2050 as shown in Table 18 below.

Table 18: Estimated GHG Reductions of Advanced Clean Cars II (ktCO2e)

Measure	2030	2040	2050	Cumulative
Advanced Clean Cars II	210	930	1,200	17,800

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).

Best Practices from Other Jurisdictions

States that have adopted ACC II or similar standards have adopted a range of approaches to support successful implementation. California[65] offers a comprehensive regulatory and market framework, while states such as Massachusetts[66] and Vermont[67] have paired vehicle standards with equity-focused incentive programs and rural deployment initiatives. Colorado has introduced tiered rebates and support for used EV purchases,[68] and New Jersey[69] 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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[65] California Air Resource Board - https://ww2.arb.ca.gov/our-work/programs/drive-forward-light-duty-vehicle-program/advanced-clean-cars

[66] Massachusetts Executive Office of Energy and Environmental Affairs, "Advanced Clean Cars II Adoption and Equity Initiatives".

[67] Agency of Natural Resources – Department of Environmental Conservation: https://dec.vermont.gov/air-quality/laws-and-regulations/recently-adopted-and-proposed-regulations.

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

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

Buildings

In the buildings sector, the state explored 7 potential carbon reduction strategies, summarized in

Table 19 below, along with each measure's annual GHG reductions in 2030, 2040, and 2050, and cumulative reductions from 2025-2050. Figure 7 shows building sector emissions in RI under the implementation of each measure. Note that each line on this chart shows the individual impact of each measure, not the impact of multiple GHG reduction strategies added together. The black dashed line represents building emissions under current policies. Under current policies, building sector emissions are modeled to decrease between now and 2030 due to compliance with the Biodiesel Heating Oil Act that requires that 50% of fuel oil delivered to homes be biodiesel by 2030. Under modeling assumptions, the carbon reduction strategies in the buildings sector that are estimated to have the largest impact on GHG emissions are the Heat Pump Accelerator program, a potential Building Performance Standard, and a potential Clean Heat Standard. However, other strategies, such as Pre-weatherization + Whole Home Electrification, could have deeper impact in terms of advancing equity.

Figure 7: Building Sector Emissions by Measure (ktCO2e)
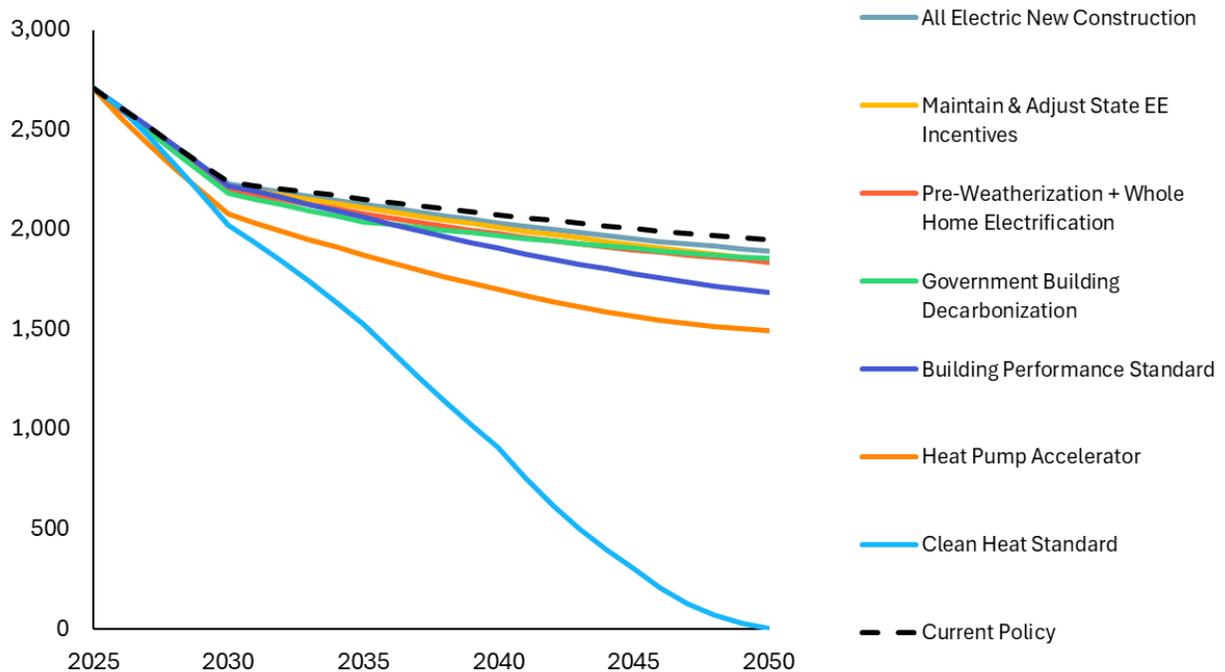
Table 19: Building Sector Emissions Reductions by Measure (ktCO2e)

Measure	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	110	90	2,100
Building Performance Standards	20	170	260	3,300
Heat Pump Accelerator	160	380	460	7,800
Clean Heat Standard	210	1,170	1,940	24,500

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.[70]

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[71]. 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 reduction impacts from the adoption of a potential all-electric new construction policy reach around 800 ktCO2e by 2050 and are shown in Table 20 below.

Table 20: Estimated GHG Reductions from All-Electric New Construction (ktCO2e)

Strategy	2030	2040	2050	Cumulative
All Electric New Construction (Low Income Only)	2	8	10	150
All Electric New Construction (All Homes)	8	42	53	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.

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[70] https://nyassembly.gov/all-electric-buildings/
[71] https://housing.ri.gov/data-reports/departmental-reports

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[72] 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).[73,74]

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.

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[72] New York State Energy Law § 11-104 (2024).

[73] NYSERDA, "Low-to Moderate-Income Energy Efficiency and Building Electrification Stakeholder Conferences,".

[74] NYC Employment and Training Coalition, "NYC Energy Efficiency Companies Launch Employer-Led Coalition to Catalyze Green Workforce Development and Market Transformation,".

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 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[75] 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 measure reach 1,400 ktCO2e by 2050 (Table 21).

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[75] https://eec.ri.gov/data-and-publications/

Table 21: Estimated GHG Reductions from Maintaining and Adjusting State Energy Efficiency Program Incentives (ktCO2e)

Measure	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 measure 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

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

+ **State Energy Program:** Offers funding 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 the 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. [76] 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. [77] New York offers integrated weatherization and heat pump programs through New York State Energy Research and Development Authority (NYSERDA), [78] 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

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[76] Mass Save, "Deep Energy Retrofit," - https://www.masssave.com/business/rebates-offers-services/deep-energy-retrofit

[77] Efficiency Vermont. - https://www.efficiencyvermont.com/news-blog/whitepapers/industrialized-weatherization-comprehensive-deep-energy-retrofits-with-prefabricated-panel-block-wall-insulation

[78] NYSERDA, "Comfort Home Program," - https://www.nyserda.ny.gov/All-Programs/Comfort-Home-Program

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,[79] and OER is piloting a Whole Home + Electrification Pilot with the Green & Healthy Homes Initiative (GHHI). The pre-weatherization + whole home electrification measure 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[80] 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 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[81]. Similarly, Connecticut and Massachusetts report[82] energy savings of hundreds of thousands of MWh per year and large increases in heat pump installations when programs address barrier remediation upfront[83].

This program is estimated to reduce GHG emissions by 1,900 ktCO2e by 2050 (Table 22).

Table 22: Estimated GHG Reductions from Pre-Weatherization + Whole Home Electrification (ktCO2e)

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

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[79] RIE Three-Year EE Plan
[80] Based on OER estimates
[81] Efficiency Maine Trust. FY2024 Annual Report. (2024). https://www.efficiencymaine.com/docs/FY2024-Annual-Report.pdf
[82] Massachusetts Energy Efficiency Advisory Council (EEAC) and 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
[83] Massachusetts Energy Efficiency Advisory Council (EEAC). Massachusetts 2025–2027 Energy Efficiency and Decarbonization Plan. (2024) https://ma-eeac.org/wp-content/uploads/Final-Draft-MA-2025-2027-Plan-04-01-24.pdf

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.
+ **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 measure 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[84], Massachusetts[85], and Maine[86] 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 [87] 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 measure 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.

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

[85] Mass Save, "Enhanced Weatherization Incentive," - https://www.masssave.com/residential/programs-and-services/income-based-offers/save-with-enhanced-incentives/enhanced-weatherization-incentive

[86] MaineHousing, "Weatherization Program," - https://www.mainehousing.org/programs-services/HomeImprovement/homeimprovementdetail/weatherization

[87] Mass Save, "Pre-Weatherization Barrier Mitigation," - https://www.masssave.com/business/rebates-and-incentives/building-insulation-and-weatherization/pre-weatherization-barrier-mitigation

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).[88] 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 23 below.

Table 23: Estimated GHG Reductions from Government Building Decarbonization (ktCO2e)

Measure	2030	2040	2050	Cumulative
Government Building Decarbonization	50	110	110	2,100

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,**[89] 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.

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[88] https://www.eia.gov/consumption/commercial/data/2018/
[89] https://www.riib.org/solutions/programs/efficient-buildings-fund/

+ **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.

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,[90] 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[91] implementation strategy, with clear timelines, funding, and performance requirements.

Vermont has supported municipal decarbonization through Efficiency Vermont and the Vermont Climate Action Commission,[92] including community-scale energy planning and public building

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

[91] 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

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

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.[93]

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.

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.[94] 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

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[93] Washington State Department of Commerce, "Clean Buildings Performance Standard," - https://www.commerce.wa.gov/growing-the-economy/energy/buildings/

[94] https://portal.ct.gov/deep/energy/new-england-heat-pump-accelerator

Request for Information (RFI) and Notice of Technical Conference.[95] 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 Consumption Survey[96], 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 to the above estimate of the Market Hub impacts, OER 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 24 below.

Table 24: Estimated GHG Reductions from New England Heat Pump Accelerator Program (ktCO2e)

Measure	2030	2040	2050	Cumulative
Heat Pump Accelerator (study team estimate of Market Hub)	43	42	45	997
Heat Pump Accelerator (NEEP estimate of Market Hub + Innovation Hub)	160	155	174	3,756

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[95] 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

[96] https://www.eia.gov/consumption/residential/data/2020/

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.

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 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.[97] 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.[98] Vermont's Efficiency Vermont program also blends midstream and downstream support and has demonstrated success in contractor engagement and training.[99] British Columbia has also invested in contractor and retailer education as part of its heat pump market transformation efforts.[100] 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.

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[97] Maine Department of Energy Resources, "Energy Efficiency," - https://www.maine.gov/energy/initiatives/energy-efficiency

[98] NYSERDA, "Heat Pump Program," - https://www.nyserda.ny.gov/All-Programs/Heat-Pump-Program

[99] Efficiency Vermont, "Heat Pumps," - https://www.efficiencyvermont.com/products-technologies/heating-cooling-ventilation/heat-pumps

[100] BC Gov News, "Province Invests in Heat Pump Rebates," - https://news.gov.bc.ca/releases/2025ECS0014-000309

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

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[101], while the Seattle program requires a 100% reduction in emissions by 2050 for all buildings over 20,000 square feet. [102] The analysis used the NREL ResStock[103] and ComStock[104] datasets to estimate the share of residential and commercial sector emissions accounted for by buildings above these size thresholds. Table 25 below shows the share of on-site emissions by building size from the NREL datasets.

Table 25: 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 26 below shows the percent emissions reductions required by sector for compliance with the example BPS programs, while Table 27 shows the final annual emissions reductions.

Table 26: Aggregate Sectoral Emissions Reduction Requirements for BPS Compliance

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

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[101] https://energyoffice.colorado.gov/bpc
[102] https://www.seattle.gov/environment/climate-change/buildings-and-energy/building-emissions-performance-standard
[103] https://resstock.nrel.gov/datasets (ResStock Dataset 2024.2)
[104] https://comstock.nrel.gov/page/datasets (ComStock Dataset 2024.2)

Table 27: Estimated GHG Reductions from Building Performance Standard (ktCO2e)

Measure	2030	2040	2050	Cumulative
Building Performance Standards	20	170	260	3,300

Regulatory Authority

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 RIEC4 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,[105] Boston,[106] Washington D.C.,[107] and Colorado.[108] 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.

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[105] New York City "Local Law 97 (LL97)," - https://www.nyc.gov/site/buildings/codes/ll97-greenhouse-gas-emissions-reductions.page

[106] City of Boston - https://www.boston.gov/departments/environment/berdo-regulations-development

[107] DC, Department of Energy & Environment - https://doee.dc.gov/service/building-energy-performance-standards-beps

[108] Commercial Property Assessed Clean Energy (C-PACE) - https://energyoffice.colorado.gov/c-pace

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.[109] 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 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 28: Estimated GHG Reductions from Clean Heat Standard (ktCO2e)

Measure	2030	2040	2050	Cumulative
Clean Heat Standard	210	1,170	1,940	24,500

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

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[109] https://www.mass.gov/doc/chs-draft-program-framework/download

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 [110], 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 [111], 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.

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[110] Massachusetts, Clean Heat Standard (CHS) - https://www.mass.gov/massachusetts-clean-heat-standard
[111] Colorado Senate Bill 21-264

Industry and Waste

The state explored two potential carbon reduction strategies in the industrial sector and one measure in the waste sector, summarized in Table 29 below, along with each measure's annual GHG reductions in 2030, 2040, and 2050, and cumulative reductions from 2025-2050. Figure 8 shows industry sector emissions in RI under the implementation of each measure (left) and waste emissions in RI under the implementation of the Organic Waste Diversion measure (right). Note that each line on these charts shows the individual impact of each measure, not the impact of multiple GHG reduction measures added together.

Figure 8: Industry (left) and Waste (right) Sector Emissions by Measure (ktCO2e)
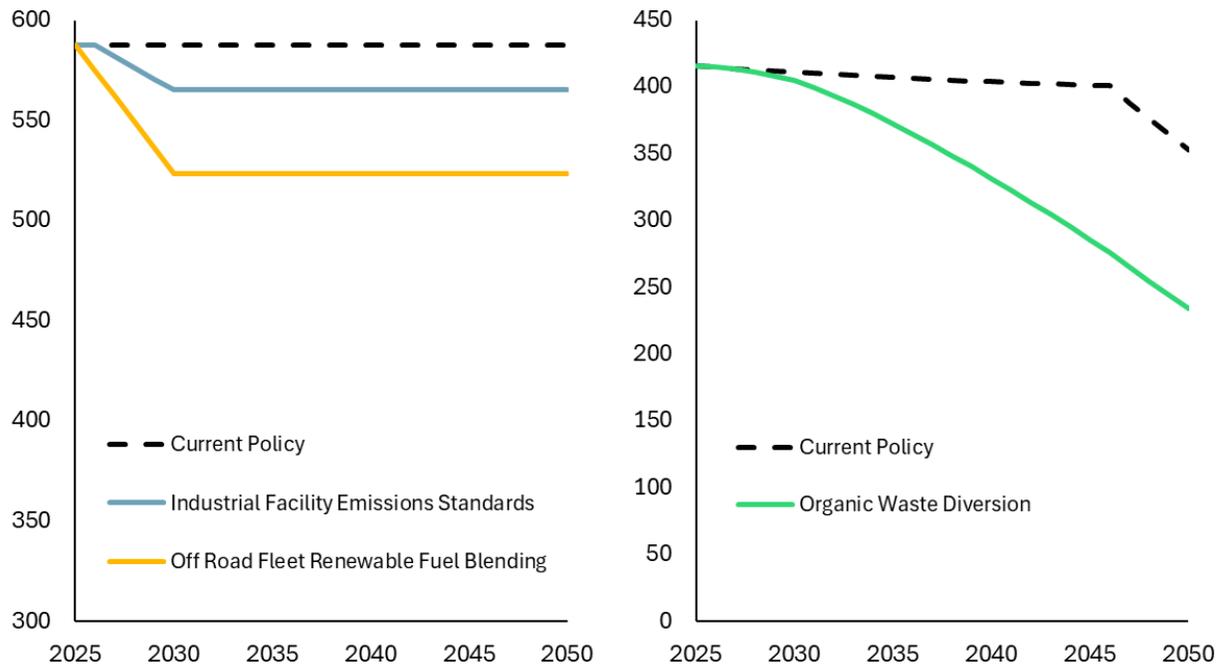
Table 29: Industry and Waste Sector Emissions Reductions by Measure (ktCO2e)

Measure	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 measure 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[112]. An earlier complimentary rule, GEMM 1, regulates emissions for energy-intensive, trade-exposed (EITE) industries like iron and steel and cement[113], 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 30, 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 30: Estimated GHG Reductions from Industrial Facility Emissions Standards

Measure	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.

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[112] https://cdphe.colorado.gov/apcd/GEMM-phase-2-rule
[113] https://cdphe.colorado.gov/apcd/GEMM-phase-1-rule

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.

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.[114] 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 measure.

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

Measure	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.

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[114] https://ww2.arb.ca.gov/our-work/programs/use-road-diesel-fueled-fleets-regulation

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

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.[115] Cities like San Francisco[116] and Oakland[117] 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[118,119], 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.[120] 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,

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[115] https://ww2.arb.ca.gov/our-work/programs/use-road-diesel-fueled-fleets-regulation

[116] https://mtc.ca.gov/planning/transportation/transportation-electrification/public-fleet-electrification-planning-assistance-program

[117] https://mtc.ca.gov/planning/transportation/transportation-electrification/public-fleet-electrification-planning-assistance-program

[118] https://www.nyc.gov/site/dcas/news/019-24/mayor-adams-full-city-fleet-has-completed-transition-renewable-diesel

[119] https://ogs.ny.gov/news/nys-office-general-services-commissioner-jeanette-moy-announces-availability-renewable-diesel

[120] https://www.epa.gov/statelocalenergy/download-state-inventory-and-projection-tool

when the Central Landfill is assumed to reach capacity and stop receiving waste.[121] For the organic waste diversion measure, a 50% reduction in landfilled waste by 2035 and a 75% reduction by 2045 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.[122]

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

Measure	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.

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[121] https://ecori.org/rhode-islands-last-landfill-is-running-out-of-room/
[122] https://rirrc.org/sites/default/files/2022-05/Final%20Report%20Organics%20Collection%20Alternatives%20March%202022%20to%20RIRRC.pdf

Implementation Strategy and Timeline

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, [123] 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.[124] 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. [125]

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 (CO_2) through photosynthesis, locking carbon in biomass and soils. In contrast, degraded or decaying forests release CO_2 back into the atmosphere through decomposition. Globally, natural systems act as a net carbon sink, removing approximately half of the CO_2 emitted by human activities.[126]

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 carbon mitigation, such as improved air and water quality, enhanced recreational opportunities,

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[123] Vermont's Universal Recycling Law (Act 148)
[124] https://www.mass.gov/guides/commercial-food-material-disposal-ban
[125] https://council.nyc.gov/shahana-hanif/2024/12/21/new-york-citys-universal-residential-composting/
[126] https://essd.copernicus.org/articles/15/5301/2023/

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

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 CO_2, 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 CO_2, 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.[127]

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.[128]

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[127] 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.
[128] The Value of Rhode Island Forests Report, 2019

Estimated GHG Sequestration

This policy estimates a stable sequestration of carbon at 0.75 million metric tons of CO_2 annually through 2050.

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 non-profit 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

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 Other 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.

Cost Analysis

Achieving Rhode Island's Act on Climate targets in the Act on Climate Scenario will require new investments and transformation across the state's energy systems, transportation, buildings, and industries. As seen in the above sections, **decarbonization will entail new infrastructure, technology deployment, and supportive infrastructure that will come with associated costs**. To assess these impacts, total resource costs were modeled for both the Current Policy and the Act on Climate scenarios and compared to a "do nothing" or "business-as-usual" (BAU) scenario. This comparison illustrates the incremental costs necessary to achieve current climate policies and compliance with the Act on Climate.

Total resource costs represent the full set of energy-related decarbonization expenses, including upfront capital costs for appliances and technologies, the cost of the gas and electric system, and fuel spending. Total resource costs also capture the societal benefits of decarbonization, such as avoided damages of climate change and improved health from better air quality.

The net costs for both the Current Policy and Act on Climate scenarios relative to BAU are shown in Table 31, Table 32, & Figure 9 below. Note that negative values represent net savings relative to BAU.

Table 31: Net Costs Relative to BAU in Current Policy Scenario (Million 2024$)

| Cost Category	2030	2035	2040	2045	2050
Vehicles	$46	$38	-$62	-$276	-$469
Fuel Costs	-$132	-$348	-$573	-$734	-$854
Building Equipment	$36	$47	$59	$73	$67
Other	$0	$0	$0	$0	$0
Electricity T&D	$42	$119	$188	$232	$258
Electricity Generation	$147	$184	$449	$696	$953
Social Cost of GHGs	-$207	-$476	-$693	-$896	-$1,067
Health Benefits	-$14	-$33	-$51	-$63	-$74
Net Total	**-$83**	**-$470**	**-$683**	**-$969**	**-$1,186**

Table 32: Net Costs Relative to BAU in Act on Climate Scenario (Million 2024$)

Cost Category	2030	2035	2040	2045	2050
Vehicles	$39	$14	-$107	-$335	-$529
Fuel Costs	-$210	-$559	-$943	-$1,259	-$1,490
Building Equipment	$106	$219	$345	$486	$622
Other	$8	$35	$79	$124	$147
Electricity T&D	$44	$166	$386	$641	$799
Electricity Generation	$188	$240	$581	$1,094	$1,560
Social Cost of GHGs	-$303	-$804	-$1,390	-$1,927	-$2,398
Health Benefits	-$30	-$78	-$136	-$181	-$207
Net Total	**-$153**	**-$754**	**-$1,168**	**-$1,339**	**-$1,477**

***Figure 9: Economy-Wide Net Costs & Benefits by Scenario***

## Societal Costs & Benefits vs Business-as-Usual

Million 2024$
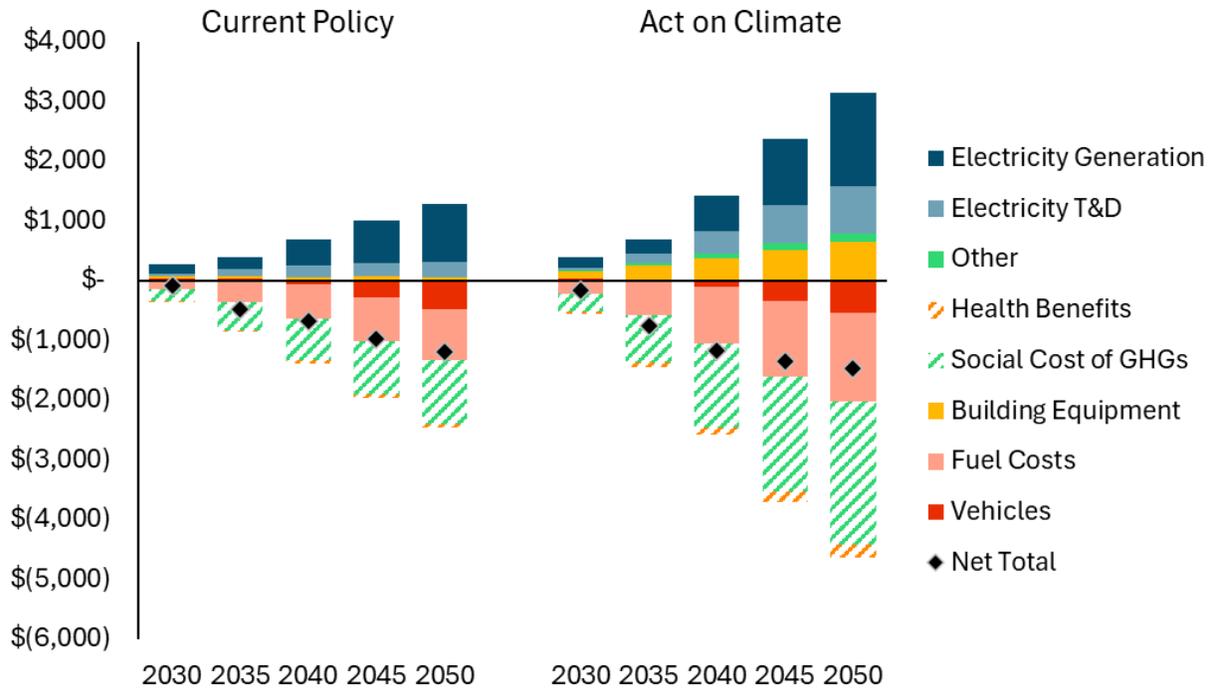
In addition to the economy-wide costs, the figures below show the net costs by four spending categories (capital investment, maintenance, electricity, and fuels) for the residential, commercial, industry, and transportation sectors. These figures include only direct spending on energy consuming equipment and the energy needed to power them and exclude the climate and health benefits of decarbonizing each sector. Finally, Figure 14 shows net costs for the electric sector by spending on generation or transmission and distribution infrastructure. Increased electric sector costs are embedded in the costs for each demand sector, so *the electricity sector costs shown in Figure 14 are not additive to the other sectoral costs*. They are shown separately only to detail the sources of increased spending on electricity.
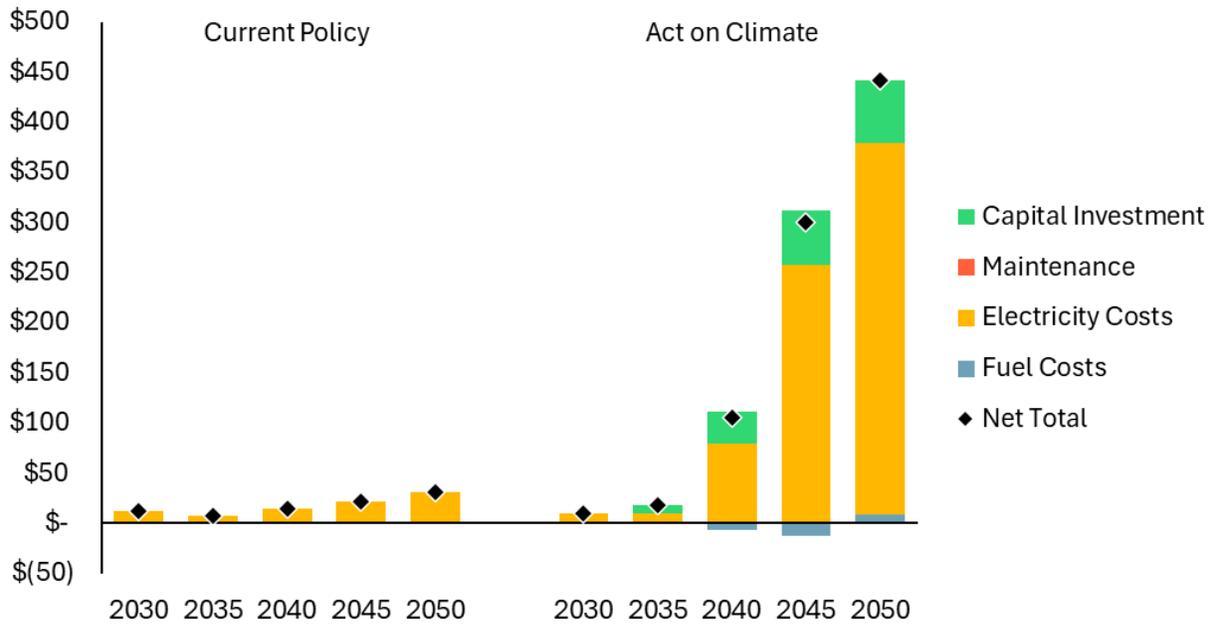
Figure 10: Residential Sector Net Costs by Category
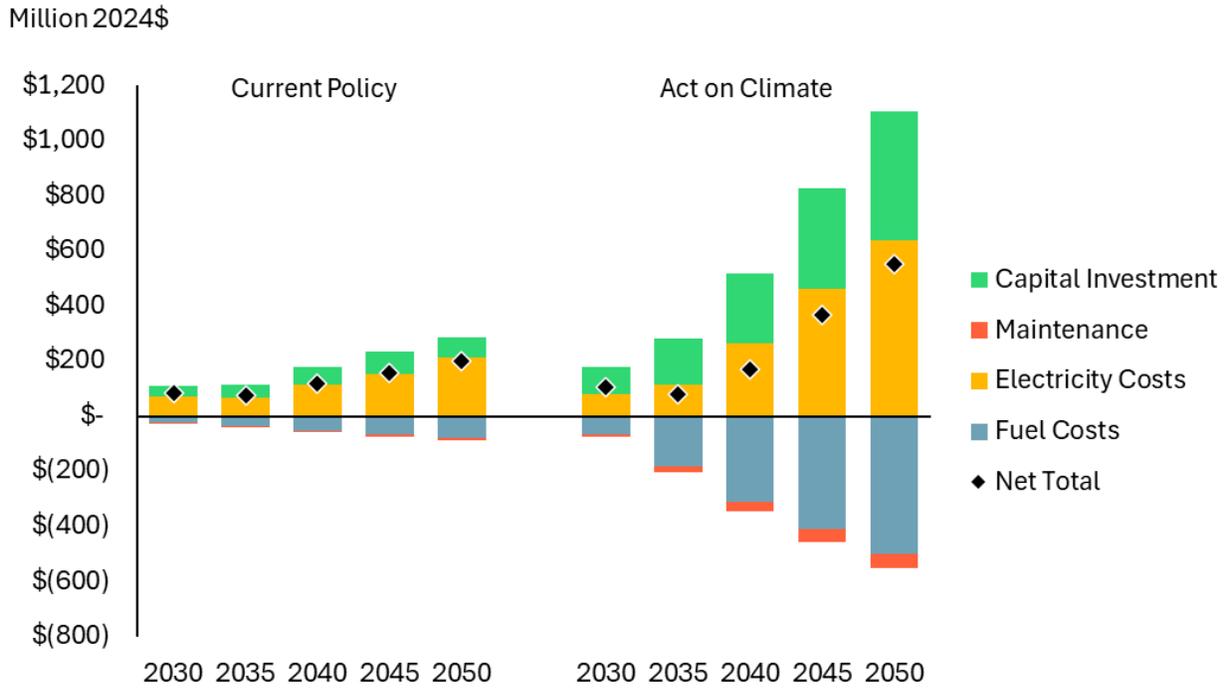
Million 2024$

