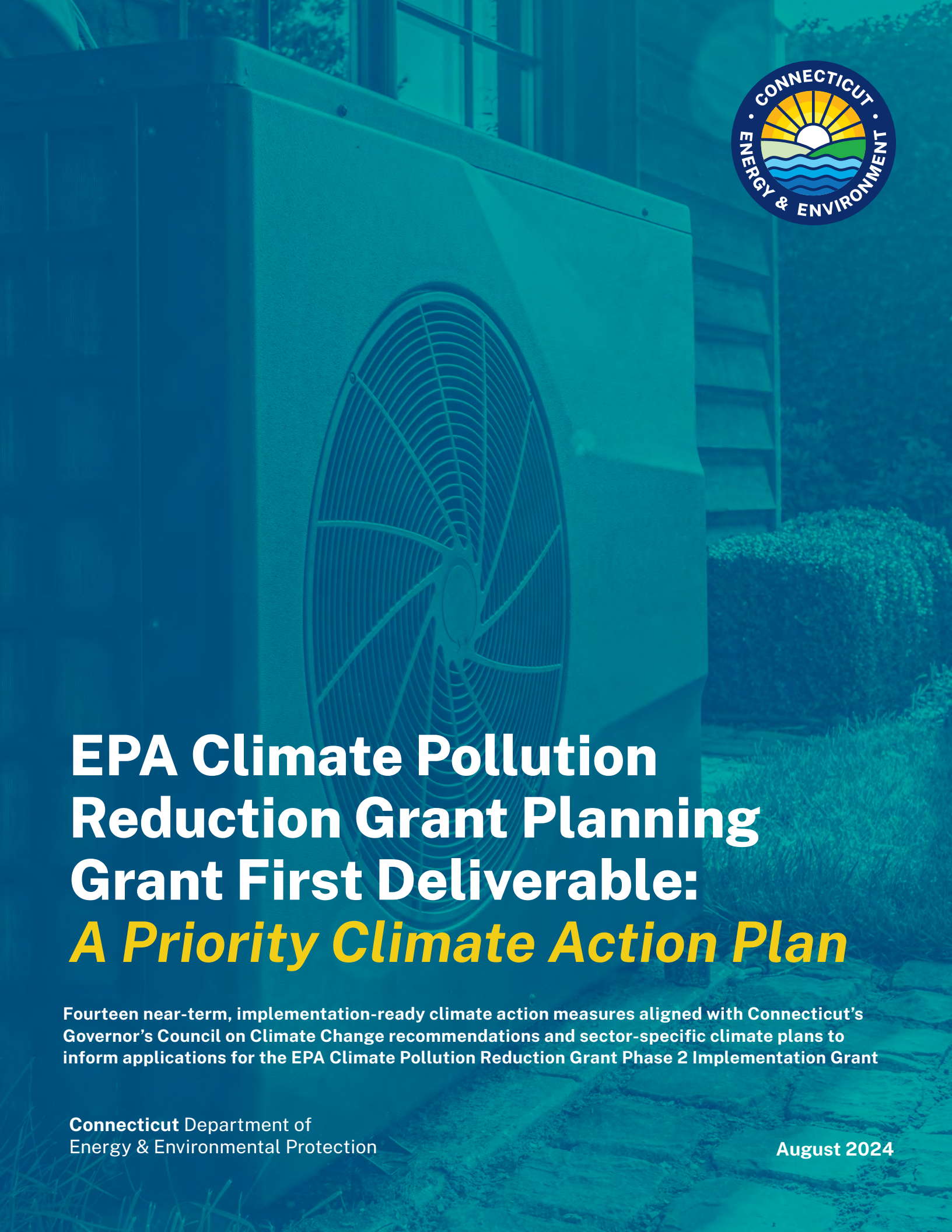

EPA Climate Pollution Reduction Grant Planning Grant First Deliverable: *A Priority Climate Action Plan*

Fourteen near-term, implementation-ready climate action measures aligned with Connecticut's Governor's Council on Climate Change recommendations and sector-specific climate plans to inform applications for the EPA Climate Pollution Reduction Grant Phase 2 Implementation Grant

Connecticut Department of
Energy & Environmental Protection

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Contents

Disclaimer

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Tables

Acronyms, Abbreviations and Definitions

BAU: Business-as-usual scenario. Describes the development of the concentration of greenhouse gas emissions in the atmosphere under the assumption that no further efforts to reduce emissions will be made.

CAPs: Criteria air pollutants

CCAP: Comprehensive Climate Action Plan

CEEJAC: Connecticut Equity and Environmental Justice Advisory Council

CO2e: Carbon dioxide equivalent. The number of metric tons of CO2 emissions with the same global warming potential as one metric ton of another greenhouse gas.

COGs: Councils of Governments in Connecticut, which are regional planning organizations that bring together the leaders of the state's municipalities

CPRG: Climate Pollution Reduction Grant

DOE: Department of Energy

DOT: Department of Transportation

EPA: Federal Environmental Protection Agency

EEJ: Equity and Environmental Justice

EJ: Environmental Justice

CT DEEP: Connecticut Department of Energy and Environmental Protection

GHG: Greenhouse gas

GC3: Connecticut's Governor's Council on Climate Change

HAPs: Hazardous air pollutants

HFCs: Hydrofluorocarbons

LIDACs: Low income and disadvantaged communities

Mitigation: Reducing emissions of and stabilizing the levels of heat-trapping greenhouse gases in the atmosphere.

(Hazard) Mitigation: Efforts to reduce loss of life and property by lessening the impact of disasters.

MSA: Metropolitan Statistical Area

MMT: Million metric tons

NOx: Nitrogen Oxides

PCAP: Priority Climate Action Plan

PM2.5: Particulate matter 2.5 micrometers or smaller

PFCs: Perfluorochemicals

RGGI: Regional Greenhouse Gas Initiative

SO2: Sulfur Dioxide

VOC: Volatile Organic Compounds

VMT: Vehicle Miles Traveled

ZEVs: Zero-Emissions Vehicles

The Climate Pollution Reduction Grant Climate Action Plans

A Priority Climate Action Plan – implementation-ready climate action measures for federal funding

The Connecticut Department of Energy and Environmental Protection (CT DEEP) developed this State Priority Climate Action Plan (PCAP) with funding from the Climate Pollution Reduction Grant (CPRG) program: Phase 1 Planning Grant from the U.S. Environmental Protection Agency (EPA) designated by the federal Inflation Reduction Act (IRA) of 2022. CT DEEP received $3 million in formula funds from EPA for the completion of this PCAP and a Comprehensive Climate Action Plan (CCAP). This PCAP is focused on identifying immediately implementable climate actions that are likely to be competitive when applying for CPRG implementation funding. The CCAP, which will be developed over a longer time-horizon, will create a roadmap for Connecticut to achieve necessary emission reductions across all sectors.

The EPA also awarded planning funds to three Connecticut Metropolitan Statistical Areas (MSAs), the Pequot Tribal Nation, and the Mohegan Tribe to develop PCAPs and CCAPs covering their geographic areas. The MSA plans are led by the relevant Council of Governments (COGs):

- WestCOG & MetroCOG: **Bridgeport-Stamford-Norwalk MSA**
- SCRCOG & NVCOG: **New Haven-Milford MSA**
- CRCOG & RiverCOG: **Hartford-East Hartford-Middletown MSA**

This State PCAP contains 14 implementation-ready climate action measures in the sectors of transportation, buildings, electricity, waste, and natural and working lands that:

- Align with Connecticut's existing climate action plans, including the Governor's Council on Climate Change (GC3) January 2021 report and the state's sector-specific climate plans (see Table 1; see also CT DEEP's **Climate Change webpage**, which highlights some of the key plans).
- Were considered competitive for funding under the CPRG program Phase 2 Implementation Grant when qualitatively evaluated against EPA's scoring criteria for that grant, including maximizing greenhouse gas (GHG) emission reductions in the near-term of 2025-2030 and with significant benefits to low income and disadvantaged communities (LIDACs), per EPA's terminology.
- Are implementable within the 5-year period of performance to meet the CPRG Implementation Grant requirement that all grant funds be spent by October 2029.
- Have existing entities within the state with the authority to implement these actions; e.g., these 14 actions do not require additional statutory authority to be implemented.
- Have a funding gap and need that could be met by the funds available from the CPRG alone or in combination with other funding sources.

Eligible entities for the CPRG Phase 2 Implementation Grant within Connecticut, which includes municipalities, Councils of Governments, and Tribes, may reference the 14 climate action measures for the purpose of applying for funding to implement that climate action. According to the Notice of Funding Opportunity issued by EPA for funding under the CPRG, entities may only apply for CPRG Implementation Grant funding for climate action measures (also known as "greenhouse gas reduction measures") included in a PCAP that covers their geographic area. The State PCAP covers all eligible entities; a regional plan from an MSA or Tribe may also cover them. The entity's Implementation Grant application may refer to either or both PCAPs. EPA will not award Implementation Grant funding for the same climate action in the same geographic location. (Therefore, eligible entities should please contact CT DEEP at **DEEP.climatechange@ct.gov** if they are planning to apply for funding aligned with a climate action in the State PCAP to avoid this situation. Coordination of applications is critical to maximizing potential CPRG funding being awarded to Connecticut. For more information go to: **https://www.epa.gov/inflation-reduction-act/about-cprg-implementation-grants**.)

The 14 highly focused, near-term implementation-ready climate actions in this State PCAP best met the criteria above for federal funding opportunities from the EPA CPRG. If implemented with additional federal funding, these 14 measures can help Connecticut meet its greenhouse gas emission reduction targets to fight climate change and benefit low income disadvantaged communities in the state by ensuring cleaner air, creating good jobs, and lowering energy bills.

This PCAP contains the required elements from the EPA CPRG Planning Grant guidance (see Sec. 15.3. of **EPA CPRG Planning Grants Program Guidance for States-Municipalities-Air Agencies 03-01-2023**) as follows:

- Greenhouse Gas Inventory
- Quantified Greenhouse Gas Reduction Measures (14 Climate Action Measures)
- Benefits Analysis (Reduction in Co-pollutants)

- Low Income Disadvantaged Communities (LIDACs) Benefits Analysis
- Review of Authority to Implement
- Intersection with Other Funding Availability (focused on other federal funding opportunities through the Bipartisan Infrastructure Law and the Inflation Reduction Act)

Additional information on Connecticut's existing climate plans, statutory economy-wide greenhouse gas emissions reduction targets, and the coordination and engagement activities conducted during the planning process are also included.

The role of the 14 climate action measures within Connecticut's climate change landscape

This PCAP aligns with — but does not replace — the pathways and recommendations described in Connecticut's climate plans (see Table 1). Instead, this plan is designed as a resource for applicants seeking CPRG Phase 2 Implementation Grants, as described above. CT DEEP and its sister agencies continue to take action to implement recommendations of the **Governor's Council on Climate Change (GC3)** (summarized in Box 1) and to work with the legislature to ensure the state has the statutory authority it needs to implement those recommendations and the state's sector-specific climate plans.

The CT DEEP is uniquely structured to meet the challenge of climate change as the state agency charged with programs for energy, environmental protection, and natural resource conservation. Under this agency structure, all the plans in Table 1 may be aligned across these divisions allowing for a multi-sector approach to addressing climate change, which is reflected in the climate actions measures of this PCAP.

The GC3 exemplifies that multi-sector approach that also centered equity and environmental justice in its planning and engagement process. The 14 climate action measures in this PCAP were informed by that process, which included 100+ organizations and 186 collaborative meetings with 231 individual working group members in addition to engagement on all the sector-specific climate plans. Building upon that previous engagement process was critical because the PCAP planning process afforded a short timeframe for completion, approximately six months from the time of award, which somewhat limited opportunities for engagement. During those six months, DEEP held a public meeting, requested feedback and public comment on the 14 measures through a public meeting and survey, sought regular advice from the Low Income Disadvantaged Communities (LIDAC) Advisory Group, and engaged with a limited number of community organizations within LIDACs, in addition to coordinating with sister agencies, the MSA organizations, and municipal governments.

The GC3's economy-wide plan and the more detailed strategies in each of the state's sector-specific plans - including the 2020 Integrated Resources Plan, which shows how the state can meet its statutory zero carbon energy supply by 2040 target - serve as the current pathways to meet Connecticut's 2030 and 2050 targets. The 14 measures in this PCAP support those pathways, but they are not an exhaustive list of all the actions that Connecticut can and needs to take to address climate change. The CCAP process described below will further strengthen the focus on meeting necessary 2050 reductions.

Summary of the 61 recommendations of the Governor's Council on Climate Change January 2021 Report

GC3 Governor's Council on Climate Change

- Prioritize mitigation and adaptation strategies in communities that will feel the impacts of climate change first and worst through launching a statewide environmental justice mapping tool and focusing planning resources on those communities, including developing and implementing a no less than 40% equity funding and/or benefit commitment.
- Protect and harness energy efficiency funds to improve building heating and cooling and move to decarbonize our buildings sector through the use of renewable thermal technologies, including heat pumps.
- Achieve a zero-carbon electric grid by 2040 through increased use of solar, wind, battery storage and a smarter and more responsive grid, while creating green jobs.
- Reduce greenhouse gas emissions from methane and hydrofluorocarbons (HFCs) and promote mitigation strategies in planning and materials management.
- Move toward a decarbonized transportation sector through putting at least 125,000 electric vehicles (EVs) on the road by 2025, including medium and heavy-duty vehicles, with EV charging infrastructure, and advance initiatives to reduce vehicles miles traveled.
- Harness the power of nature-based solutions to 1) adapt and make Connecticut's vulnerable communities more resilient to the impacts of sea level rise, coastal and riverine flooding, and drought, while creating and enhancing ecosystem services and 2) move the state to net zero emissions through carbon sequestration and storage in forests, wetlands, and agricultural landscapes.
- Build back better with resilient and sustainable infrastructure and land use, informed by the best available science and engineering standards.
- Recognize that climate change is also a public health crisis and prepare Connecticut for heat stress, air quality impacts, and vector-borne diseases, while ensuring safe drinking water and a climate-informed emergency management system.
- Leverage federal, state, and municipal funding sources to implement adaptation and resilience projects while building new financing mechanisms, including the creation of resilience authorities, stormwater utilities, and an environmental infrastructure bank.
- Ensure Connecticut's decisions continue to be informed by the best available climate science and support climate science education.

A Comprehensive Climate Action Plan – a roadmap to meet Connecticut's climate goals

Following the completion of this PCAP and submitting applications for funding under the CPRG Phase 2 Implementation Grant, CT DEEP will start work on the second plan required by EPA for the CPRG planning grant, the Comprehensive Climate Action Plan (CCAP). The CCAP will:

- build on the PCAP;
- serve as a roadmap to reach the state's statutory GHG emission reduction targets of 45% below 2001 levels by 2030, a zero-carbon energy supply by 2040, and 80% below 2001 levels by 2050;
- draw from and build upon the near-term and long-term GHG emission reduction goals and strategies in Connecticut's climate plans and GHG Inventory, including any updates to sector-specific climate plans such as the **Comprehensive Energy Strategy** and the **Integrated Resource Planning** (ct.gov);
- address all significant greenhouse gas emissions sources and sectors in Connecticut;
- conduct analysis to inform additional emissions reduction targets consistent with the United States' formal commitments to reduce emissions 50-52% relative to 2005 levels by 2030 and to reach net-zero emissions by 2050;
- update and/or establish sector-based emission reduction targets;
- quantify the benefits, including a focus on benefits to low income and disadvantaged communities, and the emission reductions that would be achieved by implementing a full suite of climate actions to meet the GHG reduction targets addressing the main GHG emission sectors: industry, electricity generation and/or use, transportation, commercial and residential buildings, industry, agriculture, natural and working lands, and waste and materials management;
- provide a business-as-usual analysis of what Connecticut's GHG emissions will be if the CCAP is not implemented;
- undertake a workforce planning analysis; and
- evaluate authority needed to implement the climate actions, costs to implement, and federal funding opportunities.

The CCAP is not due to EPA until fall 2025. This timeline allows for a robust engagement process that can include convening the GC3 and its working groups to identify new policies and strategies in 2024. Policies and strategies identified through this stakeholder engagement process in 2024 and early 2025 will be analyzed for LIDAC benefits and emissions reductions, according to EPA's requirements, for the final CCAP.

TABLE 1: Connecticut's economy-wide and economic sector plans

STUDY PLAN/TITLE	DESCRIPTION	ISSUE DATE
Governor's Council on Climate Change (GC3) Policy Recommendation Report	The GC3's Phase 1 report of near-term actions to reduce GHG emissions developed in response to Governor Lamont's Executive Order No. 3 contains dozens of recommendations and sub-recommendations that also view GHG mitigation with an equity lens and seeks to prioritize the equitable distribution of benefits in Connecticut's overburdened and environmental justice communities. Executive Order No. 21-3 was issued in December 2021 with 23 actions to implement the recommendations of the GC3.	Recommendations Issued January 2021 EO 21-3 issued December 2021
GHG Inventory	Accurate emissions inventories are critical to assessing impacts of GHG mitigation efforts and tracking progress towards statewide GHG reduction targets across eight sectors, including transportation, electricity consumption, residential and commercial buildings, industrial, municipal waste (municipal solid waste and wastewater treatment), agriculture, and natural gas leakage. All of these sectors align with the CPRG sectors, except CT does not currently track natural and working lands in its inventory. CT will include it in the inventory for the CCAP.	April 2023 for years 1990-2021 (uses the SIT data and therefore has a two-year lag)
Comprehensive Energy Strategy (CES)	The CES is Connecticut's multi-sector energy roadmap that links existing efforts and new policies necessary to meet our state's energy needs while achieving important policy goals.	2018
Electric Vehicle (EV) Roadmap	The EV Roadmap represents a comprehensive strategy for accelerating the deployment of electric vehicles (EVs) through policies and regulatory tools addressing transportation equity, purchasing incentives, consumer education, charging infrastructure expansion, consumer protection, integration of EVs into the electric grid, utility investment, and utility rate design.	2020

STUDY PLAN/TITLE	DESCRIPTION	ISSUE DATE
Multi-State Medium- and Heavy-Duty Zero-Emission Vehicle Action Plan (MHD ZEV Action Plan)	The MHD ZEV Action Plan includes more than 65 recommendations for state policymakers to support the rapid, equitable, and widespread electrification of trucks, vans, and buses. Widespread electrification of MHD vehicles is required to avoid the harshest effects of climate change and improve air quality and health outcomes, particularly in frontline and overburdened neighborhoods located near freight hubs, bus depots, trucking corridors, and other emissions sources, which are disproportionately affected by pollution from diesel trucks and buses and more vulnerable to the effects of climate change.	July 2022
Assessment of Connecticut's Need to Adopt California's MHD Emission Standards	CT DEEP's Medium and Heavy Duty (MHD) Vehicles assessment identifies air quality, GHG reduction and public health benefits associated with the adoption and implementation of new emission standards for MHD vehicles.	March 2022
GreenerGovCT – A Lead by Example Initiative	Each Connecticut state agency is tasked with developing a Sustainability Performance Plan that lists the necessary actions, milestones, and responsible parties to achieve the sustainability goals and targets set by Executive Order 1	2021 Progress Report: https://portal.ct.gov/-/media/GreenerGovCT/Reports/2021-Progress-Report.pdf
Integrated Resources Plan (IRP)	The 2020 IRP is the first to assess pathways to achieve a 100% zero-carbon electric sector by 2040.	October 2021
Connecticut Forest Action Plan and GC3 Forest Sub-Group Final Report	Natural and working lands are important carbon sinks necessary to mitigate GHG emissions from sectors that are difficult to de-carbonize at this time.	2020
Conservation and Load Management (C&LM) Plan	Connecticut's C&LM Plan is an award-winning and nationally recognized energy efficiency, demand management, and market transformation investment plan, designed to help Connecticut residents and businesses reduce energy use and save money and provides significant GHG reductions.	March 2021

STUDY PLAN/TITLE	DESCRIPTION	ISSUE DATE
Governor's Council on Climate Change (GC3) Building a Low Carbon Future for Connecticut Report	This GC3 report examined the efficacy of 2017 and 2018 GHG policies, recommended new strategies to ensure achievement of Connecticut's 2050 reduction target, and recommended 2030 interim GHG reduction targets for the state economy as well as for the buildings, transportation, and electricity generation sectors.	December 2018
Connecticut Clean Energy Industry Report	This is an annual report issued by the Connecticut Green Bank to measure clean energy activity in Connecticut's labor market.	September 2021 (2022 report to be released in the coming months)
Comprehensive Materials Management Strategy Amendment	To reduce GHG emissions by addressing reduced in-state solid waste disposal capacity and achieve greater source reduction and return Connecticut to self-sufficiency.	January 2023
Policy on Resilient Forests for Connecticut's Future (PRFCT Report)	This report provides recommended actions to, in the face of climate change, comprehensively avoid forest conversion; protect healthy, intact, and resilient forests; offset planned or permitted forest losses; provide incentives for stewardship, forest retention, and forest resiliency; and protect urban forests, build more parks, and plant more trees.	December 2021
Statewide Long-range Transportation Plan 2018-2050	The state DOT prepares a Long-Range Transportation Plan (LRTP), as required by federal DOT, every 5 years, serves as a framework for preparing future, project-specific transportation plans such as CTDOT's State Transportation Improvement Program (STIP). There are also regional LRTPs.	March 2018
Plan of Conservation and Development	OPM prepares a State Plan of Conservation and Development (State C&D Plan, also known as the POCD), every five years in accordance with Section 16a-27 of the Connecticut General Statutes. There are also municipal POCDs. Notably, Sustainable CT incentivizes the inclusion of sustainability characteristics in local POCDs.	May 2022 (state)

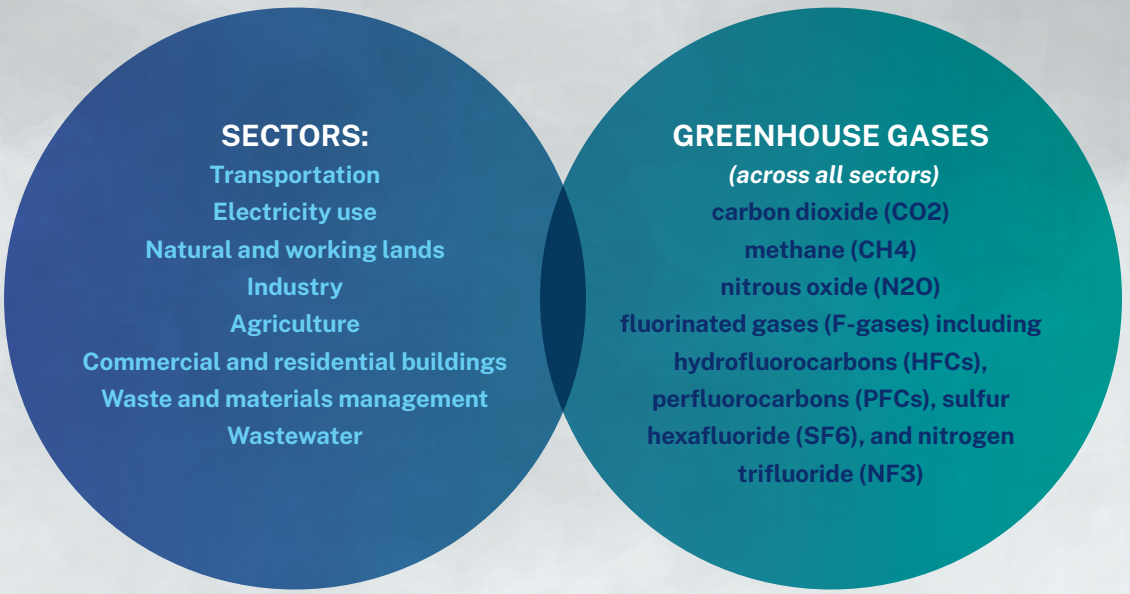
Greenhouse Gas Emissions Inventory

CT DEEP has developed a statewide inventory of major sources of greenhouse gas (GHG) emissions within Connecticut. Accurate emissions inventories are critical to assessing impacts of GHG mitigation efforts and tracking progress towards statewide GHG reduction targets across eight sectors, including transportation, electricity consumption, residential and commercial buildings, industrial, municipal waste (municipal solid waste and wastewater treatment), agriculture, and natural gas leakage. All of these sectors align with the CPRG sectors, except that Connecticut does not currently track natural and working lands emissions in its inventory. Connecticut will include that sector in the inventory for the CCAP. For more information about Connecticut's Greenhouse Gas Emissions Inventory reports, visit: **portal.ct.gov/CT DEEP/Climate-Change/CT-Greenhouse-Gas-Inventory-Reports**

This inventory was prepared using the following data resources:

- State-level GHG inventories prepared by the EPA
  www.epa.gov/ghgemissions/state-ghg-emissions-and-removals
- EPA's State Inventory Tool (SIT)
  www.epa.gov/statelocalenergy/state-inventory-and-projection-tool
- Data reported to the EPA's Greenhouse Gas Reporting Program
  www.epa.gov/ghgreporting/data-sets
- The EPA Motor Vehicle Emission Simulator (MOVES) data set
  www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves

The inventory includes the following sectors and gases:



Through the State's Greenhouse Gas Emissions Inventory, first published in 2003, CT DEEP provides a report card on more than 30 years of GHG emissions in the state, from 1990 to 2021, and tracks progress toward the state's statutory GHG emission-reduction targets. The latest inventory, released in April 2023[1], showed that Connecticut met its statutory target of 10 percent emissions reductions below 1990 levels as of January 1, 2020. In 2019, Connecticut had economy-wide emissions of 38.6 million metric tons (MMT) of carbon-dioxide equivalents (CO2e) — a decrease of 13.9 percent from 1990 levels. CT DEEP currently estimates emissions for 2021 that totaled 34.7 MMTCO2e — a 22 percent decrease from the 1990 baseline, but a six (6) percent increase from the previous year (2020).

The transportation, electricity, and residential sectors continue to account for nearly three quarters of Connecticut's GHG emissions. Transportation remains the largest source of emissions, accounting for 40% of emissions in 2019, but the residential sector has replaced the electric power sector as the second-largest emitter. As of January 1, 2020, residential sector emissions had dropped 10 percent since 1990. Except for the COVID-19 pandemic-induced dip in emissions for the years 2020-2021, transportation emissions remain near their 1990 levels, despite significant improvements in automobile fuel economy over the past three decades. Improvements in fuel economy have reduced emissions per vehicle mile traveled, but those reductions have been offset by an increase in the overall number of miles driven. In 2021, electricity consumption emissions continued to drop, falling in that year below the emissions from the State's commercial sector. This is consistent with the findings of the Integrated Resources Plan released in 2021 that showed that the state is on the path to achieving the Governor's goal of a 100% carbon free electric supply by 2040. The Integrated Resources Plan included zero carbon energy from the Park City Wind contract, which was canceled in

[1] Note that CT DEEP published an updated 1990–2021 Greenhouse Gas Emissions Inventory with a preliminary look at 2022 data in April 2024, subsequent to the submittal of this plan. That inventory is available at: portal.ct.gov/-/media/deep/climatechange/1990-2021-ghg-inventory/deep_ghg_report_90-21_pre-22.pdf

2023, but procurement for wind resources continues. In October 2023, Connecticut, Rhode Island, and **Massachusetts signed an agreement for multi-state offshore wind procurement**, the first of its kind in the United States. Under the agreement, the three states will together seek multi-state offshore wind proposals that would expand benefits for the region, capture cost reductions by developing projects at scale, and develop into viable projects.

Table 2 details GHG emissions in million metric tons (MMT) of carbon dioxide equivalents (CO2e) for all economic sectors. Table 3 details emissions of specific GHGs across all sectors.