Figure 11: Commercial Sector Net Costs by Category
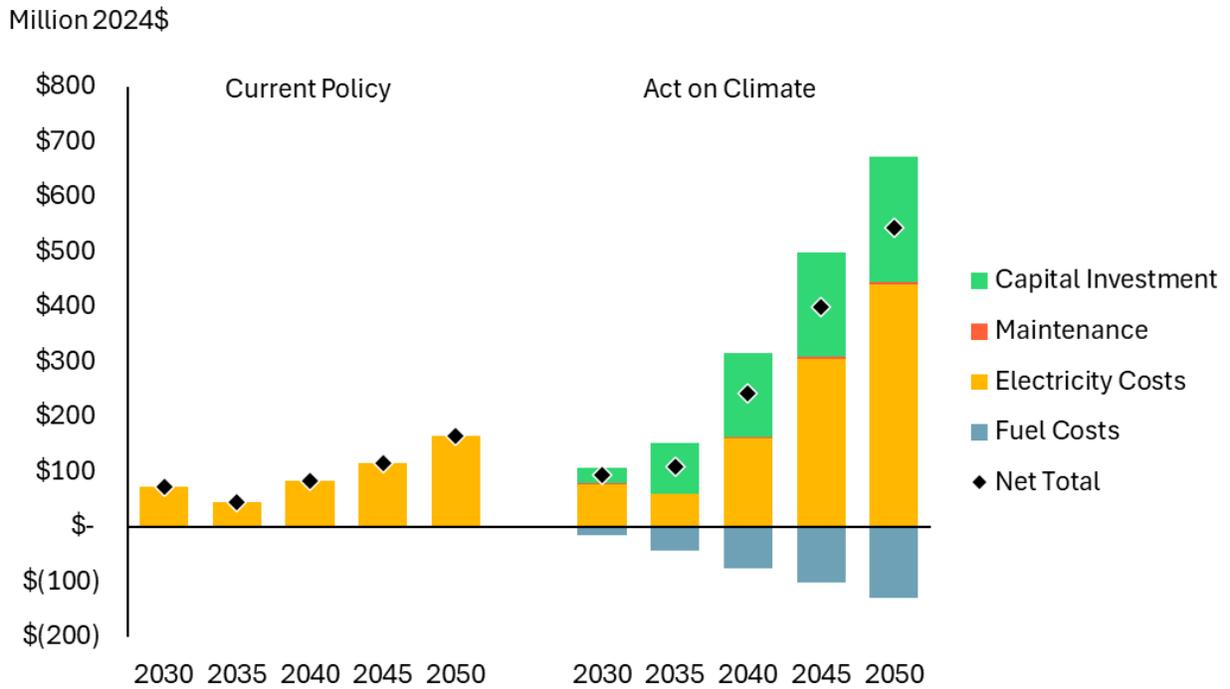
Million 2024$

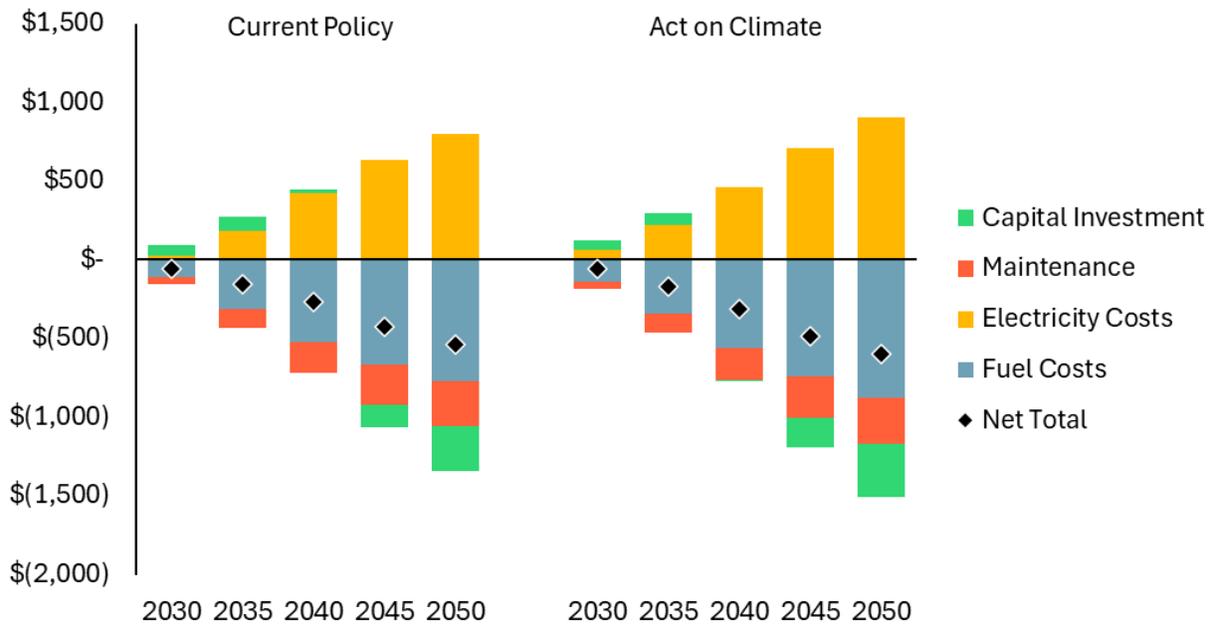## Figure 12: Industry Sector Net Costs by Category

Million 2024$

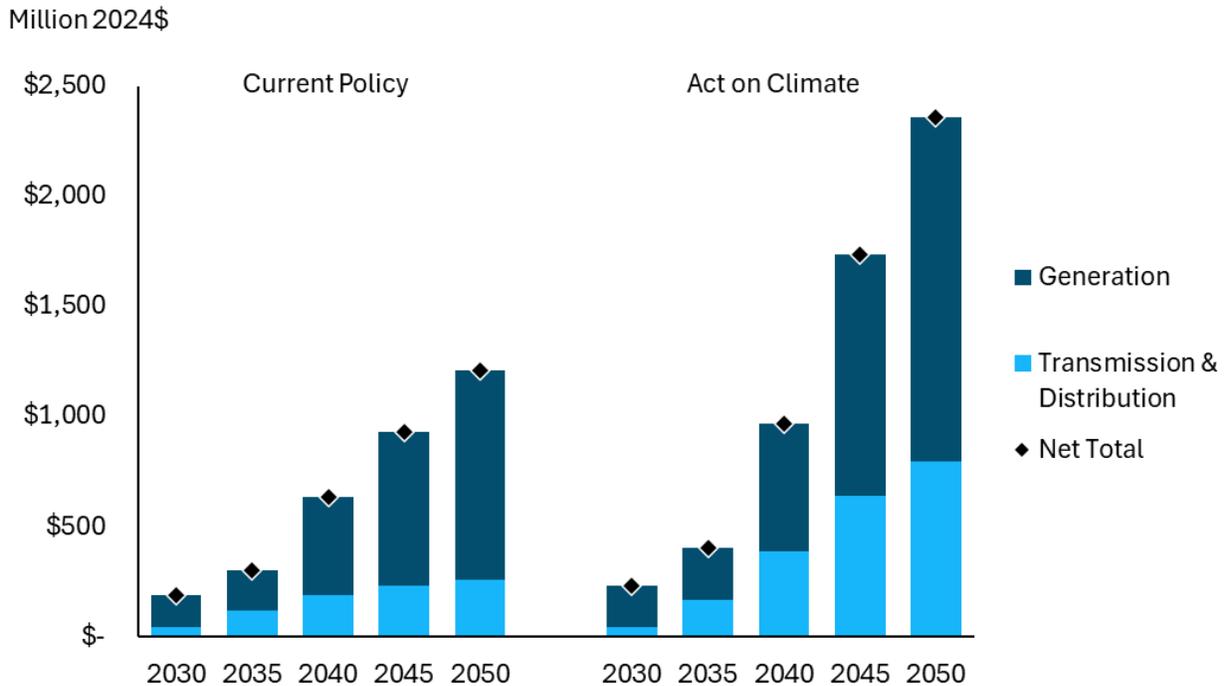## Figure 13: Transportation Sector Net Costs by Category

Million 2024$

Figure 14: Electricity Sector Net Costs by Cost Component

Million 2024$

Air Quality Benefits Analysis

Co-Pollutant Inventory

Changes in emissions of the following co-pollutants due to changes in energy consumption in Rhode Island were modeled in this analysis:

+ Nitrogen dioxide (NO2)
+ Sulfur dioxide (SO2)
+ Ammonia (NH3)
+ Particulate matter (PM2.5)
+ Volatile organic compounds (VOCs)

The energy demand by end-use and fuel type from the Pathways model was mapped to criteria air pollution emissions source types in EPA COBRA (CO-Benefits Risk Assessment Health Impacts Screening and Mapping Tool) V5.2. Criteria air pollution emissions from the sources in COBRA were scaled up or down in future years based on changes in fuel consumption for their relevant Pathways model end-uses. Criteria air pollution emissions not directly related to energy consumption (e.g., construction dust, fires), were held constant across scenarios. Co-pollutant emissions levels by scenario, sector, and year, are shown in the tables below.

Co-pollutant emissions levels by scenario and year are shown in Table 33 below.

Table 33: Co-Pollutants by Scenario and Year (US tons/year)

Scenario	Co-Pollutant	2030	2035	2040	2045	2050
Current Policy	NO2	10,944	10,222	9,391	8,474	7,843
	SO2	424	415	405	397	392
	NH3	754	709	642	545	478
	PM2.5	3,998	3,908	3,804	3,661	3,561
	VOC	35,756	34,997	34,305	33,795	33,498
Act on Climate	NO2	10,530	9,116	7,198	5,289	3,941
	SO2	413	380	340	306	285
	NH3	737	644	521	381	290
	PM2.5	3,950	3,778	3,568	3,358	3,249
	VOC	35,451	34,405	33,381	32,582	32,079

Health Benefits

Reductions in criteria air pollutants such as those outlined above (NO2, SO2, NH3, PM2.5, and VOC) lead to measurable improvements in public health. Exposure to these pollutants has been linked to a range of adverse outcomes, including premature mortality, respiratory diseases such as asthma, and cardiovascular illnesses.

Methodology

To quantify the public health impacts of reduced air pollution from climate action, this study utilized the EPA COBRA tool. COBRA provides a standardized framework for quantifying changes in ambient air quality and translating those changes into health and economic outcomes across U.S. geographies. The co-pollutant inventory outlined above was fed into COBRA. The tool uses a simplified air quality model, a Source Receptor (S-R) Matrix, to estimate changes in ambient concentrations of PM.5 and ozone (O3) based on the overall pollutant levels. Using data from peer-reviewed literature, COBRA then estimates how changes in air quality will lead to changes in the incidence of various health outcomes (such as asthma, heart attacks, etc.).[129] Those changes in incidence for health outcomes are then multiplied by a monetary valuation to determine the total avoided cost of reducing negative health impacts. Premature mortality is valued using EPA's Value of a Statistical Life (VSL) consistent with COBRA default data. Additional information on the monetary value of each health outcome can be found in the COBRA User's Manual.

Results

This study found that under both the Current Policy and Act on Climate scenarios, reductions in criteria air pollutants are expected to produce meaningful improvements in public health. These

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[129] https://www.epa.gov/cobra/cobra-questions-and-answers#2

benefits increase over time as climate policies evolve and lead to deeper emissions reductions. By 2050, both scenarios show notable declines in pollutant concentrations, leading to measurable reductions in adverse health outcomes across RI.

Due to the deeper reductions in co-pollutants from reduced fuel combustion, the Act on Climate scenario yields the largest health benefits. Under Act on Climate, about 12 premature deaths could be avoided annually by 2050 (Table 34). Both scenarios also see substantial reductions in respiratory conditions, particularly asthma. Annual cases may be reduced by approximately 1,773 in 2050 under Current Policy and by 4,856 under the Act on Climate scenario (
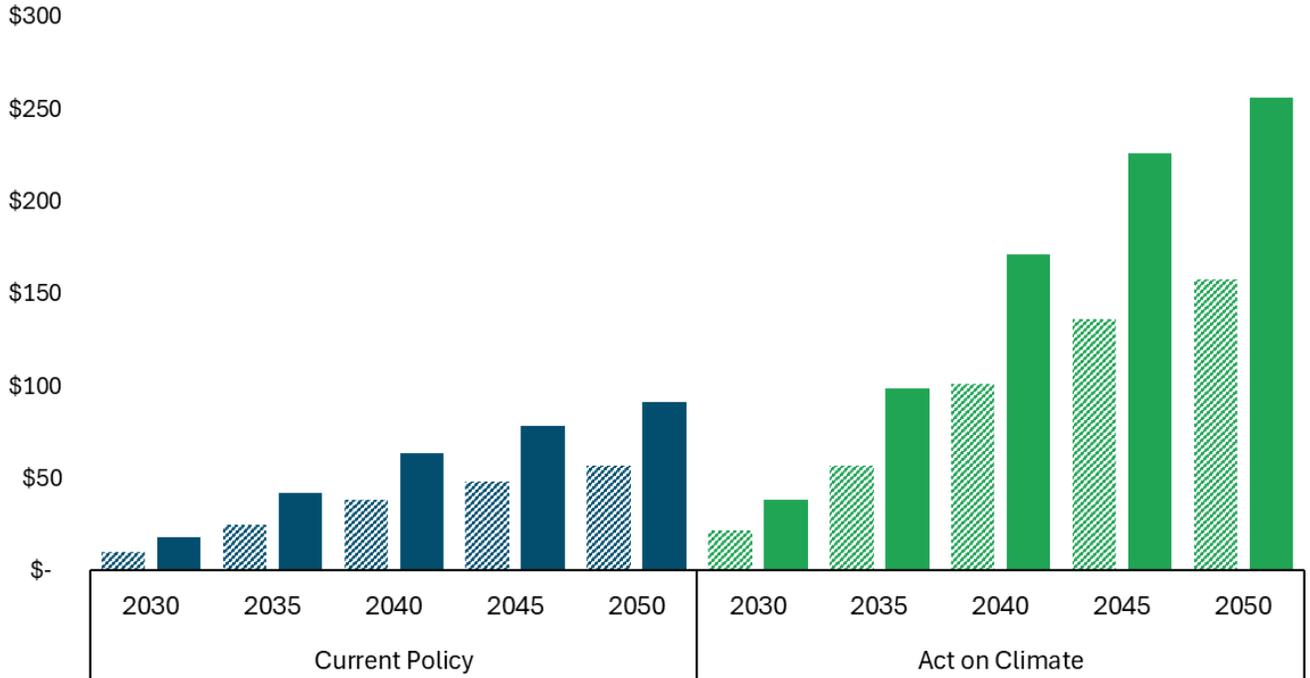
Table 35).

Table 34: Avoided Deaths by Scenario

Scenario	Low vs. High	2030	2035	2040	2045	2050
Current Policy	Low Estimate	1	1	2	2	3
	High Estimate	1	2	3	4	4
Act on Climate	Low Estimate	1	3	5	6	7
	High Estimate	2	6	9	11	12

Table 35: Avoided Incidences of Asthma Symptoms by Scenario

Scenario	2030	2035	2040	2045	2050
Current Policy	333	814	1,253	1,558	1,773
Act on Climate	721	1,844	3,203	4,247	4,856

The avoided incidences of mortality and illness lead to considerable economic benefits when monetized using the valuation framework in COBRA. In 2050, annual estimated savings from avoided health impacts could reach nearly $90M under the Current Policy scenario and nearly $250M under the Act on Climate scenario (Figure 15, Table 36).

Figure 15: Annual Health Benefits by Year and Scenario (2024 $M)

Table 36: Annual Health Benefits by Year and Scenario (2024 $M)

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

Workforce Planning Analysis

Methodology

This workforce planning analysis combines scenario-based economic modeling with occupational forecasting to estimate how Rhode Island's climate goals will shape long-term job demand. Using established input–output frameworks (IMPLAN and NREL's JEDI), the research team translates energy-system investments—such as new generation, electrification, and fuel-switching—into estimates of employment across key sectors and value-chain activities. These models provide a consistent structure for understanding how direct project spending and supply-chain activity drive jobs at the state level, and how those jobs evolve across different transition pathways.

To align these projections with workforce realities and to identify where strategic interventions are needed, the analysis incorporates insights from 14 executive interviews with training providers, state agencies, unions, and community-based organizations and an employer survey with 47 respondents,

as well as a worker survey with 185 respondents. These conversations, combined with skills mapping using O*NET KSAs and adjacent occupation databases, help surface gaps in training capacity, credential pathways, employer requirements, and worker access to high-quality jobs. By comparing projected occupational demand with existing pipeline strengths and weaknesses, the analysis identifies where Rhode Island's workforce ecosystem is well positioned to meet future needs—and where targeted investments, new partnerships, or curriculum development may be required to prepare workers for emerging clean energy roles.

## Results

Key findings from the workforce analysis include:

- Rhode Island's clean energy workforce is expanding steadily, mirroring the state's transition toward a more sustainable and electrified economy. The sector is defined by consistent growth across multiple industries, a relatively young labor force, and high worker satisfaction. Together, these factors point to a resilient and motivated workforce well-positioned to support the state's clean energy and climate goals.

- Modeling conducted for this study projects that Rhode Island's clean energy economy will add thousands of new jobs by 2035, with particularly strong increases for Electricians, HVAC/R Mechanics and Installers, and many other construction trades. While most occupations grow, notable gaps—especially among Solar Installers and Electrical Power-Line Installers and Repairers —underscore the importance of early planning and expanded training capacity to meet potential gaps in the supply of these workers. Addressing these shortages through coordinated workforce strategies will be critical to sustaining growth and meeting future energy targets.

- As Rhode Island's energy landscape evolves, much of the state's overall workforce already possesses the foundational skills needed to transition into clean energy careers. Targeted reskilling, short-term technical training, and stronger connections to ocean-based industries can accelerate these shifts while ensuring equitable access to opportunity. Emphasizing transferable skills, competitive wages, and recognized credentials will help workers and employers adapt together to a changing economy.

- Rhode Island's training and education ecosystem provides a strong starting point for building a clean energy workforce, with a robust network of CTE schools, unions, and apprenticeships. However, gaps remain in specialized areas such as solar installation and linework, and stronger alignment between training efforts and employer demand is needed. Expanding credential pathways, regional access, and coordination among providers will help ensure that training keeps pace with industry growth and needs.

- The continued success of Rhode Island's clean energy transition depends on effective collaboration among employers, unions, educators, training providers, and community partners. Expanding awareness of available programs, aligning training with employer

needs, and embedding equity into workforce strategies will help strengthen this ecosystem. By fostering coordination and shared investment, Rhode Island can ensure its clean energy growth benefits all communities statewide.
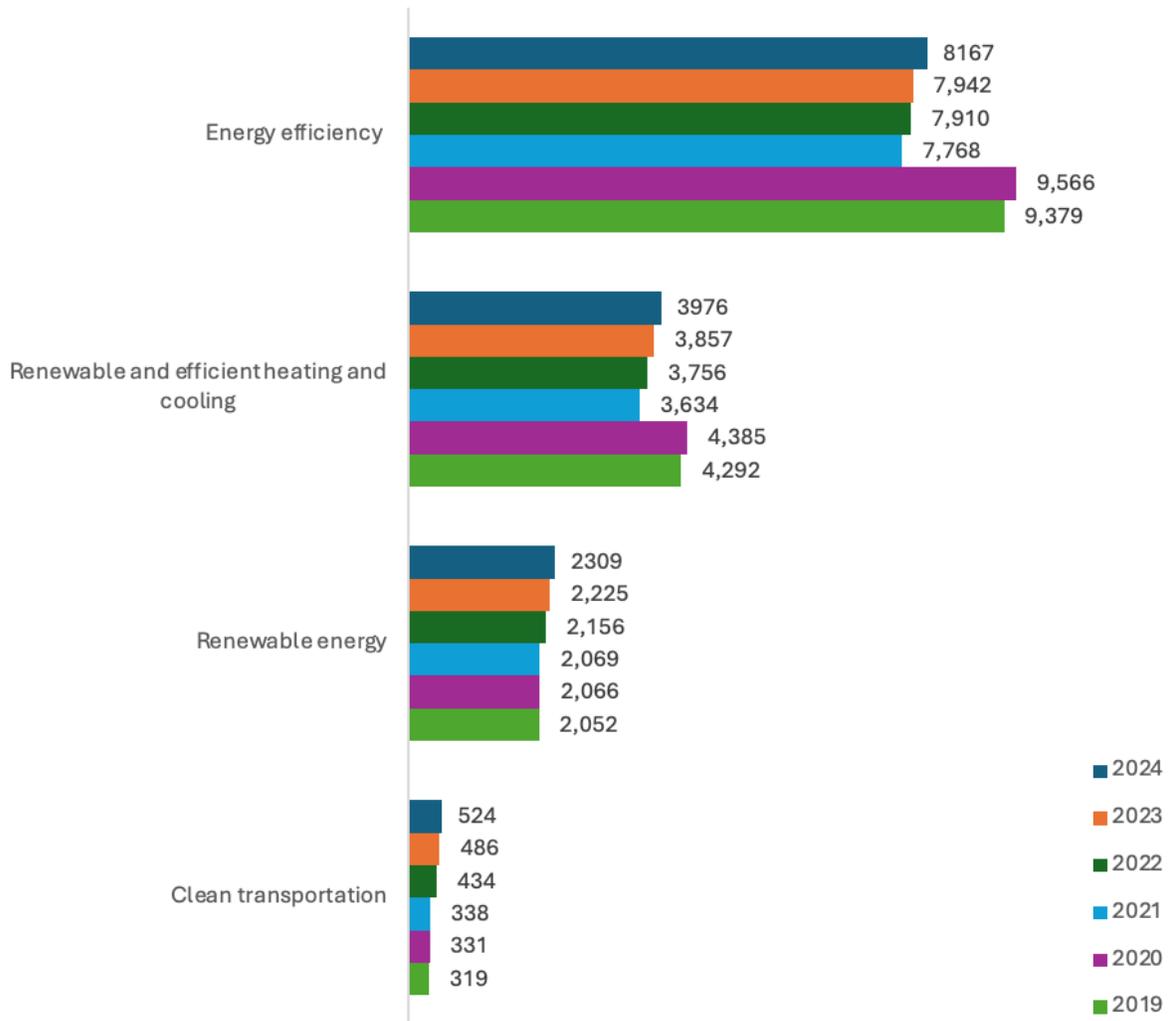
The Current Workforce

Clean energy in Rhode Island is a growing industry, employing nearly 15,000 clean energy workers at the start of 2024. The industry suffered employment loss in 2021 due to impacts from the global pandemic, but since 2021 the industry has been recovering, growing by 5% from 2021 to 2024. Within the last tracking periods, 2023 to 2024, employment grew by 3% (Figure 16).

Figure 16: Clean Energy Employment in RI, 2019-2024
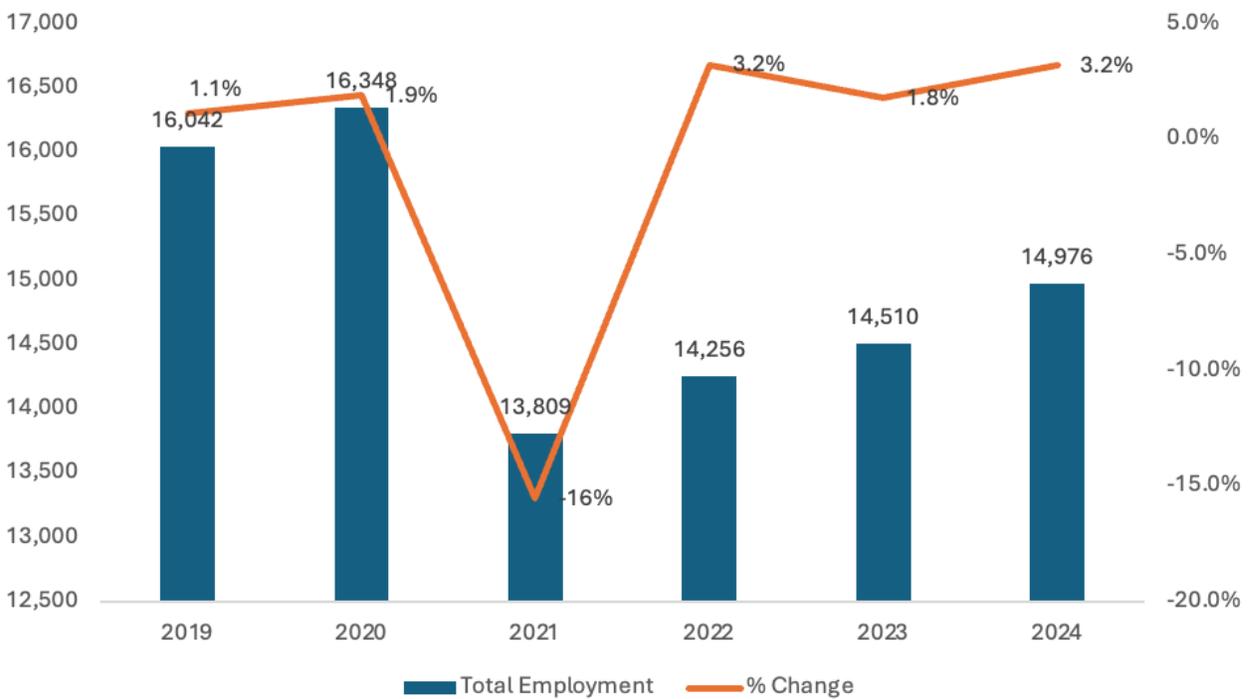
Energy efficiency workers make up over half of the state's clean energy workforce (55%), with over 8,000 workers as of 2024. These workers install electrification technologies, such as efficient lighting and ENERGY STAR appliances, along with advanced building materials. Over a quarter of the clean energy workforce (27%) works in renewable and efficient heating and cooling, performing activities such as installing high-efficiency heating and cooling systems. Renewable energy workers, who work in solar and wind, make up 15% of the workforce. While the clean transportation sector is the smallest in the state's clean energy industry, it experienced the highest growth rate from 2023 to 2024, rising by 8% (Figure 17).

## Figure 17: Clean Energy Employment by Major Technology, 2019-2024

Energy efficiency
- 8167
- 7,942
- 7,910
- 7,768
- 9,566
- 9,379

Renewable and efficient heating and cooling
- 3976
- 3,857
- 3,756
- 3,634
- 4,385
- 4,292

Renewable energy
- 2309
- 2,225
- 2,156
- 2,069
- 2,066
- 2,052

Clean transportation
- 524
- 486
- 434
- 338
- 331
- 319

Legend:
- 2024
- 2023
- 2022
- 2021
- 2020
- 2019

The largest value chain segment[130] of Rhode Island's clean energy economy is the installation, maintenance, repair, and operations segment,[131] with over 8,500 workers in 2024, representing 58% of all clean energy workers in the state. Workers in these segments are highly involved with both energy efficiency and renewable and efficient heating and cooling activities, and commonly include Electricians, HVAC/R Mechanics and Installers, Construction Laborers, and Plumbers, Pipefitters, and Steamfitters. All segments of the value chain experienced growth over the last 2023 to 2024 period, with the "other" category (utilities, organizational and non-profit work such as environment

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[130] Value chain segments refer to the distinct stages of activity involved in producing, delivering, and supporting energy-related goods and services.

[131] Installation, maintenance, repair, and operations is comprised of all workers engaged in residential, commercial, and industrial building construction, contracting and electrical work, insulation and weatherization, or plumbing and heating, air conditioning, and ventilation work.

and conservation organizations, business associations, or advocacy organizations), growing at the highest rate of 5% (Figure 18).

Figure 18: Clean Energy Employment by Value Chain, 2019-2024[132, 133, 134]
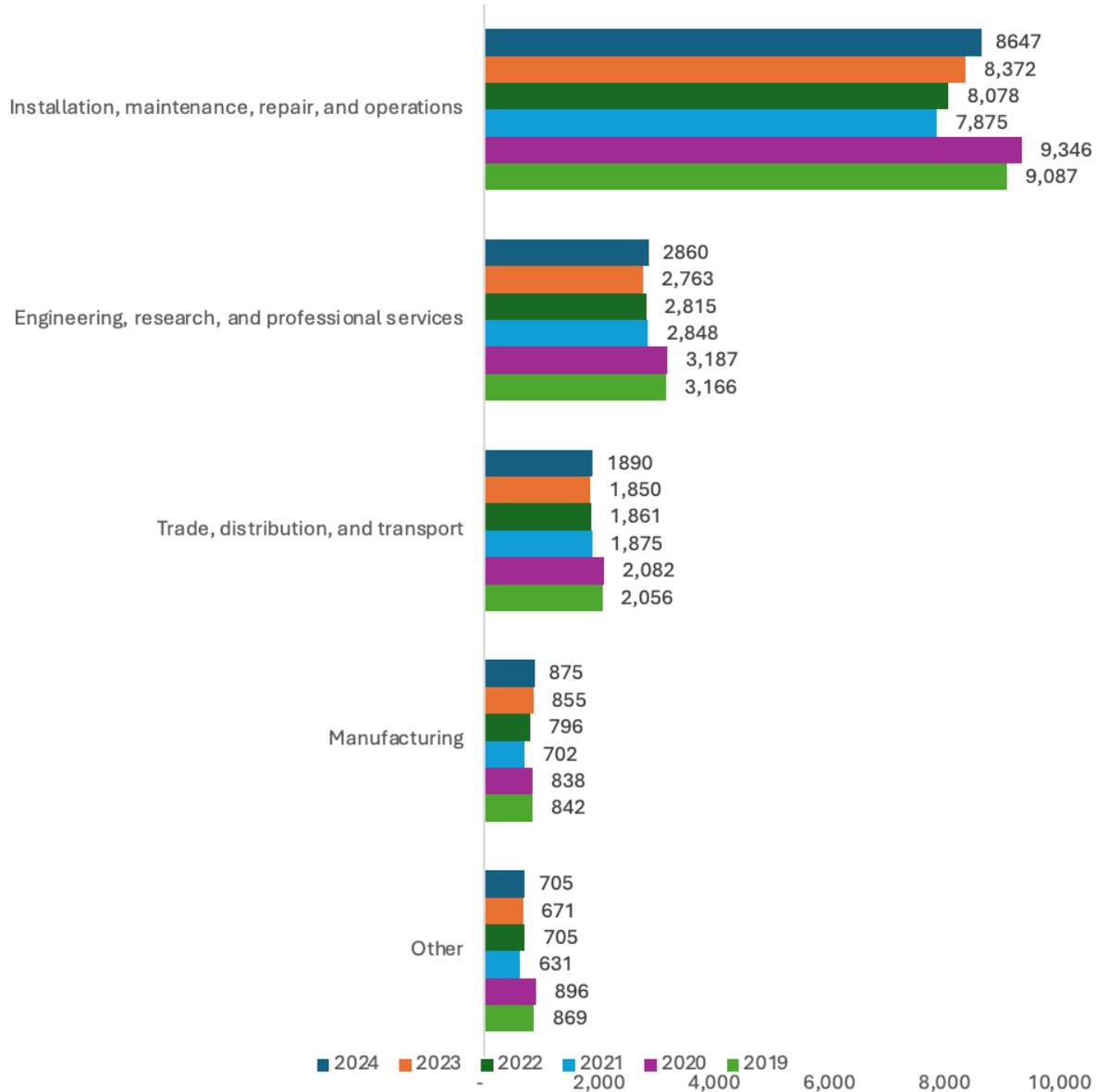
[132] Manufacturing encompasses heating and air conditioning equipment manufacturing, engine and compressor manufacturing, semiconductor manufacturing, and energy efficient product, appliance, or lighting manufacturing, as well as motor vehicle and parts manufacturing.
[133] Trade, distribution, and transport includes motor vehicle and parts wholesalers, electrical equipment and household appliance wholesalers, and other wholesale trade and distribution related to clean energy products and technologies.
[134] Professional services include all finance, legal, consulting, engineering, research, or architectural support.

More than half (57%) of the state's clean energy workforce is based in Providence County with 8,501 clean energy workers. This is unsurprising given that Providence County holds a similar percentage of the total economy-wide workforce. When looking at clean energy workers as a percentage of county's overall workforce, Kent County has the highest concentration of clean energy workers (4% of total workforce), followed by Newport County (3% of total workers) (Table 37).

The relatively balanced access across counties indicates that clean energy employment is relatively well distributed across the state. Assuming growth is consistent with current employment trends, this broad geographic reach provides a durable foundation for equitable workforce development, ensuring that Rhode Islanders in multiple regions can access growing clean energy job opportunities. As the sector expands, maintaining this balance through regionally accessible training programs, transportation options, and local employer partnerships will be critical to sustaining equitable participation in the clean energy transition.

Table 37: Clean Energy Employment by County, 2024

County	2023Q4 Clean Energy Employment	Percent of Clean Energy Workforce	Overall Workforce[135]	Clean Energy Percent of Overall County Employment
Bristol County	397	2.6%	16,866	2.4%
Kent County	2,819	18.8%	80,226	3.5%
Newport County	1,418	9.5%	44,898	3.2%
Providence County	8,501	56.8%	305,867	2.8%
Washington County	1,711	11.4%	61,434	2.8%
N/A	130	0.9%	14,326	0.9%

Projections of the Future Workforce

Utilizing investment and expenditure patterns driven by modeling of the energy system impacts from the Act on Climate, the research team projects a net gain of over 6,600 new jobs through 2035. Construction and maintenance occupations would experience the most significant growth, adding 4,382 workers between 2023 and 2035.

While most segments show strong expansion, employment in other supply chain occupations is expected to decline by about 843 positions (Figure 19). Driven by projections of significant expansion

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[135] JobsEq, 2024.

of offshore wind,[136] more than half of total job growth is projected to occur in the offshore wind industry (Figure 20).

Figure 19: Energy Employment Projections in Rhode Island, 2023-2035[137]

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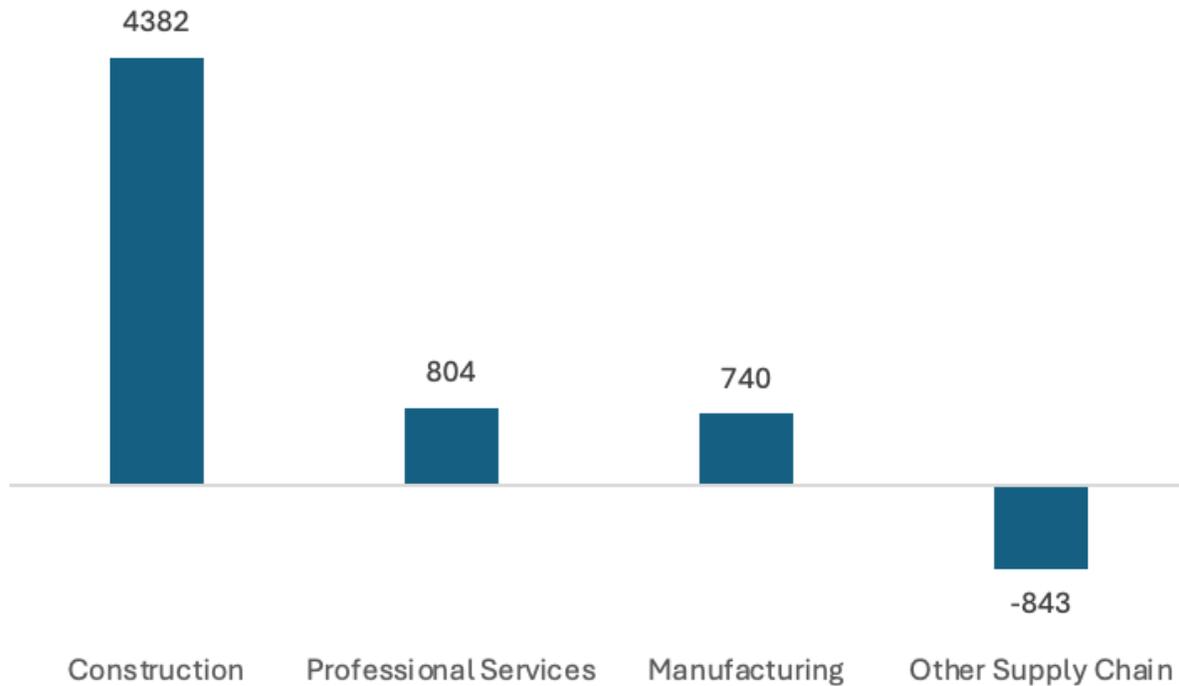
[136] Offshore wind capacity projections reflect modeling assumptions made that the current federal leasing and permitting restrictions would be resolved within the next several years. Under this assumption, new OSW project timelines were shifted approximately five years later than initially planned, rather than eliminated entirely. This approach assumes continued progress toward lifting the federal ban, as well as recent developments such as Ørsted's successful legal challenge allowing work on the Revolution Wind project to proceed.
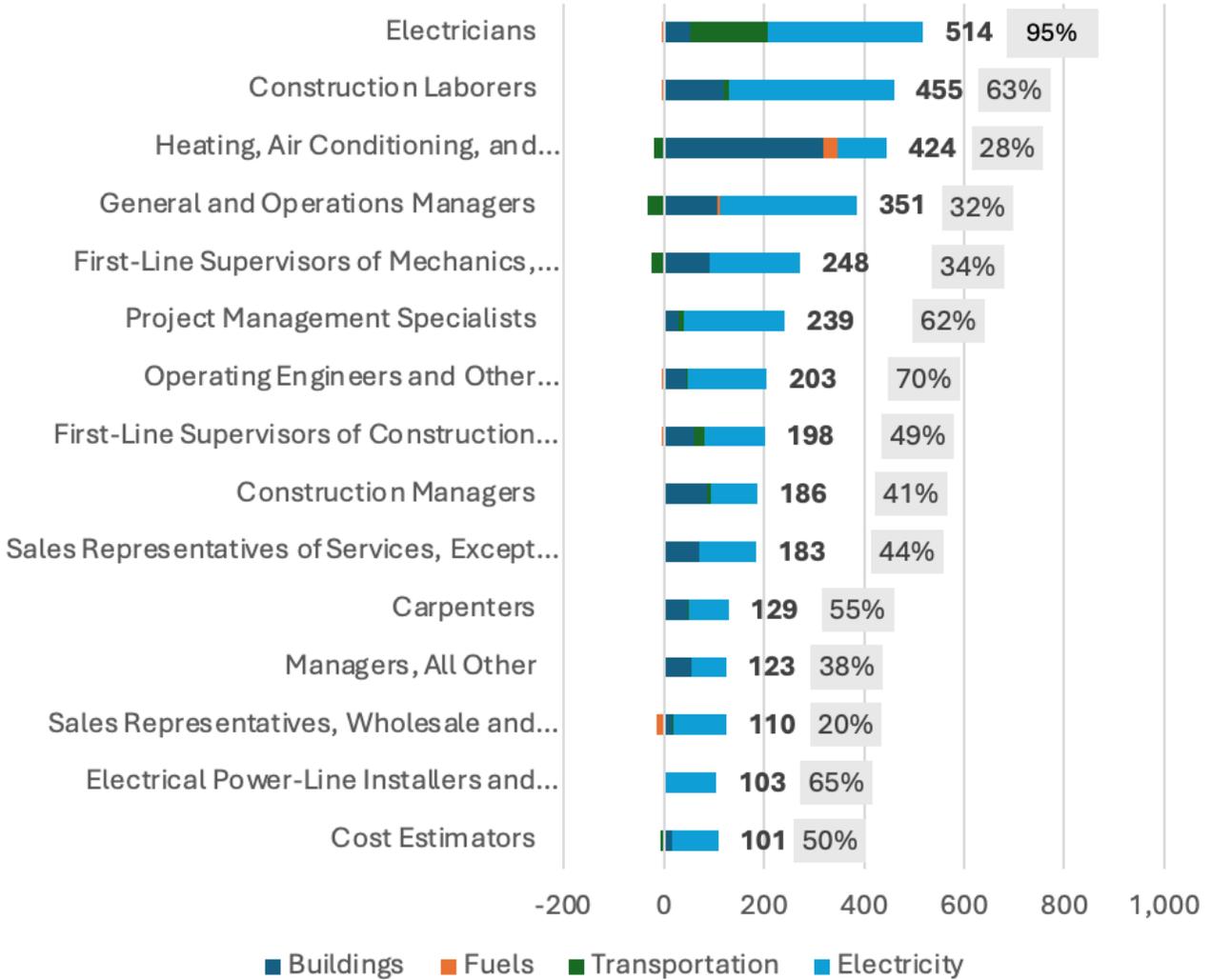
[137] Figure does not include induced employment and therefore will not sum to the 6,600 figure in the narrative.

Figure 20: Largest Employment Growth within Sub-Sectors of Rhode Island's Energy Economy, 2023-2035
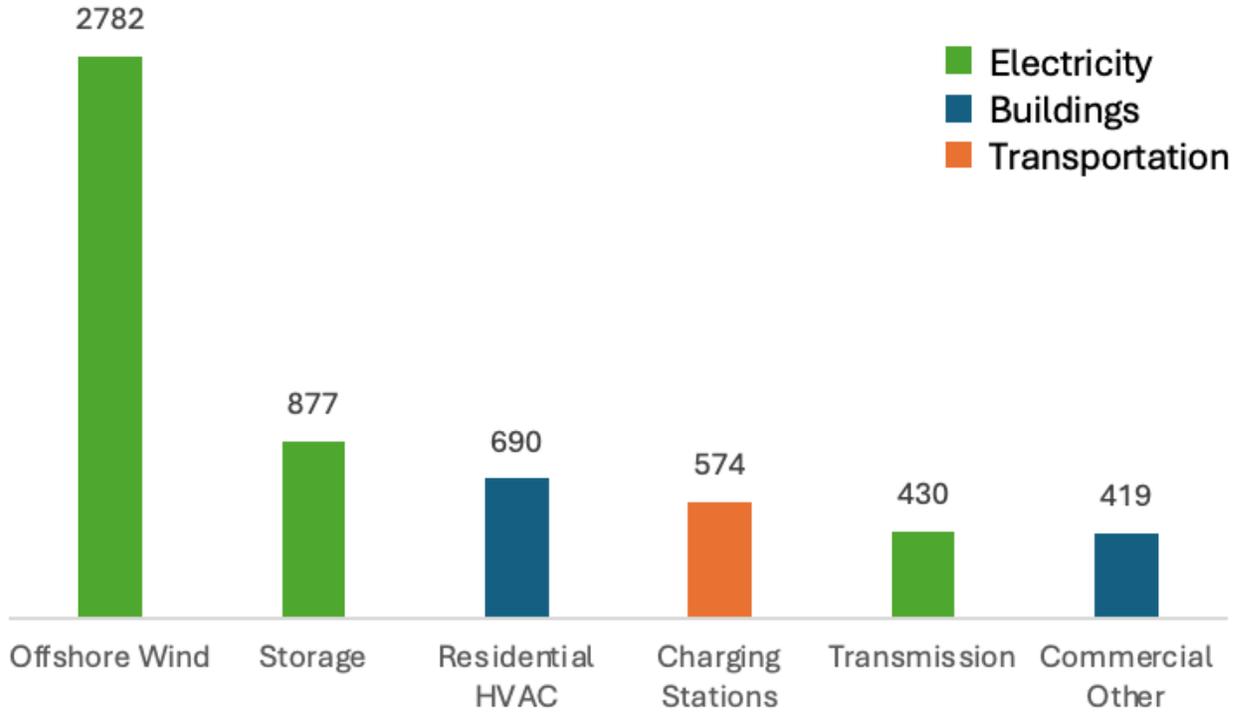
Electricians are projected to see the most job growth by 2035, adding over 500 new jobs and increasing by 95% from energy sector employment of electricians in 2023. This growth is led by the electricity sector with 311 new jobs, followed by transportation at 156 new jobs and buildings at 51 new jobs. Also seeing significant increases are Construction Laborers, adding 514 jobs, and HVAC/R Mechanics and Installers with 424 new jobs (Figure 21).

Figure 21: Top 15 Occupations by Growth 2023-2025

Chart data (left to right: occupation, value, percentage):

Occupation	Value	Percent
Electricians	514	95%
Construction Laborers	455	63%
Heating, Air Conditioning, and...	424	28%
General and Operations Managers	351	32%
First-Line Supervisors of Mechanics,...	248	34%
Project Management Specialists	239	62%
Operating Engineers and Other...	203	70%
First-Line Supervisors of Construction...	198	49%
Construction Managers	186	41%
Sales Representatives of Services, Except...	183	44%
Carpenters	129	55%
Managers, All Other	123	38%
Sales Representatives, Wholesale and...	110	20%
Electrical Power-Line Installers and...	103	65%
Cost Estimators	101	50%

Legend: ■ Buildings ■ Fuels ■ Transportation ■ Electricity

Priority Occupations

A number of occupations are expected to play a leading role as the climate sector continues to expand. Other occupations, such as Automotive Service Technicians and Mechanics, could see significant impacts during implementation of the Climate Action Strategy that will be crucial to address in workforce planning. Prioritizing these occupations can help the state design more targeted incentives, training programs, and related initiatives to strengthen Rhode Island's clean energy workforce and economic growth. This report identifies 14 priority occupations across four major occupational groups (Table 38).

Table 38: Key Occupations and Corresponding Occupational Groups for Rhode Island's Clean Energy Workforce[138]

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[138] Occupational descriptions are sourced from May 2023 Occupation Profiles of the U.S. Bureau of Labor Statistics. Accessed October 2025. https://www.bls.gov/oes/current/oes_stru.htm.

Priority Occupation Name	Standard Occupational Classification (SOC) Code	Occupational Group	Description
Electricians	47-2111	Construction and Extraction	Install, maintain, and repair electrical wiring, equipment, and fixtures. Ensure that work is in accordance with relevant codes. May install or service streetlights, intercom systems, or electrical control systems.
Plumbers, Pipefitters, and Steamfitters (Plumbers)	47-2152	Construction and Extraction	Assemble, install, alter, and repair pipelines or pipe systems that carry water, steam, air, or other liquids or gases. May install heating and cooling equipment and mechanical control systems. Includes sprinkler fitters.
Heating, Air Conditioning, and Refrigeration (HVAC/R) Mechanics and Installers	49-9021	Installation, Maintenance, and Repair	Install or repair heating, central air conditioning, HVAC, or refrigeration systems, including oil burners, hot-air furnaces, and heating stoves.
First-Line Supervisors of Construction Trades and Extraction Workers	47-1011	Construction and Extraction	Directly supervise and coordinate activities of construction or extraction workers.
Construction Laborers[139]	47-2061	Construction and Extraction	Perform tasks involving physical labor at construction sites. May operate hand and power tools of all types...May clean and prepare sites, dig trenches, set braces... May assist other craft workers.
Sheet Metal Workers	47-2211	Construction and Extraction	Fabricate, assemble, install, and repair sheet metal products and equipment...Work may involve...setting up and operating fabricating machines to cut, bend, and straighten sheet metal; shaping metal over anvils, blocks, or forms using hammer; operating soldering and welding equipment to join sheet metal parts.
Carpenters	47-2031	Construction and Extraction	Construct, erect, install, or repair structures and fixtures; building frameworks; and wood stairways, window and door frames, and hardwood floors.
Welders, Cutters, Solderers, and Brazers (Welders)	51-4121	Production	Use hand-welding, flame-cutting, hand-soldering, or brazing equipment to weld or join metal components or to fill holes, indentations, or seams of fabricated metal products.

Priority Occupation Name	Standard Occupational Classification (SOC) Code	Occupational Group	Description
Operating Engineers and Other Construction Equipment Operators (Operating Engineers)[140]	47-2073	Construction and Extraction	Operate one or several types of power construction equipment, such as motor graders, bulldozers, scrapers, compressors...to excavate, move, and grade earth, erect structures, or pour concrete or other hard surface pavement.
Solar Photovoltaic Installers (Solar Installers)[141]	47-2231	Construction and Extraction	Assemble, install, or maintain solar photovoltaic (PV) systems on roofs or other structures...May include measuring, cutting, assembling, and bolting structural framing and solar modules. May perform minor electrical work such as current checks.
Electrical Engineers	17-2071	Architecture and Engineering	Research, design, develop, test, or supervise the manufacturing and installation of electrical equipment, components, or systems for commercial, industrial, military, or scientific use.
Construction and Building Inspectors	47-4011	Construction and Extraction	Inspect structures using engineering skills to determine structural soundness and compliance with specifications, building codes, and other regulations. Inspections may be general in nature or may be limited to a specific area, such as electrical systems or plumbing.
Automotive Service Technicians and Mechanics	49-3023	Installation, Maintenance, and Repair	Diagnose, adjust, repair, or overhaul automotive vehicles.
Electrical Power-Line Installers and Repairers (Linemen)	49-9051	Installation, Maintenance, and Repair	Install or repair cables or wires used in electrical power or distribution systems. May erect poles and light or heavy-duty transmission towers.

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[139] In all analysis based on BW Modeling Construction Laborers also includes SOC 47-4090 Miscellaneous Construction and Related Workers to account for Weatherization Technicians.

[140] Operating Engineers were added to the priority occupations list after survey efforts due to the modeling analysis showing large growth. As such, this occupation is not included in survey or training inventory findings.

[141] Electricians perform the wiring and electrical components of installing solar systems. Solar companies often employ *Solar Installers* for the mechanical installation and licensed Electricians for all electrical components (which must be done by licensed personnel in RI).

Family-Sustaining and Livable Wages

Livable wages and benefits are vital to worker recruitment and retention, as well as a just transition. Stakeholders in community sessions and interviews stressed that the clean energy transition must deliver secure, good-paying jobs with benefits, particularly for workers currently employed and transitioning from fossil fuel-related sectors. These workers need reassurance of the benefits to transitioning careers and compensation for their previous work experience in other fields.

Using the MIT Living Wage Calculator,[142] the priority occupations are categorized as having Tier 1, 2, or 3 wages by their average hourly wage. **Tier 1** occupations have an average wage above $46 per hour—more than half a standard deviation higher than the average living wage across family sizes ($38.92). **Tier 2** occupations fall within half a standard deviation above or below the average living wage, while **Tier 3** occupations earn less than half a standard deviation below the average living wage (Table 7).

Table 7. Wages Tiers Based on Rhode Island Living Wages

Tier	Hourly Wage
Tier 1	Greater than $46
Tier 2	$32 - $46
Tier 3	Less than $32

Between 2023 and 2035, the Act on Climate scenario is estimated to generate significantly more employment growth in jobs earning Tier 1 and Tier 2 wages than Tier 3 wages. This is driven primarily by employment growth in the Electricity and Buildings sectors. Jobs earning Tier 3 wages still experience employment growth, albeit at a slower pace, growing by 9% from 2023 to 2035 compared to 35% in Tier 2 and 34% in Tier 1 (Figure 22).