TABLE 2: Connecticut greenhouse gas emissions in MMT CO2e by sector[2]

SECTOR/SOURCE	2005	2021
Transportation	**18.50**	**15.20**
CO2 from Fossil Fuel Combustion	18.30	15.10
Mobile Combustion	0.14	0.03
Non-Energy Use of Fuels	0.09	0.07
Electric Power Industry	**12.70**	**3.16**
CO2 from Fossil Fuel Combustion	-	1.74
Stationary Combustion	-	-
Incineration of Waste	-	1.42
Electrical Equipment	-	-
Other Process Uses of Carbonates	-	-
Industry	**4.46**	**4.72**
CO2 from Fossil Fuel Combustion	2.65	2.16
Natural Gas Systems	0.41	0.24
Non-Energy Use of Fuels	-	-
Petroleum Systems	-	-
Coal Mining	-	-
Iron and Steel Production	-	
Cement Production	-	
Substitution of Ozone Depleting Substances	-	
Petrochemical Production	-	
Lime Production	-	
Ammonia Production	-	
Nitric Acid Production	-	
Abandoned Oil and Gas Wells	-	
Wastewater Treatment	0.38	
Urea Consumption for Non-Agricultural Purposes	9E-4	
Mobile Combustion	-	
Abandoned Underground Coal Mines	-	
Adipic Acid Production	-	

[2] Data were obtained from EPA's State-level GHG inventories file, State-GHG_Trends_Emissions__Sinks_By_Gas_08312023.xlsx, which was accessed in 2023 (SIT June 2023 update). This data set is available at **www.epa.gov/ghgemissions/state-ghg-emissions-and-removals**.
Symbols:
"-"indicates that the value has not be estimated at this time or is not applicable to the State
"0" indicates that the value does not exceed 0.005 MMT CO2e

SECTOR/SOURCE	2005	2021
Substitution of Ozone Depleting Substances	0.95	1.88
Carbon Dioxide Consumption	-	-
Electronics Industry	0.01	0.01
N2O from Product Uses	-	-
Stationary Combustion	-	-
Other Process Uses of Carbonates (Limestone/Dolomite)	0.03	0.02
Fluorochemical Production	-	-
Aluminum Production	-	-
Soda Ash Production	0.03	0.02
Ferroalloy Production	-	-
Titanium Dioxide Production	-	-
Caprolactam, Glyoxal, and Glyoxylic Acid Production	-	-
Glass Production	-	-
Magnesium Production and Processing	-	-
Zinc Production	-	-
Phosphoric Acid Production	-	-
Lead Production	-	-
Landfills (Industrial)	-	-
Carbide Production and Consumptio	-	-
Agriculture	**0.41**	**0.37**
N2O from Agricultural Soil Management1,2	0.16	0.09
Enteric Fermentation	0.13	0.16
Manure Management	0.12	0.12
CO2 from Fossil Fuel Combustion	-	-
Rice Cultivation	0	0
Urea Fertilization	0	0
Liming	0	0
Mobile Combustion	-	-
Field Burning of Agricultural Residues1,2	0	0
Stationary Combustion	-	-
Commercial	**6.09**	**6.23**
CO2 from Fossil Fuel Combustion	3.75	4.08
Landfills (Municipal)	2.00	1.80
Substitution of Ozone Depleting Substances	-	
Wastewater Treatment	0.34	0.35
Composting	-	-
Stationary Combustion	-	-
Anaerobic Digestion at Biogas Facilities	-	-
Residential	**9.35**	**6.68**
CO2 from Fossil Fuel Combustion	9.35	6.68
Substitution of Ozone Depleting Substances	-	-
Stationary Combustion	-	-

[3] Data were obtained from EPA's State-level GHG inventories file, State-GHG_Trends_Emissions__Sinks_By_Gas_08312023.xlsx, which was accessed in 2023 (SIT June 2023 update). This data set is available at www.epa.gov/ghgemissions/state-ghg-emissions-and-removals.
Symbols:
"-"indicates that the value has not be estimated at this time or is not applicable to the State
"0" indicates that the value does not exceed 0.005 MMT CO2e

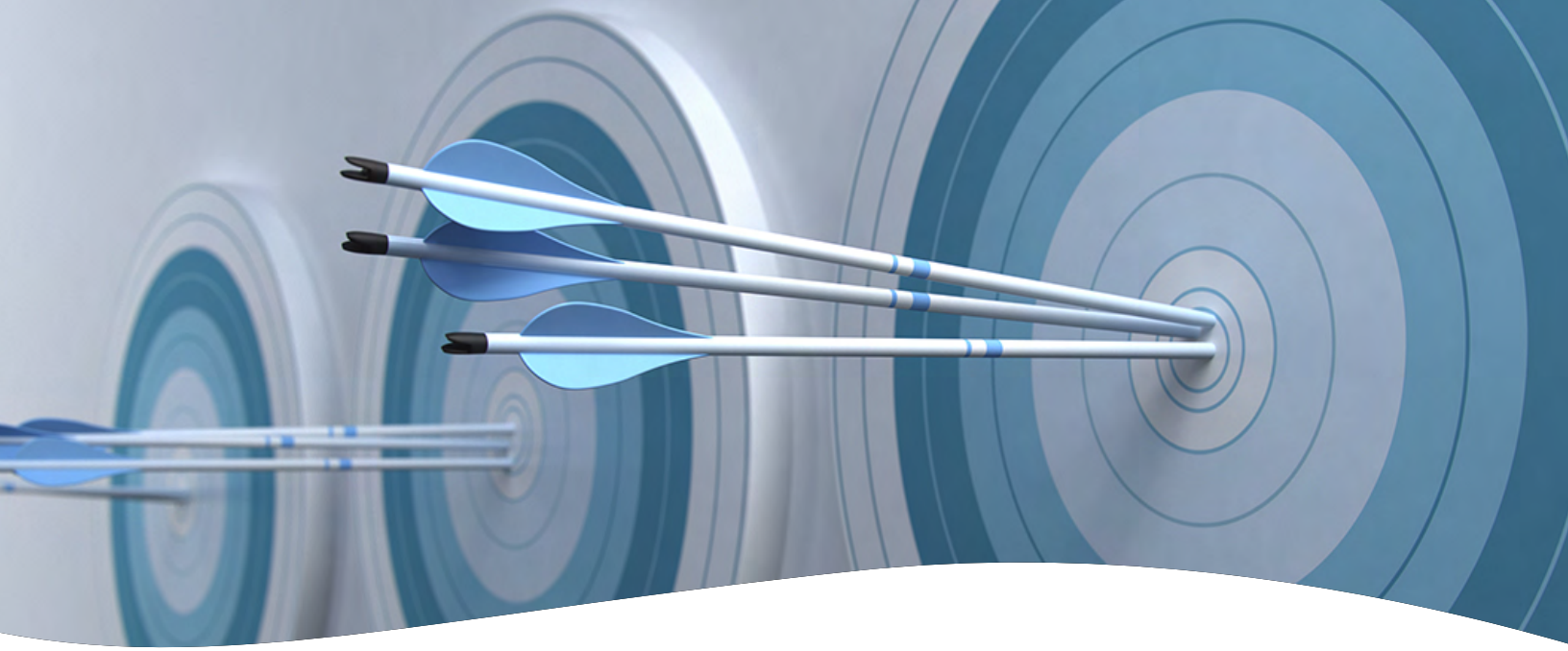
TABLE 3: Connecticut greenhouse gas emissions in MMT CO2e by gas[3]

GAS/SOURCE	2005	2021
CO^2	**51.1**	**15.20**
Fossil Fuel Combustion		
Electric Power Sector	12.7	3.0
Transportation	18.5	14.8
Industrial	3.6	3.4
Residential	9.4	6.7
Commercial	3.7	4.0
Non-Energy Use of Fuels	0.09	0.07
Natural Gas Systems	-	-
Cement Production	-	-
Lime Production	-	-
Other Process Uses of Carbonates	-	-
Glass Production	-	-
Soda Ash Production	0.03	0.02
Carbon Dioxide Consumption	-	-
Incineration of Waste	-	1.42
Titanium Dioxide Production	-	-
Aluminum Production	-	-
Iron and Steel Production & Metallurgical Coke Production	-	-
Ferroalloy Production	-	-
Ammonia Production	-	-
Urea Consumption for Non-Agricultural Purposes	-	-
Phosphoric Acid Production	-	-
Petrochemical Production	-	-
Carbide Production and Consumption	-	-
Lead Production	-	-
Zinc Production	-	-
Petroleum Systems	-	-
Abandoned Oil and Gas Wells	-	-
Magnesium Production and Processing	-	-
Coal Mining	-	-
Liming	-	-
Urea Fertilization	-	-
Substitution of Ozone Depleting Substances	-	-
International Bunker Fuels	-	-
Wood Biomass, Ethanol, and Biodiesel Consumption	-	-

GAS/SOURCE	2005	2021
CH_4	**1.26**	**1.14**
Stationary Combustion	-	-
Mobile Combustion	-	-
Coal Mining	-	-
Abandoned Underground Coal Mines	-	-
Natural Gas Systems	0.41	0.24
Petroleum Systems	-	-
Abandoned Oil and Gas Wells	-	-
Petrochemical Production	-	-
Carbide Production and Consumption	-	-
Iron and Steel Production & Metallurgical Coke Production	-	-
Ferroalloy Production	-	-
Enteric Fermentation	0.13	0.16
Manure Management	0.34	0.35
Rice Cultivation	-	-
Field Burning of Agricultural Residues	-	-
Landfills	-	-
Wastewater Treatment	0.38	0.39
Composting	-	-
Anaerobic Digestion at Biogas Facilities	-	-
Incineration of Waste	-	-
International Bunker Fuels	-	-
N_2O	**0.30**	**0.21**
Stationary Combustion	-	-
Mobile Combustion	-	-
Adipic Acid Production	-	-
Nitric Acid Production	-	-
Manure Management	0.12	0.12
Agricultural Soil Management	0.16	0.09
Field Burning of Agricultural Residues	-	-
Wastewater Treatment	-	-
N_2O from Product Uses	-	-
Caprolactam, Glyoxal, and Glyoxylic Acid Production	-	-
Incineration of Waste	-	-
Composting	-	
Electronics Industry	-	
Natural Gas Systems	-	
Petroleum Systems	-	
International Bunker Fuels	-	
HFCs, PFCs, SF_6 and NF_3	**0.96**	**1.88**
HFCs	**0.95**	**1.88**

GAS/SOURCE	2005	2021
Substitution of Ozone Depleting Substances	0.95	1.88
Fluorochemical Production	-	
Electronics Industry	-	
Magnesium Production	-	
PFCs	-	
Aluminum Production	-	
Electronics Industry	-	
Electrical Equipment	-	
Substitution of Ozone Depleting Substances	-	
SF6	**0.01**	**0.01**
Electrical Equipment	**-**	
Electronics Industry	0.01	0.01
Magnesium Production	-	-
NF_3	-	-
Electronics Industry	-	-
Total (Sources) Emissions[4]		

[4] Total emissions presented without Land Use, Land-Use Change and Forestry (LULUCF) sector.



Greenhouse Gas Emissions Projections and Targets

Connecticut's economy-wide and electric sector greenhouse gas emissions reductions targets

Connecticut has had statutory greenhouse gas (GHG) emissions reductions targets since the passage of the Global Warming Solutions Act in 2008, which set targets for 2020 and 2050. With the addition of an interim target in 2018 for 2030 and an electric sector target in 2022 for 2040, Connecticut's economy-wide GHG emissions targets are as follows:

- 20% below 1990 levels by January 1, 2020
- 45% below 2001 levels by January 1, 2030
- 0% from electricity supplied to electric customers in the state by January 1, 2040
- 80% below 2001 levels by January 1, 2050

Results of the 2018 Governor's Council on Climate Change Report: Connecticut's emissions reductions needed to meet the 2030 target and business-as-usual scenario

The analysis conducted for the 2018 Governor's Council on Climate Change (GC3) report is the current economy-wide pathways and business-as-usual modeling for the state. Additional modeling for the electric sector can be found in the Integrated Resources Plan released in 2021. The summary of the 2018 GC3 report

is provided here for context on the status of Connecticut's climate planning. Connecticut intends to update this modeling as part of the development of the CCAP. The CCAP will serve as a roadmap to reach the state's statutory GHG emission reduction targets of 45% below 2001 levels by 2030, a zero-carbon energy supply by 2040, and 80% below 2001 levels by 2050.

On Earth Day 2015, then Connecticut Governor Malloy issued **Executive Order 46** creating the Governor's Council on Climate Change, also known as the GC3. The Executive Order directs the GC3 to examine the effectiveness of existing policies and regulations designed to reduce GHG emissions and identify new strategies to meet the state's then current statutory GHG emissions reduction target of 80 percent below 2001 levels by 2050. The Executive Order also requires the GC3 to develop interim state-wide GHG reduction targets for years between 2020 and 2050 and identify short-and long-term statewide strategies to achieve the emissions reductions necessary to meet those targets. Following a comprehensive review of GHG reduction scenarios, in 2018 the GC3 unanimously recommended an economy-wide GHG emission reduction target of 45 percent below 2001 levels by 2030. This target would put Connecticut on a linear downward trajectory from 2014 GHG emissions to the 80 percent reduction by 2050 required by the Global Warming Solutions Act. At that time, it was one of the most ambitious mid-term reduction targets in the nation.

The GC3's recommendation was taken up by the Connecticut General Assembly, which passed An Act Concerning Climate Change Planning and Resiliency (Public Act 18-82), which was signed into law in 2018.

The GC3's analysis of a variety of scenarios to determine the best pathway to meet the 2030 and 2050 targets helped establish a long-term vision for decarbonizing Connecticut's economy. Three broad, fundamental objectives emerged from that vision:

1. Zero-carbon electricity generation
2. Clean transportation
3. Clean, efficient, and resilient buildings

To inform its decision-making, the GC3 evaluated and discussed the feasibility, costs, and benefits of a variety of existing and proven emission reduction measures and technologies in the key sectors of transportation, buildings, and electricity. A range of measures were combined to develop sector-specific reduction scenarios. Illustrative low-or zero-carbon technology penetration rates for each sector were also developed to inform these discussions. Upon thorough review of the various mitigation scenarios, technology-penetration rates, and costs and benefits, the Council recommended through consensus an economy-wide greenhouse reduction target of 45 percent below 2001 levels by 2030, as noted above.

The analysis also provided the following recommendations for GHG emissions reductions below 2014 levels by 2030 in each of the key sectors as follows:

- 71% reduction for electric power
- 29% reduction for transportation
- 34% collective reduction across industrial, commercial, and residential buildings

In the 2018 report, Northeast States for Coordinated Air Use Management (NESCAUM) worked closely with the GC3 to develop a Connecticut-specific business-as-usual (BAU) reference case for future emissions through 2050 to provide the basis for examining potential GHG mitigation technologies and measures using the **LEAP** model. The reference case relied on projection data from the U.S. Energy Information Administration; historical and projected energy use data; and existing federal, regional, and state regulatory requirements expected to shape Connecticut's future energy consumption. As with any modeling exercise, uncertainty will always exist when projecting outcomes many years into the future. These estimates were based on the best data available at the time of the analysis, with recognition that future conditions could evolve differently. A detailed description of the BAU and its assumptions can be found in the **2018 report**.

The BAU reference case projected that, in the absence of additional climate action, Connecticut's GHG emissions would be between 35 and 40 MMTCO2e in the year 2030 and between 30 and 35 MMTCO2e by the year 2050. The BAU reference case projected that in 2050 the transportation sector will remain the largest source of GHG emissions in Connecticut at 35%, followed by the residential buildings, electricity, and commercial building sectors (15%, 13%, and 12%, respectively).

14 Implementation-Ready Climate Action Measures

As required by EPA, the analyses below were conducted for each of the 14 near-term, implementation-ready climate action measures to fulfill the Quantified GHG Reductions element of the PCAP. Appendix I and II of this PCAP provide the detailed findings of the analyses for each measure.

- An estimate of the cumulative GHG emission reductions from 2025 through 2030 and 2025 through 2050
- An estimate of the co-pollutant emissions reductions from 2025 through 2030 and 2025 through 2050
- Key implementing agency or agencies
- Implementation schedule and milestones
- Geographic scope
- Metrics for tracking progress
- Low income and disadvantaged communities' benefits analysis
- Authority to implement
- Intersection with other funding availability

Table 4 summarizes Connecticut's PCAP 14 implementation-ready climate action measures. For more information on Connecticut's plans for reducing GHG emissions, see the plans listed in Table 1 in the overview section of this PCAP.

TABLE 4: Connecticut's PCAP 14 climate action measures – cumulative greenhouse gas emissions reductions

PCAP Climate Action Measure	Cumulative GHG emission reductions (metric tons CO2e)	
	2025–2030	2025–2050
TRANSPORTATION SECTOR		
Deploy electric vehicle chargers statewide to support light-duty and medium-heavy duty fueling needs	1,840,000	11,020,000
Establish electric vehicle incentive pathways for advanced technology vehicles (full battery electric, plug-in hybrid and fuel cell electric vehicles for light-, medium-, and heavy-duty vehicles — collectively "ZEVs")	680,000	1,480,000
Replace existing school buses with zero-emission vehicle school buses in environmental justice communities	124,951	269,636
Advance transit bus electrification — purchase buses based on the next 5-year Battery Electric Bus program	45,103	115,227
Purchase Idle Reduction ZeroRPM® for truck mounted attenuators (TMAs) for the Connecticut Department of Transportation's Crash Unit — implement TMAs that have ZeroRPM® systems to prevent idling, reduce fuel consumption and greenhouse gas emissions	8,106	34,740
Expansion of the Microtransit Program with a focus on rural areas to provide an on-demand, accessible, shared-ride service within a zone	110	284
BUILDING SECTOR		
Support increased adoption of heat pumps statewide	235,083	1,104,134
Expand energy efficiency programs under the Conservation and Load Management Program	33,019	127,117

Expand funding for the Residential Energy Preparation Services program to address health and safety barriers to weatherization	8,875	44,877
Support deployment of networked geothermal system*	695	5,698
ELECTRIC POWER SECTOR		
Expand funding for the Residential Energy Preparation Services program to address health and safety barriers to weatherization	849	6,347
Reduce electric sector emissions while maintaining electric system reliability using demand response and/or energy storage**	3,784,402	14,593,479
WASTE AND MATERIALS MANAGEMENT SECTOR		
Provide funding for enforcement and to municipalities to implement food scraps diversion programs, including grants to construct the infrastructure necessary to divert food scraps from landfills and incineration to food scraps/organics separation and collection programs	118,853	1,045,604
NATURAL AND WORKING LANDS SECTOR		
Plant trees in urban areas to increase carbon storage/sequestration and mitigate pollution and other climate change impacts in underserved communities***	38.39	142.78
TOTAL	**6,880,000**	**29,847,000**

* Values for GHG emissions reductions from networked geothermal assume construction in a new neighborhood. Appendix I contains GHG emissions values for a new and existing neighborhood.
** Values for GHG emissions reductions from electricity demand response and storage in Table 4 are for response plus storage. They are broken out separately in Appendix I.
** Values for GHG emissions reductions for urban tree planting in Table 4 are for storage. Storage and sequestration are provided in Appendix I.

Co-Pollutants Benefits Analysis

The implementation of the measures included in this PCAP are anticipated to have a broad range of benefits. This section details the anticipated co-pollutant reductions associated with implementation of the climate action measures identified in this PCAP. Connecticut suffers from some of the worst air quality in the country. One example of this can be found in the American Lung Association's State of the Air 2024 Report Card; this report shows that four of Connecticut's counties (Fairfield, Middlesex, New Haven, and New London) are received failing air quality scores when looking at the amount of high ozone days. The state has struggled for over forty years to attain the health-based National Ambient Air Quality Standards (NAAQs) and continues to look to multi-pollutant reduction strategies and co-benefits analyses as an integral part of air quality planning efforts. GHG reductions from the 14 climate action measures will provide critical co-benefit reductions of criteria pollutants that will improve air quality and deliver health benefits in Connecticut.

2020 Inventory for Co-Pollutants

CT DEEP extracted criteria pollutant (CAP) and hazardous air pollutant (HAP) emissions data from EPA's 2020 National Emissions Inventory to create a 2020 base county-level inventory for the sectors targeted by the climate action measures included in this PCAP. Table 5 presents those data for nitrogen oxides (NOx), direct fine particulate matter (PM2.5), sulfur dioxide (SO2), volatile organic compounds (VOC), and HAP by county and pollutant for Connecticut.

[5] **https://gaftp.epa.gov/air/nei/2020/data_summaries/2020neiMar_county_tribe_allsector.zip** accessed on 10/10/2023

TABLE 5: 2020 Connecticut criteria air pollutant and hazardous air pollutant emissions inventory by county, and pollutant.

Connecticut County	NOx (tons)	PM2.5 Primary (Filterable + Condensable) (tons)	SO2 (tons)	VOC (tons)	HAP (tons)
Fairfield	8,263.07	3,050.27	95.80	19,960.40	3,266.69
Hartford	8,089.63	2,991.19	103.92	21,108.60	3,213.88
Litchfield	1,681.84	1,391.94	35.36	14,903.56	1,803.90
Middlesex	1,809.68	844.17	27.23	8,871.58	1,011.02
New Haven	7,638.76	2,488.48	88.96	17,978.08	2,735.12
New London	3,186.75	1,399.54	44.09	14,912.25	2,178.05
Tolland	1,327.47	817.43	22.72	9,025.68	943.32
Windham	1,117.87	755.77	20.09	10,015.37	944.64
State Total*	**33,115.06**	**13,738.79**	**438.17**	**116,775.52**	**16,096.61**

Data are reported from the EPA's National Emissions Inventory. County level data are presented in Appendix II.

Co-pollutants Emission Changes from the 14 Climate Action Measures

Table 6 lists anticipated changes in emissions of the co-pollutants NOx and PM2.5 for each measure. Additional details about assumptions and methods for quantification of emissions changes are included in the section corresponding to each measure in Appendix I.

TABLE 6: Connecticut co-pollutant NOx and PM2.5 emissions reductions anticipated from implementation of PCAP climate action measures

PCAP Climate Action Measure	Cumulative GHG emission reductions (metric tons CO2e)			
	2025–2030	2025–2050	2025–2030	2025–2050
TRANSPORTATION SECTOR				
Deploy electric vehicle chargers statewide to support light-duty and medium-heavy duty fueling needs	1304.5	4145.7	39.2	110
Establish electric vehicle incentive pathways for advanced technology vehicles (full battery electric, plug-in hybrid and fuel cell electric vehicles for light-, medium-, and heavy-duty vehicles — collectively "ZEVs")	198	344	7	15.5
Replace existing school buses with zero-emission vehicle school buses in environmental justice communities	218	445	5.1	6.1
Transit bus electrification — purchase buses based on the next 5-year Battery Electric Bus program	64.5	137.0	0.4	0.7
Idle Reduction ZeroRPM® for truck mounted attenuators (TMAs) for the Connecticut Department of Transportation's Crash Unit - purchase TMAs that have ZeroRPM® systems to prevent idling, reduce fuel consumption and greenhouse gas emissions	29.9	80.3	1.2	2.4
Expand the Microtransit Program with a focus on rural areas to provide an on-demand, accessible, shared-ride service within a zone	0.03	0.05	0.001	0.003

BUILDING SECTOR				
Support increased adoption of heat pumps statewide	189	948	41	207
Expand energy efficiency programs under the Conservation and Load Management Program	21.1	93.5	1.2	4.5
Expand funding for the Residential Energy Preparation Services program to address health and safety barriers to weatherization	6.8	39.8	0.3	1.6
Support deployment of networked geothermal system	0.8	4.5	0.1	0.4
ELECTRIC SECTOR				
Reduce electric sector emissions while maintaining electric system reliability using demand response and/or energy storage	790.3	4545.7	N/C	N/C
Develop a pilot project to use hydrogen for port operations and long duration electric storage using hydrogen	16.6	112.8	0.9	7.1
WASTE AND MATERIALS MANAGEMENT SECTOR				
Provide funding for enforcement and to municipalities to implement food scraps diversion programs, including grants to construct the infrastructure necessary to divert food scraps from landfills and incineration to food scraps/organics separation and collection programs	N/A	N/A	N/A	N/A
NATURAL AND WORKING LANDS SECTOR				
Plant trees in urban areas to increase carbon storage/sequestration and mitigate pollution and other climate change impacts in underserved communities	0.14	0.23	0.002	0.003
TOTAL	**2866.2**	**10954.3**	**96.6**	**358.3**

N/C = not calculated
N/A = not applicable

Low Income and Disadvantaged Communities' Benefits Analysis

The implementation of the measures included in this PCAP are anticipated to provide significant benefits to low income and disadvantaged communities (LIDACs). This section identifies each LIDAC within the jurisdiction covered by this PCAP, how Connecticut meaningfully engaged with LIDACs in the development of this PCAP, and how the state will continue to engage into the future.

Connecticut followed EPA's guidance for identifying LIDACs as any community that meets at least one of the following characteristics:

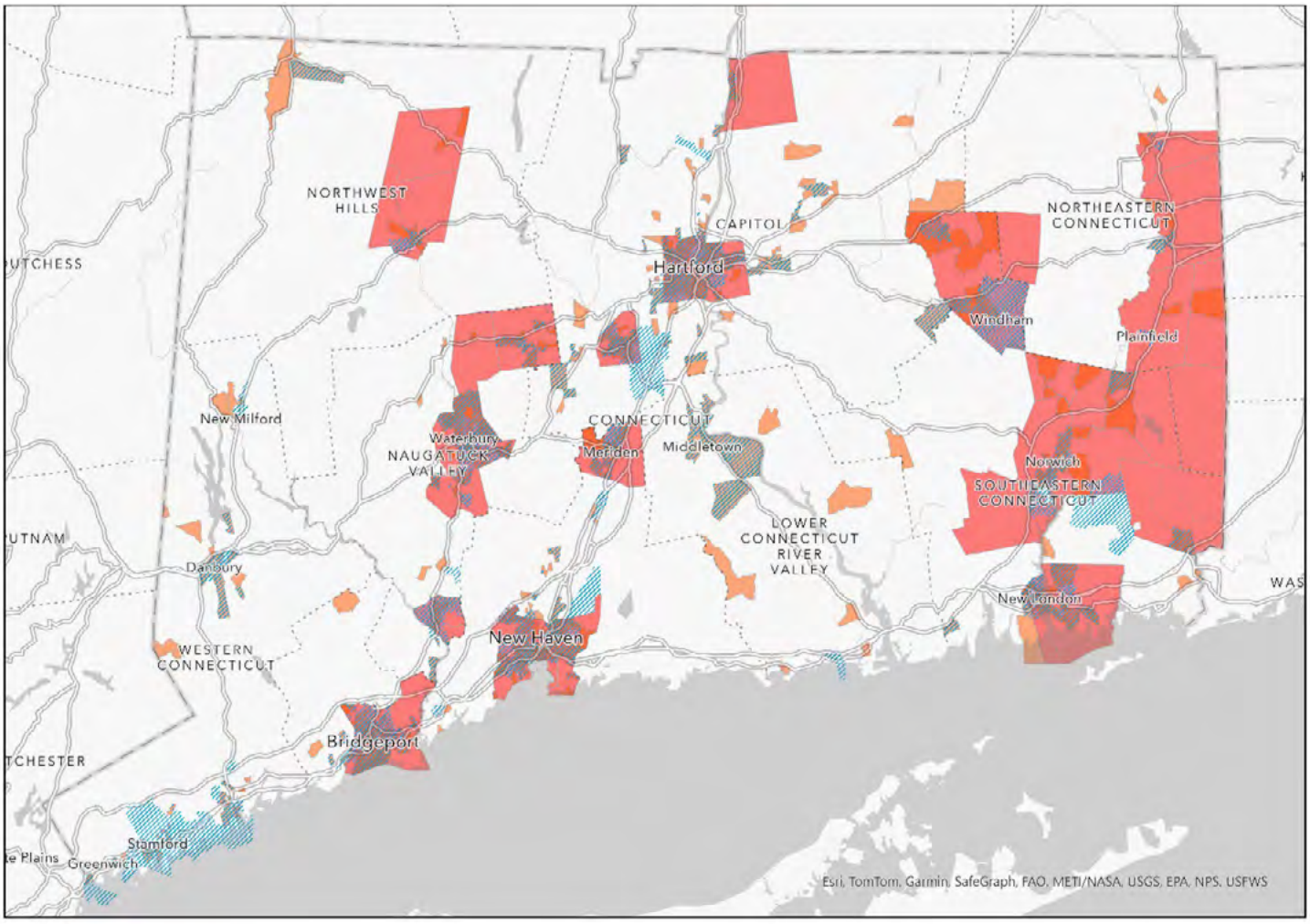
- Any census tract that is included as disadvantaged in the Climate and Economic Justice Screening Tool (CEJST)
- Any census block group that is at or above the 90th percentile for any of EJScreen's Supplemental Indexes when compared to the nation or relevant state; or,
- Any geographic area within tribal lands as included in EJScreen.

Both the CEJST and the EJScreen tools use socioeconomic, environmental, climate, and health indicator data to identify communities disproportionately impacted by environmental issues. In Connecticut, an environmental justice community is defined by the Connecticut General Statutes, pursuant to Sec. 22a-20a(a) as:

- a **distressed municipality**, as designated by the Connecticut Department of Economic and Community Development and based on high unemployment and poverty, aging housing stock, low or declining rates of growth in job creation, population, and per capita income; or
- defined census block groups where 30% of the population is living below 200% of the federal poverty level.

Co-pollutants Emission Changes from the 14 Climate Action Measures

CT DEEP identified LIDACs using EPA's IRA Disadvantaged Communities layer, which combines CEJST and EJScreen data. CT DEEP also compared the list of identified LIDACs from EPA's EJScreen with Connecticut's Environmental Justice Communities dataset. See Appendix III for the complete list of LIDACs and Connecticut's Environmental Justice Communities identified at the census block level.



Existing climate risks, impacts, and vulnerabilities among LIDACs

Connecticut faces climate issues that have significant implications for its residents, environment, and economy. LIDACs are disproportionately affected by climate impacts. These communities often face environmental injustices; including higher exposure to air pollution, increased vulnerability to extreme weather events, and limited resources and support to prepare for and recover from climate-related emergencies. Below are examples, but not an exhaustive list, of climate impacts and risks to which LIDACs in Connecticut are vulnerable.

Extreme heat events and air quality:

Figure 1 illustrates that several LIDACs are present in the southern and central regions of Connecticut where the heat vulnerability score is considerably high according to the Climate Change Vulnerability Index developed by the Connecticut Institute for Resilience and Climate Adaptation (CIRCA). During heatwaves, ground-level ozone production increases (WMO 2023). Higher temperatures increase emissions of volatile organic compounds (VOC) from industrial facilities, which drives more ozone formation. Extreme heat is expected to further degrade air quality in communities close to industrial locations where air quality is already a concern. As such, there are concerns among LIDACs in Connecticut about growing rates of asthma in their communities, particularly from extreme heat events (Yale School of Public Health 2021). The elderly (65 and older) and young children within these communities are particularly susceptible to respiratory illnesses (US EPA 2021).

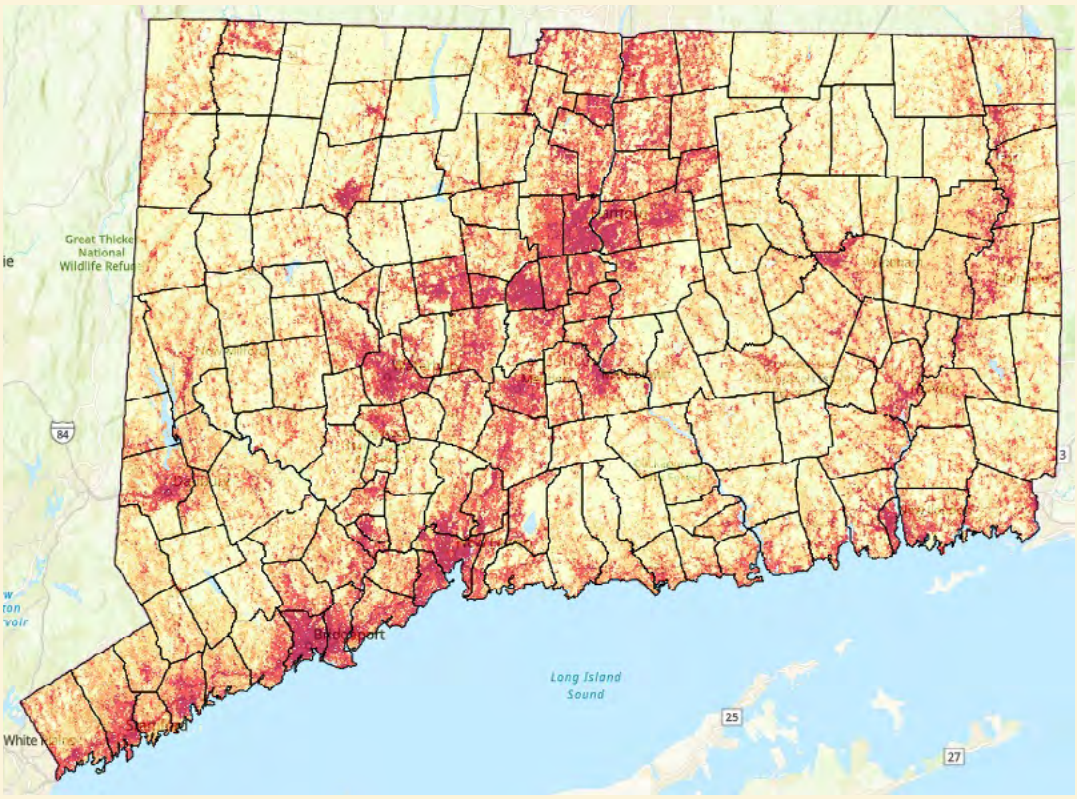


Figure 1. EPA IRA LIDACs and spatial distribution of heat vulnerability in Connecticut (Source: CIRCA 2023, https://resilientconnecticut.uconn.edu/ccvi)

Wildfires and air quality.