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[142] https://livingwage.mit.edu/

Figure 22: Total Employment Growth by Wage Tier, 2023-2035
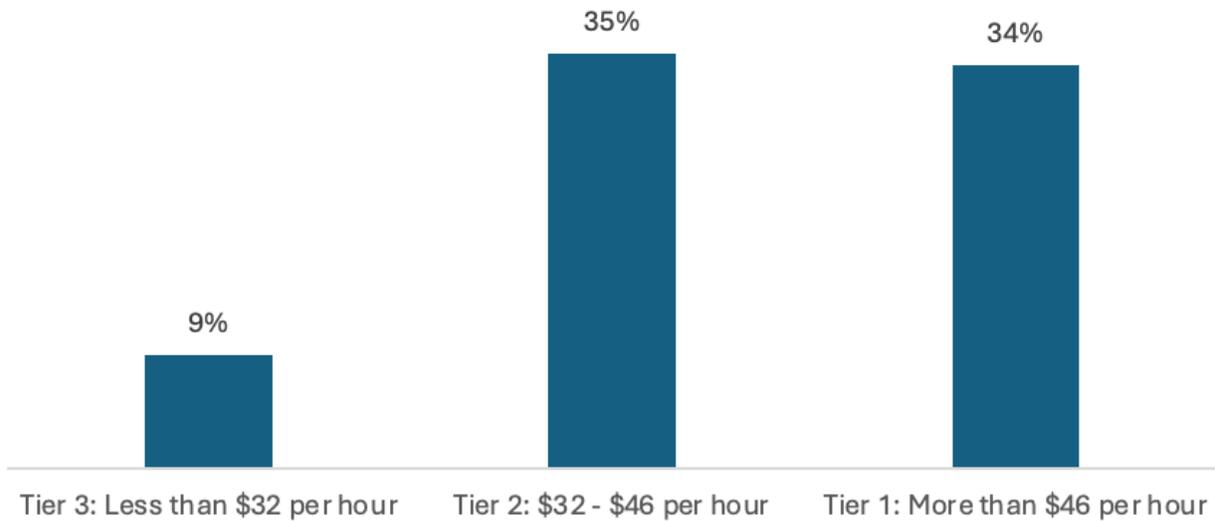
Four of the fourteen occupations have average wages in Tier 1: Electrical Engineers; Electrical Power-Line Installers and Repairers (Linemen); First-Line Supervisors of Construction Trades and Extraction Workers; and Solar Photovoltaic Installers (Solar Installers). In addition to having a Tier 1 wage, Solar Installers have the most employer anticipated demand, as well as highest rates of hiring difficulties with Linemen. Solar Installers and Linemen have lower barriers to entry in comparison to occupations like Electrical Engineers, which require a college degree, or First-Line Supervisors which require years of experience. Partnerships with employers of these occupations can help training providers, educators, state agencies, and other local support services better understand the wages and benefits offered in the clean energy industry and communicate this information to job seekers, students, and transitioning workers.

Six occupations have Tier 3 wages: Carpenters; HVAC/R Mechanics and Installers; Sheet Metal Workers; Construction Laborers; Welders, and Automotive Service Technicians and Mechanics. While these wages provide less than a living wage for some workers, the median wage for all occupations, except for Automotive Service Technicians and Mechanics, which is the only occupation included in the priority occupations due to lessening demand (see Occupational Gaps section), are higher than the state's median wage. Additionally, when moving to the 75th percentile wage, which is a proxy for senior-level experienced workers, the wages for these occupations (minus Automotive Service Technicians and Mechanics) move into the 2nd Tier, providing a family-sustaining wage for workers, showing an increasing earning potential with time in these occupations.

Table 39: Wages for Priority Occupations in Rhode Island, 2024[143]

SOC Code	Priority Occupation Name	25th percentile wage	Median wage	75th percentile wage	Average wage	Wage Tier
17-2071	Electrical Engineers	$39.90	$50.26	$61.72	$54.74	Tier 1
49-9051	Electrical Power-Line Installers and Repairers	$41.78	$51.81	$59.23	$50.94	Tier 1
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	$36.31	$46.30	$57.61	$46.01	Tier 1
47-2231[8]	Solar Photovoltaic Installers	$22.65	$49.94	$49.94	$39.50	Tier 1
47-4011	Construction and Building Inspectors	$28.73	$35.00	$43.96	$35.97	Tier 2
47-2073	Operating Engineers and Other Construction Equipment Operators	$28.86	$36.55	$40.26	$35.61	Tier 2
47-2152	Plumbers, Pipefitters, and Steamfitters	$24.31	$31.07	$39.35	$34.98	Tier 2
47-2111	Electricians	$22.85	$33.73	$42.61	$34.02	Tier 2
47-2031	Carpenters	$25.46	$29.09	$37.69	$31.62	Tier 3
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	$22.91	$30.57	$37.90	$30.45	Tier 3
47-2211	Sheet Metal Workers	$23.90	$27.38	$38.43	$30.28	Tier 3
47-2061	Construction Laborers	$23.15	$28.02	$37.49	$30.13	Tier 3
51-4121	Welders, Cutters, Solderers, and Brazers	$23.85	$27.40	$38.18	$29.56	Tier 3
49-3023	Automotive Service Technicians and Mechanics	$17.30	$24.37	$30.64	$25.48	Tier 3
00-0000	**All Occupations**	**$18.51**	**$25.98**	**$39.86**	**$33.30**	

Potential Gaps in Meeting Workforce Demand

An occupational gap analysis helps assess the feasibility of expanding Rhode Island's climate workforce to meet projected job growth under the scenarios outlined in the state's Climate Action Strategy. This analysis compares modeled occupational outcomes, discussed in previous sections

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[143] May 2024 Occupational Employment and Wages Statistics (OEWS), *U.S. Bureau of Labor Statistics,* https://www.bls.gov/oes/tables.htm.

of this study, with historical trends, baseline employment levels, and baseline growth projections for each occupation across the Rhode Island workforce. The results provide a strong foundation for identifying near-term workforce development priorities and allocating resources effectively.

Table 40: Baseline and Projected Employment in Total and Energy Economies, Rhode Island presents baseline employment levels for Rhode Island's priority occupations in both the overall economy and the energy economy as of 2023. It also includes baseline growth projections, and additional employment demand associated with the Climate Action Strategy. While some clean energy–related growth is already reflected in baseline projections, most of the additional demand identified through this modeling effort can be attributed to the state's clean energy and climate policies and investments.

Four priority occupations are expected to remain stagnant or see declines in the total economy through 2035: Carpenters, Sheet Metal Workers, Construction and Building Inspectors, and Automotive Service Technicians and Mechanics. For all these occupations besides Automotive Service Technicians and Mechanics, the additional demand expected from the Climate Action Strategy will offset the job losses for this occupation in other industries.

Table 40: Baseline and Projected Employment in Total and Energy Economies, Rhode Island

6-digit SOC Code	Occupation Name	2023 Employment		Baseline Demand Through 2035	Additional Demand Through 2035
		Total Economy	Energy Economy	Total Economy	Energy Economy
Rhode Island Overall Workforce[144]		518,137	24,456	2,780	5,082
17-2071	Electrical Engineers	597	148	65	55
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	2,211	400	142	198
47-2031	Carpenters	3,302	235	-41	129
47-2061[2]	Construction Laborers	3,519	729	251	455
47-2111	Electricians	2,322	540	222	514
47-2152	Plumbers, Pipefitters, and Steamfitters	1,795	461	59	91
47-2211	Sheet Metal Workers	433	69	-11	17
47-2231	Solar Photovoltaic Installers	63	63	24	58
47-4011	Construction and Building Inspectors	314	73	-2	6
49-3023	Automotive Service Technicians and Mechanics	2,616	1,079	-108	-155
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	1,386	1,386	110	580
49-9051	Electrical Power-Line Installers and Repairers	196	160	89	103
51-4121	Welders, Cutters, Solderers, and Brazers	1,913	119	69	52
47-2073	Operating Engineers and Other Construction Equipment Operators	1,011	291	29	203

The potential gap between current labor supply and projected demand in a region can be shaped by several factors. For each priority occupation, the analysis compares historical and projected growth relative to current employment levels, while also considering factors such as occupation-specific unemployment rates, regional employment concentrations, workforce age distributions, and reported employer difficulties in finding qualified candidates.

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[144] The baseline projections for occupations across Rhode Island's overall economy are sourced from JobsEQ® as of 2025Q1. The employment change from 2023 to 2024 was incorporated into the JobsEQ® 10-year growth projection, from 2025 to 2035, to estimate the number new workers expected from 2023 to 2035.

Table 41 shows the total new workers expected in Rhode Island based on baseline demand through 2035 in Rhode Island's overall economy, and additional demand from employment projections. Occupational demand gaps are assessed using the below metrics and gaps are classified as "mild," "moderate," or "severe."

Severe	Demand exceeds supply **and** this gap is 10% or more of the existing workforce
Moderate	Demand exceeds supply and the gap is more than 2.5% but less than 10% of the existing workforce
Mild	Demand exceeds supply and the gap is 2.5% or less than the existing workforce

This analysis identifies eight priority occupations with significant demand gaps and three with moderate gaps (Table 41). Addressing these projected shortages over the next decade will be critical to avoid workforce constraints that could slow the growth of Rhode Island's clean energy economy.

Table 41: Projected Growth of Priority Occupations Relative to Historical Growth and Baseline Employment, Rhode Island[145]

6-digit SOC Code	Occupation Name	Historical Growth (2015-2025Q1) Overall Economy	Total Projected Demand Through 2035	Total Projected Demand as a % of 2023 Employment	Total Projected Demand as a % of Historical Growth	Status
Rhode Island Overall Workforce		32,967	7,863	1.5%	23.9%	N/A
17-2071	Electrical Engineers	143	120	20.2%	84.2%	Severe
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	629	340	15.4%	54.0%	Severe
47-2031	Carpenters	-16	88	2.7%	-562.1%	Moderate
47-2061	Construction Laborers	625	709	20.8%	113.5%	Severe
47-2111	Electricians	627	736	31.7%	117.3%	Severe
47-2152	Plumbers, Pipefitters, and Steamfitters	414	150	8.3%	36.2%	Moderate
47-2211	Sheet Metal Workers	9	6	1.5%	67.2%	Mild
47-2231	Solar Photovoltaic Installers	38	81	129.8%	216.3%	Severe
47-4011	Construction and Building Inspectors	86	4	1.2%	4.3%	Mild
49-3023	Automotive Service Technicians and Mechanics	-78	263	-10.1%	337.2%	N/A
49-9021	HVAC/R Mechanics and Installers	466	690	49.8%	148.1%	Severe
49-9051	Electrical Power-Line Installers and Repairers	58	192	98.2%	333.2%	Severe
51-4121	Welders	476	121	6.3%	25.4%	Moderate
47-2073	Operating Engineers	177	232	23.0%	131.4%	Severe

The eight priority occupations with "severe" projected demand gaps include: Electrical Engineers, First-Line Supervisors of Construction Trades and Extraction Workers, Construction Laborers, Electricians, Solar Photovoltaic Installers, HVAC/R Mechanics and Installers, Electrical Power-Line Installers and Repairers, and Operating Engineers. The most pronounced gap is for Solar Photovoltaic Installers, with a projected demand of 130% higher than its 2023 workforce. This is

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[145] Overall economy historical growth and 2023 employment data sourced from JobsEQ® as of 2025Q1. Based on a four-quarter moving average and on Place of Work estimates.

followed by Electrical Power-Line Installers and Repairers, with a 98% higher projected demand from its 2023 workforce.

Construction Laborers, Electricians, and HVAC/R Mechanics and Installers are projected to add the largest numbers of workers, at nearly or over 700 workers each. Luckily, these occupations already have many established training programs and curricula in the state, as well as immense union backing. Still, focus on recruitment and training clean energy specific skill sets should be monitored.

Automotive Service Technicians and Mechanics represent another key occupation for the state—not because of rising demand, but due to the need for workforce transition. Employment in this occupation is projected to decline by 263 positions by 2035, a 10% decrease from 2023 levels, largely driven by the shift toward electrification and changes in the transportation fleet. To prevent new entrants from being trained for shrinking job opportunities and to support incumbent workers facing displacement, the state should consider targeted transition and reskilling strategies tailored to this occupation. Existing automotive workers and automotive training programs should also be equipped with electric vehicle maintenance and repair skills to remain competitive as the transportation fleet transitions toward electrification. In addition, many core automotive competencies—such as diagnostics, mechanical systems repair, and electrical troubleshooting—are transferable to a wide range of non–clean energy industries, providing displaced workers with broader pathways for reemployment.

Table 42 shows an additional collection of metrics related to potential labor supply for priority occupations.

Table 42: Unemployment Rates (UER), Location Quotients (LQ), Ages, and Reported Hiring Difficulty for Priority Occupations[146]

6-digit SOC Code	Occupation Name	Unemployment Rate 2025Q1	Location Quotient	Share of Current Workers Aged 55 Years+	Reported Hiring Difficulty: % of Employers with Great Difficulty'
	Rhode Island Overall Workforce	4.6%	1.00	26.5%	N/A
17-2071	Electrical Engineers	3.4%	1.04	28.7%	19% (n=16)
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	3.6%	0.84	28.3%	33% (n=11)
47-2031	Carpenters	6.4%	1.16	22.7%	17% (n=5)
47-2061	Construction Laborers	8.5%	0.78	19.7%	27% (n=10)
47-2111	Electricians	3.8%	0.95	22.3%	41% (n=16)
47-2152	Plumbers, Pipefitters, and Steamfitters	3.3%	1.19	23.8%	33% (n=8)
47-2211	Sheet Metal Workers	3.9%	1.10	21.4%	13% (n=11)
47-2231	Solar Photovoltaic Installers	14.8%	0.68	7.2%	42% (n=11)
47-4011	Construction and Building Inspectors	1.2%	0.75	51.8%	36% (n=12)
49-3023	Automotive Service Technicians and Mechanics	3.7%	1.02	19.9%	0% (n=4)
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	2.8%	1.06	17.5%	25% (n=11)
49-9051	Electrical Power-Line Installers and Repairers	2.4%	0.67	14.2%	50% (n=4)
51-4121	Welders, Cutters, Solderers, and Brazers	4.2%	1.43	22.5%	25% (n=4)
47-2073	Operating Engineers and Other Construction Equipment Operators	7.5%	0.68	28.0%	N/A[147]

Overall, Rhode Island had an unemployment rate of 5% in early-2025. Ten of the fourteen priority occupations had unemployment rates below the state average, including six occupations identified

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[146] LQ is the concentration of workers in RI relative to the nation.
Source: JobsEQ®. Data as of 2025Q1. Based on a four-quarter moving average. UER and LQ data are based on Place of Work estimates. Age data are based on Place of Residence estimates.
[147] Operating Engineers were added to the priority occupation list after survey and training inventory efforts.

with severe demand gaps. As a result, Rhode Island may face greater challenges in meeting workforce needs for these occupations, given the limited pool of available workers.

Despite strong projected growth, the unemployment rate for Solar Installers remains high at nearly 15%. This could reflect growing interest and training activity ahead of sufficient job availability. The situation illustrates a common "chicken-and-egg" challenge in workforce development—whether to train workers early for emerging roles that will soon be in high demand, or wait until job opportunities materialize, risking a shortage of qualified labor. Targeted support can help Solar Installer trainees build complementary electrical skills and gain related experience as the solar market expands.

Seven of the priority occupations have location quotients (LQs) above one, indicating a high concentration of these workers in the state. Of the occupations with severe demand gaps, Electrical Engineers and HVAC/R Mechanics and Installers have LQs above one, indicating (and supported by the training inventory) that these occupations have existing and established workforce training pipelines in the state.

When examining age demographics, Construction and Building Inspectors stands out, with more than half of the workforce aged 55 or older. This occupation offers a valuable opportunity for experienced workers in more physically demanding construction trades to transition into a less strenuous role as they approach retirement. Accordingly, training initiatives for this occupation may be most effective when targeted toward mid-career professionals.

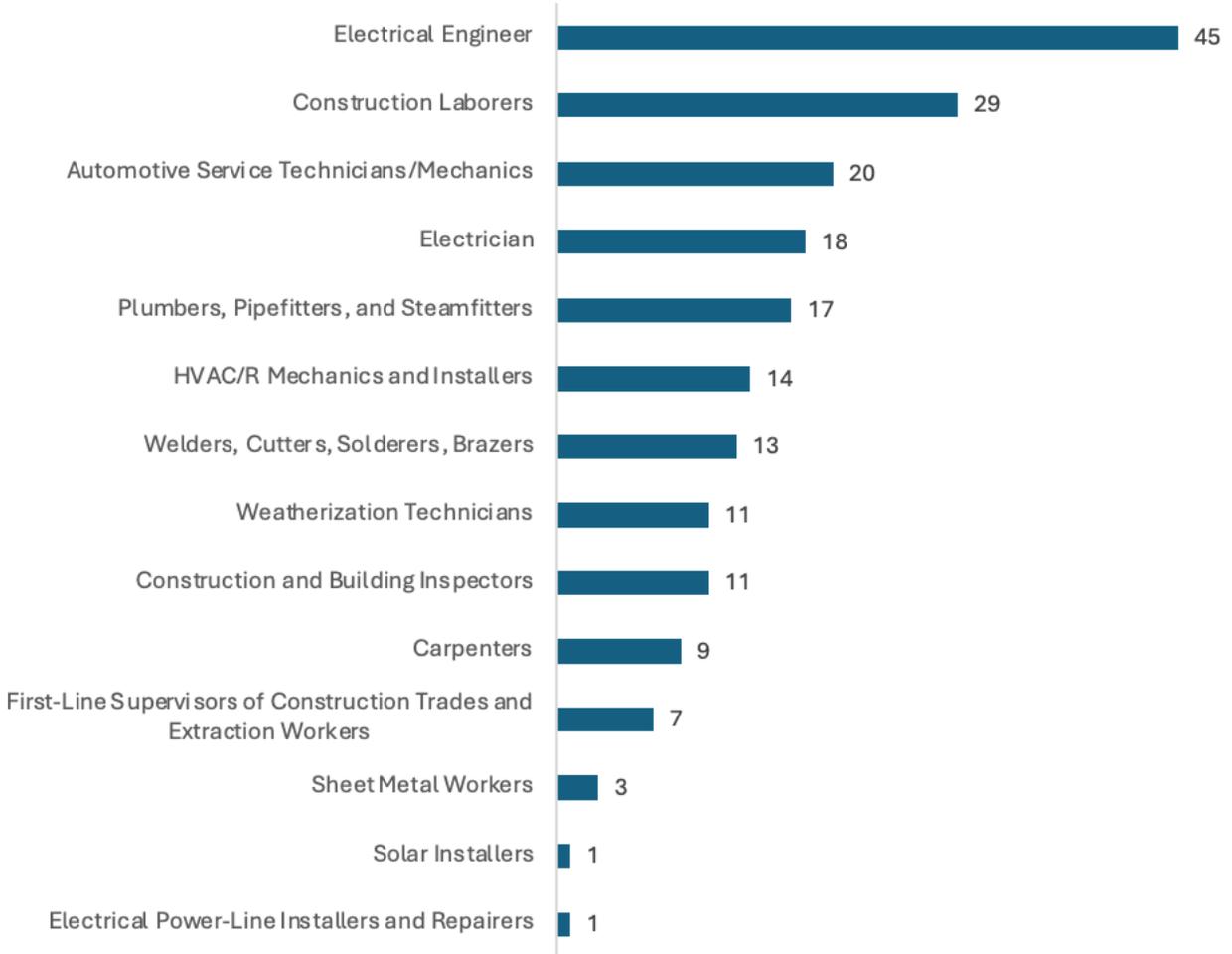*Navigating From the Current to Future Workforce Ecosystem*

The research team identified almost 200 training programs related to key climate and clean energy occupations in the state. Nearly one-quarter (45 programs) are for Electrical Engineers, largely due to the abundance of pre-engineering CTE pathways and courses at the K-12 level. While these are solid introductions to the career, students need additional four-year university training for this occupation. Opportunities in Electrical Engineering at the college/university level are offered at the Community College of Rhode Island (CCRI), New England Institute of Technology (New England Tech), Providence College (PC), Roger Williams University (RWU), and the University of Rhode Island (URI).

After Electrical Engineers, the most prominent clean energy training available is for Construction Laborers with 29 programs. Similarly, many of these training opportunities are at the high school CTE level. However, unlike Electrical Engineers, students can likely transition right into a Construction Laborer role after completing these CTE programs. For prospective workers, training is available through union apprenticeships, private training companies, and industry associations. Other occupations with more than 10 identified training programs throughout the state include Automotive Service Technicians and Mechanics; Electricians; Plumbers, Pipefitters, and Steamfitters; HVAC/R Mechanics and Installers; Welders, Cutters, Solderers, Brazers; Weatherization Technicians; and Construction and Building Inspectors.

There are three occupations with less than three opportunities throughout the state: Sheet Metal Workers, Solar Installers, and Electrical Power-Line Installers and Repairers. For Sheet Metal Workers, there are two training opportunities in Westerly, and one in Pawtucket. Electrical Power-Line Installers and Repairers only have one identified opportunity, which is an apprenticeship through the Northeastern Joint Apprenticeship & Training program. While only one opportunity was publicly available from online research, many of these positions are directly tied to local utilities and utility unions, where on-the-job training is available, such as through the Utility Workers Union of America Local 310.

While the training opportunities for Solar Installers are sparse, some of the Electrician training opportunities are applicable to this occupation. For example, New England Institute of Technology offers an associate degree in Electrical Technology with Renewable Energy Systems, teaching students not only the fundamentals of electrical installation, but also preparing students to go directly into solar and wind electricity work. Lastly, online training courses and certifications are extremely common for solar installers, but they are not included in the inventory as they are not specific to Rhode Island.

Figure 23: Occupational Focus by Training Inventory Programs

Occupation	Count
Electrical Engineer	45
Construction Laborers	29
Automotive Service Technicians/Mechanics	20
Electrician	18
Plumbers, Pipefitters, and Steamfitters	17
HVAC/R Mechanics and Installers	14
Welders, Cutters, Solderers, Brazers	13
Weatherization Technicians	11
Construction and Building Inspectors	11
Carpenters	9
First-Line Supervisors of Construction Trades and Extraction Workers	7
Sheet Metal Workers	3
Solar Installers	1
Electrical Power-Line Installers and Repairers	1

Rhode Island's strong and robust CTE network is clear by both the training program inventory and survey respondents. More than half (70%) of surveyed clean energy workers reported attending a career or vocational school for longer than six months. In the training inventory, over one-third of the identified programs are CTE programs (Figure 24).

Figure 24: Training Inventory by Program Type
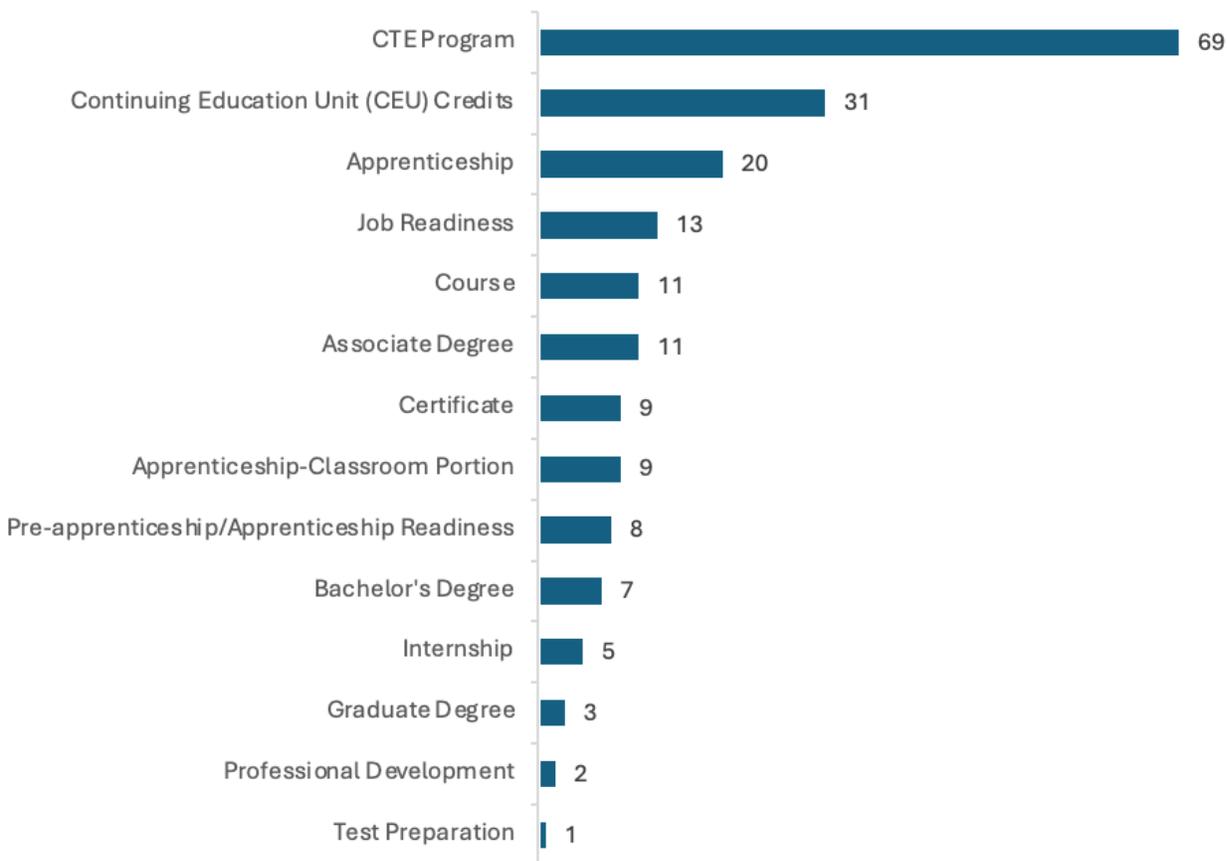
Apprenticeship, internship, and mentorship programs are key entry-points into a clean energy career. Six in ten (60%) of clean energy workers reported participation in an internship program as supporting their entrance into their current occupation, and a similar amount reported the same about both mentorships and apprenticeship programs (Figure 25). Nearly half (48%) of participants in apprentice, mentorship, or internship programs labeled them as very effective for their career, while 42% said somewhat effective, and 10% said neither effective nor ineffective. No respondents labeled these programs as ineffective (Figure 26).

In addition to workers highlighting apprenticeships, six in ten (61%) surveyed clean energy employers reported hiring workers from Rhode Island apprenticeships. Of these employers, nine in ten (91%) reported that participation in apprenticeship programs improved the performance of their employees.

Apprenticeship opportunities were the third most common type of training identified in the training inventory, with 20 programs across eight of the priority occupations (Figure 24). Additionally, eight pre-apprenticeship or apprenticeship readiness programs were captured. There were an additional five internship opportunities captured in the inventory, through the Governor's Workforce Board's "Real Skills for Youth" program.

Programs with Continuing Education Unit (CEU) Credits, most of which are online programs, also feature in the state's training landscape, with 31 programs. The range of programs available in the state's training ecosystem provide participants multiple options to pursue training and education based on needed commitment, time availability, and prior educational backgrounds.

Figure 25: Did you participate in any of the following programs to support entrance into your current occupation?
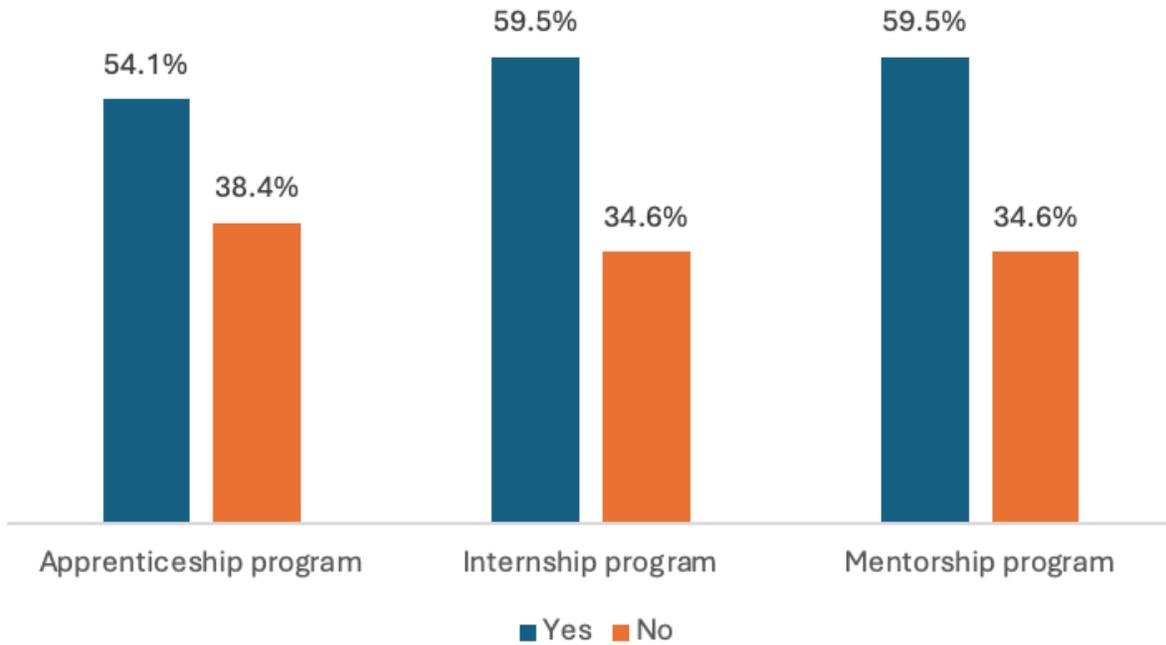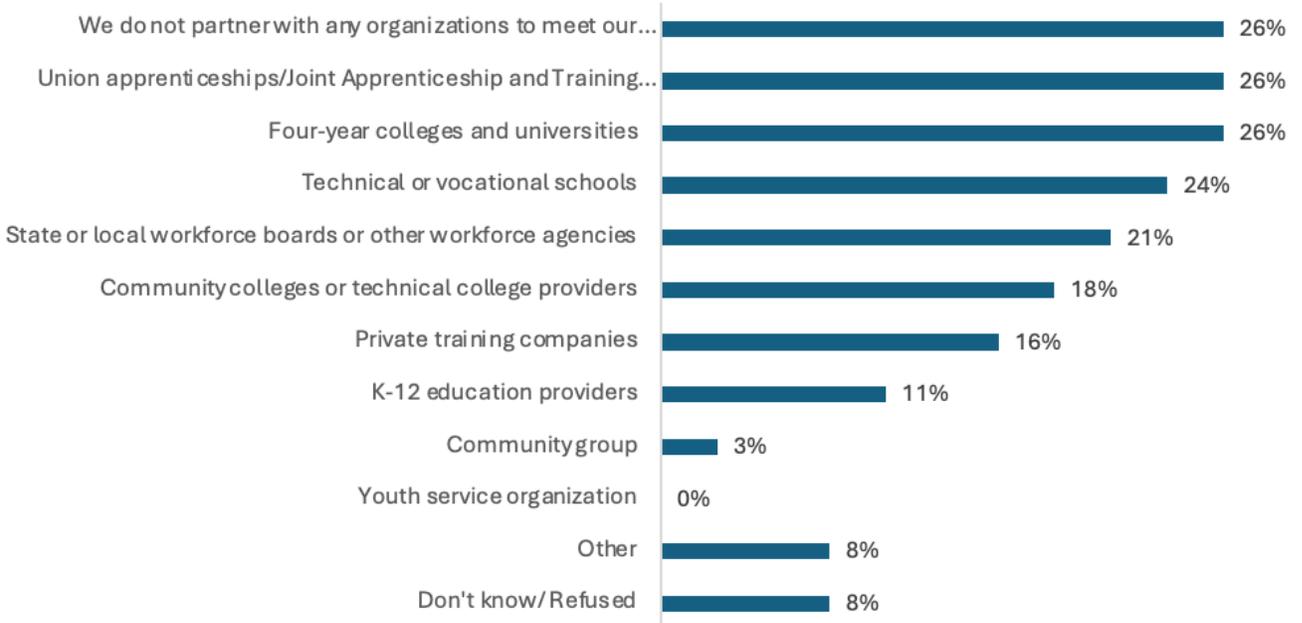
Figure 26: How effective were the apprenticeship, internship, or mentorship programs in preparing you for your current role?
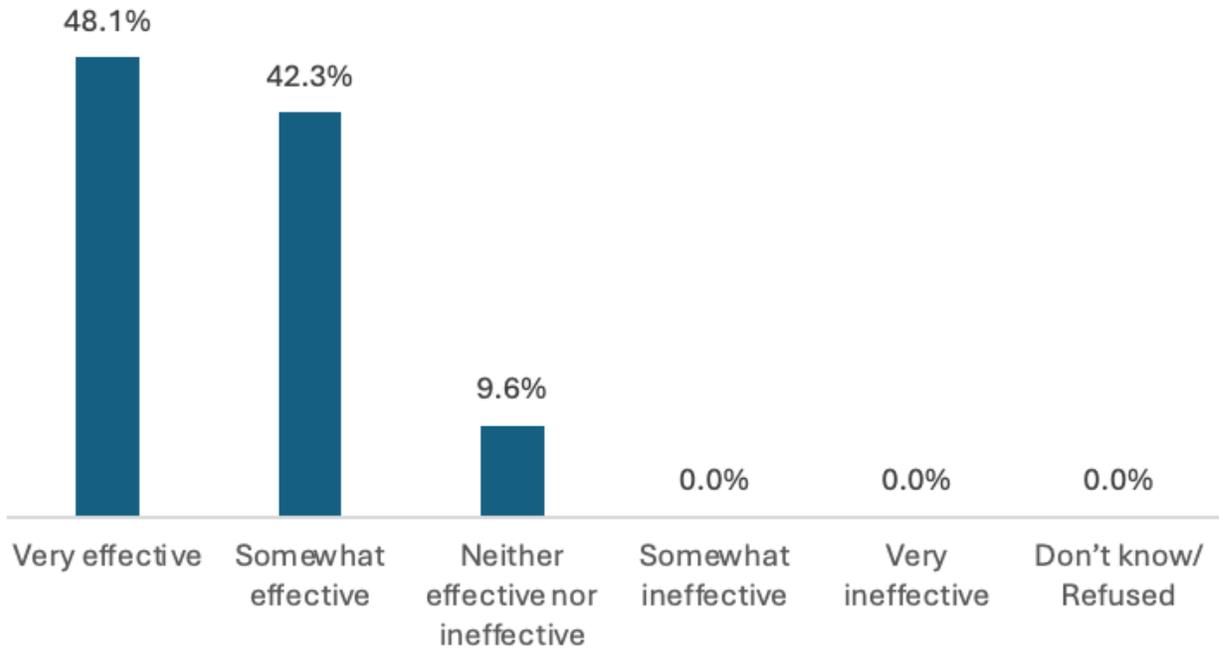
About two-thirds of surveyed employers reported that they actively partner with organization to meet their workforce needs. Over a quarter (26%) of employers reported working with four-year colleges and universities, along with union apprenticeships/joint apprenticeship, and training centers. This is not surprising, given the prominence of these organizations in the state's training landscape. Twenty-six training programs in the inventory are offered by four-year universities or colleges, while ten are offered by unions or joint-apprenticeship training centers.

Similar to colleges and union utilization, 24% of employers reported partnering with technical or vocational schools (compromising 38 programs in the inventory), followed by state or local workforce boards or other workforce agencies (21%), community colleges or technical college providers (18%), private training companies (16%) and K-12 education providers (11%) (Figure 27).

Figure 27: Responses to: "Please indicate if you partner with any of these types of organizations to meet your workforce needs"

We do not partner with any organizations to meet our...	26%
Union apprenticeships/Joint Apprenticeship and Training...	26%
Four-year colleges and universities	26%
Technical or vocational schools	24%
State or local workforce boards or other workforce agencies	21%
Community colleges or technical college providers	18%
Private training companies	16%
K-12 education providers	11%
Community group	3%
Youth service organization	0%
Other	8%
Don't know/Refused	8%

Local-Level Training and Occupation Gaps

There are training opportunities available in all counties in the state. Training opportunities are prominent in Providence County, especially in the cities of Providence, Pawtucket, and Cranston. Environmental Justice communities in Woonsocket and Newport have less nearby availability to training opportunities (Figure 28).

Figure 28: Training Programs by Location
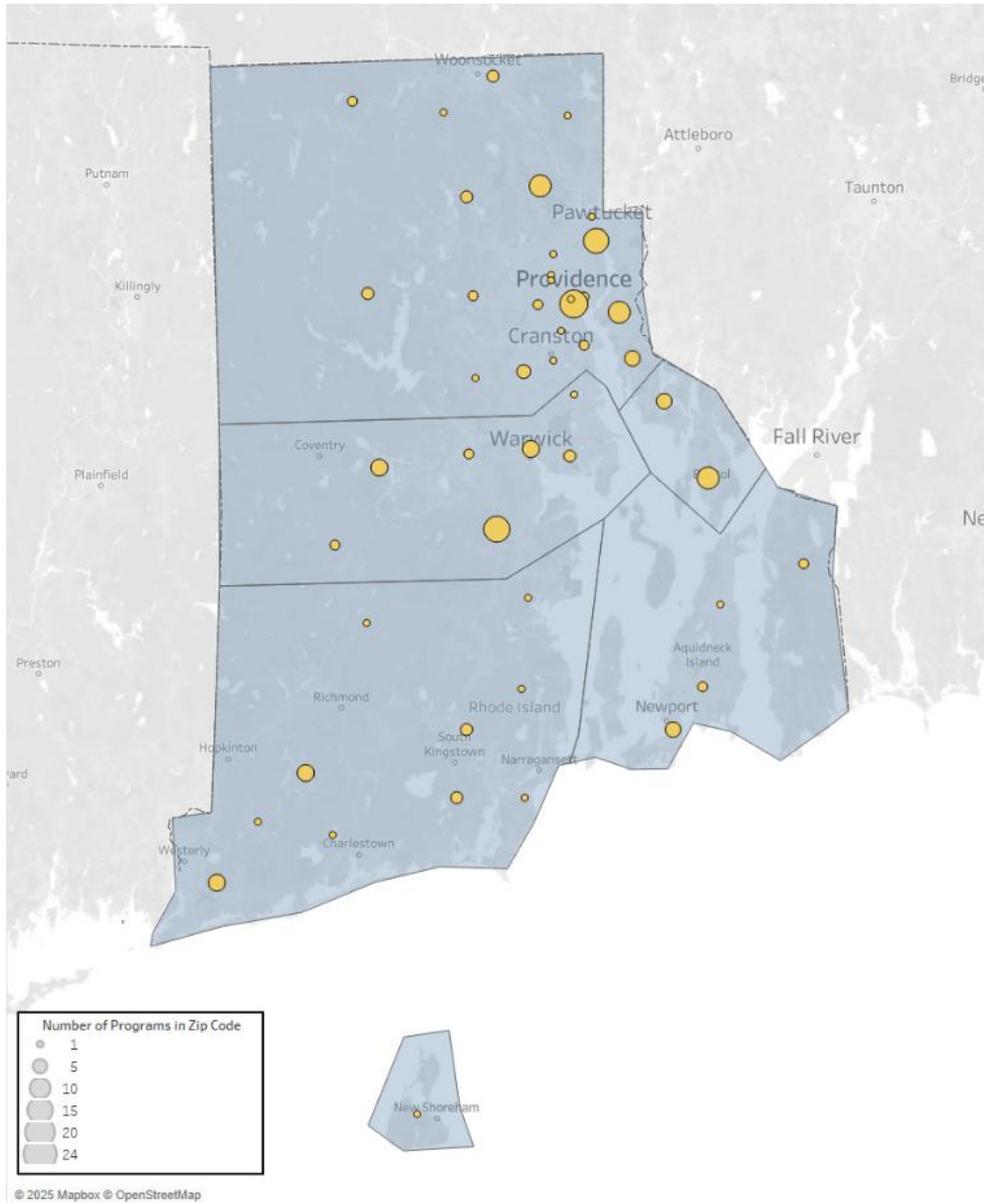
While training opportunities are available in each county, they are heavily concentrated in Providence County, making up 58% of in-person programming, and Kent County, making up 20% of in-person programming. While together these counties make up 70% of training availability, this proportion is still less than their makeup of the state's workforce at 73%. Opportunities in Bristol and Newport County are more limited, but there are an additional 24 programming opportunities offered by Rhode Island training providers online, accessible to workers in any county (Table 43).

Although training availability is relatively balanced between workforce size and program availability, the state should proactively fill regional gaps to ensure equitable access across all communities. This requires analysis going beyond county level and looking at the town and city level, particularly in Providence County.

Table 43: Training Programs by Occupation and County

Occupation	Bristol County	Kent County	Newport County	Providence County	Washington County	Multiple or Online
Automotive Service Technicians and Mechanics	0	8	2	9	1	0
Carpenters	2	1	2	4	0	0
Construction and Building Inspectors (Energy Auditors/ HERS Raters)	0	0	0	3	1	7
Construction Laborers	3	3	3	15	5	0
Electrical Engineers	4	8	4	23	6	0
Electrical Power-Line Installers and Repairers	0	0	0	0	0	1
Electricians	2	4	0	8	3	1
First-Line Supervisors of Construction Trades and Extraction Workers	4	1	0	1	0	1
HVAC/R Mechanics and Installers	0	4	0	6	0	4
Plumbers, Pipefitters, and Steamfitters	1	2	0	9	3	2
Sheet Metal Workers	0	0	0	1	2	0
Solar Installers	0	0	0	0	1	0
Weatherization Technicians	0	1	0	1	0	9
Welders, Cutters, Solderers, Brazers	0	2	1	7	3	0
Total # of Programs	16	34	12	87	25	25
Percent of In-Person Programs	9%	20%	7%	50%	14%	N/A
Percent of Total RI Workforce	3%	15%	9%	58%	12%	N/A

Gap for Occupations with "Severe" Demand Gaps at a County-Level

When comparing the workforce of "severe" demand gap occupations at the county-level, not all counties have occupational concentration levels comparable to their overall makeup of the state workforce. This is most pronounced for Electrical Power-Line Installers and Repairers: despite making up 58% of the state's overall workforce, Providence County contains 81% of the Linemen workforce. This mismatch of regional concentration, coupled with an extreme demand gap, and only one identified training program throughout the state, calls for greater focus on this occupation in future energy workforce development strategies.

Other large concentrations of "severe" demand gap occupations include Electrical Engineers in Washington County, making up 20% of the state's workforce for this occupation, compared to

Washington County's makeup of 12% of the workforce. This may be explained by the University of Rhode Island's location in the county, the state's premier institution for engineering, perhaps indicating graduating engineering students are staying in the area for employment. Similarly, the neighboring Newport County has a concentration of 16% of the state's Electrical Engineering workforce, while their total workforce makeup is only 9%. Both these counties have large maritime economies, perhaps attracting more need for Electrical Engineering workers.

Lastly, Kent County accounts for 22% of the state's HVAC/R Mechanics and Installers workforce, as opposed to the 15% of total state workforce the county holds. This is not surprising when looking at the training inventory: Kent County has four training programs for this occupation, the only county with programming aside from Providence (Table 43). Given the severe demand for this occupation in the future of the energy economy, this presents an opportunity to expand HVAC training into other counties.

Table 44: "Severe" Occupation Employment by County, 2025Q1[148]

	Electrical Engineers	First-Line Supervisors of Construction Trades and Extraction Workers	Construction Laborers	Electricians	Solar Installers	HVAC/R Mechanics and Installers	Electric Power-Line Installers and Repairers	Operating Engineers
Rhode Island Total	635	2,339	3,664	2,429	69	1,457	274	1,048
Bristol County	14	82	139	98	2	49	3	36
Kent County	64	314	516	383	12	324	10	140
Newport County	99	195	316	204	5	116	13	80
Providence County	312	1,288	2,065	1,186	40	815	221	615
Washington County	125	393	528	465	7	129	20	136
Unknown Or Undefined[149]	21	66	100	92	4	25	6	41

Workforce-Focused Policies and Government Agencies

The research team identified nearly 20 workforce policies, programs, and incentives across the state that support the clean energy workforce. The Governor's Workforce Board (GWB), serving as the official entity responsible for statewide workforce policy and planning, plays a central role in shaping strategies for all industry sectors, including renewable energy, overseeing implementation of many of the policies and programs in this inventory. Additionally, many workforce investments made by the GWB are directed through the Real Jobs RI program.

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[148] JobsEq, 2025Q1.
[149] Jobs that cannot be allocated to a specific county

Real Jobs RI, through the RI Department of Labor and Training (RIDOL), is one of the state's premier workforce development programs and serves as a model to many other initiatives. Established in 2015, Real Jobs RI is an employer-driven workforce initiative that collaborates with businesses, training providers, and community organizations to develop tailored strategies that meet industry-specific workforce needs, ranging from job placement and employee upskilling to entrepreneurial support and long-term talent pipeline development. Since its inception, the program has trained over 38,000 individuals, placed over 17,200 jobseekers, and supported more than 6,000 businesses.[150]

The Green Energy Workforce Board (GWAC) is another key driver of Rhode Island's green workforce development policy. This board, launched in 2023, coordinates stakeholders from the industry and related sectors to establish guidelines for ensuring access to employment and training opportunities in green industries and related fields. During executive interviews, experts highlighted the importance of cross-industry collaboration for a green workforce transition. Many highlighted Rhode Island's existing capacity for collaboration, with GWAC being a key example of efforts to ensure an equitable and inclusive transition process.

While the GWB directly offers workforce funding in Rhode Island, the state's economic development agency, RI Commerce, also plays a role in the funding landscape of the RI workforce. RI Commerce administers the Qualified Jobs Incentive Tax Credit, which grants companies redeemable tax credits for creating new jobs or relocating them to the state. In addition to workforce funding, the agency provides funding through the Renewable Energy Fund, which provides grants to renewable energy projects in the state.

Employers reported interest in various resources to support their workforce needs, but reported the highest interest in funds to reimburse the costs of additional training or certification for clean energy employees, with 53% indicating being "very" interested, and 29% being "somewhat" interested (Figure 29). Existing opportunities for entrepreneurial and business support should also be more effectively promoted to clean energy employers, as many remain unaware of these available resources despite their relevance.

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[150] *Governor's Workforce Board.* "Real Jobs RI: Calendar Year 2023 Performance Overview."
"https://gwb.ri.gov/sites/g/files/xkgbur746/files/2024-04/Real%20Jobs%20RI%20Performance%20in%20Calendar%20Year%202023.pdf
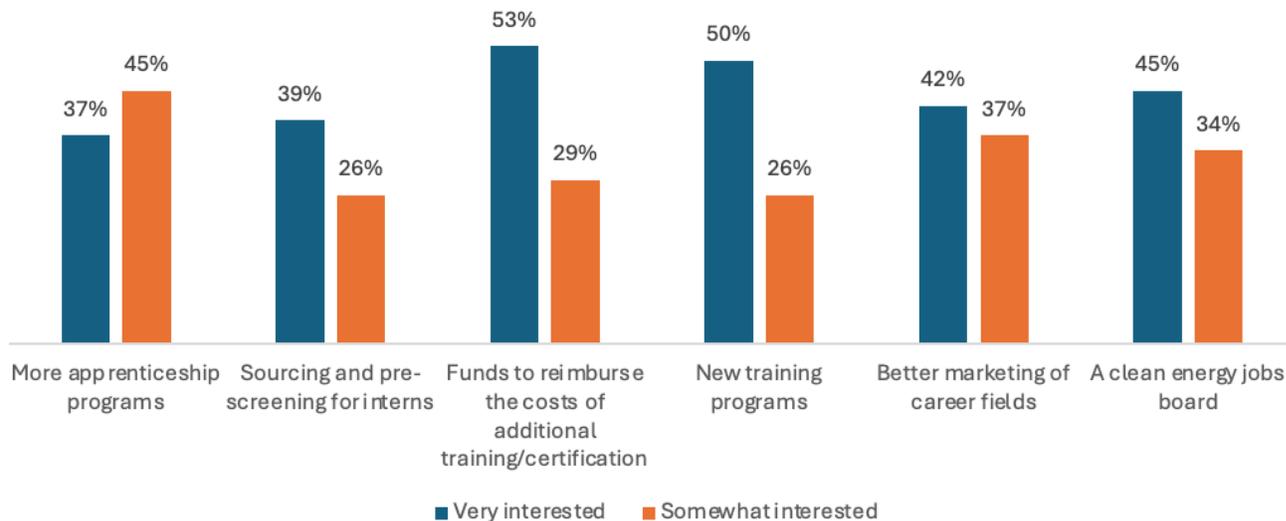
Workforce Planning Recommendations

K-12 and CTE Education

Strengthening direct pathways into clean energy careers can help build a qualified workforce quickly to meet demand, but it begins with education and awareness-raising programs at the K-12 level. This should start with efforts to education about career pathways that exist in clean energy before students are in high school and have the opportunity to pursue CTE education. Rhode Island can build on its existing CTE and workforce partnerships by developing targeted outreach materials that map key skills, illustrate how foundational abilities transfer into clean energy roles, and highlight local career pathways across the most in demand sectors such as offshore wind, building decarbonization, and electric vehicle infrastructure and maintenance. Coordinated efforts between the Department of Education, the Office of Energy Resources, and workforce development organizations can ensure these initiatives align with the state's long-term clean energy and climate goals.

Transitioning the Workforce

Stakeholders call attention to the desire for clear and coordinated guides and pathways to clean energy jobs. Currently, Wind Win RI, with support from Real Jobs RI, offers a career pathway training system for youth and adults in offshore wind. Community members highlighted the desire for more pathways like this in other occupations and sectors of clean energy work, as well as specialized pathways for economic justice for disadvantaged community members. Career pathways should not be just created for new workers but also targeted pathways for fossil-fuel workers to transition out of this industry. Including information about what certifications and stackable training to obtain, as well as where to obtain these, are other key aspects to developing these guides.

Employers can be better informed of existing financial incentives and programs. Many Rhode Island clean energy employers are eager to invest in workforce development but lack awareness of the resources already available to them. Enhancing communication and visibility around existing state and regional programs—such as funding that offsets training and certification costs—would enable employers to upskill their workers more effectively and respond to rising labor demand. The state can strengthen outreach and coordination with employers to ensure that available supports are well-publicized, easy to navigate, and aligned with industry workforce needs.

Rhode Island should strengthen coordination and establish shared standards among certification providers. Industry-recognized certifications are a critical entry point into Rhode Island's clean energy workforce and a key measure of job readiness. Most employers in the sector require or prefer certified workers, highlighting the need for consistent, high-quality credentialing opportunities. This should include industry associations, apprenticeship programs, community colleges, and private training organizations to ensure that credentials align with statewide workforce development goals and meet employer demand across emerging clean energy occupations.

Rhode Island should intentionally align its clean energy and ocean-based workforce strategies to reflect the state's unique size, geography, and maritime heritage. Stakeholders emphasized that the "Ocean State" identity connects nearly every sector of Rhode Island's economy, creating natural pathways to link traditional maritime, construction, and environmental industries with emerging clean energy fields such as offshore wind and marine technology. The state can strengthen this intersection by developing an **environmental industrial policy** that integrates workforce, safety, and environmental training standards across offshore and onshore clean energy occupations. Building on transferable skills from existing trades—like painting, electrical work, and marine operations—and layering in offshore safety and environmental awareness training, will help Rhode Island prepare workers for growing offshore wind demand while maximizing the strengths of its established ocean economy.

Understanding the climate job market and emerging roles is crucial for training providers. Training providers need to understand which jobs are part of the emerging clean energy workforce, especially those with severe demand gaps, along with which roles are newly created or already have well-established curricula. While foundational skills in construction and trades remain relevant across many clean energy sectors, the emergence of new technologies demands specialized knowledge and flexible curricula. Without consistent engagement and collaboration with industry, training providers risk offering programs that are outdated or misaligned with workforce needs.

Potential workers also need a clear sense of long-term job demand, job quality, and security— specifically those coming from fossil fuel industries and the Automotive industry. Many individuals transitioning from long-term roles expressed concerns about pay cuts, reduced hours, or uncertainty about the availability and stability of jobs in the clean energy sector. This underscores the importance of education and awareness: not just about the existence of new job pathways, but about how these roles meet or exceed the stability, compensation, and purpose of previous work.

A centralized, user-friendly resource, such as a "workforce concierge" approach, can standardize how training information is shared and providing direct support to help individuals navigate their options. Navigating opportunities can be difficult for prospective workers. The state currently offers a variety of resources through entities like OER to help prospective workers explore

clean energy careers. However, some community members report that these resources are scattered and difficult to navigate. To improve access and participation, the state should look to centralize clean energy workforce information and proactively guide prospective climate workers to it in a way that is coordinated, transparent, and responsive to evolving industry needs.

Internship, Mentorship and Apprenticeship

Expanding on-the-job training opportunities, such as internships and apprenticeships, is essential to opening more pathways into the clean energy workforce. To ensure equitable workforce growth, stakeholders should expand apprenticeships and certification programs that are free, or pay, for new and transitioning workers. Training providers should actively collaborate with union trades to deliver work readiness programs and create clear placement pipelines. Offering free, hands-on training that leads to industry-recognized credentials is critical to building a scalable and just transition.

Private businesses in the clean energy sector should also take an active role in expanding internship, mentorship, and apprenticeship opportunities. Many union apprenticeship programs are already at full capacity and often maintain long waitlists. This is not because the unions do not want to train more workers, but do not have enough projects to support larger numbers of apprentices. Apprenticeships remain highly attractive to prospective workers due to their "earn while you learn" structure, strong job placement, competitive wages, and comprehensive benefits upon completion. By replicating this proven model outside of union settings, private employers can help increase the state's training capacity and open more pathways into clean energy careers.

Mentorship will be especially critical to Rhode Island's clean energy workforce strategy given the sector's relatively young age profile. The state already has experience supporting mentorship through the Office of Energy Resources' Clean Energy Internship Program, which includes dedicated mentorship for students of color as part of its diversity efforts. Building on this successful model, the state could expand structured mentorship opportunities to all participants—while maintaining targeted supports for underrepresented groups—and extend similar frameworks into trades-based training programs. Additionally, incentivizing experienced and retirement-age workers to serve as mentors or instructors would help retain valuable technical expertise and connect new entrants with seasoned professionals, strengthening both the capacity and continuity of Rhode Island's clean energy workforce.