Climate change has significant impacts on air quality in the U.S., affecting the concentration and distribution of pollutants such as ground-level ozone and fine particulate matter (PM2.5) (US EPA 2021). Wildfire smoke adds to the already existing airborne dust and pollution, further exacerbating the air quality concerns. Although Connecticut has a low risk of directly experiencing wildfires (FEMA 2023), there is still a risk to air quality due to the transport of wildfire smoke from other regions. This was already evidenced by the many days of unhealthy levels of smoke during 2023 caused by wildfires in Canada. Poor air quality can result in respiratory and cardiovascular health effects, particularly in vulnerable groups like children and the elderly, as well as residents of LIDAC communities who may already encounter poor air quality.

Extreme heat events and heat-related illnesses.

Rising temperatures exacerbate heat-related illnesses and can create urban heat islands, particularly in densely populated areas. A study by Goddard et al (2023) calculated that 31 deaths in Connecticut per year are attributable to extreme heat. Although the study did not provide the location of these deaths, lower-income neighborhoods tend to experience higher levels of temperature mortality (US EPA 2021). Heat deaths are more likely to occur in homes that lack sufficient space cooling systems. Pre-existing conditions, including cerebral, respiratory, and cardiovascular diseases, can be exacerbated by extreme heat events (US EPA 2021) and are of particular concern in LIDAC communities, due to disparities in access to healthcare, housing, healthy foods, and recreational opportunities (Datahaven 2023). Extreme temperatures disproportionately affect outdoor workers, leading to heat-related injuries and illnesses, with lower-income workers experiencing more hardship from the lost labor hours as a result (US EPA 2021).

Heavy rainfall events.

Connecticut is prone to extreme weather events, including hurricanes and heavy rainfall, which can cause flash floods, property damage, and disruption of essential services. A map showing the flood vulnerability in Connecticut is provided in Figure 2. Connecticut experiences both inland and coastal flooding, which can damage infrastructure, homes, and businesses, leading to financial losses and displacement of residents. As shown in Figure 2, most LIDACs are extremely vulnerable to flood risks, particularly in areas along the coastline and central Connecticut. Low income households living in poor quality structures or floodplains are more likely to be adversely impacted from property damage or loss of property from floods (US EPA 2021). In a recent survey of Connecticut residents, nearly half of the lower-income respondents (making less than $49,999 per year) were unsure or did not feel that their town's emergency services were equipped to address disaster or hazard events (Shoreman-Ouimet et al. 2024). Coastal flooding also impacts roads and can lead to traffic delays, significantly affecting lower income workers who are paid on an hourly basis (US EPA 2021).

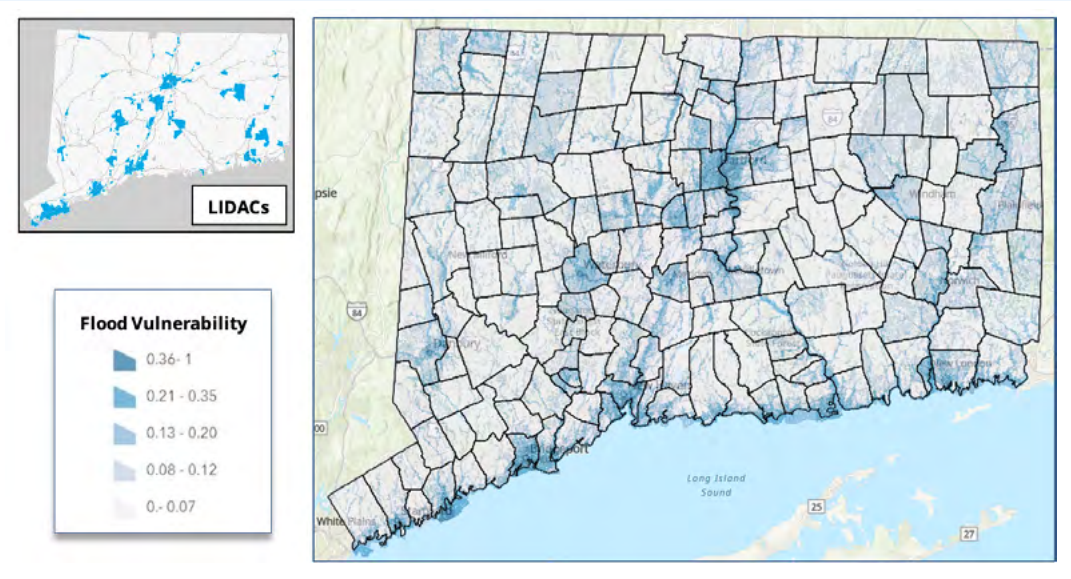


Figure 2. EPA IRA LIDACs and Spatial distribution of flood vulnerability in Connecticut (Source: CIRCA 2023, https://resilientconnecticut.uconn.edu/ccvi)

Impact of PCAP implementation on LIDACs

Anticipated benefits or potential disbenefits associated with climate action measure implementation are summarized in this section. Specific methods and assumptions for quantitative assessment of benefits associated with each climate action measure, where completed, are described in Appendix I. Appendix I includes the qualitative and, where applicable, a quantitative analysis of anticipated benefits for each measure.

Anticipated benefits of climate action measures

An analysis of the potential benefits in Box 2 was performed for each of the 14 climate action measures included in this PCAP.

EPA's examples of community benefits from GHG reduction measures

- Direct and indirect benefits from mitigating climate impacts (e.g., reduced risk of wildfires, drought, extreme weather events, and/or sea level rise)
- Increased resilience to climate change from GHG reduction measures that have both GHG reduction benefits and climate adaptation benefits (e.g., heat island mitigation strategies help reduce GHG emissions by reducing energy demand and help reduce health impacts due to extreme heat)
- Improved public health resulting from reductions in co-pollutants (e.g., CAPs, such as NOx, ozone, PM2.5, and HAPs), such as reductions in new asthma cases and reductions in hospital admissions and emergency department visits
- Creation of high-quality jobs and new workforce training opportunities in low income and disadvantaged communities with an emphasis on expanding opportunities for individuals that face barriers to employment
- Improved access to services and amenities
- Decreased energy costs and improved energy resilience
- Reduced noise pollution
- New green space and/or community beautification
- Increased access to transportation alternatives
- Improved housing quality and comfort

The analysis found significant benefits across all the measures in each sector as summarized here:

Transportation Sector

The measures in the transportation sector, which is responsible for more than 67% of ozone forming precursor emissions, will reduce air pollution and improve public health in the state that could reduce asthma, hospital admissions and emergency department visits. Moving from fossil-fuel powered engines to electric vehicles can reduce noise pollution along our transportation corridors and in communities. Continuing the investments in transit electric buses and piloting a Microtransit program can increase access to public transportation.

Residential and Commercial Buildings Sector

The measures in the buildings sector will provide a broad range of benefits to communities, including reducing GHG emissions, energy demand and energy costs; enhancing public health by reducing pollutants; improving energy efficiency and resilience; creating job opportunities in low income communities; and improving overall housing quality and comfort.

Electric Power Sector

The measures in the electric power sector will contribute to reducing GHG emissions while improving energy resilience. Implementing demand response and energy storage strategies will enhance the electric system's efficiency and stability. Developing a pilot project for hydrogen use in port operations is an innovative technology that presents potential for significant environmental benefits, job creation in emerging sectors, and enhanced public health through reduced air pollution.

Waste and Materials Management Sector

Providing funding to municipalities to implement food scraps diversion programs directly contributes to reducing GHG emissions from landfills and incineration, thereby mitigating climate change impacts. The construction of the necessary infrastructure can create new job and training opportunities. By diverting food scraps from landfills and incineration, this measure will significantly reduce emissions of methane and co-pollutants like NOx, ozone, PM2.5 and hazardous air pollutants. These reductions will have direct public health benefits, potentially lowering incidences of respiratory issues like asthma and reducing hospital admissions.

Natural and Working Lands Sector

Planting trees in urban areas enhances carbon storage and sequestration, directly contributing to mitigating climate change impacts. Trees in urban settings also play a crucial role in reducing noise and air pollution leading to improved public health. This action would result in beautification of communities by creating green spaces that can also reduce urban heat island effects, thus improving overall quality, health, and living conditions in low income and disadvantaged areas.

Engagement with LIDACs

CT DEEP engaged with LIDACs through existing and new channels to seek feedback during the development of this PCAP. Strategies for engagement with LIDACs are summarized below. See Appendices IV, V, and VI for more details on these activities.

Online resources

- State CPRG webpage
- Email list via CT DEEP's Climate Solutions Newsletter (1,612 subscribers) and other CT DEEP mailing lists
- Social media (LinkedIn, Facebook and Instagram)

Presentations and meetings

- Connecticut Equity and Environmental Justice Advisory Council (CEEJAC)
- December 18, 2023 public meeting presenting the 14 climate actions in the PCAP with opportunity for feedback at an accessible time (6 p.m.) and with simultaneous live Spanish translation. A recording of the presentations in this meeting is available in English and Spanish on the State's CPRG website as a lasting tool to convey the actions included in the PCAP.
- Meeting with the Bridgeport Regional Energy Partnership and MetroCOG. Bridgeport is a LIDAC and CT Environmental Justice Community.
- Heat pumps 101 and Energy efficiency workshops with the North Hartford Partnership. Hartford is a LIDAC and CT Environmental Justice Community.
- A full log of meetings can be found in Appendix VI.

Establishing a CPRG LIDAC Advisory Group

The LIDAC Advisory Group plays a crucial role within the CPRG framework, tasked with ensuring that GHG reduction actions are beneficial, equitable, and responsive to the specific needs of LIDACs. They provide comprehensive evaluation and expert insights while focusing on maximizing benefits, promoting inclusivity, and addressing the potential challenges and disbenefits of proposed actions. This group's support ensures that the proposed actions not only contribute to GHG reduction but also align closely with the principles of equity and effectiveness in serving LIDACs. Appendix IV includes a summary of feedback from the LIDAC Advisory Group.

We thank the members of the LIDAC Advisory Group for their continued support and participation:

- Kristin Barendregt-Ludwig, Program Manager for the Yale Center for Environmental Justice; Co-Chair of the Governor's Council on Climate Change Equity and Environmental Justice Working Group (2022-present)
- Aziz Dehkan, CT Climate and Jobs; Member of the Governor's Council on Climate Change (present); and Member of the Connecticut Equity and Environmental Justice Advisory Council (present)
- Adrienne Farrar Houël, founder, President and CEO of Greater Bridgeport Community Enterprises, Inc.; Member of the Governor's Council on Climate Change Working Group on Mitigation Strategies (present); and Member of the Connecticut Equity and Environmental Justice Advisory Council (present)

- Mark Mitchell, Professor Emeritus of Climate Change, Energy, and Environmental Health Equity at George Mason University (remote in Hartford, CT); former City of Hartford Director of Public Health; founder and former President of the Connecticut Coalition for Environmental Justice; Chair of the Connecticut Equity and Environmental Justice Advisory Council (present); and Chair of the Governor's Council on Climate Change Equity and Environmental Justice Adaptation Working Group (2020)
- Alex Rodriguez, Environmental Justice Specialist at Save the Sound; Member of the Governor's Council on Climate Change Equity and Environmental Justice Working Group (2020-2022); and Member of the Connecticut Equity and Environmental Justice Advisory Council (present)
- Brenda Watson, Executive Director of the North Hartford Partnership; former Chief Executive Officer for Operation Fuel which provides energy assistance to low income households; and Member of the Governor's Council on Climate Change (2020-present)

Public comment survey

- As recommended by the GC3 Equity and Environmental Justice Working Group public participation guidance, a survey was created to lower barriers to participation in the public comment process on the 14 climate action measures included in the PCAP released in brief as part of a Notice of Request for Public Comment issued on December 22, 2023. The public comment survey provided an easy form with options that could be selected for each measure on a range of potential challenges and benefits for each climate action. The form took about 10 minutes to complete with the option to spend more time to provide detailed written comments in open-ended questions on each climate action proposed by the state.
- The public comment survey results informed CT DEEP's analysis of the benefits and potential negative impacts of the 14 actions and plans to address those impacts on communities in Connecticut in the PCAP.
- The results of the survey were shared via the Climate Solutions Newsletter and posted on the CT DEEP Climate Action Plan website. Appendix V includes a summary of responses to this public comment survey.

Continued engagement with LIDACs throughout the implementation process

As the lead agency, CT DEEP, along with its partners is committed to maintaining a continuous and dynamic engagement process with LIDACs throughout the implementation of the 14 climate action measures in this PCAP. CT DEEP will continue maintaining platforms to engage LIDACs in all stages of the decision-making, implementation, and oversight processes to ensure that all actions are transparent, accountable, accessible, inclusive, and equitable. This will be achieved by maintaining our website and conducting in-person community events to share learning materials, provide updates, and give community members an opportunity to provide feedback and ask questions. Recognizing the critical importance of community input in shaping effective and inclusive climate action strategies, the process will be organized around the four principles of public participation in our Environmental Justice Public Participation Guidance developed by the 2020 GC3 Equity and Environmental Justice Working Group (EEJ). CT DEEP will also follow EPA's guidance on engaging capacity building through effective meaningful engagement.

Review of Authority to Implement

CT DEEP has reviewed existing statutory and regulatory authority to implement each climate action measure in this PCAP. Each implementing state agency has existing authority to implement these measures. Consistent with the PCAP goal of identifying near-term, implementation-ready measures for climate action, in many cases an existing state program may be built upon or expanded to implement the measures in this PCAP. In most cases the measures could also be implemented by other entities eligible for funding under the EPA CPRG Phase 2 Implementation Grant of municipalities, Councils of Governments, and Tribal Nations. The review of authority to implement each of the 14 climate action measures is provided in Appendix I.

Intersection with Other Federal Funding Availability

CT DEEP assessed funding availability broadly with the aim of aligning public investment with the PCAP where appropriate and applicable. CT DEEP considered the wide array of public investment available from the passage of the Bipartisan Infrastructure Law and the IRA. The climate action measures and strategies included in this PCAP were determined to align well with the evaluation criteria for the CPRG Phase 2 Implementation Grant, and to intersect with other funding opportunities beyond the CPRG program. The federal funding programs identified for each measure are included in Appendix I.

Federal funding opportunities identified that could support the climate action measures in this PCAP are:

- US EPA Clean School Bus Program
- US EPA Clean Heavy-Duty Vehicle Program
- US EPA Clean Ports Program
- US EPA Diesel Emission Reduction Act (DERA) grant program
- US EPA Environmental and Climate Justice Community Change Grants program
- US DOE Community Geothermal Heating and Cooling Design and Deployment Grant Program
- US DOE High Efficiency Electric Home (HEEH) program
- US DOE Home Electrification and Appliance Rebates Program

US DOE Home Energy Performance-Based, Whole-House rebate program (the HOMES rebate program)

- US DOT Charging and Fueling Infrastructure Grant Program (CFI)
- US DOT Low or No-Emission Vehicle Program (Low-No) grant
- US DOT National Electric Vehicle Infrastructure (NEVI) Program
- US IRS Electric Vehicle Federal Tax Credits
- US IRS Energy Efficient Home Improvement Federal Tax Credit
- US IRS Residential Clean Energy Federal Tax Credit

Coordination and Outreach

CT DEEP conducted extensive intergovernmental coordination and outreach in the development of this PCAP. This section describes the framework CT DEEP used to support robust and meaningful engagement strategies that were included in the State's climate action plan Governor's Council on Climate Change January 2021 report to ensure comprehensive stakeholder representation and overcome obstacles to engagement, including linguistic, cultural, institutional, geographic, and other barriers. All the measures in this PCAP have undergone prior extensive engagement through the development of strategic plans in the State (as shown in Table 1).

Interagency and intergovernmental coordination

CT DEEP, with its comprehensive structure encompassing a range of bureaus, including Air Management and Energy & Technology Policy, holds a strategic position for interagency coordination in climate planning. The Office of Climate Planning, along with the Air Management Bureau, spearheaded the CPRG coordination efforts and proactively coordinated cross-agency dialogues. The state agencies listed below were identified as potential coordinating agencies in the state's CPRG planning grant work plan. CT DEEP internal office directors conducted in-depth discussions with sister state agencies that have the potential to implement climate actions-including the CT Office of Policy and Management, the CT Department of Administrative Services, which oversees all state fleets and buildings; and the CT Department of Transportation-to identify collaborative avenues for priority actions and align external engagement plans. Additionally, all the state agencies listed below received a copy of the draft PCAP.

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State agencies identified for coordination

- Office of Policy and Management (OPM)
- Department of Administrative Services (DAS)
- Department of Transportation (DOT)
- Department of Labor (DOL)
- Department of Public Health (DPH)
- Office of Workforce Strategy (OWS)
- Department of Economic and Community Development (DECD
- Department of Agriculture (DoAg)
- Department of Housing (DOH)
- Department of Motor Vehicles (DMV)
- Department of Social Services (DSS)
- University of Connecticut (Uconn)

For Metropolitan Statistical Areas (MSAs) that received CPRG planning grants (led by Councils of Governments), CT DEEP collaboration focused on leveraging existing plans and resources to align state-level climate goals. CT DEEP joined the MSAs' bi-weekly coordination meetings and coordinated monthly CT DEEP-led meetings when needed. In addition, CT DEEP coordinated with those Councils of Governments that did not receive planning grants to identify their specific climate goals and challenges and integrated their perspectives and needs into the state's PCAP.

Tribal government coordination

CT DEEP sent letters to the leadership of the Tribal Governments of the Mashantucket Pequot Tribal Nation and the Mohegan Tribal Nation notifying them of the PCAP and its 14 measures with an invitation to meet to coordinate work across the plans.

Appendix VI includes a log of interagency and intergovernmental coordination and stakeholder and public engagement efforts associated with development of this PCAP. Meeting and outreach materials and resources are available at **portal.ct.gov/CT DEEP/Climate-Change/Climate-Action-Plans**

Strategies to overcome linguistic, cultural, institutional, geographic, and other barriers to participation

CT DEEP is committed to continue addressing linguistic, cultural, institutional, and geographic barriers in Connecticut's climate initiatives by employing a range of strategies and resources. Leveraging CPRG planning funds, CT DEEP aims to continue enhancing engagement and accessibility. This includes hosting both in-person and virtual community events, ensuring broad accessibility through translation services, and offering flexible event timings to cater to diverse schedules. As CT DEEP progresses with the State's CCAP due in Summer 2025, it will continue to refine these strategies with robust support from CT DEEP's Office of Equity and Environmental Justice, along with insights and guidance from the Connecticut Equity and Environmental Justice Advisory Council (CEEJAC) and the LIDAC Advisory Group, ensuring a wide-reaching and equitable approach to climate action planning.

Past engagement informing the PCAP

CT DEEP is committed to equitable and inclusive engagement in its climate planning processes. The three examples described here directly informed the 14 actions included in this plan and continue to inform climate planning within the agency. This is not an exhaustive list of engagement that has shaped CT DEEP and its sister agencies' work to address climate change, but these three processes (the Governor's Council on Climate Change, the Connecticut Environmental Justice Screening Tool, and the Connecticut Equity and Environmental Justice Advisory Council) exemplify CT DEEP's approach.

Governor's Council on Climate Change (GC3) engagement process (Years 2020-2022)

As described in the introduction of this plan, the January 2021 GC3 report included 61 recommendations for climate action in Connecticut. The GC3 engagement process is summarized below. The January 2021 report includes more detail on all of these processes, including the names and affiliations of every individual engaged in the process.

- **GC3 Equity and Environmental Justice Working Group.** The Governor's Executive Order 3, which reconstituted the Council, charges the GC3 with "prioritizing, integrating and advancing equitable distribution of the costs and benefits of climate change mitigation planning policies, specifically addressing disproportionate impacts of such strategies on environmental justice communities." To fulfill that mandate, the GC3 created an Equity and Environmental Justice (EEJ) Working Group made up of individuals affiliated with organizations focused on equity and environmental justice issues, as well as other people living and/or working in those communities. The EEJ was charged with developing a plan and guidelines for engaging diverse stakeholders in the process and working with the other working groups to evaluate recommended strategies through an equity lens.

- **The Equity Lens.** The EEJ Working Group's 2020 report states that, "the principles of equity mandate that race, national origin, socio-economic status, religion, gender, gender identify, disabilities, sexuality, or other facets of identity must not inhibit a person's access to resources, including basic necessities such as safe shelter, water, food, heat, and light, as well as opportunities for safe employment to support oneself and one's family, equal access to community supports such as public education, public transportation, healthcare and mental health care." Equity also includes the following four concepts:
    - Distributive equity: Placing the most vulnerable communities at the forefront of any potential benefits a policy might create; ensuring that the distribution of the benefits and burdens of climate change mitigation.
    - Procedural equity: Planning in partnership with low income communities and black, indigenous, and other people of color (BIPOC) communities.
    - Contextual equity: Assessing the vulnerabilities of communities across Connecticut to climate change, due to the legacy of racial and income inequality and other factors.
    - Corrective equity: Providing communities with clear processes to hold the state accountable to its commitments to pursue equity.

Throughout the planning process, the GC3 working groups, including the Mitigation Strategies Working Group, strived to apply this concept of the equity lens when drafting and finalizing their climate action recommendations. The GC3's commitment to prioritizing and addressing equity and environmental justice was further strengthened as a result of inequities that were brought to the forefront by the pandemic, the murders of George Floyd and Breonna Taylor, and the subsequent protests for racial justice across the United States.

- **GC3 EEJ Working Group activities.** The EEJ Working Group undertook the following activities as part of its public engagement and engagement with the other working groups.
    - Embedded individuals with living experience and/or knowledge of equity and environmental justice issues within each topic working group and subgroup.
    - Developed public participation guidance for meetings of the GC3, both in person and online. This public participation guidance continues to guide climate planning in Connecticut today, including in the development of this PCAP.
    - Four EEJ subcommittees (specifically, Public Participation; Environmental and Climate Justice Mapping Tool; Mitigation; and the Equity, Environmental Justice & Adaptation (EEJA) Subcommittees) provided feedback on an expedited basis to other GC3 working groups and developed recommendations for progress on mitigation and adaptation strategies.
    - Met to review the draft recommendations from the working groups, prior to their release for public comment, to provide feedback to improve how well those recommendations met the Governor's charge in this area.
    - Launched a weekly webinar series on environmental and climate justice to inform participants involved in the GC3 process as well as the general public.

Engagement process for GC3 in 2020. The GC3 had seven (7) working groups, including EEJ, from which the 61 climate action recommendations of the GC3 2021 report were drawn. The Mitigation Strategies Working Group, which primarily focused on recommendations to reduce GHG emissions, was further subdivided into subgroups for the Buildings, Electricity, Transportation, Cross-sector, and Non-Energy Sectors. Each working group and any associated subgroups met many times over the course of 2020. Every working group meeting was open to the public and most meetings provided an opportunity for public comment. Altogether, the working groups included231 individuals representing over 100 different organizations and 186 meetings were conducted.

Each working group submitted a draft report; those reports were subject to a 30-day public review period from September 22, 2020 to October 21, 2020. During the public review period, a series of six public forums were held to present the findings and recommendations of each of the working groups and to provide an interactive opportunity to solicit feedback from the public. In addition to feedback received during the public forums, hundreds of written comments on the GC3 draft reports were submitted by the public and reviewed by the working groups. After the close of the public comment period, each working group revised its report and submitted a final report. The final reports are available to view on the GC3 Working Group Report webpage, where the compiled public comments can also be found.

Development of an Environmental Justice (EJ) screening tool (Years 2021-2023)

CT DEEP, in collaboration with the Connecticut Institute for Resilience and Climate Adaptation (CIRCA), developed the Connecticut EJ Screening Tool with the primary purpose of providing a data-driven framework to assist policymakers, planners, and the public in understanding the environmental burdens and vulnerabilities within different communities.

The development of the tool was done in collaboration with community-based, non-profit hosting organizations by holding evaluation forums. The process began with selecting hosting partners with strong connections with their local communities. Five communities were chosen based on EJ characteristics and geographic spread around the state: Bridgeport, Waterbury, Hartford, City of Groton and New Haven.

The participatory approach of the tool's evaluation helped gather invaluable user feedback from diverse perspectives. Participants provided in-depth commentary on issues that affect their communities. Feedback provided included comments on energy burdens, energy poverty and access to reliable energy; EV charging infrastructure leading to more disparity; and a comment from one participant that the two most important EJ issues in Connecticut are air pollution and flooding.

For a complete report on the development of the tool visit: **https://connecticut-environmental-justice-circa.media.uconn.edu/wp-content/uploads/sites/3393/2023/08/FinalReport_ver2.0.pdf**

Connecticut Equity and Environmental Justice Advisory Council (Meeting quarterly, December 2022 to present)

Governor Lamont's Executive Order No. 21-3 established within CT DEEP a Connecticut Equity and Environmental Justice Advisory Council (CEEJAC) as part of the implementation of the recommendations of the GC3. According to the Executive Order, "[t]he purpose and mission of the CEEJAC is to advise the Commissioner of CT DEEP on current and historic environmental injustice, pollution reduction, energy equity, climate change mitigation and resiliency, health disparities, and racial inequity, including but not limited to the following:

- Integrating environmental justice considerations into the programs, policies, and activities of CT DEEP to improve the health and environment of Environmental Justice Communities, in key areas including, but not limited to: (1) rulemaking, (2) permitting standards and processes, (3) compliance and enforcement, (4) science and data, and (5) equitable program delivery; providing mechanisms for Environmental Justice Communities to have a meaningful opportunity to participate in any decision; and
- Providing mechanisms for Environmental Justice Communities to have a meaningful opportunity to participate in any decision to allow in such communities certain types of facilities which, by the nature of their activity, have the potential to increase environmental and public health stressors and where appropriate, to limit the further placement and expansion of such facilities in these communities;
- Developing a model plan for community engagement and stakeholder outreach centered around meaningful participation; and
- Strengthening CT DEEP's partnerships with other governmental agencies, other states, tribal, local governments, and community leaders and organizations regarding environmental justice issues."

CEEJAC Membership

View the 2023 CEEJAC Members

The Executive Order authorizes the Commissioner of CT DEEP to appoint members of the CEEJAC, including at a minimum, the following non-agency members:

- three (3) representatives of Environmental Justice Communities, which for purposes of this order shall be defined as members of communities of color, members or representatives of low income communities, representatives of community-based organizations, or academics with knowledge about or experience in environmental justice, climate change, racial inequity, or any other area determined by the Commissioner to be of value to the CEEJAC;
- three (3) representatives of Connecticut-based environmental advocacy organizations;
- two (2) representatives of large and small business and industry;
- two (2) representatives from municipalities or regional Councils of Government established pursuant to Chapter 127 of the Connecticut General Statutes.

The CEEJAC also includes representatives from the following State agencies: the Department of Public Health (DPH); the Department of Economic and Community Development (DECD); the Department of Housing (DOH); and the Department of Transportation (DOT). In addition, the Executive Order directs the Commissioner of CT DEEP to appoint additional members to the CEEJAC as needed in furtherance of the purpose of the CEEJAC.

The Executive Order also authorizes the Commissioner to establish subcommittees or working groups of the CEEJAC to address specific topics, and to include in such subcommittees and working groups participants who are not otherwise members of the CEEJAC. Current subcommittees include: Air and Transportation, Energy and Technology (also covers buildings issues in this space), Waste, Land, and Water.

Next Steps

This PCAP is the first deliverable under the CPRG planning grant awarded to CT DEEP. CT DEEP and its partners will continue planning, engagement, and actions to reduce emissions; invest in sustainable infrastructure, technologies, and practices; build our economy; and enhance the quality of life for all residents in Connecticut. In 2025, CT DEEP will publish a Comprehensive Climate Action Plan (CCAP) that establishes equitable and sustainable economic development strategies to reduce emissions across all sectors. The CCAP will include near-and long-term emissions projections, a suite of emission reduction measures, a robust analysis of measure benefits, plans to leverage federal funding, and a workforce planning analysis. In 2027, CT DEEP will publish a status report that details implementation progress for measures included in the PCAP and CCAP, any relevant updates to PCAP and CCAP analyses, and next steps and future budget and staffing needs to continue implementation of CCAP measures.

If you have questions about this PCAP or suggestions for the upcoming CCAP and status report, email DEEP.climatechange@ct.gov.

Appendix I: Near-Term Implementation-Ready Climate Action Measures

1. *Deploy electric vehicle chargers statewide to support light-duty and medium-heavy duty fueling needs*

Description of climate action measure

This climate action measure, if implemented, would install zero emission light-, medium-, and heavy-duty vehicle charging and fueling infrastructure. For light-duty vehicles, level two and level three 150 kW chargers were assumed to be installed in areas that currently have few options, such as near multifamily homes. If implemented, 350 kW and one MW chargers would be installed for medium- and heavy-duty vehicles. Medium-duty vehicles include cars, SUVs, pickup trucks, small box vans, and delivery vehicles. Heavy-duty vehicles include larger box trucks, vocational vehicles, and class seven/eight day and sleeper cab tractor trailers.

Estimates of the cumulative greenhouse gas emissions reductions

Climate action measure (or sub-measure)	**Cumulative GHG emission reductions (metric tons CO_2e)**	
	2025–2030	**2025–2050**
Light-duty Vehicle Chargers	190,000	1,150,000
Medium/Heavy-duty Vehicle Chargers	1,650,000	9,870,000
Total program	1,840,000	11,020,000

CO_2e = carbon dioxide equivalents

Estimates of co-pollutant emissions reductions

	Light-duty Vehicle Chargers		**Medium-/Heavy-duty Vehicle Chargers**	
Co-pollutant	**Reduction (metric tons)**		**Reduction (metric tons)**	
	2025–2030	**2025–2050**	**2025–2030**	**2025–2050**
NOx	26.5	57.7	1278	4088

$PM_{2.5}$	0.2	3.0	39	107
VOC	61.6	247.4	548	2136

Anticipated benefits and disbenefits to Low Income and Disadvantaged Communities (LIDACs)

For light-duty vehicles, the focus of this measure would be to install charging and fueling infrastructure in areas with few currently available options for charging zero-emission vehicles, such as multi-family homes. Accessibility and reliability of charging stations play an essential role in supporting electric vehicle deployment within LIDACs. By providing options for charging zero emission vehicles in LIDACs, the measure may reduce vehicle miles traveled (VMT) from gasoline and diesel vehicles. Displacing VMT from gasoline and diesel light-duty vehicles would reduce exposure to co-pollutants, such as $PM_{2.5}$, VOC, and NOx. In addition, a lower gasoline vehicle VMT will reduce emissions of hazardous air pollutants such as benzene, a known human carcinogen. Benzene is both a combustion product and an evaporative emission from gasoline vehicles. Zero emission vehicles (ZEVs) have no combustion or evaporative emissions.

Installation of charging and fueling infrastructure for medium- and heavy-duty ZEVs will provide commercial vehicle drivers options for fueling ZEVs and will encourage ZEV use. Vocational vehicles such as larger box trucks, beverage delivery, tow trucks, fuel trucks, and others often operate in LIDACs and emit co-pollutants near residents. More than half of respondents from LIDACs to CT DEEP's on-line survey on PCAP measures felt that deploying chargers statewide for trucks of various sizes would reduce greenhouse gas emissions that warm the planet, promote cleaner air, reduce noise pollution, and improve health risks. This measure is projected to reduce 2,138 tons of NOx, 64 tons of $PM_{2.5}$, and more than 979 tons of VOC between 2025-2030 in Connecticut on a population weighted basis. Between 2025 and 2050, the measure is projected to reduce 7,316 tons of NOx, 180 tons of $PM_{2.5}$, and 3,793 tons of VOC, also on a population weighted basis.

ZEVs generally have lower operating costs compared to traditional gasoline-powered vehicles, which can help low income residents save money on fuel and maintenance expenses. The focus of this measure is to install fueling or charging infrastructure in areas that currently lack options, which may help alleviate range anxiety associated with ZEVs. It would also help reduce driving time to chargers/fueling infrastructure.

The installation and maintenance of charging infrastructure would create a variety of job opportunities in fields such as electrical installation, maintenance and repair, charger assembly, general construction, software maintenance and repair, planning and design, and administration. A new report on EV charging infrastructure by the International Council on Clean Transportation projects that, by 2032, an estimated 157,200 full-time equivalent jobs related to light-duty and medium- to heavy-duty vehicle charging infrastructure will be created across the US. The following table shows the person-days required per charger type and the number of full-time equivalent jobs from implementing this measure.

Job Type*	**DC fast charger (person-day jobs)**	**Level two (2) charger multifamily home (person-day jobs)**	**Level two (2) charger single family home (person-day jobs)**
Electrical installation	10	4-5	1-2
Electrical maintenance and repair	1	1-2	-
Charger assembly	4	1	1
General construction labor	3	2	-
Software maintenance and repair	1	1	-
Planning and design	4	3-4	-
Administration and legal	1-2	1	-

*Note: does not include jobs related to operations, sales, marketing, finance, executive positions, and R&D.

By increasing domestic manufacturing and implementing higher rates of charger recycling, there is potential for further job growth. The introduction of licensing and certification requirements for the EV workforce by the government would not only ensure adherence to installation and maintenance standards but also indirectly lead to job creation in educational institutions for training and capacity building.

Options to mitigate potential disbenefits:

- The development and maintenance of EV charging infrastructure can create new job opportunities, from the installation and maintenance of charging stations to manufacturing and integration of EV components. At the same time, it may result in job losses for traditional fossil fuel-dependent industries such as gas stations. This transition will require efforts to retrain

and provide employment opportunities for individuals affected by these changes.
- If stations are not conveniently located near low income communities, residences of those communities will be subject to additional commuting time and may experience range anxiety. It is important to ensure that infrastructure is accessible and distributed equitably to meet the needs of all residents. In addition, locating infrastructure near multi-family buildings would help alleviate issues related to upgrading electrical systems to handle additional electrical loads, which can be costly for low income residents and may result in resistance from landlords or property owners.

Key implementing agency or agencies

- State agencies and quasi-public agencies, including the Connecticut Department of Energy and Environmental Protection
- Municipalities
- Councils of Governments
- Tribal Nations

Implementation schedule and milestones

- Year 1, Q1: Design Grant Program
- Year 1, Q1-Q3: Communication and stakeholder engagement
- Year 1, Q3: Issue Request for Proposals
- Year 1, Q4: Receive applications
- Year 2, Q1: Grants provided for the installation of vehicle chargers
- Years 3-5: Repeat grant rounds as necessary and funding available

Geographic scope

Statewide

Metrics for tracking progress

- Request for proposals issued for charging infrastructure
- Number of chargers installed
- Electricity usage from installed chargers
- Percent utilization of chargers
- Funds spent relative to total grant amount in each year
- Rate of spending relative to project schedule

Authority to implement

CT DEEP has authority to award vouchers to support deployment of EV chargers for light-duty and medium-heavy duty vehicles. Connecticut General Statutes (CGS) 22a-201e authorizes CT DEEP to award vouchers to "support the deployment" of certain types of zero-emission trucks (ranging from 2-axle, single-unit trucks to multi-axle, multi-trailer trucks) and school buses (ranging from pick-ups and vans to 4-axle, single-trailer trucks) and "installation of electric vehicle charging infrastructure." Because this section does not limit installation of chargers to those usable by specific types of vehicles, CT DEEP may provide vouchers for installation, anywhere in the state, of EV chargers for all types of vehicles, including light-duty and medium-heavy duty vehicles.

For more information on CT DEEP's existing EV charging programs see:
https://portal.ct.gov/DEEP/Air/Mobile-Sources/EVConnecticut/EVConnecticut---Home
https://portal.ct.gov/DEEP/Air/Mobile-Sources/VW/VW-Settlement---Grants

For more information on CT DOT's existing NEVI program see:
https://portal.ct.gov/DOT/Sustainability-and-Resiliency/NEVI-Home-Page

Intersection with other federal funding availability

The National Electric Vehicle Infrastructure (NEVI) Program, funded by the Bipartisan Infrastructure Law, provides formula grants to states to strategically deploy EV charging stations and to establish an interconnected network to facilitate data collection, access, and reliability. With funding from NEVI, Connecticut is installing EV chargers along I-95, I-84, I-91, I-395, and Route 7.

Connecticut also received a grant through the federal Charging and Fueling Infrastructure Grant Program (CFI) to fund community EV charging infrastructure. Lastly, Connecticut residents and businesses may qualify for the Alternative Fuel Vehicle Refueling Property Tax Credit. The credit was extended and modified by the IRA. The credit allowed is based on the placed-in-service date for the qualifying property.

Connecticut has utilized the Diesel Emission Reduction Act (DERA) grant program has provided rebates to support charging infrastructure for medium and heavy-duty vehicles.

The federal Clean Heavy-Duty Vehicle Program, an IRA program, is expected to launch in spring 2024 and will support zero-emission vehicle infrastructure. EPA will

administer these funds in the form of grants and rebates to eligible recipients.

Technical information

Method for estimating greenhouse gas reductions:
The MOVES4 model was run statewide to estimate per mile CO_2e, NOx, VOC, and $PM_{2.5}$ emissions in grams/MMBtu for light-, medium- and heavy-duty vehicles (classes 1-8). Light-duty vehicles were defined as vehicles up to 8,500 pounds Gross Vehicle Weight Rating (GVWR); medium-duty as vehicles between 8,500 and 26,000 pounds GVWR; and heavy-duty as vehicles above 26,000 pounds GVWR. Information on the mix of EV chargers (levels 2 and 3) for light-duty vehicles was obtained for Connecticut from the Department of Energy's Alternative Fuels Data Center Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite (https://afdc.energy.gov/evi-pro-lite. For light-duty vehicles, information on frequency of charging sessions per charger, power dispensed per charger per day, and other information was obtained from Electrify America. For medium- and heavy-duty vehicles, charger power demand was calculated using the nominal capacity of the chargers and assumed utilization rates of 30% for medium-duty vehicles, which typically operate locally, and 15% for heavy-duty vehicles based on the ICCT report "Total Cost of Ownership of Alternative Technologies for Class 8 Trucks," (https://theicct.org/wp-content/uploads/2023/04/tco-alt-powertrain-long-haul-trucks-us-apr23.pdf). Cost information from the International Council on Clean Transportation, ICF, and other sources was obtained to estimate the number of chargers that could be purchased for a given level of funding. Based on cost estimates for light-, medium-, and heavy-duty chargers, and an estimated mix of charger power levels, an estimate for the total number of chargers was developed for an assumed funding level of $25 million. Total power dispensed from the chargers was calculated and this power was converted to light-, medium-, and heavy-duty emissions using the MOVES4 emission rates for each class of vehicle.

Models/tools used:
EPA's MOVES 4 model was used to estimate Connecticut-specific light-, medium-, and heavy-duty vehicle emissions between 2025 and 2050.

Grid emissions rates were obtained from CT DEEP's 2020 Integrated Resources Plan and U.S. Department of Energy's GREET model to calculate upstream (electricity generating-related) emissions associated with EV charging. For light-duty vehicles, average power demand from existing chargers as documented in Electrify America's most recent quarterly report to the California Air Resources Board was

used to estimate average grid emissions per charger. For medium- and heavy-duty vehicles, the capacity of the chargers and assumed utilization rates of 30% (MDVs) and 15% (HDVs) were used to calculate average power demand and associated grid emissions. The net benefit was calculated by combining avoided vehicle emissions (from MOVES emissions rates) and the grid emissions associated with charging.

Measure implementation assumptions:
The following key assumptions about measure implementation were used to quantify emissions reductions for this measure:

- Based on the EVI-Pro Lite tool for light-duty vehicle charging infrastructure needs in Connecticut, we assumed that there would need to be 300 Level 2- and 150-kW chargers. Based on a review of costs in the literature, we assumed that there would need to be 30 350 kW M/HD chargers.
- We assumed a six-year phase-in for chargers between 2025 and 2030.
- Based on ICCT studies, Level 2 chargers were assumed to cost $6,000, Level 3 150 kW chargers were assumed to cost $90,000, Level 3 350 kW chargers were assumed to cost $295,000, and 1 MW chargers were assumed to cost $380,000.

Modeling assumptions:
MOVES emission rates for CO_2e, NOx, $PM_{2.5}$, and VOC were used for light-, medium-, and heavy-duty vehicles.

Reference case scenario:
The reference case for this scenario is that the EV charger mix described in this section is not installed.

Measure-specific activity data and implementation tracking metrics:
Total power dispensed from the chargers was calculated and this power was converted to light-, medium-, and heavy-duty VMT. VMT was converted to emissions using the MOVES4 emission rates for each class of vehicle. We assume that chargers installed as part of this program remain in place through 2050.

2. Establish electric vehicle incentive pathways for advanced technology vehicles (full battery electric, plug-in hybrid and fuel cell electric vehicles for light-, medium-, and heavy-duty vehicles—collectively "ZEVs")

Description of climate action measure

This climate action measure, if implemented, would expand funding for an existing light-duty zero emission vehicle purchase incentive program. It would also support a new program to provide incentives for the purchase of medium- and heavy-duty zero-emission vehicles. Vehicles eligible for the incentives would include light duty (LD) as well as medium and heavy-duty (MHD) full battery electric, plug-in hybrid, and fuel cell electric vehicles, collectively called "ZEVs". Expanding existing incentives and creating new incentives will be critical to transitioning the market to LD and MHD ZEVs. Connecticut has ZEV regulations in place through the 2025 model year that requires manufactures to place an increasing percentage of advanced technology vehicles in our state. National data show that manufacturers place twice as many ZEVs in states with a regulatory framework compared to placement of ZEVs in states without such requirements. Vehicle purchase incentives are critical to ensuring ZEVs are priced similarly to their internal combustion engine (ICE) vehicle counterparts as well as made more affordable to low and moderate-income residents in Connecticut. For light-duty ZEV incentives, CT DEEP plans to build off its Connecticut Hydrogen and Electric Automobile Purchase Rebate (CHEAPR) program, which offers rebates for light-duty ZEVs. A program to provide ZEV purchase incentives for MHD vehicles is now under development as authorized and directed by Public Act 22-25 codified at Connecticut General Statutes 22a-201e. CT DEEP is looking to model this program after existing programs in the Commonwealth of Massachusetts and New York State.

Estimates of the cumulative greenhouse gas emissions reductions

Climate action measure (or sub-measure)	**Cumulative GHG emission reductions (metric tons CO_2e)**	
	2025–2030	**2025–2050**
Light-duty Vehicle incentives	640,000	1,330,000
Medium-/Heavy-duty Vehicle incentives	40,000	150,000
Total program	680,000	1,480,000

CO_2e = carbon dioxide equivalents

Estimates of co-pollutant emissions reductions

	Light-duty vehicle incentives		**Medium-/heavy-duty vehicle incentives**	
Co-pollutant	**Reduction (metric tons)**		**Reduction (metric tons)**	
	2025–2030	**2025–2050**	**2025–2030**	**2025–2050**

NOx	157	231	41	113
$PM_{2.5}$	6.2	13.7	0.8	1.8
VOC	289	555	8	25

Anticipated benefits and disbenefits to Low Income and Disadvantaged Communities (LIDACs)

This measure is designed to address the higher upfront costs for ZEVs compared to internal combustion engine (ICE) vehicles. This cost disparity presents a greater financial barrier for lower-to-moderate income (LMI) residents who might be considering ZEVs. The measure would expand funding for Connecticut's CHEAPR Rebate+ program, which is an income qualified vehicle incentive program for the purchase of ZEVs that also prioritizes incentives for residents within environmental justice and disadvantaged communities. ZEV purchase incentives are even more critical for LMI residents as studies show ZEV operating and maintenance costs are lower than for gasoline powered vehicles. A 2023 Consumer Reports analysis found that maintenance and repair costs for EVs are less than 50% of repair costs for ICE vehicles. The study also found, assuming existing federal vehicle purchase incentives, that EV owners will save money in the first year of EV ownership and that total lifecycle costs of purchasing and owning ZEVs are $6,000 to $12,000 lower than for ICE vehicles. Low income residents that purchase a ZEV would, therefore, save money as compared to owning an ICE vehicle, provided additional funding for ZEV purchase incentives could allow LIDACs residents to take advantage of these lower vehicle operating costs. While limited access to charging infrastructure can present challenges for lower-income residents who may rely on public charging stations, Connecticut has in place several utility-sponsored programs as well as additional federal funding to support EV charging infrastructure through the U.S. DOT's National Electric Vehicle Incentive (NEVI) program and Charging and Fueling Infrastructure (CFI) discretionary grant programs.

Increasing ZEVs and reducing ICE vehicle emissions will lower co-pollutant exposure to residents of LIDACs. LIDAC members are facing well-documented health risks from their exposure to higher levels of air pollution. The respondents to the feedback survey conducted by CT DEEP reported that reducing greenhouse emissions and improving health were highly important. Additionally, respondents expressed the significance of establishing incentive pathways for ZEVs to reduce GHG emissions, enhance air quality, minimize noise, and promote better health within their communities.

The additional CHEAPR incentives that this measure will fund are estimated to reduce light-duty vehicle NOx emissions by 157 tons between 2025 and 2030 and 231 tons by 2050. $PM_{2.5}$ emissions will be reduced by 6.2 tons by 2030 and 13.7 tons by 2050. Some of the ZEV vehicle miles traveled will occur in LIDACs areas, reducing exposure to co-pollutants, including, hazardous air pollutants such as benzene will be reduced in LIDACs. Benzene is a known human carcinogen and is both a combustion product and an evaporative emission. Medium- and heavy-duty vehicle co-pollutants will also be reduced significantly by this measure. NOx will be reduced by 41 tons through 2030 and 113 tons by 2050. $PM_{2.5}$ emissions will be reduced by 0.8 tons to 2030 and 1.8 tons to 2050. Trucks frequently operate in disadvantaged communities that bear a disproportionate burden of pollution.

Options to mitigate potential disbenefits:

- While the International Council on Clean Transportation determined that ZEVs powered on an existing and projected grid are still cleaner than ICE vehicles, pairing a transition to EVs with a transition to renewable electricity will maximize GHG and co-pollutant benefits.
- Implement a battery recycling program and support federal programs to minimize environmental impacts of mining for battery materials.
- Jobs programs to train and retrain workers on maintenance and operation of EVs to mitigate job losses related to existing ICE vehicle maintenance and operations.

Key implementing agency or agencies

- State agencies and quasi-public agencies, including the Connecticut Department of Energy and Environmental Protection, which is the agency that administers CHEAPR and is authorized to administer an MHD incentive program.

- Incentives for purchasing of light-, medium-, and heavy-duty ZEVs could also be implemented by:
    - Municipalities
    - Councils of Governments
    - Tribal Nations

Implementation schedule and milestones

- Year 1, Q1: Design Grant Program for MD and HD ZEVs
- Year 1, Q1-Q3: Communication and stakeholder engagement
- Year 1, Q2: Create outreach materials and application materials for MH and HD grant program
- Year 1, Q2: Fund CHEAPR program with additional grant dollars
- Year 1, Q3: Fund MD and HD incentive programs
- Year 1, Q4 - Year 2, Q1: Receive applications for LD/MD/HD ZEVs
- Year 2, Q1: Issue rebates for LD, MD, and HD ZEVs
- Years 3 – 5: Repeat grant rounds as necessary and funding available

Geographic scope

Statewide

Metrics for tracking progress

- Number of public relations, community engagement, and education events concerning the grant program
- Contractor oversight
- Number of applications for funding received
- Number of rebates issued
- Tracking of the total amount of funding disbursed
- Progress in disbursing funds relative to the project schedule and budget
- Number of light-, medium-, and heavy-duty ZEVs placed in service

Authority to implement

CT DEEP has authority to provide incentives for purchase of electric vehicles. CGS 22a-202(b) requires CT DEEP to "establish and administer" the Connecticut Hydrogen and Electric Automobile Purchase Rebate program. Under the program, Connecticut residents, municipalities, businesses, nonprofit organizations, and tribal entities are given rebates or vouchers when they purchase or lease a new or used "battery electric vehicle," "plug-in hybrid electric vehicle" or "fuel cell electric vehicle" (CGS 22a-202(d)). While these categories are broadly defined without specifying any vehicle-type limits (CGS 16-19eee), until June 30, 2027 only vehicles whose manufacturer's suggested retail price does not exceed $50,000 are eligible (CGS 22a-202(d)). CT DEEP can set and revise the amounts of the rebates and vouchers and the maximum income levels for qualification. In addition, CT DEEP is authorized under CGS 22a-201e to award vouchers to "support the deployment," e.g., purchase or lease, of certain types of zero-emission trucks (ranging from 2-

axle, single-unit trucks to multi-axle, multi-trailer trucks) and school buses (ranging from pick-ups and vans to 4-axle, single-trailer trucks).

Intersection with other federal funding availability

Connecticut has utilized EPA's Diesel Emission Reduction Act (DERA) grant program to provide rebates for medium and heavy-duty vehicles.

Under the IRA, three new tax credits are available to individual purchasers of clean vehicles:

- Up to $4,000 for buyers of qualified, previously owned clean vehicles
- Up to $7,500 for buyers of qualified, new clean vehicles
- Up to $1,000 toward the cost of a home EV charger

For more information see: https://www.energy.gov/energysaver/new-and-used-clean-vehicle-tax-credits

Technical Information

Method for estimating greenhouse gas reductions:

The MOVES4 model was used to develop emission inventories for light-, medium-, and heavy-duty vehicles specific to Connecticut for the calendar years 2025-2050. The number of ZEV purchases that could be incentivized through the program was calculated based on an assumed funding level of $50 million for light-, medium-, and heavy-duty ZEV incentives. Annual ZEV VMT was calculated for the different classes of incentivized ZEV purchased. Based on the estimation of new ZEV VMT that would occur as a result of the ZEV incentives, ICE vehicle VMT was reduced in each calendar year between 2025 and 2050. Emissions reductions were estimated by applying estimated ICE VMT reductions to the MOVES4 emissions estimates for CO_2, NOx, VOC, and $PM_{2.5}$. Emissions reductions were summed for 2025 to 2030 and 2025 to 2050.

Grid emissions associated with charging these additional ZEVs were estimated using calculated estimates of the electricity demand from these vehicles along with emissions rates provided by DOE's GREET model and CT DEEP's Bureau of Energy and Technology Policy. The overall emissions reductions represent a net value reflecting both the reduction in tailpipe emissions and the increase in grid emissions.

Models/tools used:

EPA's MOVES4 model was used for this analysis. Using emission factors for class 1-8 vehicles, Sonoma Technology developed a calculator for ZEV purchase incentives. The calculator estimates the ICE vehicle VMT that will be displaced as a result of the ZEV purchase incentives.

Measure implementation assumptions:
The following key assumptions about measure implementation were used to quantify emissions reductions for this measure:

- According to EVI-Pro Lite (https://afdc.energy.gov/evi-pro-lite), in order to have 25% of the CT light-duty fleet electrified (674,000 ZEVs on the road) in 2030, CT would need 20,874 public level 2 chargers and 971 public level 3 fast chargers. A 25% ZEV fleet in CT in 2030 would be in line to meet a 100% ZEV fleet by 2052, assuming a linear increase in the number of LD ZEVs in the state LD fleet of 3.5% each year. These assumptions would place 300 level 2 and level 3 chargers in CT.
- According to a 2023 ICCT study (https://theicct.org/wp-content/uploads/2023/05/infrastructure-deployment-mhdv-may23.pdf), 1,441 MWh would need to be dispensed daily in CT to meet MHD ZEV charging needs in 2030. The proposed measure would install chargers that would dispense approximately 60 MWh daily.
- Funding was assumed to be allocated in the following way: 30% for LDV, 45% for MDV, and 25% for HDV ZEV incentives.
- In each calendar year between 2025 and 2030, 1/6th or 16.7% of vehicles incentivized as part of the program were assumed to be introduced into the fleet. Between 2025 and 2030, 100% of the vehicles are introduced into the fleet, equaling a total of 4,300 light-duty ZEVs, 469 medium-duty vehicles, and 77 heavy-duty ZEVs. Light-duty ZEVs were assumed to be 50% battery EVs and 50% plug-in hybrid EVs.
- LD ZEVs were assumed to cost 50% less than ICE vehicles to operate and maintain.
- MD ZEV incentives were assumed to average $50,000 per vehicle.
- HD ZEV incentives were assumed to average $150,000 per vehicle.

Modeling assumptions:
The following key assumptions about emission reductions were used to quantify emission reductions for this measure:

- Annual VMT estimates for light-, medium-, and heavy-duty ICE vehicles were taken from the MOVES model.
- Tailpipe emissions for ZEVs was assumed to be zero and emission factors from MOVES were used for ICE vehicles.

Reference case scenario:
The reference case for this scenario is no expansion of the purchase incentive program for light duty vehicles and no new program to provide incentives for the purchase of medium- and heavy-duty zero-emission vehicles.

Measure-specific activity data and implementation tracking metrics:
A 15-year lifespan was assumed for the introduced ZEVs. Vehicles introduced in 2025 were assumed to be retired in 2040. Vehicles introduced in 2026 were assumed to leave the fleet in 2041 and so on. By 2050, no ZEVs introduced as part of this program were assumed to be on the road.

3. *Replace existing school buses with zero-emission vehicle school buses in environmental justice communities*

Description of climate action measure

This climate action measure, if implemented, would replace a total of 2,108 school buses powered by diesel engines with zero emission school buses in Connecticut Environmental Justice (EJ) Communities, many of which are also LIDAC areas. The measure would be accompanied by the separately funded replacement of 5,468 diesel school buses with electric buses in non-EJ Communities. Diesel emissions contribute to unhealthy levels of air pollution that can harm children's health. Because of this, the measure is anticipated to provide important health benefits in addition to climate benefits in LIDAC areas of Connecticut.

Estimates of the cumulative greenhouse gas emissions reductions

Climate action measure (or sub-measure)	Cumulative GHG emission reductions (metric tons CO_2e)	
	2025–2030	2025–2050
2,108 electric school buses	124,951	269,636

CO_2e = carbon dioxide equivalents

Estimates of co-pollutant emissions reductions

Co-pollutant	Reduction (metric tons)	
	2025–2030	2025–2050
NOx	218	445
$PM_{2.5}$	5.1	6.1
VOC	21	39

Anticipated benefits and disbenefits to Low Income and Disadvantaged Communities (LIDAC)

Co-pollutants, including NOx, $PM_{2.5}$, and VOC, would be reduced by converting diesel school buses to zero-emitting buses. The 2,108 zero-emission buses that will operate in EJ Communities would lower NOx emissions by a cumulative 218 tons between 2025 and 2030 and a cumulative 445 tons between 2025 and 2050. VOC would be reduced by a cumulative 21 tons between 2025 and 2030 and 39 tons between 2025 and 2050. NOx and VOC are ozone precursors. Elevated ozone levels cause adverse health effects, including reduced lung function and an increased incidence of asthma. Low income and disadvantaged communities bear a disproportionate burden from air pollution. In recent years, air quality monitors

adjacent to Connecticut LIDACs have recorded some of the highest ozone concentrations in the region. In addition to reducing ozone precursor emissions, the measure would lower $PM_{2.5}$ emissions. $PM_{2.5}$ is associated with a higher incidence of asthma and other adverse health effects. Diesel school buses emitted $PM_{2.5}$ near children riding, boarding, and waiting for buses. Converting school buses to zero-emitting would reduce exposure to $PM_{2.5}$ at street level and near tailpipes. In addition, eliminating $PM_{2.5}$ emissions from buses has the potential to reduce $PM_{2.5}$ inside of school buildings, since building air intakes can be impacted by street level $PM_{2.5}$ emissions. $PM_{2.5}$ emissions will be lowered by a cumulative 5 tons between 2025 and 2030, and 6 tons between 2025 and 2050.

During Connecticut's GC3 meetings, community representatives requested prioritization of green transit investments in EJ Communities. In addition, community members raised the need to reduce emissions from school buses. LIDAC respondents to CT DEEP's on-line survey on the PCAP measures said improved health (e.g., decreased incidence of asthma) was extremely important to them. And "having cleaner air where I live/work/play" was also rated as extremely important to a majority of LIDAC respondents. Respondents also indicated that replacing diesel school buses in LIDACs would improve air quality, reduce climate warming gases, improve health, and reduce noise.

A majority of residents from LIDACs who responded to a question on noise rated noise reduction as extremely important. Electric school buses have the potential to reduce noise pollution by more than 50% compared to a diesel school bus.

The school bus electrification measure will impact almost all LIDAC communities. There are 1,056 public schools in Connecticut, 498 of which are in LIDACs. Of the 1,319 census block groups identified as LIDACs, 93 contain public schools.

Options to mitigate potential disbenefits:

- Avoid tax increases for low income residents for the purchase of electric school buses through offering subsidies.
- Provide tax credits to bus fleets that pay taxes to cities when they use renewable energy to charge school buses to maximize greenhouse gas emissions benefits.
- Job programs to retrain and train workers on electric school bus operations needs to mitigate job losses in the maintenance of diesel buses and fueling stations.

Key implementing agency or agencies

- State agencies and quasi-public agencies, including CT DEEP, which administers the Connecticut Clean School Bus program
- Municipalities, school districts, and school bus operators
- Councils of Governments
- Tribal Nations

Implementation schedule and milestones

- Year 1, Q1: Develop specifications for electric school buses and issue RFP
- Year 1, Q1-Q3: Communication and stakeholder engagement
- Year 1, Q2: Review proposals and select a contractor
- Year 1, Q1-Q4: Complete any needed infrastructure changes for charging buses
- Year 1, Q3: Purchase Year 1 electric school buses
- Year 1, Q4: Place Year 1 electric school buses in service
- Repeat for Years 2, 3, 4, 5, and 6

Geographic scope

The measure will be focused on the EJ Communities in Connecticut and LIDAC areas. A parallel state effort will be undertaken to replace diesel school buses in Connecticut with electric buses outside of LIDACs.

Metrics for tracking progress

- Number of community education events on the introduction of electric school buses in LIDAC areas
- Number of electric school buses placed in LIDACs/EJ Communities
- Number of diesel buses operating in LIDACs/EJ Communities that are retired or scrapped
- Tracking and reporting on funds disbursed as part of the project
- Tracking progress toward meeting the project schedule of replacing all 2,108 diesel buses in LIDACs/EJ Communities with electric buses by 2030

Authority to implement

CT DEEP has authority to support replacement of existing school buses with zero-emission school buses in environmental justice communities. Connecticut mandated that by January 1, 2030 all school buses in school districts entirely in, or encompassing one or more, environmental justice communities as of July 1, 2022

must be zero-emission buses (CGS 22a-201d(c)). Consistent with that mandate, CT DEEP must "establish and administer" a grant program providing "matching funds" needed by "municipalities, school districts and school bus operators" to apply for federal grants for the "purchase or lease of zero-emission school buses and electric vehicle charging or fueling infrastructure" and must give preference to state-matching-grant applications that involve buses "operated primarily in an environmental justice community" (CGS 22a-201d(d)). In addition, as discussed above, CT DEEP may award vouchers to support "deployment", e.g., purchase or lease, of certain types of zero-emission school buses (ranging from pick-ups to 4-axle, single-trailer trucks) and is required to set aside 40% of available funding for vouchers under this section for use "in maximizing air pollution reductions in environmental justice communities" (CGS 22a-201e). CT DEEP also may provide grants or rebates to "municipalities, academic institutions and other entities [e.g., school districts]" for the purchase or installation of "alternative vehicles [e.g., zero emission school buses]" (CGS 16a-14f).

To learn more about CT DEEP's existing Connecticut Clean School Bus Program see: https://portal.ct.gov/DEEP/Air/Mobile-Sources/CT-Clean-School-Bus.

Intersection with other federal funding availability

EPA's Clean School Bus Program is a Bipartisan Infrastructure Law program to fund the replacement of existing school buses with clean and zero-emission school buses. Connecticut was notified by EPA that the state will be awarded funding for 50 electric school buses through the EPA Clean School Bus Program.

The Diesel Emission Reduction Act (DERA) grant program has provided rebates for the purchase of electric school buses. The U.S. Department of Agriculture's Community Facilities Direct Loan and Grant Program provides affordable funding to develop essential community facilities in rural areas. Loans for the purchase of ZEV school buses are available through this program in small communities. The Connecticut General Assembly established an electric school bus adoption requirement passed in 2020 in CGA Substitute for SB-4 (C G A - Connecticut General Assembly).

Technical information

Method for estimating greenhouse gas reductions:
The EPA's AVoided Emissions and geneRation Tool (AVERT) was used to calculate the emissions for bus conversion for the years 2025 to 2028, as the tool limits the years of analysis. The total emissions generated per pollutant was divided by the number of buses purchased in that year to determine the per bus emissions rate. The annual per bus rate of change for GHG emissions and criteria pollutants was calculated from the per bus emissions rate and this rate of change was applied to the remaining years (2029-2030). Finally, the per-bus emissions rate was multiplied by the number of electric buses in service in that year to determine the annual avoided on-road emissions through 2050.