Retraining and Upskilling

Retraining and upskilling existing workers is necessary for those transitioning from traditional, fossil fuel–based industries of which are most at risk during the clean energy transition. Many of these workers bring valuable experience, including both technical and soft skills, which can serve as a solid foundation for new employment. There'd a need to make the connections between their current roles and their relevance to clean energy and climate solutions more explicit. For example, individuals with mechanical or systems experience might not initially recognize how their background could apply to HVAC, heat pumps, or building electrification. Rhode Island should capitalize on shared competencies between declining and emerging occupations by creating coordinated reskilling initiatives that connect at-risk workers to expanding clean energy sectors.

Short-term and accessible retraining programs are key. In many cases, transitioning workers may not need to pursue lengthy certification or degree programs. Instead, targeted, shorter-term retraining and upskilling pathways are often more appropriate—particularly for individuals who cannot afford extended periods of unpaid training due to financial obligations. **These programs should emphasize technical and trade-specific competencies that align with emerging clean energy jobs, rather than focusing primarily on general transferable skills.** Additionally, providing compensation or stipends and other wraparound support for training participation can further ensure that workers are not penalized economically during their transition and can fully engage in preparing for high-demand clean energy occupations.

There needs to be protections in place for workers displaced by a clean energy transition. Supporting legacy fossil fuel workers through career counseling and supplementary training is essential to help them understand what alternative fields are available, what roles match their skillsets, and how much additional training may be needed. While retraining and upskilling opportunities are core aspects of worker transition, older workers close to retirement may will require alternative compensation structures.

Unions

Rhode Island's labor unions must play an expanded role in building and sustaining the state's clean energy workforce by leading targeted recruitment, training, and curriculum development efforts in partnership with state agencies and training providers. Unions are uniquely positioned to communicate skill needs from the field to educators and workforce organizations, ensuring training programs align with job-site requirements—particularly in emerging areas such as electrification, offshore wind, and energy efficiency retrofits. By continuing and expanding their collaborations with the Department of Labor and Training, the Office of Energy Resources, and CTE programs, unions can help integrate soft skills, safety training, and hands-on experience into pre-apprenticeship and apprenticeship pipelines. Unions should also continue outreach in high schools, community colleges, and underserved communities to promote awareness of trade careers and pathways into clean energy work.

Managing Supply and Demand

The most effective approach to clean energy workforce development is to focus on specific, high-growth priority occupations, guided by state-specific data. The clean energy transition is projected to create strong demand for skilled trades—particularly Solar Installers, Lineworkers, HVAC/R Mechanics and Installers, Electricians, and Operating Engineers—whose work is critical to renewable energy deployment, weatherization, and other energy efficiency projects. At the same time, modest declines anticipated in certain supply chain roles underscore the need for targeted transition strategies to ensure balanced and sustainable workforce development. Expanding access to high-quality training programs for these priority occupations across all regions of the state is essential, as is ensuring that these jobs offer competitive wages and benefits that make them attractive career options. Finally, coordinated outreach and recruitment campaigns should highlight the stability, mobility, and long-term opportunity these occupations provide as Rhode Island continues to grow its clean energy economy.

Rhode Island should prioritize targeted investments and coordination to close critical workforce gaps in high-growth clean energy trades, particularly Solar Installers and Electrical Power-Line Installers and Repairers. Demand for these occupations is projected to double or more by 2035, yet the state currently has few dedicated training programs to prepare workers for these roles. Expanding capacity through partnerships among employers, unions, training providers, and state agencies will be essential to scaling the workforce needed to meet the state's electrification and infrastructure goals. **Rhode Island should facilitate coordination among training providers, employers, and state agencies to align program timing and capacity with projected industry growth, ensuring a ready and appropriately sized workforce as new clean energy opportunities accelerate.**

Additionally, to strengthen clean energy workforce pipelines and avoid supply shortages caused by sudden spikes in demand, Rhode Island can take a phased approach by investing in infrastructure that creates steady opportunities for hands-on experience in decarbonization projects. State-owned facilities can lead by example, undertaking energy retrofit and electrification projects that serve as training grounds while also acting as energy hubs that nearby small businesses and residential areas can connect to. Expanding investment in both pre-apprenticeship and registered apprenticeship programs—particularly in the building trades—will further enhance work-based learning opportunities, preparing Rhode Island's workforce for large-scale deployment in electrification, weatherization, and energy efficiency work as demand continues to grow.

Community Engagement and Equity

To make retraining and upskilling programs more effective, these programs must include strong community and workforce engagement. Workers should not feel blindsided or left behind by the energy transition. They need opportunities to help shape retraining programs so that they reflect real experiences, preferences, and barriers. State-level plans, such as retraining initiatives connected to climate action strategies, should include direct engagement with workers through internal briefings and invitations to participate in workforce strategy meetings, such as those held during the development of the 2025 Climate Action Strategy.

Engaging communities directly in workforce planning, feedback, and recruitment is also essential. Decision-making processes should be community-led, ensuring residents and local organizations have a voice in shaping programs that affect them. To achieve this, stakeholder meetings for future workforce initiatives should be designed for accessibility—offered both in-person and virtually, scheduled at varied times (including evenings and weekends), and hosted in locations across the state. Online surveys can further expand participation by reaching those unable to attend in person. Feedback opportunities should remain open for extended periods, be widely promoted through local partners and community networks, and be used strategically to engage key stakeholder groups, particularly those historically underrepresented in clean energy employment.

To achieve a just transition, Rhode Island must ensure that clean energy training opportunities are accessible to all residents, regardless of where they live. While overall training availability is relatively balanced statewide, gaps in access remain at the local levels—particularly in parts of Providence County and Newport county. The state should work proactively to identify and address

these gaps by mapping training access at the town and city level and expanding programs in underserved areas, including Woonsocket and Newport.

Community engagement should continue to serve as a direct bridge to opportunity—connecting residents with training programs, apprenticeships, and employment pathways in the clean energy sector. Partnering with local organizations and schools can help ensure that recruitment efforts reach diverse communities, and that Rhode Islanders are aware of, and prepared for, emerging clean energy careers.

Rhode Island's training ecosystem already demonstrates progress toward a more inclusive and accessible workforce system. Training providers across the state are expanding participation by offering programs in multiple languages, locating centers within environmental justice communities, and partnering with local organizations to reach diverse residents. Some programs also provide tailored support for formerly incarcerated individuals, recognizing the barriers that background checks can create. **Expanding efforts to compensate trainees from disadvantaged communities and adopting "train-the-trainer" models can further strengthen trust and opportunity within underrepresented groups. Ongoing collaboration among employers, community organizations, and training providers will be vital to ensuring that all Rhode Islanders can equitably share in the benefits of clean energy workforce growth.**

Increasing funding and programs for wraparound services are also fundamental to a just transition. These services, which can range from preparation services like resume help and interview prep to housing, transportation, and childcare support and stipends, ensure that workers facing barriers, as well as those in disadvantaged communities, have the opportunity to pursue training opportunities.

A coordinated workforce strategy should align closely with Rhode Island's decarbonization plans and commitment to expanding access to opportunities to ensure the state's climate goals can be achieved through a well-prepared, locally rooted workforce. This strategy should be grounded in established just transition principles and build upon the foundational work of groups such as the GWAC. To be effective, the strategy must include a broad coalition of stakeholders, including industry partners, state agencies such as DLT and OER, and worker support organizations like Climate Jobs Rhode Island. Engagement with Black, Indigenous, and People of Color-led community organizations is also essential to ensure equity is embedded in all workforce development efforts. Industry leaders, such as offshore wind developers, should be viewed as critical participants, as their future projects have the potential to drive major employment opportunities and serve as a vehicle for advancing labor priorities in the state's clean energy transition.

Stakeholder Engagement

Overview of Stakeholder Engagement Process

The Rhode Island Office of Energy Resources (OER) and Department of Environmental Management (DEM), in partnership with the consulting teams, led a comprehensive, multi-phase stakeholder engagement process throughout 2025. This work supported the development of both the Comprehensive Climate Action Plan (CCAP) and the RI 2025 Climate Action Strategy Plan.

Figure 30: Overview of Stakeholder Engagement Process
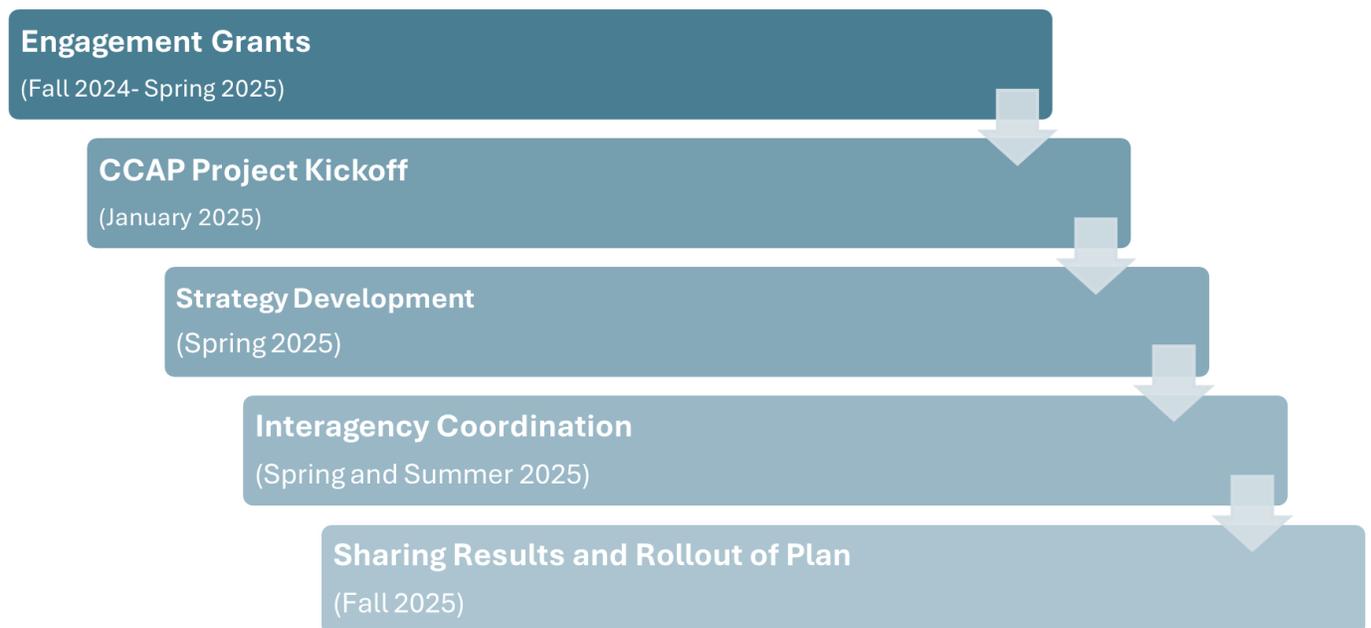
Engagement Grants: DEM provided grants to six community groups for direct engagement with community members. These projects were conducted from the fall of 2024 through the spring of 2025. The project team held several meetings with these groups for collaborative learning and discussion of what community members were saying. The reports and outcomes were incorporated into the themes and policy recommendations in the strategy.

Project Kickoff: In January 2025, Rhode Island OER and DEM kicked off the stakeholder engagement process for the RI CCAP.

Plan Development: From February to May 2025, the project team conducted extensive stakeholder engagement to inform the RI CCAP. This phase included:

+ Ten public stakeholder meetings, covering key topic areas such as transportation, energy, buildings, workforce, municipalities, and environmental justice. Most of the meetings were

held online via Zoom, while 3 were held in-person, in Woonsocket, Providence, and Newport.

+ Ongoing technical engagement, including release of Pathways model inputs and assumptions for public comment, and dedicated Q&A sessions with state agencies.

+ Coordination with RI's utilities and RIPUC.

+ Two in-person working sessions with transportation and buildings-focused state agencies to develop near-term GHG strategies based on stakeholder priorities.

+ Multiple channels of feedback, including verbal input, chat comments, breakout sessions, in-person notes, surveys, and SmartComment submissions.

+ Continued engagement with project grantees as they finalized their projects and submitted reports.

+ Presentations to RIEC4, RIEC4 Advisory Board, and the RIEC4 Science & Technical Advisory Board

Interagency Coordination: In spring and summer of 2025, the project team met with a cross section of state agencies to further develop the GHG reduction strategies in each sector. Activities included multiple 3-hour working sessions with building and transportation-focused agencies to discuss GHG reduction strategies for consideration.

Sharing Results and Rollout of Plan: In Fall 2025, the project team held three public webinars to discuss key modeling results and framing for the plan. In December 2025, the project team held a final public webinar to present the final report. Specific activities included:

+ Interagency meetings and presentation of results to key building, transportation, and energy-focused agencies

+ Three public webinars focused on the major themes: *Carbon Reduction Strategies*, *Pathways to Decarbonization*, and *Workforce and the Green Economy*.

+ Release of the Executive Summary for the RI Climate Action Strategy for public comment.

+ Release of the modeling outputs (in an Excel workbook and CSV files) for public review.

+ Presentations to RIEC4, RIEC4 Advisory Board, and the RIEC4 Science & Technical Advisory Board.

+ A final public webinar to present the complete plan and next steps.

In addition to these meetings and in-person engagements, the state posted data inputs and key assumptions online for public review and comment. 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. Throughout the process, an online SmartComment portal remained open to collect ongoing input and maintain transparent communication with all interested stakeholders.

Throughout both phases, stakeholder input directly informed the design of climate strategies, ensuring that the final plans reflect local priorities, community insights, and technical rigor. This memo summarizes key themes heard from stakeholders across the 2025 engagement process.

A summary of public meetings held for development of the CCAP are summarized in Table 45 below, along with attendance for each meeting.

Table 45: 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
	Final Webinar	December 19, 2025	

Overall, RIDEM gathered feedback using several methods, such as:

+ Verbal comments made during meetings
+ Comments made in the Zoom chat box during meetings
+ Comments made during breakout group sessions in virtual meetings
+ Notes made on posters during in-person meetings
+ Survey responses
+ SmartComment responses
+ Meetings with project grantees who did direct community engagement
+ Reports from engagement projects and lessons learned from community meetings

Summary of Results

Stakeholder input played a central role in shaping the RI CCAP. Through public meetings, webinars, surveys, and written comments, community members, municipal leaders, advocates, technical experts, and the public shared perspectives on priorities, barriers, and opportunities across sectors. Common themes included the urgent need for implementation, stronger coordination across agencies and sectors, and deep, sustained engagement with Environmental Justice communities. Feedback also emphasized affordability, equitable access to programs, workforce transition, and localized capacity building. These insights informed both the content and structure of the Climate

Action Strategy by helping to prioritize near term action, refine policy design, and align strategies with community identified needs.

Feedback heard during the stakeholder engagement process was analyzed and organized into key categories, including:

+ Crosscutting themes
+ Transportation
+ Buildings
+ Energy
+ Municipalities
+ Environmental Justic and Equity
+ Workforce

Key findings by category are discussed in detail below, and more information can be found on the state's [Climate Change Webpage](#) in the Stakeholder Feedback Summary.[151]

Cross-Cutting Themes

+ **Desire to shift from planning to immediate, well-funded implementation of climate strategies:** There was consistent emphasis on the need for clear accountability mechanisms, timelines, and transparent progress tracking to ensure that actions are followed through and not delayed by additional rounds of planning. This urgency was emphasized specifically in discussions around building decarbonization and public transit investments.
+ **Concern of fragmentation and lack of coordination across state agencies, municipalities, utilities, and transit authorities:** Stakeholders highlighted the need for cross-sector and interagency collaboration, especially in areas like transportation planning, electric vehicle (EV) infrastructure deployment, and energy system upgrades. Participants urged the state to provide clearer guidance and streamlined processes to help municipalities and community groups align with statewide climate goals.
+ **Resilience and climate risk integration:** Many stakeholders linked climate mitigation with adaptation, emphasizing that decarbonization strategies must also build resilience to flooding, sea-level rise, and extreme heat in frontline communities.

Environmental Justice and Equity

+ **Equitable investments:** Participants called for prioritizing investments in low-income and historically overburdened communities, including targeted programs for weatherization, electrification, clean transport, and resilience. Stakeholders particularly emphasized the need for targeted investments for transportation decarbonization strategies to deliver direct

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[151] https://climatechange.ri.gov/media/1946/download?language=en

benefits to environmental justice communities. Specific recommendations included reliable bus service, improved bus stop infrastructure, bus electrification, and upgrades to sidewalks and bike lanes to ensure accessibility.

+ **Education and engagement:** Participants stressed the importance of transparent decision making, open access to data, and frequent public communication. Building trust, particularly in EJ communities will require intentional outreach, culturally relevant materials, and ongoing opportunities for two-way engagement, not just during major planning milestones. There was a clear message that engagement must go beyond one-time consultations and instead be community-led, sustained, and reflective of local priorities, particularly in neighborhoods disproportionately impacted by pollution, climate risks or underinvestment.

+ **Affordability:** Stakeholders stressed the importance of making decarbonization accessible by reducing upfront costs, expanding incentives, simplifying application processes, and ensuring rebates and financing options are available to renters, low-income households, and small businesses

+ **Address displacement and gentrification risks:** Participants expressed concern that building decarbonization efforts could contribute to the displacement of low-income renters if not designed or implemented equitably. Stakeholders suggested solutions such as embedding tenant protections into building upgrade programs in order to maintain housing stability.

Transportation

+ **Expand EV charging infrastructure:** Stakeholders emphasized the need to grow Rhode Island's EV charging network, especially in rural areas, multifamily housing, and EJ communities. Key recommendations included improving charger reliability, supporting vehicle-to-grid technologies, and integrating EV planning with local infrastructure efforts.

+ **Strengthen public transit:** There was widespread support for increasing investment in RIPTA, expanding service areas, and fully implementing the Transit Master Plan. Transit was viewed as essential public infrastructure deserving long-term funding and coordination with land use planning.

+ **Promote mode shift:** Participants urged the state to reduce car dependence by investing in biking, walking, and greenway infrastructure, especially in tandem with transit-oriented development and land use reforms that support compact, walkable communities.

+ **Electrify bus fleets:** Electrification of school and public bus fleets was strongly supported as a near-term strategy to reduce emissions and modernize transit.

+ **Ensure affordability and accessibility:** Stakeholders emphasized that transportation systems, EVs and public transit alike, must be affordable, reliable, and accessible to low-income Rhode Islanders. Incentives for low-income EV adoption were recommended.

Buildings

+ **Accelerate equitable electrification:** Electrification of residential and commercial buildings is widely supported. Participants emphasized the need to address barriers such as high upfront costs, split incentives between landlords and renters, and risks of tenant displacement.
+ **Mandate all-electric new construction:** Many stakeholders supported policies that require all-electric systems in new buildings and discourage further investment in natural gas infrastructure.
+ **Expand incentives and financing:** Heat pump incentives, low-interest loans, and pre-weatherization support were seen as essential to enable equitable electrification. Participants also supported electricity rate structures that make electric heating affordable.
+ **Retrofit aging buildings:** Upgrading existing buildings was seen as critical, particularly those facing structural or health barriers such as mold and lead. Stakeholders emphasized the need for programs that prepare buildings for electrification and weatherization.
+ **Adopt performance standards and benchmarking:** Stakeholders recommended setting energy performance standards for large buildings and requiring benchmarking as a foundational tool to track and reduce emissions.
+ **Focus on execution:** Delays due to extended planning were a concern. Stakeholders urged the state to focus on executing existing building strategies with measurable outcomes and adequate funding.

Workforce

+ **Grow an inclusive, skilled clean energy workforce:** Participants called for accessible job training programs, apprenticeships, and community college partnerships to prepare workers for roles in EV deployment, solar installation, building upgrades, and related fields.
+ **Support workers in transition:** Stakeholders emphasized the need for transition planning and job protections for fossil fuel-related workers (HVAC technicians, oil delivery personnel). Supportive policies, trust-building, and public recognition were seen as vital.
+ **Center equity in workforce development:** Wraparound support such as childcare, transportation assistance, and language access were recommended to ensure broader participation. Participants stressed the need for family-sustaining wages and benefits, particularly for underrepresented communities.
+ **Coordinate across sectors:** Stakeholders recommended stronger coordination among workforce boards, municipalities, unions, and economic development agencies to align training and hiring efforts with climate goals.
+ **Workforce development:** Across multiple sessions, participants emphasized the need to build a strong, inclusive clean energy workforce. This includes accessible training programs, certification pathways, and wraparound supports such as childcare, transportation assistance, and language access. There was widespread agreement that

green jobs should be secure, well-paid, and come with benefits, particularly for workers impacted by fossil fuel phase-out, such as HVAC technicians and fuel delivery workers.

Energy

+ **Grid modernization:** Stakeholders also expressed broad support for modernizing the grid. Smart grid technologies were seen as critical to improving system reliability, enhancing resilience, and reducing long-term infrastructure costs.
+ **Distributed energy resources:** Participants voiced strong support for distributed energy resources. Many called for increased investment in rooftop and community solar, virtual power plants, and thermal energy networks.

Municipalities

+ **Advance decarbonization of municipal facilities:** Stakeholders advocated for expanded renewable energy and energy efficiency projects on municipal properties (solar carports, streetlights, heat pumps). Support for municipal aggregation was also raised as a way to boost local energy control.
+ **Invest in regional planning and coordination**: Participants highlighted the need for regional collaboration across towns to align energy, housing, and infrastructure strategies reducing duplication and maximizing shared benefits.
+ **Build local capacity:** Many smaller municipalities lack the staff, funding, and expertise needed to advance climate goals. Stakeholders requested state-provided tools, templates, and technical assistance to help local governments plan and implement projects effectively.
+ **Establish resilience hubs:** Participants recommended creating resilience hubs in vulnerable areas to maintain access to energy, water, cooling, and other essential services during climate emergencies.
+ **Prioritize equity at the local level:** Stakeholders emphasized the importance of targeting municipal climate investments in EJ communities, improving access to localized data, and ensuring local plans reflect equity goals.

Summary and Key Findings

+ **Implementation and coordination:** Stakeholders broadly expressed frustration with slow progress and emphasized the need for immediate, well-funded implementation of climate strategies, rather than additional planning phases. Participants frequently noted the fragmentation of climate-related efforts across agencies and called for better coordination, especially in areas like transportation, land use, housing, and energy infrastructure.
+ **Equitable access and community trust:** Equity was a dominant concern especially in the context of electrification, transit investments, and incentive programs. Stakeholders called for prioritization of low-income and EJ communities when pursuing GHG reduction

strategies, more user-friendly program/funding design, and meaningful community engagement that builds long-term trust.

+ **Clean energy and electrification:** Electrification of buildings and transportation paired with grid modernization and expansion of distributed energy resources was seen as central to achieving climate goals. There was strong interest in heat pumps, EV charging, and solar access. At the same time, stakeholders stressed the need to address barriers to building electrification, find solutions to prevent displacement or gentrification after building upgrades, and address the split incentive between landlords and renters. Participants also emphasized the need for broader EV charging infrastructure to support transportation electrification and expanded public transit access.

+ **Affordability and workforce transition:** Stakeholders expressed concern about affordability impacts of climate policy, especially on vulnerable populations. There was strong support for workforce transition planning, job training, and protecting workers currently in fossil fuel-related industries. Participants highlighted the need for the growing workforce to include jobs with good wages, benefits, and opportunities for advancement.

Metrics and Tracking Progress

Rhode Island recently launched a new Climate Dashboard as a way of tracking/informing Rhode Islanders about the State's progress on meeting the mandates in the Act on Climate, performance of incentive programs, education of RI's future workforce and related topics. It also links to other important dashboards developed by other member agencies of the RIEC4 that track related metrics. Where performance goals have been established, we can track progress.

Measures identified and modeled above which can currently be tracked in RI's climate dashboard include:

+ RI's Renewable Energy Standard
+ DRIVE EV Incentives
+ Public fleet electrification (state fleet)
+ Transit electrification
+ Clean Heat RI (heat pump) incentives
+ Energy efficiency (impacts)

Rhode Island will continue to modify the dashboard as needed to incorporate additional information/data on measures currently not tracked in the dashboard. Information about maintaining carbon sinks (e.g. via natural & working lands), Advanced Clean Cars II/Advanced Clean Trucks, school bus electrification, organic waste diversion, NEVI charging infrastructure, VMT/mode shift, weatherization incentives/programs, RI's biodiesel blending requirements, and the New England Heat Pump Accelerator program can all be considered for future edits/additions to the dashboard.

For measures that require future regulatory or statutory amendments, RIDEM will work with the RI General Assembly, Office of Regulatory Reform, Office of the Governor and other RIEC4 agencies to

discuss and outline potential implementation opportunities. This includes measures such as: travel pricing mechanisms, all electric new construction requirements, building decarbonization, building performance standards, a clean heat standard, facility emission standards, and fuel blending requirements. RIDEM will report out on progress on measures that require regulatory or statutory authority in its 2027 Status Update.

Conclusion

Rhode Island's 2025 CCAP and related 2025 Climate Action Strategy will provide options for implementation for reducing emissions while advancing affordability and job opportunities. Many actions, programs, laws and regulations have already been put in place to advance the state's climate goals including the Renewable Energy Standard, State Energy Efficiency Program, Clean Heat Rhode Island, Electric Vehicle and Electric Bicycle Rebate Programs, Biodiesel Heating Oil Act, and investments in renewables, all of which are key to advancing progress. Rhode Island has met the first GHG reduction target set by the Act on Climate for 2020 and is striving to reach its 2030 target thanks to the efforts outlined withing this CCAP. This CCAP and the 2025 RI Climate Action Strategy will guide the state's next steps to ensure Rhode Island continues to meet the Act on Climate targets.

As was highlighted in the RI 2022 Climate Update and 2024 PCAP, discussions of identifying and allocating resources to support ongoing and new decarbonization efforts will continue. The decarbonization and transition of our economy must be done carefully, and deliberately with affordability in mind, to meet the goals set forth in the Act on Climate. This will require both internal and external expertise and support for action across all of government. However, it is important to emphasize that acting on climate change cannot be championed by state government alone. Businesses, municipalities, non-profit leaders and residents will continue to be called upon to prioritize action towards RI's greenhouse gas reduction goals. The RIEC4 looks forward to working with the Governor's Office and state legislative leaders beginning in 2026 to consider the measures identified in this report.

Appendix A.

A.1. Crosswalk Between RI CCAP and CPRG Requirements

Table 46: Crosswalk Between RI CCAP Components and EPA CPRG Requirements

Requirement	Met in RI CCAP?	Relevant Chapter
GHG Inventory	Yes	GHG Inventory
GHG Emissions Projections	Yes	Emissions Projections
GHG Reduction Targets	Yes	Near-Term and Long-Term GHG Reduction Targets
Quantified GHG Reduction Measures	Yes	GHG Reduction Measures
Benefits Analysis	Yes	Benefits Analysis
Authority to Implement GHG Reduction Measures	Yes	GHG Reduction Measures
Intersection with Funding Availability	Yes	GHG Reduction Measures
Workforce Planning Analysis	Yes	Workforce Planning Analysis
Meaningful Engagement	Yes	Stakeholder Engagement

A.2. Detailed Pathways 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 demands 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

- o Agriculture
- o Coal Mining
- o Natural Gas & Oil Systems
- o Industrial Processes & Product Use (IPPU)
- o Waste
- o 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).