Models/tools used:
AVERT is a web-based tool that allows users to analyze GHG emissions and criteria pollutants for electric school buses.

Measure implementation assumptions:
The following key assumptions were used to quantify emissions reductions for this measure:

- Connecticut would replace a total of 2,108 diesel school buses operating in LIDACs to electric buses between 2025 and 2030.
- Three-hundred and fifty-one diesel school buses would be replaced with electric school buses in LIDACs in each year between 2025 and 2030.
- In addition, using funds other than CPRG, Connecticut would replace an additional 5,468 diesel buses with electric school buses between 2025 and 2040. An additional 342 electric buses, therefore, would be placed in service and replace diesel school buses outside of LIDACs each year between 2025 and 2040.
- The electric buses have a 10-year useful life pursuant to state law. Therefore, 351 LIDAC-serving buses and 342 statewide buses would be removed from service annually starting in 2034. All electric school buses placed in LIDACs as part of this project are assumed to be retired from service by 2040.

Modeling assumptions:
The following key assumptions were used to quantify emission reductions for this measure:

- Tailpipe emission rates for electric school buses were assumed to be zero grams per mile. Annual NOx emissions in 2025 for a diesel school bus were assumed to be 77 lbs/year, VOC emissions were 7.9 lbs/year, and $PM_{2.5}$ emissions were 2.4 lbs/year.
- Emission factors used in the AVERT model were obtained from EPA's MOVES model.
- In AVERT, 351 diesel buses were replaced with electric school buses in LIDACs each year between 2025 and 2030. Three-hundred and forty-two diesel school buses were replaced outside of LIDACs annually between 2025 and 2040.

Reference case scenario:
To develop the reference case scenario, AVERT was used to estimate the emissions from 5,468 school buses for each year from 2025 to 2028. The rate of change between the GHG emissions generated between 2025 and 2028 was calculated and then carried forward to develop the estimated emissions from 2029 to 2050. For the period between 2025 and 2030, the reference case scenario generated a cumulative total of 530,803 MT of GHG emissions. The reference case would generate 1,579,587 MT of GHG emissions between 2025-2050. For the LIDAC reference case, AVERT was used to estimate the GHG emissions from 2,108 buses for each year from 2025 to 2028. The rate of change between emissions between 2025 and 2028 was calculated and carried forward from 2029 to 2050 to generate the estimate emissions for the LIDAC reference case. For the period between 2025 and 2030, the LIDAC reference case would generate 204,651 MT of GHG emissions, and the period between 2025 and 2050 would generate 608,848 MT of GHG emissions.

Measure-specific activity data and implementation tracking metrics:

Activity data used to estimate GHG emission reductions for this measure included the number of electric school buses placed in service and miles traveled per bus.

4. Transit bus electrification—purchase buses based on the next 5-year Battery Electric Bus program

Description of climate action measure

This climate action measure, if implemented, would replace 142 diesel transit buses with electric buses. The buses are anticipated to serve in the following counties: Hartford, New Haven, Fairfield, Litchfield, New London, Tolland, and Windham Counties. Connecticut's bus network plays a crucial role in the lives of thousands of people, providing transportation for those who depend upon the bus for getting to work, to school, to medical appointments and, for those who cannot or do not wish to drive. Replacing diesel transit buses will reduce GHGs, co-pollutants, hazardous air pollutants, and noise.

Estimates of the cumulative greenhouse gas emissions reductions

Below, cumulative emissions reduced between 2025-2030 are presented for carbon dioxide equivalents (CO_2e). In addition, cumulative emission reductions are provided for NOx, SO_2, VOC, and $PM_{2.5}$.

Climate action measure (or sub-measure)	**Cumulative GHG emission reductions (metric tons CO_2e)**	
	2025–2030	**2025–2050**
Transit bus electrification—purchase buses based on the next 5-year Battery Electric Bus program	45,103	115,227

CO_2e = carbon dioxide equivalents

Estimate of co-pollutant emission reductions

Co-pollutant	**Reduction (metric tons)**	
	2025–2030	**2025–2050**
NOx	64.5	137.0
$PM_{2.5}$	0.4	0.7
VOC	2.1	4.3

Anticipated benefits and disbenefits to Low Income and Disadvantaged Communities (LIDACs)

In all communities, NOx, $PM_{2.5}$, and VOC would be reduced by converting diesel buses to zero-emitting buses. More than 64 tons of NOx, 0.4 tons of $PM_{2.5}$, and 2 tons of VOC would be reduced between 2025 and 2030 as a result of this measure. NOx and VOC are ozone precursors. Elevated ozone levels cause adverse health effects, including reduced lung function and an increased incidence of asthma. Low income and disadvantaged communities bear a disproportionate burden from air pollution. In recent years, air quality monitors adjacent to Connecticut LIDAC communities have recorded some of the highest ozone concentrations in the region. In addition to reducing ozone precursor emissions in LIDACs, the measure would lower $PM_{2.5}$ emissions. $PM_{2.5}$ is associated with a higher incidence of asthma and other adverse health effects. A majority of LIDAC residents who responded to a CT DEEP survey question on the PCAP measures indicated that electric buses hold the potential to improve air quality.

Since electric buses have no engines, operation of the buses would reduce noise by approximately 50% as compared to diesels. Reducing noise pollution was identified as a priority for self-identified LIDAC residents in a public survey conducted by CT DEEP on the PCAP measures.

While converting diesel buses to zero-emitting buses offers significant direct health benefits, it is important to consider the potential cost, job, and health impacts associated with the transition. Absent subsidies or grant funds to pay for the cost of electric buses, the higher upfront cost of replacing the buses could result in an increase in taxes or bus fares. An increase in electricity demand from charging electric buses could potentially reduce the net GHG and co-pollutant benefits of the measure. This is of particular importance for households that live nearby fossil fuel-based power plants. There may also be health issues related to the inadequately disposed battery waste generated by electric buses. While the deployment of electric school buses may create new jobs for maintenance and operation, there would be job losses in the maintenance of diesel buses and gas station services.

Options to mitigate potential disbenefits:

- Pair with a transition to renewable electricity to maximize GHG and co-pollutant benefits
- Implement a battery recycling program and address early retirement of diesel vehicles

- Create jobs programs to train and retrain workers on maintenance and operation of electric buses

Key implementing agency or agencies

- State agencies and quasi-public agencies, including the CT DOT for the Battery Electric Bus initiative.
- Transit bus electrification like that being implemented through the Battery Electric Bus initiative could also be implemented by:
    - Municipalities
    - Councils of Governments
    - Tribal Nations

Implementation schedule and milestones

- Year 1, Q1: Develop design specifications for electric transit buses and issue RFP
- Year 1, Q1-Q3: Communicate and conduct outreach to
- Year 1, Q2: Review proposals and select contractor
- Year 1, Q1-Q4: Complete any needed infrastructure changes at depot
- Year 1, Q3: Purchase Year 1 buses
- Year 1, Q4: Place Year 1 buses in service
- Repeat for Years 2, 3, 4, and 5.

Geographic scope

Statewide

Metrics for tracking progress

- Number of public relations, community engagement, and education events concerning the electric buses in each jurisdiction
- Number of electric buses purchased
- Number of electric buses operating
- Tracking and reporting on project progress on expenditures and purchases.
- Tracking, measuring, and reporting accomplishments on proposed timelines and milestones

Authority to implement

CT DOT has authority to purchase battery electric buses for transit systems. CT DOT is authorized to contract with any transit district or any political subdivision or entity "for the purposes of initiating, continuing, developing, providing or improving any…transportation service" that "operat[es]…to, from or in the state" (CGS 13b-

34(a)). Further, CT DOT may "provide all or a portion of any such service, share in the costs of or provide funds for such service, or furnish equipment or facilities for use in such service" (CGS 13b-34(a)). CT DOT may purchase or lease, or "own and operate," such facilities and equipment (CGS 13b-34(a)). Under this authority, CT DOT currently owns and operates local bus systems in several municipalities and has transit operating assistance contracts with local transit districts. CT DOT may therefore purchase battery electric buses for its local bus systems or provide funding assistance for local transit districts to purchase such buses.

To learn more about CT DOT's existing Battery Electric Bus (BEB) Initiative see: https://portal.ct.gov/DOT/Publictrans/Bureau-of-Public-Transportation/Battery-Electric-Bus-Projects-and-Partners

Intersection with other federal funding availability

The Bipartisan Infrastructure Law established a competitive grant program for the purchase or lease of zero-emission and low-emission transit buses as well as acquisition, construction, and leasing of required supporting facilities. The Connecticut Department of Transportation was awarded a FY2023 Low or No-Emission Vehicle Program (Low-No) grant in the amount of $26,437,120 to buy battery-electric buses to replace older diesel buses, support battery-electric bus service, and modernize its CT*transit* Stamford Division. The project would ensure continued service reliability, improve air quality, and advance environmental justice in Stamford, CT. For more information see: https://www.transit.dot.gov/lowno

Technical information

Method for estimating greenhouse gas reductions:

The MOVES4 model was used to develop emission factors for Connecticut transit buses and the Department of Energy GREET model was used to develop an emission estimate of well-to pump GHG emissions for transit buses for calendar years 2025-2050. Tailpipe emissions reductions were estimated by applying estimated urban bus VMT to the MOVES4 emissions factors for CO_2, NO_x, VOC, and $PM_{2.5}$. Grid emissions associated with charging additional ZEVs were estimated using estimates of the electricity demand from these vehicles along with emissions rates from CT DEEP's 2020 Integrated Resources Plan. The overall emissions reductions represent a net value reflecting both the reduction in tailpipe emissions and the increase in grid emissions.

Models/tools used:
EPA's MOVES4 model was used to estimate GHG reductions from this measure. In addition, the Department of Energy's GREET tool was used to estimate GHG emissions on a well-to-pump basis for diesel transit buses. Electricity-related emissions were taken from CT DEEP's 2020 Integrated Resource Plan.

Measure implementation assumptions:
The following key assumptions about measure implementation were used to quantify emissions reductions for this measure:

- Introduction of the electric buses is assumed to take place over five years, from 2025 to 2029, with the bus purchases spread evenly across the five years. From 2025-2029, 28 diesel buses were assumed to be retired with two additional buses being retired in 2029.
- Electric transit buses were assumed to cost $200,000 more than a diesel bus.

Modeling assumptions:
The following key assumptions about emission reductions were used to quantify emission reductions for this measure:

- MOVES source ID type 42 (Urban Buses) was used for CO_2 and criteria pollutant emission factors.
- Annual VMT estimates for urban buses were taken from the MOVES model.
- Tailpipe emissions for ZEVs is assumed to be zero and electricity-related emissions from electric buses were calculated using emissions on a lb/MWh basis from CT DEEP's Integrated Resource Plan.

Reference case scenario:
The reference case for this measure is not converting the 142 diesel buses modeled here to electric buses.

Measure-specific activity data and implementation tracking metrics:
A 12-year lifespan was assumed for the electric transit buses. Buses introduced in 2025 were assumed to be retired in 2036. Vehicles introduced in 2026 were assumed to leave the fleet in 2037, etc. By 2042, all buses were assumed to be retired.

5. *Purchase Idle Reduction ZeroRPM® systems for truck mounted attenuators (TMAs) for the Connecticut Department of Transportation's Crash Unit*

Description of climate measure

The CT DOT has a fleet of 144 trucks that protect highway crews and drivers during road construction and repair. The trucks have built-in crash protection called "mounted attenuators." Because construction takes place over long periods, these trucks must idle all day to provide power for warning lights, signage, and other truck-mounted equipment. Each truck idles for 262 days and over 2,000 hours per year. As part of this measure, Connecticut would purchase truck mounted attenuators that have a ZeroRPM® battery storage system. The system would provide power for lights and signage, eliminating the need for idling for the144 trucks.

Estimates of the cumulative greenhouse gas emissions reductions

Climate action measure	Cumulative GHG emission reductions (metric tons CO_2e)	
	2025–2030	2025–2050
Purchase 144 ZeroRPM idle reduction technology systems for DOT crash truck units	8,106	34,740

CO_2e = carbon dioxide equivalents

Estimates of co-pollutant emissions reductions

Co-pollutant	Reduction (metric tons)	
	2025–2030	2025–2050
NOx	29.9	80.3
$PM_{2.5}$	1.2	2.4
VOC	4.0	9.2

Anticipated benefits and disbenefits to Low Income and Disadvantaged Communities (LIDACs)

Up to 2,096 gallons and $6,288 cost for gallons of fuel consumed can be eliminated by the ZeroRPM system, per year. By reducing truck idling, TMA exhaust emissions

would decrease, which could improve air quality in low income neighborhoods. This could lead to a reduction in respiratory issues such as asthma, which low income households may be more susceptible to due to factors like limited access to healthcare resources and because these communities are already overburdened by air pollution from multiple stationary and mobile emissions sources. Over 29 tons of NO_x and one ton of $PM_{2.5}$ would be reduced between 2025 and 2030 as a result of this measure. LIDACs located along major highways such as I-84, I-95, I-91, I-684 and others would benefit from reduced emissions from the TMAs. These communities include New Haven, Bridgeport, Hartford, and others. A majority of Connecticut's LIDACs are located near at least one major roadway.

LIDACs members have also raised concerns about high levels of noise. Respondents from LIDACs to DEEP's on-line public comments survey reported that "Increasing community awareness of strategies for reducing greenhouse gasses" is extremely important. Respondents also reported that "Having cleaner air while I live/work/play" and "Improved health" were extremely important. The majority of respondents from LIDACs believed that TMAs would reduce greenhouse gas emissions, reduce noise pollution, and decrease health risks.

Key implementing agency or agencies

Connecticut Department of Transportation

Implementation schedule and milestones

- Year 1, Q1: Issue RFP for TMA devices
- Year 1, Q2: Evaluate responses to RFP
- Year 1, Q1-Q3: Conduct outreach to communities near TMA operation
- Year 1, Q2: Award contract for TMA devices and installation
- Year 1, Q4: Year 1 devices installed
- Years 2-5: Year 2-5 devices installed

Geographic scope

Statewide

Metrics for tracking progress

The primary metrics to track progress for this measure are:

- Ongoing engagement with Connecticut residents on the TMA idle reduction measure would be conducted. The measure was discussed with Connecticut residents during a December 18th public meeting on the PCAP measures. In

addition, a survey that included questions on the TMA measure was completed by 521 Connecticut residents. The public will continue to be engaged during implementation of this measure to communicate the GHG and co-pollutant benefits of the measure.

- Establishment of a contract with a company for installation of the idle reduction technology
- CT DOT oversight of the contractor's activities
- Tracking to ensure that the 144 trucks are equipped with the idle reduction system on schedule
- Tracking and reporting on project expenditures and purchases
- Tracking of data from telematics devices on the truck idle reduction

Authority to implement

CT DOT has authority to purchase truck-mounted attenuators with ZeroRPM® systems for use in road construction to protect highway crews and drivers. CT DOT may "construct, reconstruct, repair, improve, manage, maintain and operate expressways, and reconstruct and relocate existing highways, sections of highways, bridges or structures and incorporate and use the same… as parts of such expressways" and "do all things necessary or convenient to carry out the purposes and exercise the powers expressly given in this part" (CGS 13a-23(a) and (d)). CT DOT also may "construct, alter, reconstruct, improve, relocate, maintain, repair, widen and grade any state highway whenever, in [CT DOT's]…judgment, the interest of the state so requires" (CGS 13b-26(b)) and has "such additional powers…as may be necessary or proper for the effective performance of his powers and duties" (CGS 13b-23). The purchase of equipment to protect workers during such road construction, repair, and maintenance falls well within CT DOT's "necessary or convenient" powers, and its selection of equipment that minimizes air pollution caused by the equipment is consistent with mandated statewide greenhouse gas emissions reductions (CGS 22a-200a(a)) and state policy to "to manage the basic resources of air, land and water to the end that the state may fulfill its responsibility as trustee of the environment for the present and future generations" (CGS 22a-1).

Intersection with other federal funding availability

The Clean Heavy-Duty Vehicle Program is an IRA-funded program that will invest $1 billion to replace dirty heavy-duty vehicles with clean, zero-emission vehicles, support zero-emission vehicle infrastructure, and to train and develop workers. The EPA will administer these funds in the form of grants and rebates to eligible recipients to replace existing heavy-duty vehicles with clean, zero-emission vehicles.

This program is expected to launch in spring 2024. More information see: https://www.epa.gov/inflation-reduction-act/cleanheavy-duty-vehicle-program

Technical information

Method for estimating greenhouse gas reductions:
The EPA's MOVES4 model was run at the Project Scale to estimate idle emissions of CO_2e, NOx, SO_2, VOC, and $PM_{2.5}$ exhaust for source type 52 (short-haul single-unit trucks). These reflect normal idling activity, as MOVES does not permit modeling of extended idle for these types of vehicles (extended idle is only modeled in MOVES for combination trucks). The emissions estimates were reported by regulatory class, and the idle emissions and corresponding idling activity from MOVES were used to generate an idle emissions rate in grams per hour applicable to the TMA trucks. MOVES was also run at the Default scale to estimate the trend in co-pollutant running emissions rates over time; CO_2e rates were assumed to not change, since they are almost entirely based on fuel consumption rates. Then, using the information above regarding the number of trucks and their idle activity and assuming a 5-year phase-in, the annual reductions in CO_2e and co-pollutant emissions were calculated, as well as 2025-2030 and 2025-2050 cumulative totals.

Models/tools used:
According to the EPA's website (MOVES and Mobile Source Emissions Research | US EPA) EPA's Motor Vehicle Emission Simulator (MOVES) is a state-of-the-science emission modeling system that estimates emissions for mobile sources at the national, county, and project level for criteria air pollutants, greenhouse gases, and air toxics. This model was used to calculate the GHG and co-pollutant emissions reductions.

Measure implementation assumptions:
The following key assumptions about measure implementation were used to quantify emissions reductions for this measure:

- The TMA measure assumes that 144 TMAs are equipped with idle reduction technology between 2025 and 2030, at a rate of 24 installations per year for the six years, and that units operate for 13 years in service.
- 2025 is an implementation milestone for installation of idle reduction equipment in the 144 TMAs.
- The full measure lifetime is 18 years, from 2025 to 2042. By 2042, all of the TMAs have been retired.

- Operation and maintenance costs will be reduced since diesel trucks use approximately one gallon of fuel per hour when idling. In addition, truck idling results in increased maintenance costs. These costs will be reduced when idling is eliminated.

Modeling assumptions:
The following key assumptions about emission reductions were used to quantify emission reductions for this measure:

- Emission rates for this measure were developed using the EPA MOVES4 model.
- MOVES4 was run at the Project Scale to estimate idle emissions of CO_2e, NOx, VOC, and $PM_{2.5}$ exhaust for source type 52 (short-haul single-unit trucks).
- Emission factors were expressed as grams per hour for CO_2e and for co-pollutants.

Reference case scenario:
Absent implementation of the TMA measure, more than 8,000 tons of CO_2e will be emitted between 2025 and 2030. Between 2025 and 2050, more than 34,000 tons of CO_2e will be emitted. Approximately 1.5 million gallons of diesel fuel will be combusted between 2025 and 2030 absent this measure.

Measure-specific activity data and implementation tracking metrics:
TMA trucks were assumed to idle for 2,096 hours per vehicle over 262 days per year. A total of 301,824 truck idling hours per year for MOVES4 regulatory class 46 vehicles were assumed to be reduced as a result of the measure.

6. Expansion of the Microtransit Program with a focus on rural areas to provide an on-demand, accessible, shared-ride service within a zone

Description of climate action measure

Microtransit service is a mode of transportation that uses a digital network to offer on-demand transportation in response to consumer demand in select service zones. Many Connecticut residents have access to an extensive public transit system, but gaps exist in the system. This climate action measure, if implemented, would address those gaps, particularly in rural areas, by creating first and last-mile connections to existing public transportation systems and bringing service to communities that have been historically underserved, including seniors and individuals with mobility impairments. Specifically, this transportation measure, if implemented, would reduce passenger car vehicle miles travelled by expanding the service area of an existing on-demand microtransit service and establishing new service to rural areas. Service to new areas will be provided with an electric 12-seat van, rather than a gasoline powered van.

Users can access the service through an app or by phone to request and schedule a ride within designated service areas. More options for public transportation will reduce the number of miles traveled by vehicles, reducing harmful air pollution. The sector to be targeted by this measure is rural areas that aren't currently served.

Estimates of the cumulative greenhouse gas emission reductions

Climate action measure (or sub-measure)	**Cumulative GHG emission reductions (metric tons CO_2e)**	
	2025–2030	**2025–2050**
Purchase one 12-passenger electric shuttle bus	110	284

CO_2e = carbon dioxide equivalents

Estimate of co-pollutant emission reductions

Co-pollutant	**Reduction (metric tons)**	
	2025–2030	**2025–2050**
NOx	0.03	0.05
$PM_{2.5}$	0.001	0.003
VOC	0.05	0.13

Anticipated benefits and disbenefits to Low Income and Disadvantaged Communities (LIDACs)

Microtransit, a transportation service that uses smaller vehicles and flexible routing to provide on-demand rides, has gained attention as a potential solution for the transportation needs of rural communities. Microtransit can increase transportation options for individuals living in rural areas, especially lower-income households that may not have access to private vehicles. Microtransit can be cheaper compared to traditional transit systems by utilizing smaller vehicles and on-demand service rather than operating on fixed-routes, thereby reducing fuel consumption. However, without sufficient ridership, the service may not be financially viable or may require ongoing subsidies to sustain operations. Conducting surveys among rural households can provide valuable insights into their willingness to use microtransit services, as compared to traditional taxis which, presumably, would cost more. Like taxis, microtransit offers flexibility that can be especially beneficial for individuals with irregular schedules, medical appointments, or unexpected travel needs. However, services that depend on the use of smart phones and apps may pose challenges as cell phone coverage is often spotty in low income areas and rural communities, creating a "digital divide". Although, the use of mobile apps can provide a cost-effective way to providing microtransit services, for LIDACs, there is a lack of infrastructure investment by telecom companies, with lower-income areas receiving almost 15% less network coverage compared with more affluent areas. Additionally, low income individuals may face challenges due to a lack of access to smartphones or affordable mobile data plans. Because of this, implementing the option to use a land line to make a phone call for the service will be important.

In addition to cost benefits, there are health benefits to utilizing microtransit services. First, the service offers rural residents an alternative way to access health services that are often located in urban areas. There are also emissions benefits: The EV microtransit van service is estimated to reduce a cumulative 0.03 tons of NOx, 0.001 tons of $PM_{2.5}$, and 0.05 tons of VOC between 2025 and 2030. Between 2025 and 2050, the service is estimated to reduce a cumulative 0.05 tons of NOx, 0.003 tons of $PM_{2.5}$, and 0.13 tons of VOC from reduced single occupancy vehicle miles traveled. There are also jobs associated with implementing a new microtransit service, including operators, dispatchers, technicians, customer support, and data analysts.

An estimated $80,917 per year could be saved by residents of rural areas of the state due to avoided single occupancy miles traveled. A cumulative $485,000 could

be saved between 2025 and 2030 from avoided single occupancy miles traveled. A cumulative estimated $1.2 million dollars in avoided costs from single occupancy vehicle miles traveled between 2025 and 2050 could be avoided due to this measure. These savings are from reduced gasoline expenditures, lower vehicle maintenance costs, and lower vehicle depreciation.

An estimated 1,500 gallons of gasoline use could be avoided in rural areas as a result of this measure. More than 9,000 gallons of avoided gasoline use could be realized between 2025 and 2030 in rural areas and more than 22,500 gallons of avoided gasoline use could be realized between 2025 and 2050 in rural areas as a result of this measure.

LIDACs in rural areas are anticipated to be affected by implementation of this measure. Examples of rural LIDACs that could potentially be served are Haddam, North Stonington, which are both within 15 minutes of a city. Sprague, Lisbon, and Preston are also rural LIDACs that could be served.

In CT DEEP's on-line survey on the PCAP measures, LIDAC respondents indicated that "Having access to reliable and affordable public transportation" and "reducing noise affecting my community" are extremely important. They also indicated that "Increased access to services/amenities in my community" is extremely important. A majority of LIDAC respondents noted that an expansion of the Microtransit Program with a focus on rural areas could help meet these priorities. CT DEEP will continue to engage LIDACs throughout the implementation of this measure, using forums such as the GC3 working groups, by conducting surveys to identify community member needs, through webinars, and by distributing information on-line to the communities.

Key implementing agency or agencies

- State agencies or quasi-public agencies, including the CT DOT for the current Microtransit Pilot Program
- Microtransit projects like those being implemented the Microtransit Pilot Program could also be implemented by:
    - Municipalities
    - Councils of Governments
    - Tribal Nations

Implementation schedule and milestones

- Year 1, Q1: Allocate funding for new transit bus service

- Year 1, Q1-Q2: Develop communication strategy for new service
- Year 1, Q1-Q3: Communication and stakeholder engagement
- Year 1, Q3: Design ap/other modes of communication for requesting rides
- Year 2, Q2: Place new bus in service

Geographic scope

Statewide with a focused expansion on rural areas

Metrics for tracking progress

- Number of public relations, community engagement, and education events concerning the grant in each jurisdiction
- Overseeing subrecipients, and/or contractors and vendors
- Tracking and reporting on project progress on expenditures and purchases in each jurisdiction
- Tracking, measuring, and reporting accomplishments on proposed timelines and milestones in each jurisdiction

Authority to implement

CT DOT has authority to expand the Microtransit Program providing on-demand, accessible shared-ride service focused on rural areas. As discussed above, CT DOT is authorized to contract with any transit district or any political subdivision or entity "for purposes of initiating, continuing, developing, providing or improving any…transportation service" in the state. CGS 13b-34(a). Further, CT DOT may "provide all or a portion of any such service, share in the costs of or provide funds for such service, or furnish equipment or facilities for use in such service" (CGS 13b-34(a)). Consistent with this authority, Section 23(b) of Public Act 22-40 (May 17, 2022) requires CT DOT to "establish a two-year pilot program to test microtransit services in the state, including rural areas not currently served by public transportation" and authorizes agreements "with third parties to provide such services." Section 23(a) of the Act defines "microtransit" as "transportation by a multipassenger vehicle that uses a digital network or software application service to offer fixed or dynamically allocated routes and schedules in response to individual or aggregate consumer demand."

Learn more about the existing Microtransit Pilot Program: https://portal.ct.gov/DOT/CTDOT-Press-Releases/2023/Governor-Lamont-Announces-Launch-of-Microtransit-Pilot-Program

Intersection with other federal funding availability

No other federal funding source was identified to support Microtransit.

Technical information

Method for estimating greenhouse gas reductions:

The EPA MOVES4 model was run for Connecticut. Vehicle emissions on a gram per mile basis for CO_2, NOx, $PM_{2.5}$, and VOC specific to the state were developed. In an Excel spreadsheet, the emission factors for GHGs and co-pollutants were multiplied by the total number of avoided single occupancy vehicle miles travelled resulting from the measure. Total avoided emissions for CO_2 and co-pollutants were converted to tons. Electric shuttle bus emissions were estimated based on power plant-related emissions for each year. The difference between the avoided single occupancy vehicle emissions and the electricity-related emissions was calculated to establish net emissions reductions for the measure.

Models/tools used:

The EPA Motor Vehicle Emissions Simulator (MOVES) model, version 4 (MOVES4) was used for this analysis to generate emission factors for light-duty passenger cars and trucks. The model generates emission factors for CO_2, NOx, $PM_{2.5}$, and VOC for specific vehicle classes.

Measure implementation assumptions:

The following key assumptions about measure implementation were used to quantify emissions reductions for this measure:

- The measure assumes that introducing the new micro-transit service will avoid 40,560 single occupancy vehicle miles traveled each year. The measure assumes that all trips taken on the shuttle service replace single occupancy vehicle miles traveled.
- The measure assumes one 12-seat electric van will be placed in service and will have a 50% occupancy or 6 passengers per trip. Using this assumption, there are 6,760 van miles driven each year.
- The measure lifetime is assumed to be 15 years from the time that the electric shuttle bus is introduced until it is taken out of service.
- The incremental cost for an electric 12-seat passenger van is assumed to be $84,000 as compared to a gasoline van. The total estimated cost of the electric van is $129,000.

- Single occupancy vehicle operating cost savings are assumed to be the federal rate of $0.67 per mile, which accounts for gasoline costs, vehicle maintenance, and vehicle depreciation.
- It was assumed that the electric shuttle bus transit service is free for riders.
- Operational costs for the electric van are assumed to be 50% lower than a gasoline van operated in the same service. In calculating these costs, electricity charging costs are assumed to be $0.48/kWh and gasoline is assumed to be $3.50 per gallon.

Modeling assumptions:
The following key assumptions about emission reductions were used to quantify emission reductions for this measure:

- Emissions for the shuttle bus are assumed to be zero for tailpipe emissions.
- Emissions resulting from additional electricity required to operate the electric shuttle bus were assumed to be total electric van miles traveled each year times the emission factors for CO_2e, NOx, $PM_{2.5}$, and VOC for the Connecticut electricity generating mix, taken from the Integrated Resource Plan.
- Emission rates for light-duty passenger vehicles were assumed to be the regulatory category for passenger cars and light-duty trucks in MOVES.
- Emission factors for avoided single-occupancy vehicle trips were assumed to be fleet average MOVES passenger car and light-duty truck emissions on a gram per mile basis for each calendar year evaluated (between introduction of the shuttle bus in 2025 until it is taken out of service in 2040).

Reference case scenario:
BAU emissions are equal to 40,560 single occupancy vehicle miles traveled each year multiplied by the MOVES4 emission rate for passenger cars and light-duty trucks.

Measure-specific activity data and implementation tracking metrics:

- Procurement of the electric shuttle bus
- Placement of the bus in service
- Shuttle bus miles traveled each year
- Survey of passengers indicating the mode share of avoided trips
- Outreach to the community on the value of the service

7. Support increased adoption of heat pumps statewide

Description of climate action measure

This climate action measure, if implemented, would support increased adoption of heat pumps statewide through incentives for households to install whole-home air- and ground-source heat pumps and heat pump water heaters, which use similar technology to transfer heat in the air to water. Heat pumps are highly efficient and can provide up to four units of heat energy for every unit of energy input. Further, they can serve as an all-electric replacement for fossil fuel heating equipment. Because Connecticut law requires zero-carbon electric supply by 2040, electric heat pumps can play a key role in reducing greenhouse gas (GHG) and co-pollutant emissions.

Through existing utility rebate programs, residential customers who install an air- or ground-source heat pump are currently eligible to receive a rebate of $750 per ton, up to $15,000. Customers can also receive a rebate of $650 for installation of a heat pump water heater. This measure, if implemented, would expand these programs to incentivize the installation of approximately 17,000 air-source heat pumps and 17,000 heat pump water heaters by 2030. Connecticut is part of the US Climate Alliance coalition commitment to collectively reach 20 million heat pump installations by 2030, quadrupling the number of heat pump installations across the coalition, with the aim of ensuring at least 40 percent of benefits flow to disadvantaged communities.

Estimates of the cumulative greenhouse gas emissions reductions

Increased adoption of heat pumps would reduce cumulative GHG emissions by an estimated 235,083 metric tons of CO_2 equivalent (CO_2e) during the period 2025–2030 and 1,104,134 metric tons CO_2e over the period 2025–2050. The annual GHG emission reduction in 2030 would be 61,214 tons or 0.93 percent of Connecticut's GHG emissions in the residential sector compared to 2021.

Climate action measure	**Cumulative GHG emissions reductions (metric tons CO_2e)**	
	2025–2030	**2025–2050**
Support adoption of heat pumps	235,083	1,104,134

CO_2e = carbon dioxide equivalents

Estimates of co-pollutant emissions reductions

Adoption of heat pumps through incentives would reduce criteria air pollutants (CAP) emissions by an estimated 542 metric tons during the period 2025–2030 and 2,727 metric tons over the period 2025–2050. The annual criteria air pollutant reduction in 2030 would be 146 metric tons. Hazardous air pollutant (HAP) emissions would fall by an estimated 94,255 pounds during the period 2025–2030 and 473,265 pounds over the period 2025–2050 due to increased adoption of heat pumps. The annual reduction in 2030 would be 25,292 pounds.

Pollutant	**Units**	**Time period**		
		2030, Annual	**2025-2030, Cumulative Reductions**	**2025-2050, Cumulative Reductions**
GHG	**Metric tons CO_2e**	**61,214**	**235,083**	**1,104,134**
Arsenic	Pounds	0	1	3
Benzene	Pounds	1,173	4,386	22,081
Beryllium	Pounds	0	0	0
Cadmium	Pounds	1	3	16
Carbon Monoxide	Pounds	181,327	674,681	3,397,018
Chromium	Pounds	1	4	22
Formaldehyde	Pounds	58	212	1,075
Lead	Pounds	0	1	7
Manganese	Pounds	0	1	7
Methane	Pounds	23,766	88,558	444,616
Nickel	Pounds	2	6	30
Nitrogen Oxides (NOx)	Pounds/Metric Tons	113,474/51.5	415,908/189	2,090,396/948
Nitrous Oxide	Pounds	289	1,078	5,388
PM, filterable	Pounds	2,338	8,568	43,037
PM, primary	Pounds/Metric Tons	24,387/11	90,628/41	457,132/207
Polycyclic Organic Matter (POM)	Pounds	1	4	18
Sulfur Dioxide	Pounds	1,386	5,105	25,426
Total CAP	**Metric tons**	**146**	**542**	**2,727**
Total Urban Toxics HAP	**Pounds**	**25,292**	**94,255**	**473,265**

Anticipated benefits and disbenefits to Low income and Disadvantaged Communities (LIDACs)

Installing heat pumps in LIDACs would reduce air pollution and benefit local economies. Because they are all-electric, heat pumps produce virtually no on-site emissions, in contrast to fossil fuel heating appliances. Expanding funding for heat pump incentives would allow more LIDAC households to benefit from the health improvements and energy savings that heat pumps provide.

Fossil fuel-fired heating appliances release a wide range of air pollutants, which are linked to numerous health problems such as the following: respiratory irritation and illnesses; cardiovascular disease; fatigue; and damage to the kidneys, liver, and central nervous system. The concentration of air pollutants indoors may be two to five times higher than outdoors, especially if combustion equipment is improperly vented. Removing fossil-fuel-dependent equipment from buildings—such as by installing a heat pump in place of a combustion appliance—will have health benefits, especially for vulnerable populations who are particularly susceptible to air pollutants (vulnerable populations include children, pregnant women, older adults, and those with asthma and pre-existing heart and lung conditions). The need for reducing indoor air pollution is underscored by scientific studies that show the prevalence of unvented combustion in low income areas and the negative health impacts that this can cause. As a result of these negative health impacts, these households may experience economic impacts from missing days of work or school and incurring medical bills.

One of the priorities for the building sector identified by the Governor's Council on Climate Change in 2020 is to reduce electric consumption by 1-2 million megawatt-hours by replacing inefficient electric heaters with high efficiency technologies. In CT DEEP's CPRG community benefits survey, Connecticut residents indicated that the greatest benefits they see for heat pump installation are reduced GHG emissions, cleaner air, decreased energy costs, employment opportunities, and improved housing quality. A limited number of respondents expressed concerns about heat pump affordability, reliability in cold weather or during power outages, strain on the electric grid, or inequitable adoption that leaves low income households behind. Expanding funding for heat pumps will help remove financial barriers to heat pump adoption for LIDAC households. Incentives for heat pump adoption will be provided statewide, and thus has the potential to benefit each LIDAC.

Options to mitigate potential disbenefits:

- A potential disbenefit of heat pumps is increased demand on the electric grid. Replacing electric resistance heating with heat pumps and accomplishing building energy efficiency upgrades would help mitigate potential electric load increases.

Key implementing agency or agencies

- State agencies or quasi-public agencies, including CT DEEP
- Heat pump incentives could also be implemented by:
    - Municipalities
    - Councils of Governments
    - Tribal Nations

Implementation schedule and milestones

- Year 1, Q1: Design heat pump incentive program
- Year 1, Q1-Q3: Communication and stakeholder engagement
- Year 1, Q3: Issue Request for Proposals or otherwise procure an implementer for the program
- Year 1, Q4: Receive applications
- Year 2, Q1: Incentives provided to households
- Years 3-5: Repeat incentive program rounds as necessary and funding available

Geographic scope

Statewide

Metrics for tracking progress

The primary metrics to track progress for this measure are:

- types of heat pumps installed (quantity, efficiency, capacity),
- pre-existing system types,
- energy saved by fuel type,
- unique households served, and
- total cost of projects incentivized.

Metrics should be tracked separately for space heating and water heating.

Authority to implement

CT DEEP has authority to support increased adoption of heat pumps for space heating and water heating. CT DEEP must review and approve a Conservation and Load Management Plan, which electric distribution and gas companies must jointly prepare every three years. The Plan must include, among other things, "energy conservation programs" with all options "selected within an integrated supply and demand planning framework" and all "[s]ervices provided under the plan" being made available to all electric and gas customers (CGS 16-245m(d)(1)). In particular, the Plan may include programs for the "purchase of energy-efficient appliances and heating…[and] air conditioning…devices [e.g., heat pumps]" (CGS 16-245m(d)(5)). The Plan must include a budget funding "all energy efficiency that is cost-effective or lower cost than acquisition of equivalent supply," and CT PURA – in the Energy Branch of CT DEEP -- must ensure that electric and gas utilities recover the costs of the Plan through a "conservation adjustment mechanism" in their rates (CGS 16-245m(d)(1)).

CT DEEP also must establish and administer programs to provide financing and grants for heat pumps. For example, CT DEEP must administer a program to provide financing -- through the Housing Environmental Improvement Revolving Loan Fund -- for "retrofitting projects for multifamily residences located in environmental justice communities or alliance districts" that "improve [their]…energy efficiency…, which may include…the installation of heat pumps…and any electric system or wiring upgrades necessary for such retrofit," or provide "services to assist residents and building owners to access and implement the programs" (CGS 8-240a(c)). Such financing may also be provided for rental "residential dwelling unit[s]" (CGS 8-240a(d)). CT DEEP must also administer a "residential heating equipment financing program" allowing residential electric or gas customers to "finance, through on-bill financing or other mechanism, the installation… ductless heat pumps to replace (1) burners, boilers and furnaces that are not less than seven years old with an efficiency rating of not more than seventy-five per cent, or (2) electric heating systems" (CGS 16a-40l(a)). CT DEEP must also administer an "energy efficiency retrofit grant program" to fund "energy efficiency upgrades" for affordable housing and rental dwelling units, which upgrades may include installation of heat pumps (CGS 16a-46m(a)).

Intersection with other federal funding availability

The IRA reinstituted and increased the Energy Efficient Home Improvement Credit, which allows households to credit up to 30% of the cost of energy efficiency home upgrades against their taxes. Depending on the equipment or improvement made, this credit can total up to $3,200 per year for residential efficiency and

electrification upgrades. Households are eligible for up to $1,200 per year for weatherization, including insulation and efficient windows and doors, as well as electrical panel upgrades installed in connection with a heat pump. Households can also claim an additional $2,000 for electric heat pumps and heat pump water heaters. The full credit is available for home improvements made starting in 2023. For more information see: https://energizect.com/IRA-FAQ

The IRA extended the Residential Clean Energy Credit, which allows households to credit up to 30% of the cost of installing solar panels, geothermal heat pumps, and batteries against their taxes. This credit is available for solar and geothermal heat pumps installed starting in 2022, and for residential batteries installed starting in 2023. Connecticut customers installing ground source heat pumps as their primary source of heating may receive up to $15,000 from the Energize CT program. For more information see: https://energizect.com/IRA-FAQ

Technical information

Method for estimating greenhouse gas reductions:
To estimate GHG emissions reductions, we subtracted the emissions associated with heat pump electricity use from the emissions associated with baseline equipment that would have been installed in lieu of a heat pump. We estimated the annual emissions of heat pumps by multiplying the annual energy consumption of the air-source heat pump or heat pump water heater by the forecasted Connecticut electricity grid GHG emission factor for each year of the measure lifetime; because relatively few ground-source heat pumps are installed in Connecticut, using air-source heat pump energy use is appropriate, if slightly conservative. We calculated the emissions from the baseline equipment by weighting the annual energy consumption of the baseline (i.e., non-heat pump) equipment according to fuel type and then multiplying by the corresponding emissions factors. We determined the fuel type mix of the baseline equipment using results from previous modeling for the Connecticut Comprehensive Energy Strategy. Finally, we estimated the cumulative emissions reductions over time, assuming annual measure spending that increases from $7.5 million in 2025 to $18.75 million in 2029.

While space heat pumps can provide both heating and cooling, we only considered the emissions impacts from the replacement of heating equipment with an air-source heat pump. Installed heat pumps may replace existing cooling systems (which would reduce emissions due to increased equipment efficiency) or heat

pumps may provide cooling in homes where no cooling was previously installed (which would increase emissions).

To quantify CAP and HAP emissions reductions, we multiplied the fuel savings of the baseline equipment by emissions factors for combustion equipment from EPA's AP-42 and WebFIRE database. We selected emission factors specific to the sector, end-use equipment, and fuel type. We did not account for changes in CAP or HAP emissions from electricity consumption.

Models/tools used:
We used the Building Decarbonization Calculator (BDC). The BDC is an in-house tool developed by Synapse Energy Economics used for modeling the energy consumption of major building end uses, including space and water heating, in residential and commercial buildings throughout the United States. The BDC quantifies how accelerating the adoption of new technologies impacts GHG emissions and energy consumption and uses a stock turnover framework to forecast energy use over time associated with various technologies. We relied on assumptions and results from the BDC, including equipment efficiencies, annual energy consumption, and equipment sales by fuel type, to estimate emissions reductions. We also used EPA's AP-42 and WebFIRE database to identify appropriate emission factors for CAP and HAP.

Measure implementation assumptions:
To quantify emissions reductions for this measure, we assumed the following:

- Only residential customers are eligible.
- Customers install a heat pump when their existing equipment fails.
- Heat pump installations must meet the entire heating load of the household.
- Incentives are equal to existing levels under the Energize CT program for air- and ground-source heat pumps and heat pump water heaters.
- Program funds will be spent between 2025 and 2029; 10% of incentives are dispersed in 2025, 20% in 2026 and 2027, and 25% in 2028 and 2029.
- Measure lifetimes are based on the 2023 Connecticut Program Savings Document. Air-source heat pumps for space heating have lifetimes of 18 years and heat pump water heaters have lifetimes of 15 years.
- Annual energy consumption was based on BDC assumptions. Consumption is calibrated to actual consumption estimates from EIA's Residential Energy Consumption Survey (RECS), and accounts for equipment efficiency.

Modeling assumptions:
The following key assumptions about emission reductions were used to quantify emission reductions for this measure:

- Emissions rates for fuel oil decline over time due to increased biofuel blending. We assume the statutory minimum for biofuel blending levels: starting with 5%, increasing to 10% in 2025, 15% in 2030, 20% in 2034, and 50% in 2035 onwards.
- GHG emissions factors for combustion fuels are based on the EPA's 2023 EPA Emissions Factors Hub. We converted emissions into metric tons of CO_2 equivalents (CO_2e) using Global Warming Potentials (GWPs) from the Intergovernmental Panel on Climate Change (IPCC) 5th Assessment report.
- Electric emissions factors for 2024–2039 were forecasted based on modeling done for the CT DEEP Integrated Resources Plan published in 2020. Electric emissions factors after 2040 are assumed to be zero, as statute requires Connecticut to achieve a zero-carbon grid by that year.
- Criteria and hazardous air pollutant emissions factors for combustion fuels are based on EPA's AP-42: Compilation of Air Pollutant Emissions Factors from Stationary Sources and EPA's WebFIRE database.

Reference case scenario:
For the reference scenario, Business-as-Usual (BAU) existing program data were used to determine the fuel type of the space or water heating equipment customers would install if they were not given a rebate for a heat pump. For example, in 2025, the BAU scenario assumes that 71 percent of non-heat pump space heating equipment sales are natural-gas-fueled equipment. We used the proportion of non-heat pump equipment installed in each year to determine the equipment fuel type and consumption in the reference scenario.

Measure-specific activity data and implementation tracking metrics:
The table below summarizes key activity data used to estimate and track emission reductions for GHGs, criteria air pollutants, and hazardous air pollutants.

Metric	Units	Heat pumps - Total	Heat pumps for space heat	Heat pump water heaters
CPRG funding	2023$	$75,000,000	$42,500,000	$7,500,000
Average per-unit CPRG spending	2023$/unit	$2,142	$3,600	$650
Spending				
2025	2023$, million	$7.50	$4.25	$0.75
2026	2023$, million	$15.00	$8.50	$1.50
2027	2023$, million	$15.00	$8.50	$1.50
2028	2023$, million	$18.75	$10.63	$1.88
2029	2023$, million	$18.75	$10.63	$1.88
Projects completed				
2025	units	3,502	1,181	1,154
2026	units	7,003	2,361	2,308
2027	units	7,003	2,361	2,308
2028	units	8,754	2,951	2,885
2029	units	8,754	2,951	2,885
Cumulative energy savings, 2025-2030				
Fuel oil	Btu, billion	737	603	134
Natural gas	Btu, billion	1,932	1,689	243
Propane	Btu, billion	200	129	71
Wood	Btu, billion	26	25	1
Electricity	Btu, billion	-706	-677	-29
Cumulative energy savings, 2025-2050				
Fuel oil	Btu, billion	3,633	3,083	550
Natural gas	Btu, billion	9,806	8,808	998
Propane	Btu, billion	943	652	290
Wood	Btu, billion	133	128	5
Electricity	Btu, billion	-3,601	-3,486	-116
Annual energy savings, 2030				
Fuel oil	Btu, billion	199	162	37
Natural gas	Btu, billion	530	464	67
Propane	Btu, billion	54	34	19
Wood	Btu, billion	7	7	0
Electricity	Btu, billion	-191	-183	-8

8. *Expand energy efficiency programs under the Conservation and Load Management Program*

Description of climate action measure

The Conservation and Load Management (C&LM) Plan guides Connecticut's energy efficiency programs and services, which the state's electricity and gas utilities administer through Energize CT. This climate action measure, if implemented, would expand funding for the programmatic offerings under C&LM, allowing for increased investment in rebates, financing, and other services for energy efficiency and clean energy improvements. C&LM helps homes and businesses save energy, reduce costs, and lower emissions.

C&LM provides a range of programs for residential, commercial, and industrial buildings. These include retail products, new construction, home energy solutions, heating, ventilation, and air conditioning (HVAC) and water heating equipment, behavioral strategies, demand management, retrofit services, business and energy sustainability, and multifamily programs. Each year, C&LM expends $200–$300 million in programmatic costs, yet the existing programs are often fully subscribed and have been oversubscribed for the past three years. The proposed CPRG measure, if implemented, would supplement C&LM funding, increasing participation rates and driving emission reductions. Emissions reductions estimates are based on a $50 million additional investment of funding.

Estimates of the cumulative greenhouse gas emissions reductions

Increased participation in C&LM programs would reduce cumulative GHG emissions by an estimated 33,019 metric tons of carbon dioxide equivalents (CO_2e) during the period 2025–2030 and 127,117 metric tons CO_2e over the period 2025–2050. The annual GHG emission reduction in 2030 is 10,019 tons or 0.15 percent of Connecticut residential sector GHG emissions in 2021.

Climate action measure	**Cumulative GHG emission reductions (metric tons CO_2e)**	
	2025–2030	**2025–2050**
Expand energy efficiency programs under the Conservation and Load Management Program	33,019	127,117

CO_2e = carbon dioxide equivalents

Estimates of co-pollutant emissions reductions

Energy efficiency and conservation enabled through this measure would reduce criteria air pollutants by an estimated 31 metric tons during the period 2025–2030 and 136 metric tons over the period 2025–2050. The annual criteria air pollutant reduction in 2030 is 9 metric tons.

Hazardous air pollutant emissions would fall by an estimated 2,275 pounds during the period 2025–2030 and 11,521 pounds over the period 2025–2050 due to increased participation in C&LM programs. The annual reduction in 2030 is 623 pounds.

Pollutant	**Units**	**Time period**		
		2030, Annual	**2025-2030, Cumulative**	**2025-2050, Cumulative**
GHG	Metric tons CO_2e	10,019	33,019	127,117
Arsenic	Pounds	0	0	0
Benzene	Pounds	0	1	3
Beryllium	Pounds	0	0	0
Cadmium	Pounds	0	0	1
Carbon Monoxide	Pounds	4,851	17,708	75,555
Chromium	Pounds	0	1	2
Formaldehyde	Pounds	7	26	99
Lead	Pounds	0	0	1
Manganese	Pounds	0	0	1
Methane	Pounds	605	2,207	11,182
Nickel	Pounds	0	1	3
Nitrogen Oxides (NOx)	Pounds/Metric Tons	12,764/5.8	46,590/21.1	206,189/93.5
Nitrous Oxide	Pounds	11	40	229
PM, filterable	Pounds	266	971	4,333
PM, primary	Pounds/Metric Tons	715/0.3	2,608/1.2	10,003/4.5
Polycyclic Organic Matter (POM)	Pounds	0	0	0
Sulfur Dioxide	Pounds	149	545	2,741
Total CAP	Metric tons	9	31	136
Total Urban Toxics HAP	Pounds	623	2,275	11,521

Anticipated benefits and disbenefits to Low income and Disadvantaged Communities (LIDACs)

Expanding funding for C&LM could allow more LIDACs residents to benefit from energy efficiency upgrades in their homes. Reducing consumption through energy efficiency provides multiple direct benefits to participants, including health and financial benefits. Low income customers are more likely to have a high level of energy burden, meaning a larger portion of their household spending goes to energy costs. Households with high energy burdens may have to make decisions between paying their energy bills and paying for other essentials, such as food and medicine. In 2020, an estimated 18 percent of households in Connecticut earning less than $50,000 experienced those types of energy insecurity. The installation of energy efficiency measures reduces household energy consumption, and therefore lowers energy bills, which can help households afford other essentials without forgoing basic energy necessities. A priority in the Governor's Council on Climate Change's 2020 Mitigation Strategies working group report is increasing climate resiliency. Energy efficiency upgrades help achieve this by making homes more secure and resilient during extreme weather events; for example, adequate insulation enables a home to stay warmer in the winter and cooler in the summer, even in the event of a grid outage.

Energy efficiency also provides indirect benefits for LIDAC communities. Reducing energy consumption decreases emissions of air pollutants. which improves regional air quality and can reduce the rate of asthma and other respiratory illnesses. Further, energy efficiency can reduce energy consumption during extreme weather events, which alleviates strain on the grid and improves overall resilience. Additionally, expanding energy efficiency services will create new job opportunities in Connecticut. Every million dollars invested in energy efficiency creates 7.7 new job opportunities, as compared to only 2.7 jobs per million dollars spent on fossil fuels. Connecticut already employs 70,000 people in the energy sector, around half of which work in energy efficiency; expanding C&LM funding could create new jobs that could support LIDAC economies.

In CT DEEP's CPRG community benefits survey, Connecticut residents indicated that the greatest benefits they see for addressing barriers to weatherization include decreased energy costs, reduced greenhouse gas emissions, cleaner air, new employment opportunities, and improved housing quality. Several respondents expressed concerns about the cost of energy efficiency upgrades. While some respondents recommended greater financial support for such improvements—

including for programs that remove structural barriers to energy efficiency—others thought that was not a good use of ratepayer or taxpayer funds.

Options to mitigate potential disbenefits:

- A progressive rate structure or limits to energy cost burdens that recognize that low income households often consume less energy than higher income households and industries.

Key implementing agency or agencies

CT DEEP for the Conservation & Load Management Program

Energy efficiency upgrades like those offered through Energize CT could also be implemented by:

- Municipalities
- Councils of Governments
- Tribal Nations

Implementation schedule and milestones

Year 1, Q1: Review current C&LM offerings, performance and funding allocations needs
Year 1, Q1-Q3: Communication and stakeholder engagement
Year 1, Q3: Update program as needed
Year 1, Q4: Approval and relaunch
Year 2, Q1: Outreach campaign targeted at eligible households
Year 2-5: Monitoring and evaluation

Geographic scope

This measure would be implemented in areas covered by investor-owned utilities in Connecticut. Energy efficiency upgrades like those offered through the C&LM/Energize CT programs could also be implemented in the geographic areas covered by municipalities, Councils of Governments, and Tribal Nations.

Metrics for tracking progress

- number of participants
- type, quantities, and efficiencies of material or equipment installed
- pre-existing system type
- energy saved by fuel type

- CPRG expenditures
- total cost of projects incentivized

Metrics should be tracked separately by participant segment (residential, income-eligible residential, and commercial and industrial) and by C&LM program.

Authority to implement

The authority to implement the C&LM plans in Connecticut is established through a collaborative process involving the utilities as program administrators of the Connecticut Energy Efficiency Fund, CT DEEP, and the Public Utilities Regulatory Authority. The C&LM is developed in a three-year cycle with input from the Energy Efficiency Board, and stakeholders.

To learn more about Connecticut's existing C&LM plan and programs: https://portal.ct.gov/DEEP/Energy/Conservation-and-Load-Management/Conservation-and-Load-Management

Intersection with other federal funding availability

The Home Electrification and Appliance Rebates Program includes rebates for low- and moderate-income households (or those working on their behalf) that install new, efficient electric appliances. CT DEEP will administer the Home Efficiency Rebates in Connecticut. Energize CT also helps Connecticut low income households make energy efficiency improvements through its existing offerings. Learn more at https://energizect.com/IRA-FAQ

Homeowners and landlords of single- and multi-family homes can benefit from savings with the Home Energy Performance-Based, Whole-House rebate program (the HOMES rebate program). Program eligibility is not income-based and instead measures the actual performance of whole-home energy efficiency and electrification improvements. Learn more at https://energizect.com/IRA-FAQ

The High Efficiency Electric Home (HEEH) program includes rebates for low- and moderate-income households (or those working on their behalf) that install new, efficient electric appliances. With some potential adjustments, Energize CT residential programs may be adapted to align with the HEEH rebate program. Eligibility for the HEEH rebate is income-based. Learn more at https://energizect.com/IRA-FAQ

The IRA reinstituted and increased the Energy Efficient Home Improvement Credit, which allows households to credit up to 30% of the cost of energy efficiency home upgrades against their taxes. Depending on the equipment or improvement made, this credit can total up to $3,200 per year for residential efficiency and electrification upgrades. Households are eligible for up to $1,200 per year for weatherization, including insulation and efficient windows and doors, as well as electrical panel upgrades installed in connection with a heat pump. Households can also claim an additional $2,000 for electric heat pumps and heat pump water heaters. The full credit is available for home improvements made starting in 2023. Learn more at https://energizect.com/IRA-FAQ

Technical information

Method for estimating greenhouse gas reductions:
We used historical program C&LM reporting data to estimate emission reductions due to program participation. We began by quantifying the average annual historical energy use savings by fuel type for the full portfolio of existing C&LM programs per dollar spent. We calculated the associated emission reductions by multiplying fuel savings by the corresponding emissions factors. Finally, we estimated the cumulative emissions reductions over time, assuming annual measure spending that increases from $5.0 million in 2025 to $12.5 million in 2029.

To quantify CAP and HAP emissions reductions, we multiplied the fuel savings by emissions factors for combustion equipment from EPA's AP-42 and WebFIRE database. We selected emission factors specific to the sector, end-use equipment, and fuel type. We did not account for changes in CAP or HAP emissions from electricity consumption.

Models/tools used:
This analysis relies primarily on historical program data. We also used EPA's AP-42 and WebFIRE database to identify appropriate emission factors for CAP and HAP.

Measure implementation assumptions:
To quantify emissions reductions for this measure, we assumed the following:

- Investor-owned utilities' customers in Connecticut are eligible to participate in C&LM.

- Energy use savings from participation are equal to average historical energy use savings for C&LM.
- Program funding will be spent between 2025 and 2029; 10% of funds will be spent in 2025, 20% each in 2026 and 2027, and 25% each in 2028 and 2029.
- Measure lifetimes are based on reported lifetime energy savings divided by annual energy savings by fuel type. Measure lifetimes vary by fuel type: 13.9 years for natural gas, 20.4 years for fuel oil, 17.1 for propane, and 9.5 for electricity.

Modeling assumptions:
The following key assumptions about emission reductions were used to quantify emission reductions for this measure:

- Emissions rates for fuel oil decline over time due to increased biofuel blending. We assume the statutory minimum for biofuel blending levels: starting with 5%, increasing to 10% in 2025, 15% in 2030, 20% in 2034, and 50% in 2035 onwards.
- GHG emissions factors for combustion fuels are based on the EPA's 2023 Emissions Factors Hub. We converted emissions into metric tons of CO_2 equivalents using GWPs from the IPCC 5th Assessment report.
- Electric emissions factors for 2024-2039 were forecasted based on modeling done for the CT DEEP Integrated Resources Plan published in 2020. Electric emissions factors after 2040 are assumed to be zero, as statute requires Connecticut to achieve a zero-carbon grid by that year.
- Criteria and hazardous air pollutant emissions factors for combustion fuels are based on EPA's AP-42: Compilation of Air Pollutant Emissions Factors from Stationary Sources and EPA's WebFIRE database.

Reference case scenario:
In the reference scenario for C&LM, program participation is constrained by non-CPRG funding. Thus, we assume that in absence of CPRG funding, no additional buildings (beyond those that would already participate) will achieve energy savings.

Measure-specific activity data and implementation tracking metrics:
The table below summarizes key activity data used to estimate and track emission reductions for greenhouse gases, criteria air pollutants, and hazardous air pollutants.

Metric	Units	Value used for modeling
Annual energy savings, 2030		
Fuel oil	Btu, billion	30
Natural gas	Btu, billion	96
Propane	Btu, billion	7
Wood	Btu, billion	0
Electricity	Btu, billion	139
Cumulative energy savings, 2025-2030		
Fuel oil	Btu, billion	110
Natural gas	Btu, billion	352
Propane	Btu, billion	25
Wood	Btu, billion	0
Electricity	Btu, billion	507
Cumulative energy savings, 2025-2050		
Fuel oil	Btu, billion	632
Natural gas	Btu, billion	1,350
Propane	Btu, billion	123
Wood	Btu, billion	0
Electricity	Btu, billion	1,390

9. *Expand funding for the Residential Energy Preparation Services program to address health and safety barriers to weatherization*

Climate action measure and description

The Residential Energy Preparation Services (REPS) program removes health and safety barriers such as asbestos, mold, and vermiculite to enable home weatherization for low income households. REPS prepares households to participate in Connecticut's existing low income weatherization programs, the Home Energy Solutions Income Eligible program (HES-IE) and the Weatherization Assistance Program (WAP). This climate action measure, if implemented, would expand the number of households served under REPS, thereby enabling upgrades that improve energy efficiency, resilience, and comfort of low income homes.

An estimated 23 percent of low income households cannot participate in weatherization programs due to health and safety issues such as presence of asbestos, mold, vermiculite, or pests. With approximately 67,000 households in Connecticut eligible for REPS, current program funding is insufficient to meet the need. This measure assumes additional upgrades for approximately 4,500 households by 2030, substantially increasing in-state low income weatherization rates.

Estimates of the cumulative greenhouse gas emissions reductions

Increased rates of weatherization associated with REPS will reduce cumulative greenhouse gas emissions (GHG) emissions by an estimated 8,875 metric tons of carbon dioxide equivalents (CO_2e) during the period 2025–2030 and 44,877 metric tons CO_2e over the period 2025–2050. The annual GHG emission reduction in 2030 is 2,462 tons or 0.04 percent of Connecticut residential sector GHG emissions in 2021.

Climate action measure	**Cumulative GHG emission reductions (metric tons CO_2e)**	
	2025–2030	**2025–2050**
Expand funding for the Residential Energy Preparation Services program to address health and safety barriers to weatherization	8,875	44,877

CO_2e = carbon dioxide equivalents

Estimates of co-pollutant emissions reductions

Weatherization enabled through this measure will reduce emissions of criteria air pollutants (CAPs) by approximately ten (10) metric tons during the period 2025–2030 and 57 metric tons over the period 2025–2050. The annual criteria air pollutant reduction in 2030 is three (3) metric tons.

Hazardous air pollutant (HAP) emissions will fall by an estimated 937 pounds during the period 2025–2030 and 5,592 pounds over the period 2025–2050 due to increased rates of weatherization. The annual reduction in 2030 is 257 pounds.