The final energy demands from Pathways are typically passed to energy supply models like the E3 RESOLVE model for electricity sector capacity expansion and the E3 fuels optimization module to determine the cost and emissions associated with meeting final energy demands under various resource and emissions constraints. Figure 31 below shows the process flow for a typical economy-wide analysis using Pathways in conjunction with these other tools. Using energy supply models to optimize electricity sector costs and emissions rates and fuel prices and blend levels is not required to generate economy-wide outputs using Pathways, as users also have the option to input pre-determined emissions rates and prices for all fuels within Pathways itself.

Figure 31: Flow chart of Pathways model used in conjunction with energy supply tools
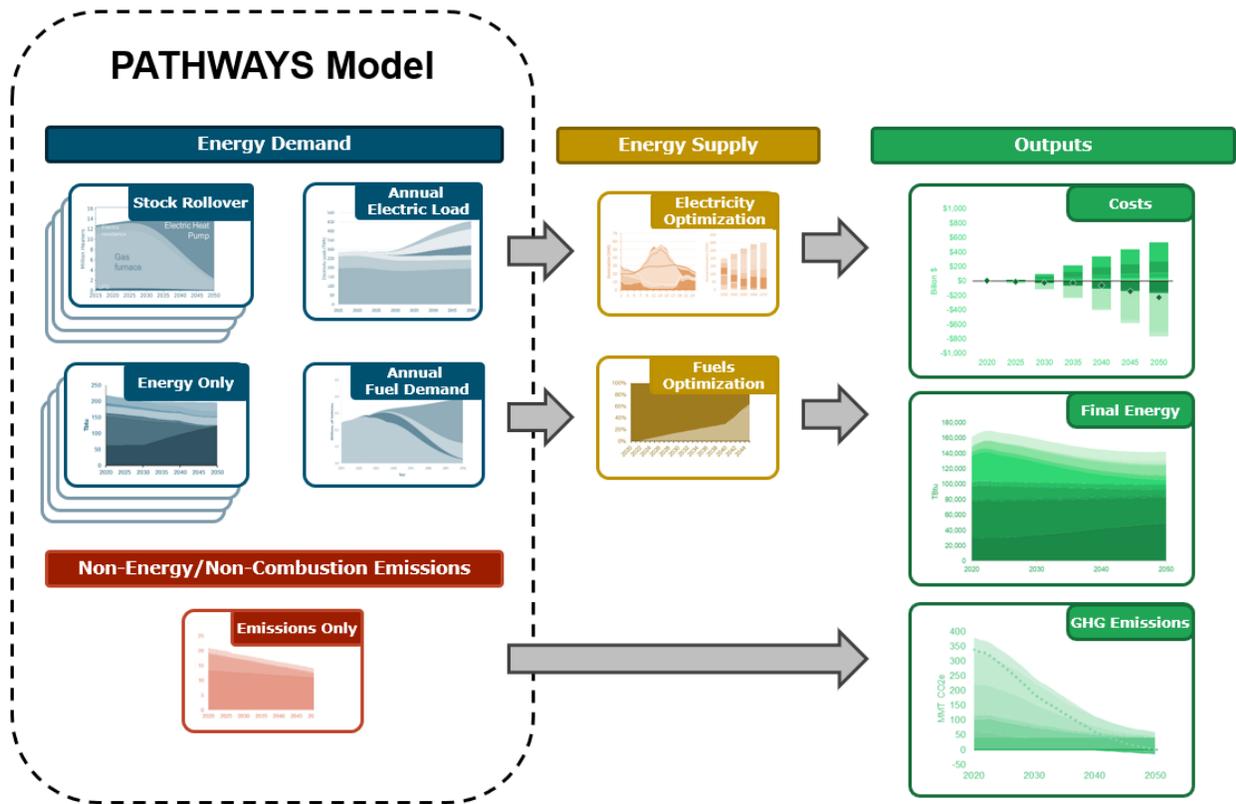
Stock Rollover Subsectors

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.[152] For future years, the total stock is determined using growth rates for various key indicators (e.g., population). Table 47 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).

Table 47: Stock rollover subsectors in Pathways

Subsector	Key Driver
Residential Clothes Drying	Households
Residential Clothes Washing	Households
Residential Cooking	Households
Residential Dishwashing	Households

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

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.

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

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:

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

$$\hat{A}_{ijk} = A_{(i-1)jk} - P_{ijk} \qquad \text{A.2}$$

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:

$$\sum_j Q_{ijk} = X_{ik} * \sum_j \hat{A}_{ijk} \qquad \text{A.3}$$

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:

$$\tilde{A}_{ijk} = \hat{A}_{ijk} - Q_{ijk} \qquad \text{A.4}$$

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:

$$Y_{ijk} = \left(P_{ijk} * B_{ijk}\right) + \left(Q_{ijk} * D_{ijk}\right) + \left(r_i - \sum_{jk} \tilde{A}_{ijk}\right) * B_{ijk} \qquad \text{A.5}$$

- 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:

$$A_{ijk} = \tilde{A}_{ijk} + Y_{ijk} \qquad \text{A.6}$$

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_{ikf}^S, represents the energy demand year i for device type k and fuel type f. E_{ikf}^S is calculated as shown in Equation 2.7:

$$E_{ikf}^S = d_{ik} * \sum_j X_{ijkf} * (A_{ijk} \div F_{ijkf}) \qquad \text{A.7}$$

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

$$E_{if}^S = \sum_k E_{ikf}^S \qquad \text{A.8}$$

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

Table 48: Stock rollover default data sources

Subsector	Stocks	Service Demands	Device Efficiency	Device Costs
Residential Clothes Drying	EIA RECS[153]	EIA NEMS[154]	EIA NEMS, Martin et al., 2016[155]	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[156]	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[157]	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, E3 2024[158]	Clean Heat Rhode Island Project Data
Residential Multi Family Space Heating	EIA RECS	EIA NEMS	EIA NEMS, E3 2024	Clean Heat Rhode Island Project Data

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[153] U.S. Department of Energy, Energy Information Administration. (2023). *Residential Energy Consumption Survey 2020*; https://www.eia.gov/consumption/residential/data/2020/

[154] U.S. Department of Energy, Energy Information Administration. (2023). *National Energy Modeling System*; https://www.eia.gov/outlooks/aeo/nems/documentation/

[155] Martin et al. (2016). *Measured Performance of Heat Pump Clothes Dryers*. https://www.aceee.org/files/proceedings/2016/data/papers/1_160.pdf

[156] Sweeney et al. (2014). *Induction Cooking Technology Design and Assessment*. https://www.aceee.org/files/proceedings/2014/data/papers/9-702.pdf

[157] 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

[158] E3. (2024). *Rhode Island Investigation into the Future of the Regulated Gas Distribution Business: 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

Subsector	Stocks	Service Demands	Device Efficiency	Device Costs
Residential Water Heating	EIA RECS	EIA NEMS	EIA NEMS	E3 2024
Commercial Air Conditioning	EIA CBECS 2018[159]	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[160]	RI MOVES	BTS and VIUS for existing vehicles[161], EIA AEO 2023 for future year ICE vehicles[162], Slowik et al., 2022 for EVs [163]	Slowik et al., 2022, Edmunds 2024[164]
Transportation Light Medium Duty Trucks	RI MOVES	RI MOVES	VIUS for existing vehicles, EIA AEO 2023 for future year vehicles	Mullholland, 2022[165]

[159] U.S. Department of Energy, Energy Information Administration. (2022). *Commercial Building Energy Consumption Survey 2018*; https://www.eia.gov/consumption/commercial/data/2018/

[160] 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

[161] 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

[162] U.S. Department of Energy, Energy Information Administration. (2023). *Annual Energy Outlook 2023*; https://www.eia.gov/outlooks/aeo/

[163] 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

[164] https://www.edmunds.com/car-buying/average-price-electric-car-vs-gas-car.html

[165] 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

Subsector	Stocks	Service Demands	Device Efficiency	Device Costs
Transportation Medium Duty Trucks	RI MOVES	RI MOVES	VIUS for existing vehicles, EIA AEO 2023 for future year vehicles	Slowik et al., 2023[166]
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[167]	Slowik et al., 2023

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[166] 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

[167] 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 49 below lists the default energy only subsectors used in Pathways.

Table 49: 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, E3 proposes to hold underlying energy demand in industry flat, as natural gas demand has maintained 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.

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:

$$\hat{E}_{if}^{I}, = E_{if}^{I0} - \sum_{g}\left(E_{if}^{I0} * W_{ifg}\right) + \sum_{g}\left(E_{if}^{I0} * W_{igf} \div V_{igf}\right) \qquad \text{A.9}$$

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_{if}^I, as shown in Equation 3.2:

$$E_{if}^I, = \hat{E}_{if} * (1 - R_{if})$$ A.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 50 below lists the default data sources for key inputs to the energy only subsectors.

Table 50: Energy only default data sources

Subsector	Base Year Energy Demand	Energy Efficiency Costs	Electrification Costs	CCS Costs
Residential Other	EIA SEDS[168], RIDEM[169]	Schiller et al., 2020[170] and Frick et al., 2021[171]	Smillie et al., 2024[172]	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[173], EIA SEDS, RIDEM	Schiller et al., 2020 and Frick et al., 2021	Zuberi et al., 2022[174] and DOE 2023[175]	NETL 2014[176]
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

[168] 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

[169] 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

[170] 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

[171] 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

[172] S. Smillie, D. Alberga, R. Loken, S. Bharadwaj, T. Clark, A. Mahone, "Measuring Economic Potential for Decarbonization Industrial Heat," Energy and Environmental Economics, Inc., October 2024; https://www.ethree.com/wp-content/uploads/2024/10/CAELP-E3-Industrial-Electrification-Report.pdf

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

[174] 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

[175] 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

[176] 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

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 51 below lists the default emissions only sectors and subsectors used in Pathways.

Table 51: 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

Sector	Subsector	Pollutant
	Urea Consumption	CO2
	Phosphoric Acid Production	CO2
	Petrochemical Production CO2	CO2
	Carbide Production and Consumption CO2	CO2
	Lead Production	CO2
	Zinc Production	CO2
	Magnesium Production and Processing CO2	CO2
	Petrochemical Production CH4	CH4
	Carbide Production and Consumption CH4	CH4
	Iron and Steel Production CH4	CH4
	Ferroalloy Production CH4	CH4
	Adipic Acid Production	N2O
	Nitric Acid Production	N2O
	N2O from Product Uses	N2O
	Caprolactam and Others Production	N2O
	Electronics Industry N2O	N2O
	ODS Substitutes	CO2e
	HCFC-22 Production	CO2e
	Magnesium Production and Processing	CO2e
	Aluminum Production	CO2e
	Electronics Industry	CO2e
	Electrical Transmission and Distribution	CO2e
Waste	Waste Combustion CO2	CO2
	Landfills	CH4
	Wastewater Treatment CH4	CH4
	Composting CH4	CH4
	Anaerobic Digestion	CH4
	Waste Combustion CH4	CH4
	Wastewater Treatment N2O	N2O
	Waste Combustion N2O	N2O
	Composting N2O	N2O
Land-Use, Land-Use Change, and Forestry (LULUCF)	LULUCF CH4 Sources	CH4
	LULUCF N2O Sources	N2O
	LULUCF Carbon Stock Change	CO2

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:

$$\gamma_{ip} = \gamma_{ip}^0 - \alpha_{ip} \qquad\qquad \text{A.11}$$

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

Table 52: 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[177]	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[178]	E3 2024[179]
Industrial Processes and Product Use (IPPU)	*ODS Substitutes*	RIDEM	BAU forecast from EPA regulatory impact analysis for HFC rulemaking[180]	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[181]

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[177] U.S. Environmental Protection Agency. (2023). *U.S. State-level Non-CO₂ GHG Mitigation Report*; https://www.epa.gov/global-mitigation-non-co2-greenhouse-gases/us-state-level-non-co2-ghg-mitigation-report

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

[179] 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

[180] 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

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

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 energy demands by fuel type from Pathways can be passed to a set of energy supply optimization tools like E3's RESOLVE electricity sector capacity expansion model and E3's fuels optimization module. RESOLVE calculates optimal long-term electricity generation and transmission investments subject to reliability, policy, and technical constraints. The fuels optimization module calculates what production and allocation of low carbon fuels like biofuels, electrolytic fuels, and fossil fuels with negative emissions technology, provides the lowest cost portfolio that meets final energy demands and economy-wide emissions targets. Both RESOLVE and the fuels optimization tool provide emissions rates and prices for electricity and fuels, respectively, that are used to calculate final economy-wide emissions and costs.

Pathways can still be used to calculate economy-wide results on its own without the use of energy supply optimization models, but requires the user to enter predetermined annual emissions rates and prices for electricity and emissions rates, prices, and fuel blends for all liquid and gaseous fuel types. The default assumptions for fuel prices in Pathways are taken from the Reference case forecast in EIA AEO23.

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

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:

$$E_{ic} = \sum_f (E_{if} * \rho_{ifc}) \qquad\qquad \text{A.12}$$

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[182]. Subsector emissions, γ_{ip}, for each year i pollutant p are calculated as shown below:

$$\gamma_{ip} = \sum_c (E_{ic} * \beta_{icp}) \qquad\qquad \text{A.13}$$

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:

$$\gamma_i^{CCS} = \sum_f (E_{if} * \beta_f * \tau_{if} * \mu_{if}) \qquad\qquad \text{A.14}$$

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:

$$\gamma_i^{CCS} = \gamma_i * \tau_i * \mu_i \qquad\qquad \text{A.15}$$

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

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[182] 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

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:

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

A.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.

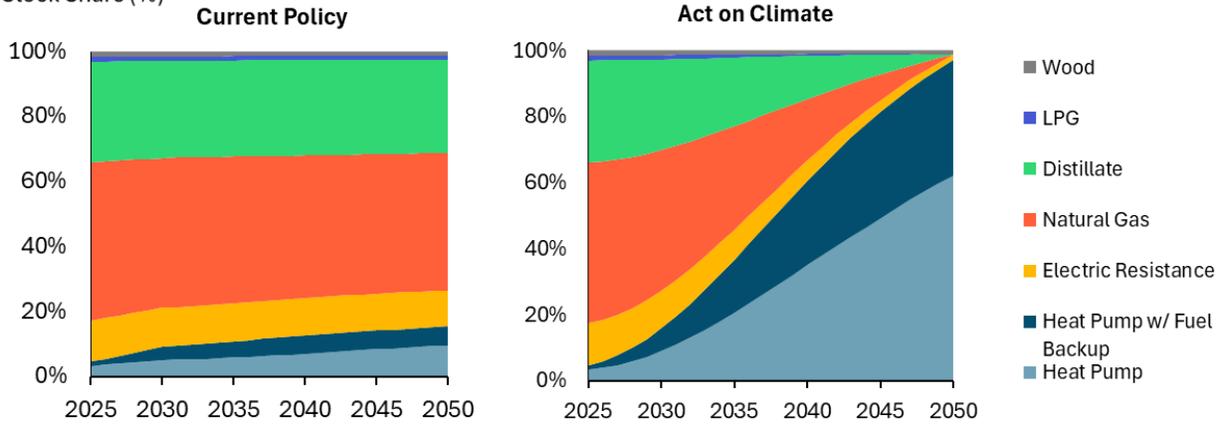## Figure 32: Residential Space Heating Sales and Stocks by Equipment Type (%)

Res Space Heating Sales Transition
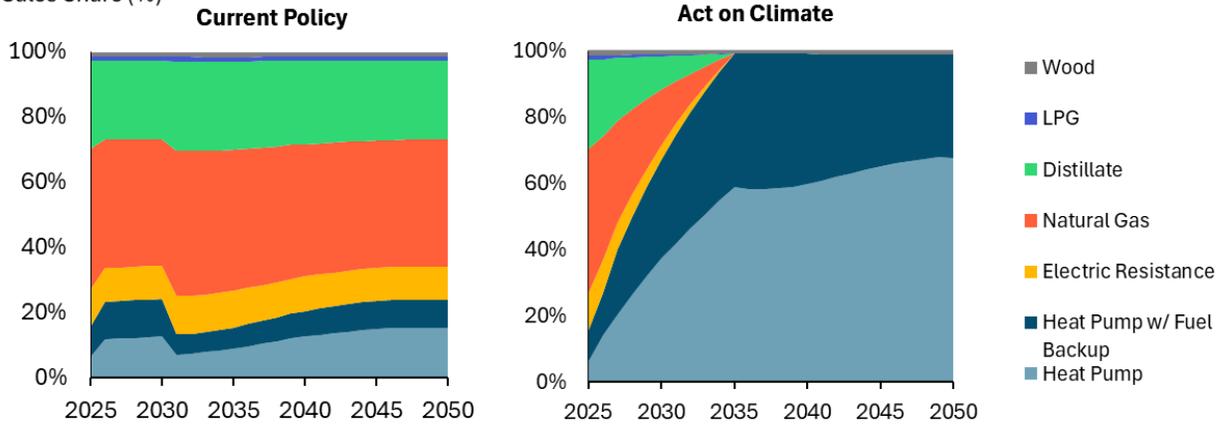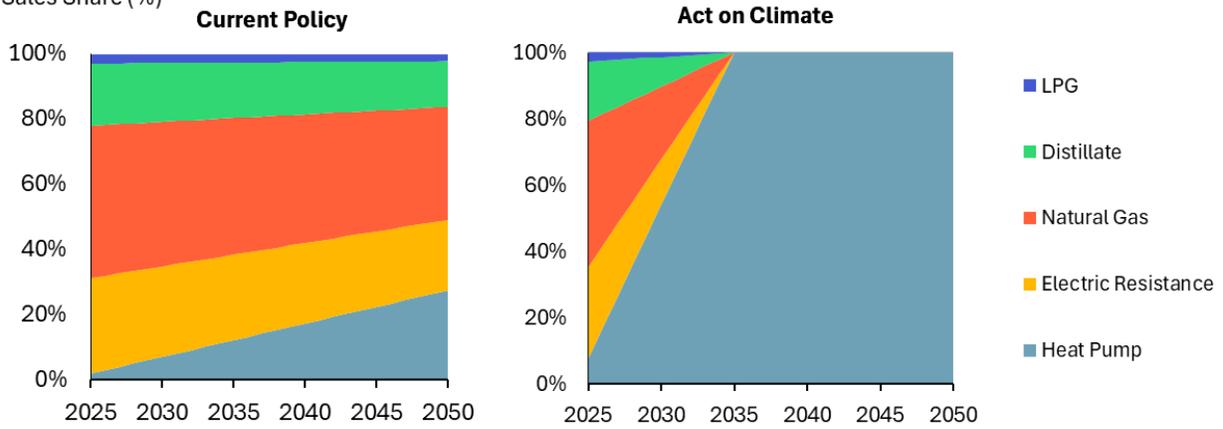
Sales Share (%)

Res Space Heating Stock Transition

Stock Share (%)

Figure 33: Residential Water Heating Sales and Stocks by Equipment Type (%)
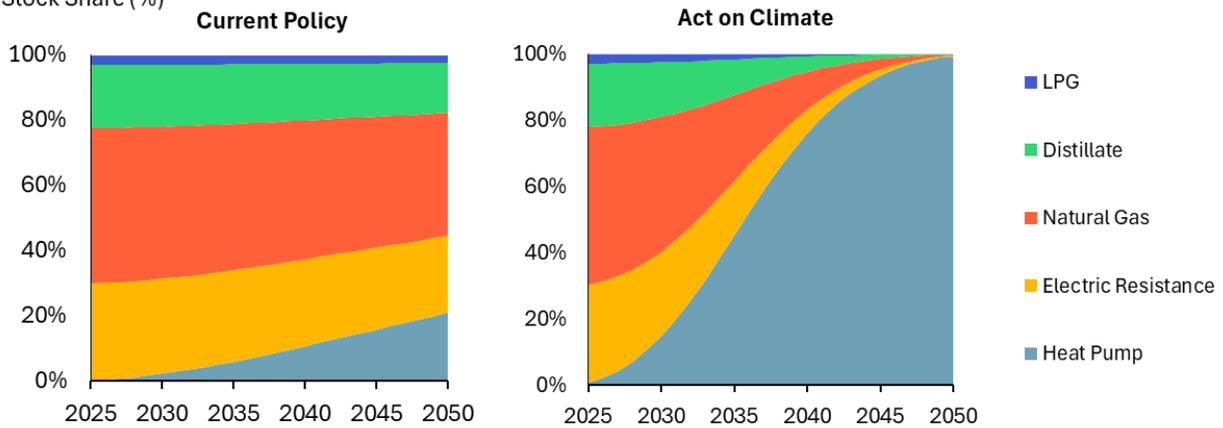
Res Water Heating Sales Transition
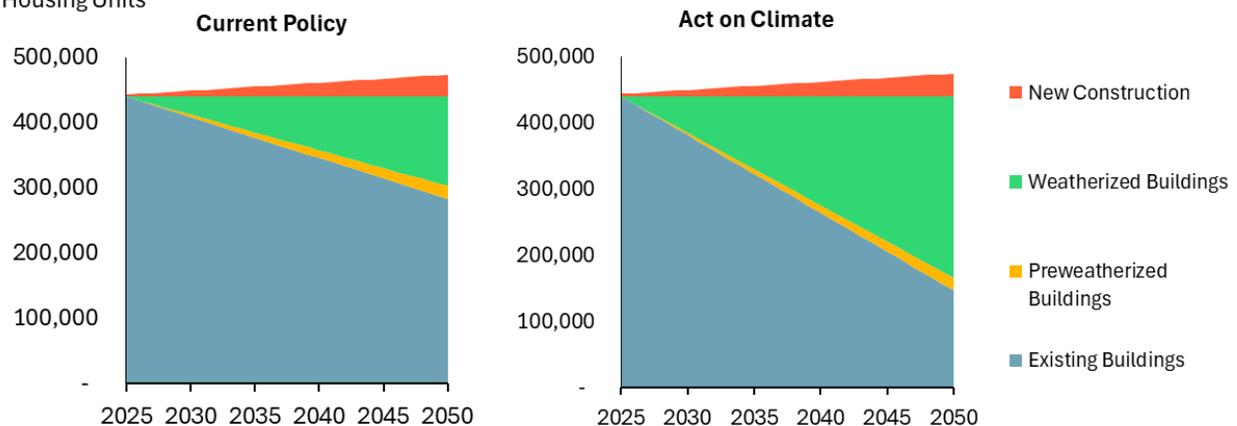
Sales Share (%)

Res Water Heating Stock Transition

Stock Share (%)

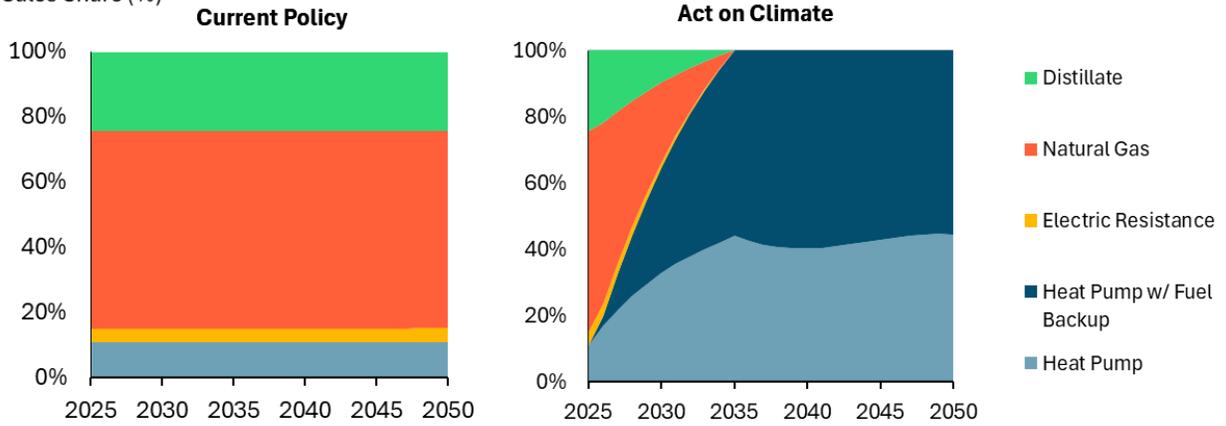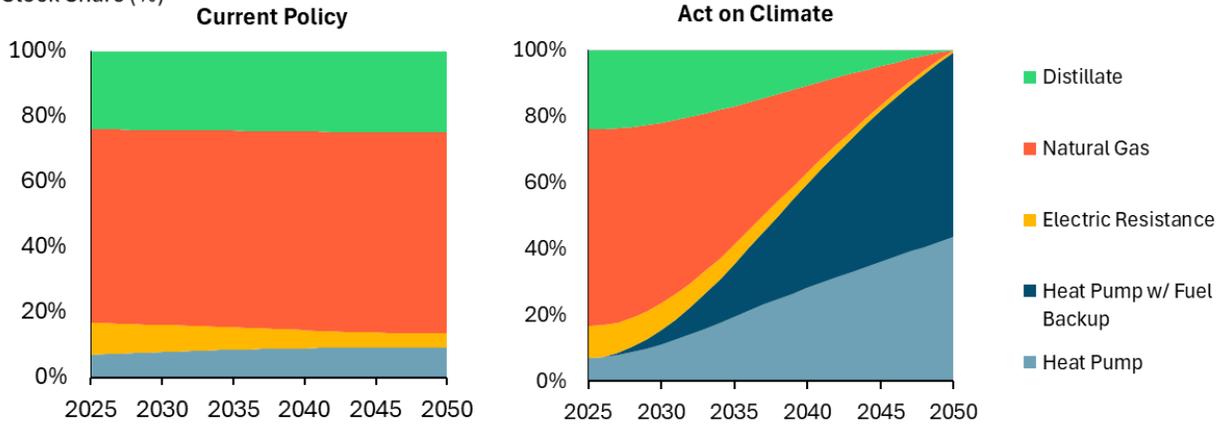## Figure 34: Residential Buildings by Envelope Type (# of housing units)

Residential Building Stock Transition

Housing Units

Figure 35: Commercial Space Heating Sales and Stocks by Equipment Type (%)

Com Space Heating Sales Transition

Sales Share (%)

Com Space Heating Stock Transition

Stock Share (%)