Pollutant	**Units**	**Time period**		
		2030, Annual	**2025-2030, Cumulative**	**2025-2050, Cumulative**
GHG	**Metric tons CO_2e**	**2,462**	**8,875**	**44,877**
Arsenic	Pounds	0	0	0
Benzene	Pounds	0	0	1
Beryllium	Pounds	0	0	0
Cadmium	Pounds	0	0	1
Carbon Monoxide	Pounds	1,439	5,253	30,781
Chromium	Pounds	0	0	1
Formaldehyde	Pounds	2	6	35
Lead	Pounds	0	0	0
Manganese	Pounds	0	0	0
Methane	Pounds	249	910	5,431
Nickel	Pounds	0	0	1
Nitrogen Oxides (NOx)	Pounds/Metric Tons	4,079/1.9	14,889/6.8	87,668/39.8
Nitrous Oxide	Pounds	6	20	123
PM, filterable	Pounds	86	316	1,861
PM, primary	Pounds/Metric Tons	168/0.08	611/0.3	3,518/1.6
Polycyclic Organic Matter (POM)	Pounds	0	0	0
Sulfur Dioxide	Pounds	61	222	1,323
Total CAP	**Metric tons**	**3**	**10**	**57**
Total Urban Toxics HAP	**Pounds**	**257**	**937**	**5,592**

Anticipated benefits and disbenefits to Low income and Disadvantaged Communities (LIDACs)

Participation in the REPS program provides multiple benefits for LIDACs households. Nearly a quarter of income-eligible homes have barriers to weatherization that are also health and safety issues, such as mold, asbestos, and vermiculite. The remediation of these health and safety barriers can reduce rates of asthma and other medical conditions which are higher in LIDACs. In addition to making homes safer and healthier, removal of these barriers allows homes to move forward with weatherization. Weatherization services such as repairing leaks, upgrading ventilation, and electrifying appliances offer LIDACs benefits including energy savings and improved health. One study found that weatherization saves households $1,537 annually from mitigation of thermal stress (coldness) and arthritis, improved home productivity, and reduced fire risk (Boomhower et al. 2020).

The Governor's Council on Climate Change 2021 report identified similar benefits and highlights the importance of promoting building envelope improvements and access to thermal energy efficiency measures among low- and moderate-income communities. The report notes that properly constructed and insulated buildings have fewer health and safety challenges, increased thermal comfort and increased temperature stability, and therefore improved resiliency during extreme weather, pandemics, or other crises.

In CT DEEP's CPRG community benefits survey, Connecticut residents indicated that the greatest benefits they see for addressing barriers to weatherization include decreased energy costs, improved housing quality, new employment opportunities, reduced GHG emissions, and improved health. Several respondents expressed concerns about how costly energy efficiency upgrades are and recommended greater financial support for such improvements.

The REPS program is provided statewide, and thus has the potential to benefit members of all LIDACs.

Options to mitigate potential disbenefits:

- A limited number of respondents expressed concern that housing upgrade programs in LIDACs could be disruptive, suffer from lack of accountability, and/or produce poor results. Providing greater financial support for energy efficiency improvements for low income households and increasing oversight

of housing upgrades and increase and improve workforce training could improve results.

Key implementing agency or agencies

State agencies and quasi-public agencies, including CT DEEP, which runs the REPS program, and the Connecticut Department of Social Services
+
Programs similar to REPS and WAP could also be implemented by:

- Municipalities
- Councils of Governments
- Tribal Nations

Implementation schedule and milestones

- Year 1, Q1: Review existing REPS program performance and review current Program Operator contract
- Year 1, Q2: Assess program capacity and funding needs
- Year 1, Q2: Stakeholder workshops and feedback sessions
- Year 1, Q3-Q4: Update program guidelines and operator contract
- Year 2, Q1: Launch expanded REPS program
- Year 2, Q1-Q2: Outreach campaign targeted at eligible households
- Year 2-5: Monitoring and evaluation

Geographic scope

Statewide

Metrics for tracking progress

- Number of unique households served and costs
- Differentiated by weatherization barrier (asbestos, mold, vermiculite, pests)
- Funding expenditures against project milestones
- Number of unique households that subsequently participate in state weatherization programs
- Weatherization-related energy saved by fuel type.

Authority to implement

Existing program for CT DEEP. Learn more here:

https://portal.ct.gov/DEEP/Energy/Conservation-and-Load-Management/Weatherization-Barrier-Mitigation

Conservation and Load Management Plan:
https://portal.ct.gov/-/media/DEEP/energy/ConserLoadMgmt/CLM-Plan-Update-2022-2024/2023-CLM-Update-Determination.pdf

Intersection with other federal funding availability

There is no federal funding source to address health and safety barriers such as asbestos, mold, and vermiculite to enable home weatherization for low income households.

Technical information

Method for estimating greenhouse gas reductions:
We used historical program REPS and HES-IE reporting data to estimate per-household emission reductions due to program participation. We began by quantifying the average historical per-household energy use savings by primary heating fuel type for REPs participants. Next, we estimated the mix of equipment, fuel types, and associated heating efficiencies in future participating households. We calculated average emission reductions per participating household by weighting the energy savings according to primary heating fuel type of existing building stock then multiplying by the corresponding emissions factors. Finally, we estimated the cumulative emissions reductions over time, assuming annual measure spending that increases from $5.0 million in 2025 to $12.5 million in 2029.

To quantify CAP and HAP emissions reductions, we multiplied the energy savings by fuel type by emissions factors for combustion equipment from EPA's AP-42 and WebFIRE database. We selected emission factors specific to the sector, end-use equipment, and fuel type. We did not account for changes in CAP or HAP emissions from electricity consumption.

Models/tools used:
We relied on historical REPs and HES-IE program data using the Building Decarbonization Calculator (BDC). The BDC is an in-house tool developed by Synapse Energy Economics used for modeling the energy consumption of major building end-uses, including space and water heating, in residential and commercial

buildings throughout the United States. We also used EPA's AP-42 and WebFIRE database to identify appropriate emission factors for CAP and HAP.

Measure implementation assumptions:

To quantify emissions reductions for this measure, we assumed the following:

- All low income households with health and safety barriers to weatherization are eligible.
- Per-household energy savings from REPS participation are equal to average historical per-household energy savings from participation in REPS and HES-IE.
- The cost to prepare a household for weatherization is $11,070 (2023 dollars), based on historical REPS program data.
- Program funds will be spent between 2025 and 2029; 10% of households to be served participate in 2025, 20% each in 2026 and 2027, and 25% each in 2028 and 2029.
- Measure lifetimes are based on reported lifetime savings divided by reported annual savings for the HES-IE program. Measure lifetimes vary by equipment fuel type: 20.3 years for natural gas, 21.1 years for fuel oil, 21.7 for propane, and 8.1 for electricity. These values include air sealing and insulation (all weatherization measures combined).

Modeling assumptions:

The following key assumptions were used to quantify emission reductions for this measure:

- Emissions rates for fuel oil decline over time due to increased biofuel blending. We assume the statutory minimum for biofuel blending levels: starting with 5%, increasing to 10% in 2025, 15% in 2030, 20% in 2034, and 50% in 2035 onwards.
- GHG emissions factors for combustion fuels are based on the EPA's 2023 Emissions Factors Hub. We converted emissions into metric tons of CO_2 equivalents using GWPs from the IPCC 5th Assessment report.
- Electric emissions factors for 2024–2039 were forecasted based on modeling done for the CT DEEP Integrated Resources Plan published in 2020. Electric emissions factors after 2040 are assumed to be zero, as statute requires Connecticut to achieve a zero-carbon grid by that year.
- Criteria and hazardous air pollutant emissions factors for combustion fuels are based on EPA's AP-42: Compilation of Air Pollutant Emissions Factors from Stationary Sources and EPA's WebFIRE database.

Reference case scenario:

In the reference scenario for REPS, the number of households that participate in REPs is constrained by non-CPRG funding levels. Thus, we assume that in absence of CPRG funding, no additional households achieve weatherization-related energy savings.

Measure-specific activity data and implementation tracking metrics:
The table below summarizes key activity data used to estimate and track emission reductions for GHGs, criteria air pollutants, and hazardous air pollutants.

Metric	Units	Value
Projects completed		
2025	units	452
2026	units	903
2027	units	903
2028	units	1,129
2029	units	1,129
Annual energy savings, 2030		
Fuel oil	Btu, billion	15
Natural gas	Btu, billion	23
Propane	Btu, billion	2
Wood	Btu, billion	0
Electricity	Btu, billion	9
Cumulative energy savings, 2025-2030		
Fuel oil	Btu, billion	56
Natural gas	Btu, billion	83
Propane	Btu, billion	6
Wood	Btu, billion	0
Electricity	Btu, billion	34
Cumulative energy savings, 2025-2050		
Fuel oil	Btu, billion	339
Natural gas	Btu, billion	475
Propane	Btu, billion	37
Wood	Btu, billion	0
Electricity	Btu, billion	83

10. *Support deployment of networked geothermal systems*

Description of climate action measure

This climate action measure, if implemented, would construct a pilot networked geothermal system. Networked geothermal systems, also known as district geothermal systems or district thermal networks, combine ground-source heat pumps with district energy to create highly efficient, neighborhood-scale heating and cooling systems. This technology represents an all-electric alternative to fossil fuel heating equipment.

The type of networked geothermal system proposed for the pilot consists of a shared, ambient-temperature loop that circulates working fluid between the buildings in a neighborhood and a series of vertical geothermal boreholes. Individual ground-source heat pumps within each building extract or reject heat into the loop, depending on the thermal needs of the building. The loop stays at ambient temperature by exchanging heat with the ground as it circulates through the boreholes. This design enables a single shared loop to provide both heating and cooling, and it may allow for load sharing between buildings that have simultaneous heating and cooling needs, further increasing system efficiency.

District geothermal is an emerging technology, therefore public funding would be proposed to cover 100 percent of installation costs. Once the system is installed, residents of buildings served by the system would pay for operating costs (e.g., electricity consumed by the ground-source heat pumps and for pumping) as part of their utility bills.

This measure assumes the construction of one pilot district geothermal system serving approximately 375 tons of heating capacity total. The system would be installed in an urban area with a mixture of residential and commercial buildings to take advantage of load sharing opportunities.

Estimates of the cumulative greenhouse gas emissions reductions

If the district geothermal pilot is installed in an existing neighborhood, we estimate that it will reduce cumulative greenhouse gas (GHG) emissions by 881 metric tons carbon dioxide equivalent (CO_2e) from 2025–2030 and 4,861 MT CO_2e from 2025–2050. If the system is installed in a newly constructed neighborhood, cumulative GHG emissions reductions will be approximately 695 metric tons CO_2e from 2025–2030 and 5,698 tons from 2025–2050. The annual GHG emissions reduction in 2030

will be 261 metric tons CO_2e for a system serving existing buildings and 208 metric tons CO_2e for a system serving new construction. Emission savings are greater for new construction due to the following counterfactual assumptions; for the existing neighborhood, we assume that, in the absence of networked geothermal, an increasing number of buildings adopt heat pumps over time (in line with current trends), for new construction, however, we assume that the counterfactual buildings will have gas furnaces throughout the study period (because this is still standard equipment for most new developments; and the equipment would be expected to last for a couple of decades). Networked geothermal offers a small efficiency benefit over standard heat pumps, but in the later years the emissions intensity of the electricity is so low that the difference between the gas furnaces and the networked geothermal dominates. Similarly, networked geothermal offers a substantial efficiency benefit over air-source heat pumps; at scale, this efficiency is beneficial for reducing grid load.

Climate action measure	**Cumulative GHG emission reductions (metric tons CO_2e)**	
	2025–2030	**2025–2050**
Support deployment of networked geothermal systems - district geothermal pilot installed in an existing neighborhood (i.e., one where the buildings are not new construction).	881	4,861
Support deployment of networked geothermal systems - pilot installed in a newly constructed neighborhood	695	5,698

CO_2e = carbon dioxide equivalents

Estimates of co-pollutant emissions reductions

The tables below summarize emissions reductions for a district geothermal pilot installed in an existing neighborhood (i.e., one where the buildings are not new construction) and a pilot installed in a newly constructed neighborhood.

The district geothermal pilot will reduce criteria air pollutant emissions by 4 metric tons from 2025–2030 and 18 metric tons from 2025–2050 if installed in an existing neighborhood. For a system installed in a newly constructed neighborhood, reductions will be 1 metric ton from 2025–2030 and 7 metric tons from 2025–2050.

Hazardous air pollutant emissions will fall by an estimated 846 pounds from 2025–2030 and 3,617 pounds from 2025–2050 in an existing neighborhood or 35 pounds from 2025–2030 and 266 pounds from 2025–2050 in a newly constructed neighborhood. Annual emissions reductions in 2030 will be 267 pounds or 12 pounds for the two system designs, respectively.

Summary of emissions reductions for a district geothermal pilot installed in an existing neighborhood

Pollutant	**Units**	**Time period**		
		2030, Annual	**2025-2030, Cumulative**	**2025-2050, Cumulative**
GHG	**Metric tons CO_2e**	**261**	**881**	**4,861**
Arsenic	Pounds	0	0	0
Benzene	Pounds	14	45	187
Beryllium	Pounds	0	0	0
Cadmium	Pounds	0	0	0
Carbon Monoxide	Pounds	1,882	5,955	25,884
Chromium	Pounds	0	0	0
Formaldehyde	Pounds	0	1	5
Lead	Pounds	0	0	0
Manganese	Pounds	0	0	0
Methane	Pounds	250	791	3,385
Nickel	Pounds	0	0	0
Nitrogen Oxides (NOx)	Pounds/Metric Tons	563/0.3	1,738/0.8	9,915/4.5
Nitrous Oxide	Pounds	3	9	38
PM, filterable	Pounds	11	35	202
PM, primary	Pounds/Metric Tons	248/0.1	785/0.4	3,459/1.6
Polycyclic Organic Matter (POM)	Pounds	0	0	0
Sulfur Dioxide	Pounds	8	23	120
Total CAP	**Metric tons**	**1**	**4**	**18**
Total Urban Toxics HAP	**Pounds**	**267**	**846**	**3,617**

Summary of emissions reductions for a district geothermal pilot installed in a newly constructed neighborhood

Pollutant	**Units**	**Time period**		
		2030, Annual	**2025-2030, Cumulative**	**2025-2050, Cumulative**
GHG	**Metric tons CO_2e**	**208**	**695**	**5,698**
Arsenic	Pounds	0	0	0
Benzene	Pounds	0	0	0
Beryllium	Pounds	0	0	0
Cadmium	Pounds	0	0	0
Carbon Monoxide	Pounds	194	583	4,469
Chromium	Pounds	0	0	0
Formaldehyde	Pounds	0	1	8
Lead	Pounds	0	0	0
Manganese	Pounds	0	0	0
Methane	Pounds	11	34	257
Nickel	Pounds	0	0	0
Nitrogen Oxides (NOx)	Pounds/Metric Tons	457/0.2	1,370/0.6	10,503/4.8
Nitrous Oxide	Pounds	0	0	0
PM, filterable	Pounds	9	28	212
PM, primary	Pounds/Metric Tons	37/0.02	111/0.05	849/0.4
Polycyclic Organic Matter (POM)	Pounds	0	0	0
Sulfur Dioxide	Pounds	3	9	67
Total CAP	**Metric tons**	**0**	**1**	**7**
Total Urban Toxics HAP	**Pounds**	**12**	**35**	**266**

Anticipated benefits and disbenefits to Low income and Disadvantaged Communities (LIDACs)

Locating district geothermal pilot programs in LIDACs will reduce air pollution and benefit local economies. Because they are all-electric, these systems produce virtually no on-site emissions, in contrast to fossil fuel heating appliances. Fossil fuel heating appliances release a wide range of air pollutants that are linked to numerous health problems such as respiratory irritation and illnesses; cardiovascular disease; fatigue; and damage to the kidneys, liver, and central nervous system. The concentration of indoor air pollution may be two to five times higher than outdoor pollution, especially if combustion equipment is improperly vented.

Because they remove fossil-fuel-dependent equipment from buildings, district geothermal systems will have health benefits, especially for vulnerable populations who are particularly susceptible to air pollutants (vulnerable populations include children, pregnant women, older adults, and those with asthma and pre-existing heart and lung conditions). The need for reducing indoor air pollution is underscored by recent research showing the prevalence of unvented combustion in low income areas and the negative health impacts that this can cause. District geothermal would also improve comfort by providing space cooling to homes that may have lacked it previously.

Investing in the development of district geothermal is aligned with community desires for cleaner air and the Governor's Council on Climate Change (GC3) target for "transitioning building fossil fuel thermal loads to efficient renewable thermal technologies." District geothermal systems have consistently high energy efficiencies, even at extreme outdoor air temperatures, so they also align with GC3's goal to reduce building sector electric consumption by 1–2 million megawatt-hours using high efficiency technologies.

Finally, installing a district geothermal system is a sizable construction project that would create job opportunities, and locating these projects in or near LIDACs would benefit LIDACs economies. Installing and maintaining district geothermal requires many of the same skills as installing and maintaining gas pipelines, so deployment of district geothermal systems could safeguard pipeline jobs that would otherwise be at risk and could provide this workforce with a path forward.

In CT DEEP's CPRG community benefits survey, Connecticut residents indicated that the greatest benefits they see for a networked geothermal project include reduced GHG emissions, cleaner air, decreased energy costs, employment opportunities, and improved health. Numerous respondents were concerned about the cost of installation and maintenance for networked geothermal systems. A limited number of respondents expressed concerns about environmental impacts of excavation and space constraints that may limit the applicability of this measure.

Options to Mitigate Potential Disbenefits:

- Explore greater subsidies and/or financing for networked geothermal to address the up-front capital costs
- Continue learning from case studies on best practices to limit environmental impacts and navigate space constraints

Key implementing agency or agencies

State agencies and quasi-public agencies, including CT DEEP. This measure could also be implemented by:

- Municipalities
- Councils of Governments
- Tribal Nations

Implementation schedule and milestones

- Year 1 Q1-Q3: Communication and stakeholder engagement to identify a pilot location
- Year 1 Q3: Issue Request for Proposals to implement the pilot project
- Year 1 Q4: Receive applications and select implementer
- Year 2: Design and permitting
- Years 3-5: Construction

Geographic scope

The proposed measure would install a networked geothermal system pilot in a single LIDAC, with the final location yet to be determined.

Metrics for tracking progress

- Number of meetings and attendees on pilot site selection
- System capacity (e.g., tonnage and floor area served), operating efficiency, and energy use for major system components

- Retrofit pre-existing system type or new construction counterfactual system type
- Energy saved by fuel type
- Grant expenditures against project milestones

Authority to implement

CT DEEP may accept federal funds to pass through to an entity that may construct, own and operate a networked geothermal system. CT DEEP is the current recipient of a grant from the Department of Energy to design a networked geothermal system (see intersection with other funding availability below).

Intersection with other federal funding availability

The U.S. Department of Energy has funded 11 projects across the country to explore the potential of community-scale networked geothermal systems, through the Community Geothermal Heating and Cooling Design and Deployment Grant Program.

CT DEEP won an award, in partnership with the University of Connecticut, Wallingford Housing Authority, Wallingford Electric Division, and Northeast Energy Efficiency Partnerships, to conduct community engagement, design a networked geothermal system for part of the housing authority's campus, and complete a Connecticut geothermal workforce needs assessment.

The primary objective of that proposed project is to design a technically and economically feasible low-temperature, shallow geothermal heating and cooling system for an affordable housing complex in a Connecticut environmental justice community in Wallingford, CT that will serve at least 50% of the heating and cooling load of a 132-unit, affordable housing complex in Wallingford, CT — Ulbrich Heights. The Ulbrich Heights community has been actively seeking to undertake capital and energy improvements that address American with Disabilities Act (ADA) compliance and energy efficiency for an affordable-housing development providing homes to 21 disabled, 19 elderly, and 100 female-headed households.

Technical information

Method for estimating greenhouse gas reductions:

To estimate greenhouse gas emissions reductions, we compared emissions associated with electricity consumption by the district geothermal system to the emissions that space heating equipment would produce if the system were not

installed. We assumed that the design and installation cost of the pilot would be similar to Eversource's district geothermal pilot in Framingham, MA, since it shares the same climate zone as Connecticut, has similar density to Connecticut's large and mid-sized cities, and construction of the system is nearly complete. We used Eversource's estimates of electricity consumption from the shared components of the system (e.g., pumps and backup loop heating). Eversource did not publish an estimate for electricity consumption by the in-building ground-source heat pump units, so we estimated this value using the Synapse Thermal Network Assessment Model, calibrated to match the parameters of the Framingham pilot.

To determine counterfactual energy use and emissions, we examined two possible scenarios. If the pilot is installed in an existing neighborhood, we assumed that counterfactual energy use would follow the statewide average in the business-as-usual scenario. If the pilot is installed in a newly constructed neighborhood, we assumed that buildings would have installed efficient gas furnaces in absence of the district geothermal system.

While district geothermal can provide both heating and cooling, we only considered the emissions impacts from the replacement of heating equipment with ground-source heat pumps. Installed heat pumps may replace existing cooling systems, which would reduce emissions due to increased equipment efficiency, or heat pumps may provide cooling in homes where no cooling was previously installed which would increase emissions.

To quantify CAP and HAP emissions reductions, we multiplied the fuel savings of the baseline equipment by emissions factors for combustion equipment from EPA's AP-42 and WebFIRE database. We selected emission factors specific to the sector, end-use equipment, and fuel type. We did not account for changes in CAP or HAP emissions from electricity consumption.

Models/tools used:
To model the electricity consumption of the district geothermal system, we relied on data from Eversource's pilot in Framingham, MA. We also modeled the Framingham pilot using Synapse's Thermal Network Assessment Model. The Thermal Network Assessment Model is an in-house tool developed by Synapse Energy Economics used to model the electricity consumption, peak load, and lifetime costs of networked geothermal systems. As described above, we used this model to calculate electricity consumption by the ground-source heat pump component of the system.

For the two counterfactuals, we used the Building Decarbonization Calculator (BDC). Like the Thermal Network Assessment Model, the BDC is a modeling tool developed by Synapse Energy Economics. It is used for modeling the energy consumption of major building end uses, including space and water heating, in residential and commercial buildings throughout the United States. The BDC quantifies how accelerating the adoption of new technologies impacts GHG emissions and energy consumption and uses a stock turnover framework to forecast energy use over time associated with various technologies. We relied on assumptions and results from the BDC, including equipment efficiencies, annual energy consumption, and equipment stock by fuel type to estimate emissions reductions. We also used EPA's AP-42 and WebFIRE database to identify appropriate emission factors for CAP and HAP.

Measure implementation assumptions:

To quantify emissions reductions for this measure, we assumed the following:

- One pilot district geothermal system will be installed in either an existing neighborhood or a newly constructed neighborhood.
- The district geothermal system will provide 375 tons of heating capacity and will serve approximately 65,200 square feet of multifamily buildings, 65,200 square feet of single-family homes, and 32,600 square feet of commercial buildings.
- The system will begin operating at the beginning of 2028.
- The ground loop and boreholes will have a lifetime of 54 years and the ground-source heat pumps will have lifetimes of 18 years.
- This measure would pay for initial capital costs but not operating costs or the cost for replacement ground-source heat pump units at end-of-life.
- Certain system installation costs may qualify for a 30 percent investment tax credit (ITC) under the IRA.
- The installation cost for a district geothermal system in a newly constructed neighborhood is approximately 31 percent less than the installation cost for a system in an existing neighborhood.

Modeling assumptions:

The following key assumptions about emission reductions were used to quantify emission reductions for this measure:

- In the existing building counterfactual, emissions rates for fuel oil decline over time due to increased biofuel blending. We assume the statutory minimum for biofuel blending levels: starting with 5%, increasing to 10% in 2025, 15% in 2030, 20% in 2034, and 50% in 2035 onwards.

- GHG emissions factors for combustion fuels are based on the EPA's 2023 EPA Emissions Factors Hub. We converted emissions into metric tons of CO_2 equivalents using GWPs from the IPCC 5th Assessment report.
- Electric emissions factors for 2024–2039 were forecasted based on modeling done for the CT DEEP Integrated Resources Plan published in 2020. Electric emissions factors after 2040 are assumed to be zero, as statute requires Connecticut to achieve a zero-carbon grid by that year.
- Criteria and HAP emissions factors for combustion fuels are based on EPA's AP-42: Compilation of Air Pollutant Emissions Factors from Stationary Sources and EPA's WebFIRE database.

Reference case scenario:

We analyzed emissions reductions for two possible scenarios: a district geothermal pilot installed in an existing neighborhood and a pilot installed in a newly constructed neighborhood. For the existing neighborhood, reference case emissions are the average emissions, normalized by square foot, for residential and commercial buildings in the business-as-usual scenario. For the newly constructed neighborhood, we assumed that the buildings would have installed gas furnaces if they had not been connected to the district geothermal system, and we used equipment efficiency and load data from the BDC for the year the district geothermal system begins operating.

Measure-specific activity data and implementation tracking metrics:

The table below summarizes key activity data used to estimate and track emission reductions for GHGs, criteria air pollutants, and hazardous air pollutants.

Metric	Units	Existing buildings, no ITC	New construction, no ITC	Existing buildings, with ITC	New construction, with ITC
Projects completed					
2025	units	0	0	0	0
2026	units	0	0	0	0
2027	units	0	0	0	0
2028	units	1	1	1	1
2029	units	0	0	0	0
Cumulative energy savings, 2025-2030					
Fuel oil	Btu, billion	5.6	0.0	5.6	0.0
Natural gas	Btu, billion	10	15	10	15
Propane	Btu, billion	0.7	0.0	0.7	0.0
Wood	Btu, billion	0.4	0.0	0.4	0.0
Electricity	Btu, billion	-7.9	-9.3	-7.9	-9.3
Cumulative energy savings, 2025-2050					
Fuel oil	Btu, billion	26	0	26	0

Natural gas	Btu, billion	68	115	68	115
Propane	Btu, billion	3.9	0.0	3.9	0.0
Wood	Btu, billion	1.7	0.0	1.7	0.0
Electricity	Btu, billion	-59	-71	-59	-71
Annual energy savings, 2030					
Fuel oil	Btu, billion	1.8	0.0	1.8	0.0
Natural gas	Btu, billion	3.4	5.0	3.4	5.0
Propane	Btu, billion	0.2	0.0	0.2	0.0
Wood	Btu, billion	0.1	0.0	0.1	0.0
Electricity	Btu, billion	-2.6	-3.1	-2.6	-3.1

11. Reduce electric sector emissions while maintaining electric system reliability using demand response and/or energy storage

Description of climate action measure

This climate action measure, if implemented, would reduce demand for electricity during times of high usage such as during heat waves and cold snaps through demand response programs and energy storage. A demand response program encourages individuals and businesses to use less energy during high demand periods by offering a rebate to participants for voluntarily lowering their energy use. Participants in a demand response program can reduce energy by dimming lights, temporarily changing the settings on a supermarket freezer, running air conditioning chillers during off-peak periods, avoiding running the dishwasher or clothes washing machine at certain times of day, and other approaches.

The second measure to reduce energy consumption during periods of high demand is energy storage. Energy storage can be paired with clean, variable energy resources like wind and solar to store excess energy when curtailment of renewables might ordinarily occur. Stored energy can then be used during periods of high demand when additional electricity is needed. Deployment of solar and storage was identified as a primary strategy for the electricity sector by Connecticut's Governor's Council on Climate Change in the 2018 report *Building a Low Carbon Future for Connecticut*. This measure, if implemented, would help offset peaking units that can be higher emitting than other electric generating units (EGU). Energy storage can also help to better integrate large electrification loads, like electric vehicle fleets. The use of demand response and storing energy can reduce brownouts and power outages, including providing backup power to increase community resilience.

Estimates of the cumulative greenhouse gas emission reductions

Climate action measure	Cumulative GHG emission reductions (metric tons CO_2e)	
	2025–2030	2025–2050
Demand response	3,622,950	12,550,286
Energy storage	161,452	2,043,193

CO_2e = carbon dioxide equivalents

Estimates of co-pollutant emission reductions

Co-pollutant	Reduction (metric tons)	
	2025–2030	2025–2050
Demand response NOx	748.61	3,754.07
Demand response SO_2	266.28	1,405.12
Energy storage NOx	41.7	791.6
Energy storage SO2	19.8	347.6

Anticipated benefits and disbenefits to Low Income and Disadvantaged Communities (LIDACs)

Demand response programs offer financial incentives, such as lower electricity rates or direct payments, for reducing energy usage during peak demand periods. This can result in cost savings for low income households, who tend to have limited resources and often struggle with high energy bills. As per a public survey conducted by CT DEEP, demand response is highly valued by LIDACs. It decreases greenhouse gas emissions and improves overall grid reliability, reducing the likelihood of power outages. Lower-income households find this particularly important as they are often disproportionately affected by environmental issues and are more vulnerable to the negative impacts of outages. However, many low income households may be unaware of demand response programs or how to participate, limiting the potential benefits of demand response for low income households and perpetuating energy inefficiency. Low income households may lack the necessary infrastructure or technology to actively participate in demand response programs. For example, households without smart thermostats may face challenges in adjusting their energy usage. Additionally, demand response programs may incentivize low income households to reduce energy usage below comfort levels to save money. This action can lead to less heating or cooling during

extreme weather conditions, which may impact the overall comfort and well-being of occupants, particularly for vulnerable populations such as the elderly or those with health conditions.

In addition to demand response, energy storage plays an important role in improving the integration of renewables and reducing reliance on inefficient fossil fuel power generation. Transitioning to renewable energy sources and minimizing the operation of fossil fuel power plants leads to enhanced air quality, resulting in reduced health impacts caused by pollutants like sulfur dioxide, nitrogen oxides, and particulate matter. This improvement in air quality is particularly significant for households located near these power plants. The reduction in greenhouse gases also benefit low income households, who are most vulnerable to climate impacts. While energy storage systems can offer numerous benefits, their implementation and integration into the grid could lead to increased rates for customers, which can be detrimental for low income households that already experience high energy cost burdens.

Options to mitigate potential disbenefits:

- Low income households often consume less energy compared to higher income households and industries. The majority of energy capacity is driven by the higher energy consumption of wealthier households and industries. A progressive rate structure or other assistance could address the potential for increased energy costs associated with energy storage.
- Education, outreach, and targeted support can play a vital role in maximizing the benefits and minimizing the challenges associated with demand response participation for low income households.

Key implementing agency or agencies

State agencies and quasi agencies, including the Connecticut Department of Energy and Environmental Protection

- Municipalities
- Councils of Governments
- Tribal Nations

Implementation schedule and milestones

Year 1, Q1: Design demand response and energy storage program
Year 1, Q1-Q3: Communication and stakeholder engagement
Year 1, Q3 – Year 2, Q3: Issue Request for Proposals or otherwise procure an implementing entity

Year 2, Q4: Enroll households in the demand response program and begin deployment of energy storage systems
Years 3-5: Repeat program rounds as necessary and funding available

Geographic scope
Statewide

Metrics for tracking progress

- Number of public relations, community engagement, and education events on demand response
- Overseeing contractors and vendors
- Tracking, measuring, and reporting accomplishments on proposed timelines and milestones in each jurisdiction
- Number of participants enrolled in the demand response program
- Number of storage units deployed

Authority to implement
CT DEEP and CT PURA have authority to reduce electric sector emissions through demand response and energy storage. CT DEEP must approve an "Integrated Resources Plan for the procurement of energy resources, including…load management, demand response,…and other emerging technologies [e.g., energy storage using batteries] to meet" projected customer needs "in a manner that minimizes the cost…and maximizes consumer benefits consistent with the state's environmental goals and standards, including…the state's greenhouse gas reduction goals…" (CGS 16a-3a(a)). CT DEEP must periodically review, and revise as appropriate, the Plan (see CGS 16a-3a(b) and (j)). In addition, electric distribution and gas companies must jointly prepare every three years a Conservation and Load Management Plan, which must include, among other things, "demand management" (CGS 16-245m(d)(1)), may include "load management" and "demand-side technology" programs (CGS 16-245m(d)(5)), and is subject to CT DEEP approval.