Figure 36: Commercial Water Heating Sales and Stocks by Equipment Type (%)
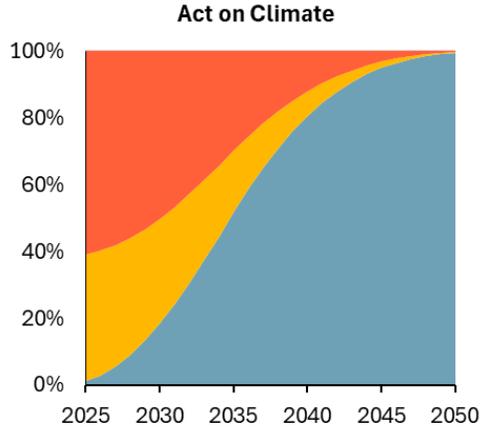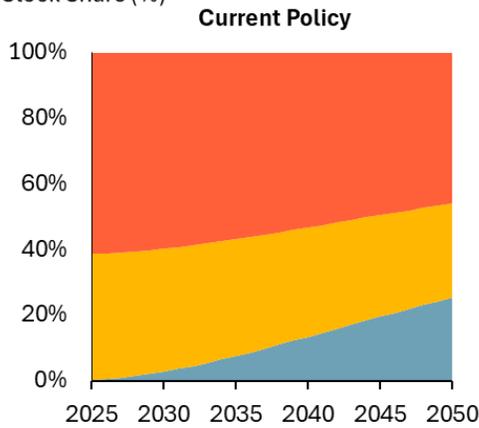
Com Water Heating Sales Transition
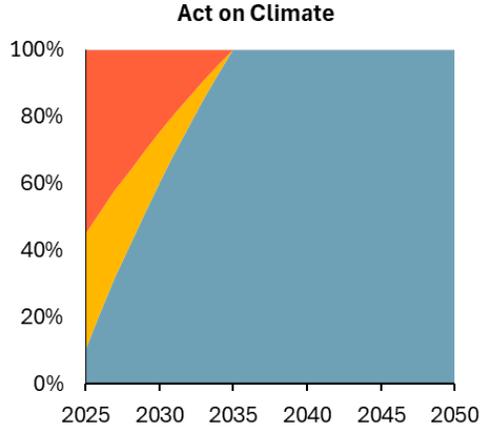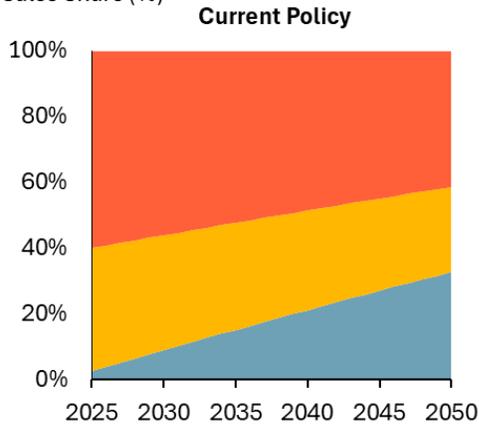
Sales Share (%)

Com Water Heating Stock Transition

Stock Share (%)

Figure 37: Light-Duty Vehicle Sales and Stocks by Vehicle Type (%)

Light Duty Vehicle Sales Transition
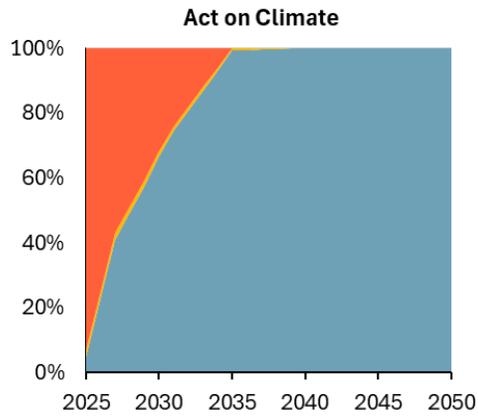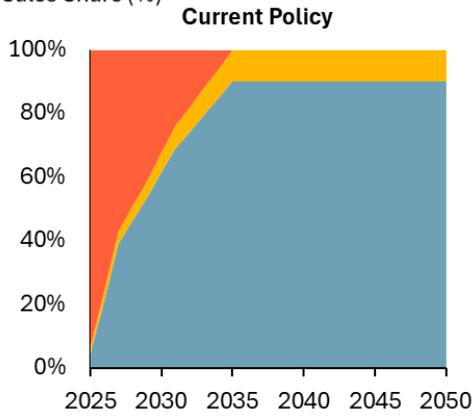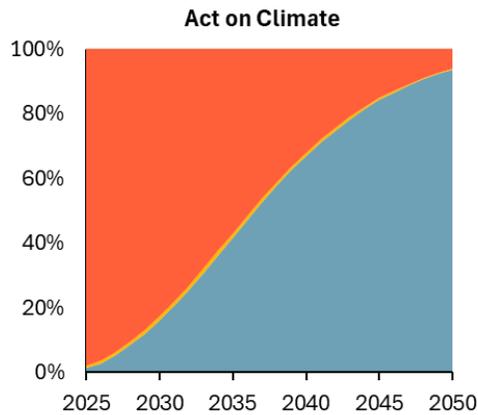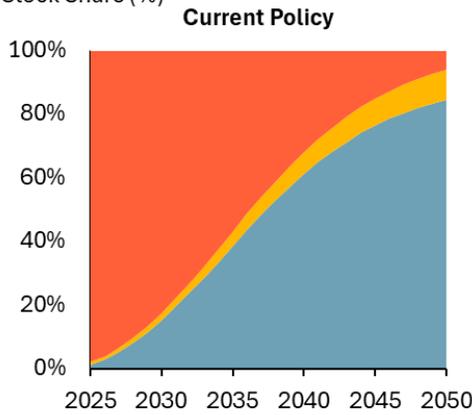
Sales Share (%)

Light Duty Vehicle Stock Transition

Stock Share (%)

Figure 38: Medium- and Heavy-Duty Vehicle Sales by Vehicle Type (%)

Medium & Heavy Duty Vehicle Sales Transition
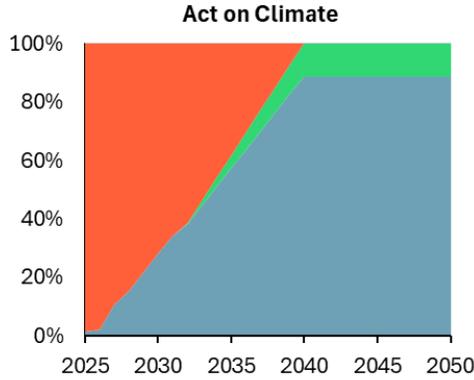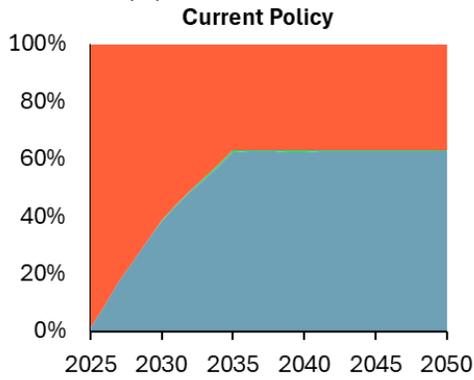
Sales Share (%)

Medium & Heavy Duty Vehicle Stock Transition

Stock Share (%)
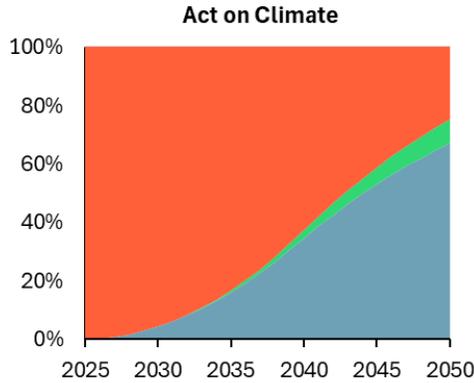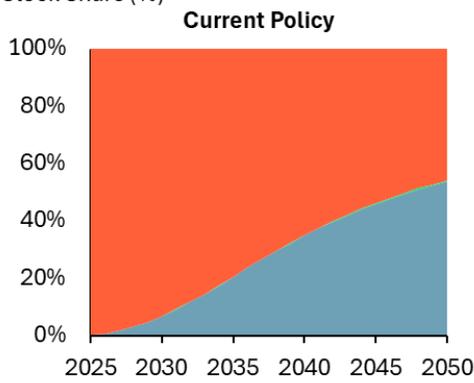
Final Energy Demand Outputs

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 39: Final Energy Demand in Buildings

Buildings Energy Demand by Fuel Type
TBtu
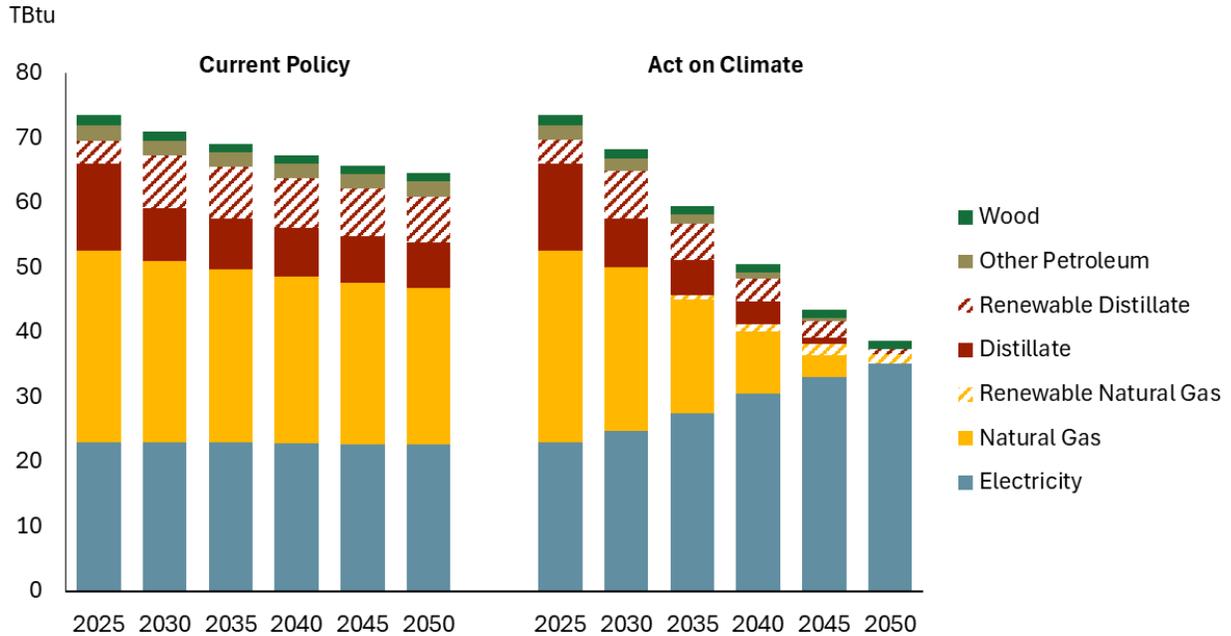
Figure 40: Final Energy Demand in Industry

Industrial Energy Demand by Fuel Type
TBtu
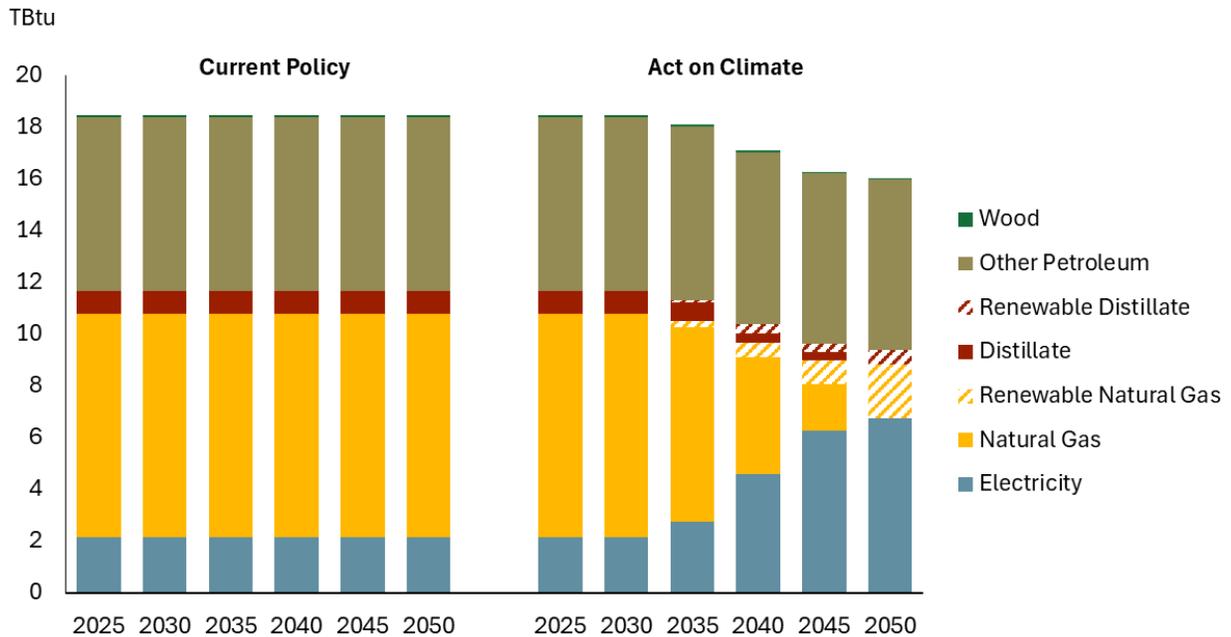
Figure 41: Final Energy Demand in Transportation

Transportation Energy Demand by Fuel Type

TBtu

Legend (Figure 41):
- Other Petroleum
- Renewable Jet Fuel
- Jet Fuel
- Renewable Distillate
- Distillate
- Gasoline
- Renewable Natural Gas
- Natural Gas
- Hydrogen
- Electricity
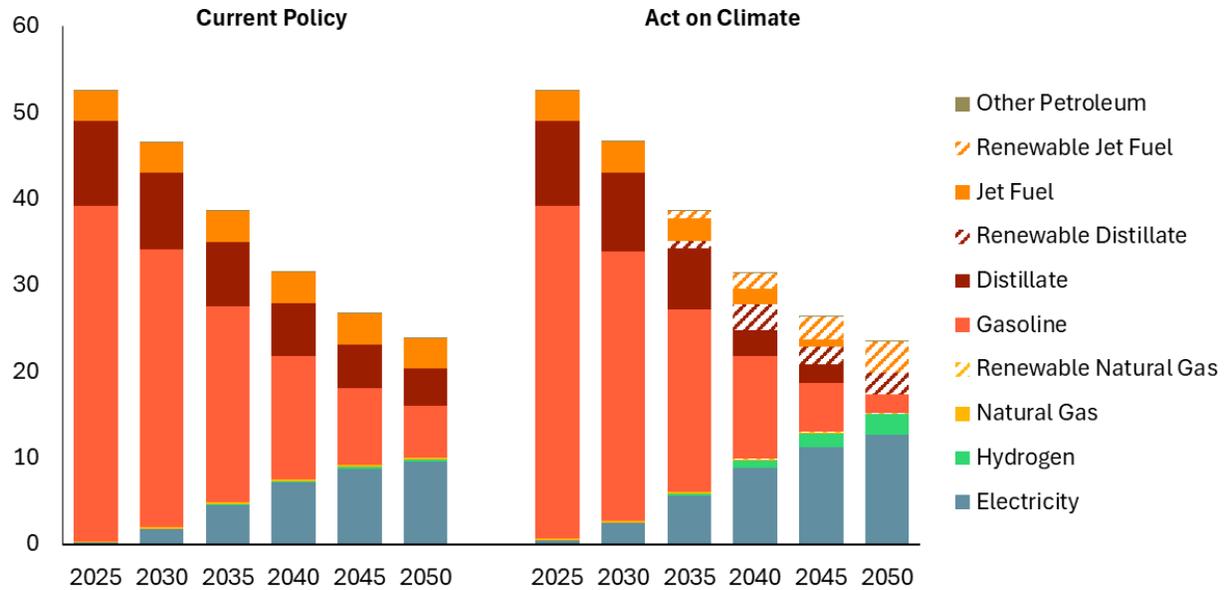
Figure 42: Final Energy Demand Across All Sectors

Economy-wide Energy Demand by Fuel Type

TBtu

Legend (Figure 42):
- Wood
- Other Petroleum
- Renewable Jet Fuel
- Jet Fuel
- Renewable Distillate
- Distillate
- Gasoline
- Renewable Natural Gas
- Natural Gas
- Hydrogen
- Electricity
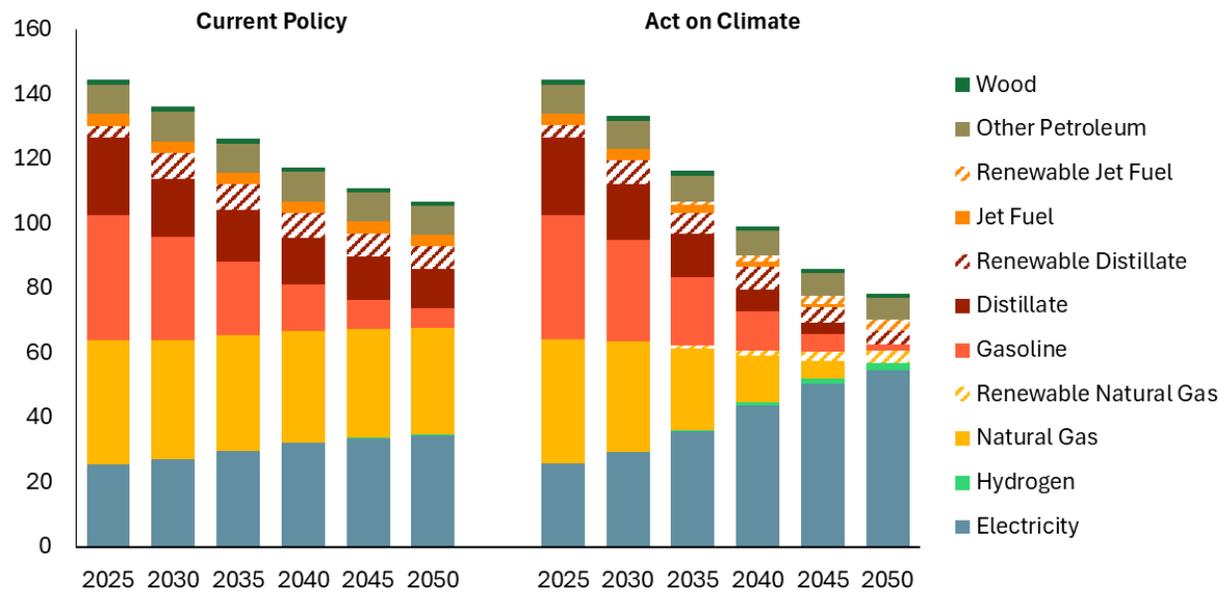
A.3. Workforce Modeling Methodology

Summary of Input-Output Models

Input-output (I/O) modeling is used to generate employment estimates based on different investments or changes in a given economy over time. The research team used two different I/O models, **IMPLAN** and the National Renewable Energy Laboratory's (NREL) **JEDI** (Jobs and Economic Development Impact) model software for this purpose. Input-output models illustrate the interdependent relationships between different sectors of a region's economy. Investments or activities in a given sector are used as inputs into the model to estimate the ripple or multiplier effect on business, household, and government expenditures and industry employment.

I/O models are static, and do not incorporate changes to labor and capital productivity over time. They are not dynamic models or equilibrium-seeking models and thus do not incorporate changes to prices due to changes in supply or demand given an economic event. I/O models like IMPLAN and JEDI rely on Social Accounting Matrix (SAM) which uses U.S. Bureau of Economic Analysis (BEA) data and state level economic agency data to track expenditures throughout the economy. Since there are no statistical analyses run in the research team's use of I/O modeling, there is unfortunately no margin of error to be calculated. However, uncertainty can be categorized into two main categories:

1. **Scenario uncertainty:** or uncertainty in assumptions about Rhode Island's energy future. This depends on the realization of the investments and energy activities on the timeline reported in the outputs of the energy system modeling.

2. **Model build uncertainty:** this uncertainty lies in the research teams' decisions on which IMPLAN industries or JEDI models best fit the activities and investments involved in the changes in each energy sub-sector. This relies on the researcher's expertise and understanding of both the energy technologies and the I/O modeling software. The research team seeks to avoid this uncertainty by leveraging decades of experience in the energy economy and I/O economic modeling.

I/O modeling outputs are broken down into direct, indirect, and induced impacts. **Direct effects** show the change in the economy associated with the initial economic activity. An example of a direct job would be a construction worker hired to work on the installation of a new high efficiency heat pump. **Indirect effects** include all the backward linkages or the supply chain responses resulting from the initial direct economic activity. An example of an indirect job added to the local economy would be a new worker at a fabrication company hired to handle the increased demand for construction equipment resulting from the initial investment. **Induced effects** refer to the effects of increased household spending and are the result of direct and indirect workers spending their wages within the local economy. An example of an induced job would be a local restaurant hiring more staff because construction workers during the construction phase have new disposable income and eat at this local restaurant.

IMPLAN runs user input investment into one or more of IMPLAN's industry codes in a specific region through regional data, mapping economic interactions between industries, households, and

governments to estimate job creation associated with the investment.[183] JEDI estimates job creation by running user input of project location facility size and year of construction, in combination with the built-in model defaults and economic multipliers.[184]

Sector Framework

The technical analysis will estimate employment across Rhode Island's Electricity, Fuels, Buildings, and Transportation sectors. Employment outputs do not extend to parts of the employment supply chain that are not connected to the four primary sectors. The Electricity, Fuels, Buildings, and Transportation sectors are further broken down into the following 27 sub-sectors:

1. **Electricity**
   a. Distributed Solar
   b. Utility Solar
   c. Offshore Wind
   d. Land-based Wind
   e. Hydropower
   f. Other Renewable Generation (biomass, hydrogen, geothermal)
   g. Distribution (local power lines and local smart grid)
   h. Transmission (regional transmission hub)
   i. Storage (batteries, flywheels, thermal energy, pumped hydro)
   j. Natural Gas Generation
   k. Other Fossil Generation (coal, oil, and other fossil fuel burning plants)
   l. Nuclear

2. Fuels
   a. Hydrogen
   b. Biofuels (ethanol, bio-gasification, biomass fast pyrolysis)
   c. Natural Gas
   d. Natural Gas Distribution (natural gas pipelines, liquid natural gas trucks and tankers)
   e. Other Fossil Fuels (oil and gas, coal, kerosene)

3. **Buildings**
   a. Commercial HVAC (pipes, sheet metal, air conditioning)
   b. Commercial Other (lighting fixtures, water heating, cooking appliances)

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[183] For more information on IMPLAN and its data sources, see https://support.implan.com/hc/en-us/articles/360038285254-How-IMPLAN-Works.

[184] While users have the option of inputting project-specific data (i.e., construction costs, equipment costs, annual operating and maintenance costs, financing parameters, etc.), JEDI provides default values (i.e., "average costs and spending patterns developed from a number of sources") for these categories if nothing is inputted by the user. These inputs are then run through the JEDI multipliers, which are derived from IMPLAN. For more information on the data used in the JEDI model, see https://www.nrel.gov/analysis/jedi/using-data.html.

    c. Residential HVAC (sheet metal, air conditioning and heating)
    d. Residential Shell (paintings, coatings, insulation, windows, and doors)
    e. Residential Other (laundry, refrigerators, lighting fixtures, water heaters, cooking appliances, and other household appliances)

4. **Transportation**
    a. Vehicle Manufacturing (electric vehicles, conventional vehicles, and dual-use technologies)
    b. Wholesale Trade Parts (wholesale of vehicle components)
    c. Charging Stations (manufacturing, installation, and maintenance)
    d. Vehicle Maintenance
    e. Conventional Fueling Stations (fossil fuel fueling stations)

Initial Employment Output Methodology

The Initial Employment Outputs (IEOs) estimate the quantity of jobs by value chain in the baseline year (2023) and then in five-year increments, in 2025, 2030, 2035, 2040, 2045, and 2050. The value chain details the industry area in which direct and indirect jobs are employed, which include Construction, Manufacturing, Professional Services, Other Supply Chain, [185] and Induced employment.[186] IEOs are provided for each sub-sector and scenario and are reported at the state level.

The IEOs generated for this analysis follow the same general methodological approach across the four primary sectors, with the most relevant tools and data sources based on what is appropriate for each sub-sector. Assumptions made within specific sub-sectors vary due to the nature of the different activities, however the general structure remains consistent. The IEO methodology follows six steps:

1. Initially, the research team determines the unit inputs for the model. Unit inputs typically come from the forecasts developed by E3 data and take the form of device stocks and sales, MW of electric capacity, and fuel demand over time.

    a. **Example:** For the Storage sub-sector within the Electricity sector, the research team will use storage cost data from forecasts developed by E3.

2. Next, the research team determines the total investments associated with the unit inputs described in Step 1 above. Investment inputs come from the forecasts developed by E3 data where provided, and additional investments are developed based on secondary sources where needed. For more information on additional input into each sector, see Inputs and Assumptions by Sector.

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[185] The Other Supply Chain value chain includes utilities, wholesale trade, repair and maintenance, etc.
[186] While induced employment is broken out into its own category, the Construction, Manufacturing, Professional Services, and Other Supply Chain value chains include both direct and indirect employment.

    a. **Example:** For the Storage sub-sector, the research team will aggregate the storage cost data from forecasts developed by E3 to find total investment for each of the study years.

3. Next, the research team processes the investment data to reduce inter-annual variation as needed.
4. Next, the research team allocates the processed investment data into the relevant industry categories based on the activities associated with the investments by using technical cost data from secondary sources.

    a. **Example:** For the Storage sub-sector, the research team will allocate investment into IMPLAN code 52 - Construction of new power and communication structures. The research team will use technical cost data from NREL's U.S. Solar Photovoltaic System and Energy Storage Cost Benchmark: Q1 2020[5]report to create a custom spending pattern within IMPLAN code 52.[6]

5. Next, the research team applies IMPLAN/JEDI industry employment multipliers based on the allocation described in Step 4 to calculate employment outputs.

    a. **Example:** For the Storage sub-sector, the research team runs $1 million of investment into IMPLAN code 52 - Construction of new power and communication structure to find the employment supported per $1 million of investment. These are then multiplied by the E3 investment values for each year (in millions of dollars) to estimate employment outputs for each year.

6. Finally, employment outputs are reported by industry category (Construction, Professional Services, Manufacturing, Other Supply Chain, and Induced). The 2023 baseline employment is derived from the [2024 United States Energy and Employment Report](#) (USEER) unless otherwise stated.

Secondary Employment Output Methodology

The Secondary Employment Output (SEO) estimates translate the direct and indirect employment[187] estimated generated by the IEOs into occupational outputs, illustrating how jobs would change by occupation and wage distribution across the region. SEOs are presented for the baseline year (2023) and 2035 by detailed occupations for each sub-sector.

The methodology for conversion of IEO data to SEO outputs includes three steps and both primary (2024 USEER) and secondary (IMPLAN, BLS,[188] OEWS,[189] etc.) data sources. The steps are as follows:

+ Complete a crosswalk of IMPLAN industry categories to 6-digit North American Industry Classification System (NAICS) codes for each of the sub-sectors by each of the value chain categories as defined in the IEOs:

    • Construction

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[187] SEO estimates do not include induced employment.
[188] Bureau of Labor Statistics
[189] Occupational Employment and Wage Statistics (OEWS)

- Professional services
- Manufacturing
- Other supply chain

+ Run direct and indirect employment from IEOs through proprietary staffing patterns (NAICS to SOC[190]) for each of the value chain categories within each sub-sector for 2023 and 2035. SEO outputs include employment estimates by SOC code and total estimated employment by detailed occupations and aggregated occupational categories in 2023 and 2035 for each of the sub-sectors.

+ Using finalized staffing patterns and proportional employment within sub-sector and value chain categories, wages provided by the BLS OEWS data series are grouped into three tiers: Tier 1, or above a sustaining wage; Tier 2, or at a sustaining wage; and Tier 3, or below a sustaining wage.[191] Proportional employment by wage tier is presented for 2023 and 2035 using 2023 dollars.

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[190] Standard Occupational Classification (SOC) system is used to classify occupations. Read more: https://www.bls.gov/soc/
[191] Wage tiers are determined using MIT's Living Wage Calculator: https://livingwage.mit.edu/