CT PURA has authority to review and approve the use of demand response rates and energy storage to meet electricity demand and the recovery of the costs of these measures through electricity rates. CT PURA "oversee[s] the implementation" of the Integrated Resource Plan (CGS 16a-3b(a)). In particular, CT PURA determines the rates charged by electric distribution companies (CGS 16-19(a) and 16-19a(a)(1)) and regulates the companies' "expansion of plant or equipment," taking into account, among other things, "prudent management of the natural environment" (CGS 16-19e(a)(3)). Electric distribution companies must implement "demand-side

measures, including…load management, demand response, and other emerging technologies, specified" in the Integrated Resource Plan and in the Conservation and Load Management Plan (CGS 16a-3b(a)). Approved demand response measures are reflected in, and their implementation costs are recoverable through, electricity rates (see, e.g., CGS 16-19oo and 16-245m(d)(1)). In addition, the companies must solicit and select requests for proposal for non-generation energy resources (e.g., energy storage), subject to approval by CT PURA (CGS 16a-3b(c)). Also, CT DEEP may solicit and select proposals for energy storage systems, subject to CT PURA approval, and the costs incurred by the companies under approved proposals must be recovered through electricity rates (CGS 16a-3h and 16-243dd(a) and (c)).

Intersection with other federal funding availability
The Inflation Reduction Act extended the Residential Clean Energy Credit, which allows households to credit up to 30% of the cost of installing batteries against their taxes. This credit is available for residential batteries installed starting in 2023. Connecticut customers with residential batteries are eligible to participate in the Energize CT Energy Storage Solutions and receive a $7,500 upfront plus performance incentives. You can find further details and information here: https://energizect.com/explore-solutions/demand-response-and-smart-devices/energy-storage.

Technical information

Methods for demand response

Method for estimating greenhouse gas reductions:
For demand response, we developed Baseline and Policy Scenarios to evaluate the impact of the demand response measure on greenhouse gas and criteria pollutant emissions. The Baseline Scenario assumed that the 2025 emissions rates for greenhouse gases and criterial pollutant emissions remained constant throughout the analysis period (2025-2040) and would then drop to zero. In the policy case, emissions reduce annually from 2025-2040, and then zero out in 2040 to reflect the use of energy storage and renewable energy. In the Policy Case, emissions rates increase slightly in 2030 due to the anticipated retirement of existing nuclear power plants, before rates decline again by the end of the analysis period. The Policy Case reflects analysis conducted for the development of the 2020 Integrated Resource Plan for the State of Connecticut, which includes separate projections for gross load (no electrification), electric vehicles, air source heat pumps, energy efficiency, and

behind-the-meter solar. These separate projections were then combined to get the net load and net demand (2020 Integrated Resource Plan, Table 12). Annual emission rates and loads are shown in the table below.

Annual Emissions Rates and Connecticut Loads

	Emissions Rate (lbs/MWh)						CT Load (both scenarios) (MWh)
	Policy Scenario			Baseline Scenario			
Year	GHG	NOx	SO_2	GHG	NOx	SO_2	
2025	132	0.091	0.031	132	0.091	0.031	27,131,708
2026	77	0.073	0.025	132	0.091	0.031	27,224,131
2027	53	0.052	0.018	132	0.091	0.031	27,474,750
2028	44	0.047	0.016	132	0.091	0.031	28,022,449
2029	61	0.069	0.023	132	0.091	0.031	28,413,967
2030	137	0.152	0.051	132	0.091	0.031	28,991,893
2031	136	0.145	0.048	132	0.091	0.031	29,387,671
2032	138	0.139	0.046	132	0.091	0.031	29,921,904
2033	105	0.110	0.036	132	0.091	0.031	30,241,237
2034	86	0.088	0.028	132	0.091	0.031	30,680,637
2035	91	0.086	0.028	132	0.091	0.031	31,118,197
2036	62	0.058	0.019	132	0.091	0.031	31,680,552
2037	57	0.057	0.019	132	0.091	0.031	31,984,159
2038	32	0.033	0.011	132	0.091	0.031	32,417,344
2039	2	0.002	0.001	132	0.091	0.031	32,848,396
2040	-	-	-	-	-	-	33,417,824

To determine the total emissions that the Baseline and Policy Scenarios would generate, we multiplied the annual emissions rates by the projected energy load in the above table. We then calculated the delta between the Baseline and Policy Scenarios to determine the estimated benefit of the demand response measure for GHG and criteria pollutant emissions.

Models/tools used:

To quantify the estimated GHG and criteria pollutant emissions reductions, we developed a spreadsheet in Microsoft Excel.

Modeling assumptions:
The following key assumptions about measure implementation were used to quantify emissions reductions for this measure:

For the Baseline Scenario we assumed that the 2025 emissions rates for greenhouse gases and criterial pollutant emissions remained constant throughout the analysis period (2025-2040) and would then drop to zero. In the Policy case, emissions reduce annually from 2025-2040 before zeroing in 2040 to reflect the use of energy storage and renewable energy. Annual emissions rates for the two scenarios are shown in the above table.

We multiplied the annual emissions rates by the projected annual energy loads, which are also shown in the above table, to determine the projected emissions associated with each scenario. We then calculated the delta between the Baseline and Policy Scenarios to determine the estimated benefit of the demand response measure for GHG and criteria pollutant emissions.

Reference case scenario:
The Reference Case (Baseline) Scenario assumed that the 2025 emissions rates for both greenhouse gas and criteria pollutant emissions remained constant from 2025-2040. We determined the emissions generated by multiplying the emissions rates by the projected electricity load for Connecticut from 2025-2040. The Reference Case Scenario was based on analysis from the 2020 Integrated Resource Plan for the State of Connecticut.

Measure-specific activity data and implementation tracking metrics:
Installed battery or hydrogen storage in MW.
Agreements to participate in demand response programs.

Methods for energy storage

Method for estimating greenhouse gas reductions:
This measure represents the addition of 1,000 MW of grid-based battery energy storage, introduced in 2024 and maintained until 2050. Estimates of avoided emissions are calculated using a bottom-up methodology in which electrical load is explicitly redistributed among hourly dispatch periods (representing the energy absorbed, and later released, by batteries), using energy arbitrage to exploit differences in hourly grid emission rates.

Models/tools used:
The analysis was conducted using a purpose-built spreadsheet model in Microsoft Excel, developed by the Stockholm Environment Institute.

Measure implementation assumptions:
For Connecticut's PCAP, the measure assumes that 1,000 MW of grid-based battery storage is added in 2024 and sustained through all years of the analysis. The storage technology represents currently-available lithium-ion batteries with four full-load hours of energy capacity (or equivalently, four MWh per MW). The storage capacities in each year are assumptions only, developed to estimate approximate emission reductions and unitized emission reductions per unit cost, but they may be revised using the spreadsheet tool developed for this measure. This measure implementation assumption is a demonstration, and does not presume to be the maximum, or even optimal, amount of battery storage that the state could procure. Energy absorbed by the batteries is assumed to come from the ISO New England (ISO-NE) grid electricity mix, and when released, is assumed to displace the grid electricity mix – albeit a different resource mix, at a different time. The rationale for this assumption is that even if electricity from a particular resource (or a particular resource mix, such as that used to meet Connecticut's hedged electricity load) was stored in batteries, that resource would then no longer provide energy to the grid, and other resources would need to be used to meet demand instead. Therefore, no special assumptions are required about the mix of generating resources meeting Connecticut's load. The energy storage facilities may be located in Connecticut, but their emissions impact was estimated as if they were located anywhere in the ISO New England service territory.

Modeling assumptions:
Average annual emission rates through 2040 for CO_2, NO_x and SO_2 were based on electricity emissions factors from the 2022 ISO New England Electric Generator Air

Emissions Report. which were assumed to remain constant at 2040 levels through 2050. DEEP also provided a forecast of Connecticut and ISO-NE electricity demand through 2040, which was assumed to continue through 2050 growing at the same average annual rate established between 2024 and 2040. Marginal emission rates in 2022 for CO_2, NO_x and SO_2 were taken from ISO-NE's Air Emissions Report (distinguishing between on-peak and off-peak emission rates, which apply during different time periods, and for NO_x only, during and not during the ozone season), which were all assumed to evolve at the same rate as the forecasted ISO-NE emission rates for each pollutant. Hourly emission rates were derived from National Renewable Energy Laboratory's (NREL's) 2022 Cambium Data, which contains modeled marginal CO_2 emission rates for New England for a selection of years through 2050 (2024, 2026, 2028, 2030, 2035, 2040, 2045 and 2050, henceforth called "analysis years"). The NREL scenario "95% decarbonization by 2050" was chosen because this was thought to best reflect the outcome of New England states' current climate policies. Nonetheless, NREL's hourly emission rates were recalibrated to recover the ISO-NE marginal emissions rate (as projected earlier) as the mean during on-/off-peak and ozone/non-ozone periods. Hourly estimates of NO_x and SO_2 marginal emission rates were estimated by assuming they obey the same hour-to-hour and year-to-year rate of change observed for CO_2.

System-wide load curves were estimated in each analysis year, beginning with the 2023 (historical) hourly load from ISO-NE. Summertime and wintertime loads were projected using ISO-NE's anticipated average annual peak load growth rate in summer and winter, based on the 2023 CELT Report. The annual demand that would result from this procedure was then calibrated to reproduce the annual ISO-wide demand forecast supplied by DEEP, before being divided into the monthly/hourly dispatch periods described earlier.

Load curves for each analysis year were then adjusted to account for battery charging (adding load) during some dispatch periods, followed by battery discharging (subtracting load) a number of hours later. The hours during which charging and discharging occur are assumptions only (because this analysis did not simulate energy market dynamics), but they were selected so that charging occurs only during hours of non-zero solar photovoltaic generation, and discharging occurs at a later time selected to maximize cumulative CO_2 reductions. Energy discharged from storage was subjected to a flat loss penalty of 15%, based on a lithium ion battery's round-trip energy efficiency. The total amount of energy transferred among hours in the same representative day is given by the assumed additional battery capacity and full-load hours (1,000 MW * 4 MWh/MW = 4,000

MWh). Batteries are assumed to undergo one complete charging and discharging cycle each day: inter-month or inter-seasonal energy storage is not covered by this measure.

Finally, estimates of avoided emissions for each pollutant and in each analysis year were obtained by multiplying the marginal emission rate in each dispatch period by the difference between the unadjusted and storage-adjusted load for the same period. Annual estimates are linearly interpolated between each analysis year, so that cumulative avoided emission values can be calculated.

Reference case scenario:
The Reference Case is characterized by the average annual emission rates of CO_2, NOx and SO_2 described by CT DEEP in its initial data offering. It does not include the adjusted load curves which were estimated to arise from introducing 1,000 MW of additional storage capacity.

12. Develop pilot project to use hydrogen for port operations and long duration electric storage using hydrogen

Climate action measure and description

This climate action measure, if implemented, would replace 16 diesel and 13 propane power forklifts operating at ports. Hydrogen powered forklifts, would replace diesel and propane powered forklifts like those used in vessel operations and mechanic shops at the Port of New Haven. Hydrogen energy can reduce carbon emissions for processes that are hard to electrify, like manufacturing and large trucks. Ports are a good place to pilot and demonstrate hydrogen energy because they are the cornerstone of supply chains and utilize a variety of hard to decarbonize equipment, like large trucks and heavy lift vehicles. Moreover, several ports in Connecticut are located in low income disadvantaged communities.

Estimates of the cumulative greenhouse gas emissions reductions

Climate action measure (or sub-measure)	**Cumulative GHG emission reductions (metric tons CO_2e)**	
	2025–2030	**2025–2050**
Convert propane and diesel forklifts at ports to hydrogen energy	849	6,347

CO_2e = carbon dioxide equivalents

Estimates of co-pollutant emissions reductions

Co-pollutant	**Reduction (metric tons)**	
	2025–2030	**2025–2050**
NOx	16.6	112.8
$PM_{2.5}$	0.9	7.1
VOC	0.7	4.8

Anticipated benefits and disbenefits to Low Income and Disadvantaged Communities (LIDACs)

Connecticut's major ports are located in LIDACs. Implementing a pilot program to use hydrogen to decarbonize port operations will lead to co-pollutant reductions in and around the port (see co-pollutants table above for tons reduced from the measure), and as a result, benefit nearby low income and disadvantaged households. NOx is an ozone precursor. Elevated ozone levels cause adverse health

effects including reduced lung function and increased incidence of asthma. Similarly, $PM_{2.5}$ is associated with a higher incidence of asthma and other adverse health effects.

Compared to carbon dioxide and other greenhouse gases, hydrogen has a shorter atmospheric warming potential, making it an indirect greenhouse gas. This characteristic makes a shift from fossil fuel use to hydrogen beneficial for the climate. Moreover, producing hydrogen through cleaner methods like electrolysis using renewable electricity, renewable natural gas pyrolysis, or biomass gasification can significantly reduce greenhouse gas emissions, leading to near-zero emissions from production. Since LIDACs are more susceptible to the impacts of climate change, the reduction in greenhouse gases achieved through hydrogen adoption will be advantageous for these vulnerable communities.

The measure will result in the reduction of 22,352 gallons of diesel fuel each year and 33,544 pounds of propane. Between 2025 and 2030, this will result in 1.3 million gallons of reduced diesel fuel use at the port and over 2 million pounds of propane reduced.

Key implementing agency or agencies

State agencies and quasi-public agencies, including CT DEEP

- Municipalities
- Councils of Governments
- Tribal Nations

Implementation schedule and milestone

- Year 1 Q1: Initiate procurement for H2 forklifts
- Year 1 Q1-Q3: Communication and stakeholder engagement
- Year 1 Q4: Purchase Year 1 H2 forklifts (five forklifts)
- Year 1 Q4: Retire Year 1 diesel/propane forklifts (five diesel or propane forklifts)
- Repeat procurement of H2 forklifts and retirement of diesel/propane forklifts in Year 3 and in Year 5.

Geographic scope

Statewide

Metrics for tracking progress

- Track number of purchased hydrogen (H_2) forklifts each year and compare progress with the proposed timeline for the project.
- 16 H_2 forklifts should be placed in service by 2030.
- Number of hours operated each year per forklift as compared to the number of hours operated each year for the propane and diesel forklifts.
- Tracking of project expenditures for each year between 2025 and 2030.
- Track retirement of diesel and propane forklifts to ensure that 16 are retired from operation by 2030.

Authority to implement

CT DEEP has authority to provide incentives, through pilot projects, for hydrogen fueled vehicles. As discussed above, CGS 22a-202(b) and (d) require CT DEEP to "establish and administer" the Connecticut Hydrogen and Electric Automobile Purchase Rebate program, under which Connecticut businesses are given rebates or vouchers when they purchase or lease a new or used "fuel cell electric vehicle." The term, "fuel cell electric vehicle," includes a vehicle powered solely by "a device that directly or indirectly produces electricity directly from hydrogen or hydrocarbon fuel through a noncombustive electro-chemical process," i.e., a hydrogen fueled vehicle (see CGS 16-19eee(3) and 12-412(113)(B)(1)). Using its authority to "administer" the program and "establish and revise, as appropriate, the appropriate rebate levels…[and] voucher amounts" (CGS 22a-202(d)), CT DEEP can establish pilot projects that provide rebates or vouchers for businesses to purchase or lease hydrogen fueled vehicles for use in ports. However, CGS 22a-202(d) limits, until June 30, 2027, vehicles eligible for rebates or vouchers to those whose manufacturer's suggested retail price does not exceed $50,000, a level likely to be exceeded by hydrogen fueled trucks. CT DEEP also may provide grants or rebates to "municipalities, academic institutions and other entities [e.g., businesses]" for the purchase or installation of "alternative vehicles [e.g., hydrogen fueled trucks]" and "alternative vehicle fueling equipment" (CGS 16a-14f).

Intersection with other federal funding availability

The EPA Clean Ports Program is an IRA-funded program. EPA has $3 billion to fund zero-emission port equipment and infrastructure as well as climate and air quality planning at U.S. ports. This new funding program will build on EPA's Ports Initiative, which helps our nation's ports, a critical part of our infrastructure and supply chain, address public health and environmental impacts on surrounding communities. EPA anticipates this new funding opportunity will become available for application

through a notice of funding opportunity (NOFO) released in late winter 2024. More information is available at: https://www.epa.gov/ports-initiative/cleanports

Clean Heavy-Duty Vehicle Program is an IRA-funded program that will invest funds to replace dirty heavy-duty vehicles with clean, zero-emission vehicles, support zero-emission vehicle infrastructure, and to train and develop workers. The Clean Heavy Duty Vehicle Program will invest $1 billion to reduce vehicle emissions and better protect the health of the people living and working near ports, schools, and other truck routes. The EPA will administer these funds in the form of both grants and rebates to eligible recipients to replace existing heavy-duty vehicles with clean, zero-emission vehicles. This program is expected to launch in spring 2024. More information is available at: https://www.epa.gov/inflation-reduction-act/clean-heavy-duty-vehicle-program

Technical information

Method for estimating greenhouse gas reductions:
We conducted a literature review to identify the GHG and criteria pollutant emissions factors for diesel and propane forklifts. From the research we identified the emissions factors shown in the table below.

Summary of emissions factors for propane and diesel forklifts

Pollutant	Propane emission factor	Unit	Source	Diesel emission factor	Unit	Source
CO	16	kg/m³	Commonwealth of Australia (2008), Table 25	15.5	g/kg fuel	Pang, K. et al. (2021)
NOx	25	kg/m³	Commonwealth of Australia (2008), Table 25	5.0992	g/kWh	Han, S., et al. (2011)
$PM_{2.5}$	0	kg/m³	Commonwealth of Australia (2008), Table 25	4.3	g/kg fuel	Pang, K. et al. (2021)
PM_{10}	0	kg/m³	Commonwealth of Australia (2008), Table 25	0.1132	g/kWh	Han, S., et al. (2011)

SO_2	0	kg/m³	Commonwealth of Australia (2008), Table 25	0.0132	g/kWh	Han, S., et al. (2011)
VOC	2.1	kg/m³	Commonwealth of Australia. (2008). Table 25.	1.975	g/kg fuel	Avg of low and high value from Zhou, W. et al. (2022)
CO_2	0.227	kg/kWh	Facchini, F. et al. (2016).Table 1	3100	g/kg fuel	Pang, K., et al. (2021)

In 2023, there were 16 diesel forklifts and 13 propane forklifts at the Port of New Haven, which consumed 22,352 gallons of diesel fuel and 33,544 pounds of propane, respectively. Based on the total fuel consumed, we developed the unit conversions shown in in the table below to conduct the emissions analysis.

Unit conversions for diesel and propane consumed in 2023

Total Annual Diesel Consumption	**Unit**	**Average Diesel Consumption per forklift**	**Unit**
22,352	gal	1,396.94	gal
71973.44	kg	4,498.14	kg
909,726.40	kWh	56,855.36	kWh
Total Annual Propane Consumption	**Unit**	**Average Propane Consumption per forklift**	**Unit**
33,544	lb	2,580.31	lb
17731.25	kg	1,363.94	kg
30.86	m³	2.37	m³
228190.14	kWh	17,553.09	kWh

Models/tools used:
We used Microsoft Excel to calculate the emissions reductions estimated for this measure.

Measure implementation assumptions:
The following key assumptions about measure implementation were used to quantify emissions reductions for this measure:

- Five fossil fuel powered forklifts are retired in 2025, five in 2027, and six in 2029.
- Five H_2 forklifts are introduced in 2025, five in 2027, and six in 2029.
- We assume a cost of $75,000 per hydrogen forklift and 16 hydrogen forklifts purchased for a total of $1,200,000.

Modeling assumptions:
The following key assumptions about emission reductions were used to quantify emission reductions for this measure:

- 2023 emissions for both diesel and propane forklifts would remain constant for future years for the reference case.
- The amount of diesel and propane fuel used in 2023 would be held constant for future years for the reference case.
- The useful life of a forklift is 5 years based on research that indicates that the useful life is between 10,000-11,000 hours, or between 4-6 years.
- In the policy case, a third of the forklift fleet would be retired in 2025, a third would retire in 2027, and a third would retire in 2029.
- Following the retirement of the diesel and propane forklifts, these vehicles would be replaced by hydrogen forklifts. Therefore, there would be no emissions from diesel or propane emissions after 2029.
- There will not be retirements for hydrogen fuel cell forklifts.
- The hydrogen forklifts would be powered by hydrogen fuel cells, and would, therefore, have no tailpipe emissions.
- The hydrogen produced for the hydrogen fuel cells would be generated from green hydrogen, and thus, would not have generation emissions.

Reference case scenario:
The table below shows annual emissions for propane and diesel forklifts in 2023. The Reference Case Scenario for this measure assumes that the annual emissions for both propane and diesel forklifts shown in that table will remain constant between 2025-2050. We also assumed that the amount of diesel and propane fuel used in 2023 would be held constant for between 2025-2050.

Annual Emissions for Propane and Diesel Forklifts (2023; metric tons)

	CO	NOx	$PM_{2.5}$	PM_{10}	SO_2	VOC	CO_2

Propane	.49	.08	-	-	-	0.064	51.80
Diesel	1.26	4.64	0.31	0.10	0.01	0.15	223.12

13. Provide funding for enforcement and to municipalities to implement food scraps diversion programs, including grants to construct the infrastructure necessary to divert food scraps from landfills and incineration to food scraps/organics separation and collection programs

Description of climate action measure

This climate action measure, if implemented, would provide funding for food waste diversion programs that would result in 20% diversion of food waste. Key actions for achieving 20% diversion include the construction of infrastructure necessary to divert food waste from landfills and waste-to-energy facilities, as well as increasing enforcement to achieve greater compliance with laws concerning commercial generators of organic waste (e.g., CGS 22a-226e). Approximately 22% of municipal solid waste currently disposed of is made up of food waste, and 58% of landfill methane emissions come from degrading food waste. Setting up municipal programs to divert food waste to local recycling facilities reduces these methane emissions. Local recycling facilities that can better manage food waste include composting facilities, animal feed operations, and anaerobic digestors. Anaerobic digestors generate biogas and digestate from food waste, which can be used as a renewable energy source and for other beneficial uses, like fertilizer or animal bedding.

Estimates of the cumulative greenhouse gas emission reductions

The food waste diversion measure would result in more than 100,000 tons of avoided carbon dioxide equivalents (CO_2e) through 2030. Cumulative reductions in CO_2e between 2025 to 2050 would be greater than one million tons.

Climate action measure (scenario)	Cumulative greenhouse gas emission reductions (metric tons CO_2e)	
	2025-2030	2025-2050
20% diversion of food waste	118,853	1,045,604

CO_2e = carbon dioxide equivalents

Anticipated benefits and disbenefits to Low Income and Disadvantaged Communities (LIDACs)

Respondents to CT DEEP's on-line public comment survey from LIDACs reported that providing funding to municipalities to implement food scrap diversion

programs would reduce greenhouse gas emissions and supply new job opportunities. This measure is expected to reduce $PM_{2.5}$ from the combustion of waste; however, these reductions will likely occur out of state. This is because diversion of food scraps is expected to reduce the amount of waste exported from Connecticut, rather than reducing waste landfilled or combusted in-state. Thus, we do not anticipate any reductions in co-pollutants in Connecticut as a result of this measure. There may be economic benefits in LIDACs from the establishment of composting or anaerobic digesting facilities. These could include:

- Additional jobs at anaerobic digestion facilities in Connecticut: The Quantum Biopower anaerobic digestor facility in Southington created both construction jobs and up to 50 permanent employees.
- Additional jobs at composting facilities in Connecticut: A study conducted for the State of Maryland found that composting facilities employ more workers than incinerators and landfills per 10,000 tons of food scraps diverted. The analysis found that small-scale facilities employ 13 jobs for every 10,000 tons per year processed; medium sized, six jobs; and large sites, three jobs per 10,000 tons per year composted. Incinerators were found to employ one full time workers per 10,000 tons of waste processed. Furthermore, the study found that skilled jobs were created at compost facilities, including equipment operators for windrow turners, front-end loaders, grinders, and screeners.
- Additional jobs associated with transportation of food scraps to dedicated facilities for recycling the material.
- This measure also holds the potential to reduce natural gas consumption in-state. The Quantum Biopower facility in Connecticut produces 420,000 cubic feet of biogas a year from 40,000 tons of food waste. In the 20% diversion scenario, 80,000 tons of food waste would be diverted each year, potentially generating an equivalent amount of biogas and displacing natural gas use (assuming 50% of the food scraps are composted and 50% are processed in anaerobic digesters each year).

Key implementing agency or agencies

State agencies and quasi-public agencies, including CT DEEP

- Municipalities
- Councils of Governments
- Tribal Nations

Implementation schedule and milestones

- Year 1, Q3: State/municipalities issue RFPs for recycling of food scraps
- Year, Q3: State/municipalities issue RFPs for food scrap hauling to facilities
- Year 2, Q2: Communication and stakeholder engagement
- Year 2, Q2: Award contracts to waste haulers and food scrap recycling facilities
- Year 2, Q3: Limited food scrap diversion begins
- Year 3, Q1: Permitting and design for food waste recycling facilities is completed
- Year 4, Q1: Construction of new or expanded food waste recycling facilities is completed
- Year 4, Q1: Expanded food scrap diversion begins

Geographic scope

Statewide

Metrics for tracking progress

- Number of municipalities and Regional Waste Authorities participating,
- Number of new facilities established to compost food scraps, or new contracts with existing facilities to recycle additional food scraps,
- Establishment of new or expansion of existing anaerobic digester(s),
- Tons of food diverted to new facilities and diverted from the waste stream (donation, animal feed, composting, anaerobic digestion).

Authority to implement

CT DEEP has authority to provide funding to municipalities to implement food scraps diversion programs, including construction of infrastructure (e.g., facilities for composting or anaerobic digestors). CT DEEP must adopt a state-wide solid waste management plan with "a strategy for diverting, through source reduction, reuse and recycling, not less than sixty per cent of the solid waste generated in the state after January 1, 2024," which strategy includes, among other things, "modernization of solid waste management infrastructure, promotion of organic materials management, and composting of solid waste CGS 22a-241a". "Organic materials" include food scraps (see CGS 22a-207(30)). CT DEEP "within available resources, shall develop and implement a program to support solid waste reduction strategies that are consistent" with the state plan including "solid waste diversions, unit-based pricing, organic materials diversion and reuse and recycling strategies" (CGS 22a-241m). CT DEEP shall "develop and implement a program to

support [e.g., provide funding for] solid waste reduction strategies that are consistent with" the state-wide plan, including "organic materials diversion" (CGS 22a-241n).

Intersection with other federal funding availability

No other federal funding opportunity was identified to support organics/food waste diversion.

Technical information

Method for estimating greenhouse gas reductions:
CT DEEP used the EPA's Solid Waste Emissions Estimation Tool (SWEET) model to estimate emissions reductions. Two SWEET runs were completed by CT DEEP's contractor, one to estimate business-as-usual emissions (SWEET_Version4.0.3_CT_Baseline) and one to estimate emissions for each of the three diversion scenarios (SWEET_Version4.0.3_CT).

Models/tools used:
SWEET is an Excel-based tool to estimate project or source level emissions from the solid waste sector and to compare alternative waste treatment scenarios. It is valuable for municipal solid waste officials to establish a baseline of air pollutant and short-lived climate pollutants and to identify mitigation options. SWEET offers estimates of emissions of specific climate-forcing pollutants, including CO_2, NOx, CH_4, Black Carbon, Organic Carbon, SOx, $PM_{2.5}$, and PM_{10}.

Modeling assumptions:
The following key assumptions about emission reductions were used to quantify emission reductions for this measure:

Assumptions for the modeling are listed in the table below. Because SWEET does not have the ability to account for food scraps diverted to animal feed, an additional calculation was performed to remove the tonnage of waste diverted to animal feed from the waste stream. To complete this, CT DEEP's consultant Abt changed the *Per capita waste generation rate inside formal collection zones* from 2.000 to 1.999, as shown in the below table. SWEET uses this variable to estimate the total tons of waste collected. By slightly reducing this variable, the estimated tons of waste collected decreased by 3,873 tons, which is the total amount of food waste that was diverted to animal feed in 2022. In other words, this adjustment simulates the diversion of 3,873 tons of food waste to animal feed.

Assumptions for modeling greenhouse gas reductions

Input	Value	Justification
Per capita waste generation rate inside formal collection zones *(Business-as-Usual Case)*	2.000 (kg/capita/day)	SWEET uses a default value of 2.630 for North America based on the 2019 Refinement to the 2006 IPPC Guidelines for National Greenhouse Gas Inventories. The value was decreased to better reflect Connecticut's waste collection data as the original default value was overestimating waste generated.
Per capita waste generation rate inside formal collection zones *(Alternative Scenarios)*	1.999 (kg/capita/day)	Reduced to account for food scraps to animal feed
Average annual percent growth rate in the quantity of waste collected – historical and projected future	0 percent	The amount of solid waste collected over the past several years has remained constant and can be assumed to remain constant in the future.
Percentage of waste generated inside formal collection zones that is collected	100 percent	It is assumed that all waste is generated within the state of Connecticut is collected.

Reference case scenario:

Reference (business-as usual) and diversion destination scenarios (tons/year)

Destination	business-as usual	20% diversion
Anaerobic Digestion	20,710	77,657
Animal Feed	3,873	14,522
Compost	1,446	5,423

Measure-specific activity data and implementation tracking metrics:

We used state level estimates, including:

- *2022 MSW Quarterly Disposal data,* which details the quarterly tonnage of MSW sent to each in-state and out-of-state disposal facility,
- *2022 MSW Diversion Activity data*, which details the tonnage of materials diverted by type and pathway,
- *Waste characterization estimates by waste stream components from 2015*, which was applied to estimate the 2022 disposal tonnage, and

- *Various diversion scenarios* of the percentage of food scraps that could be diverted from disposal either through anaerobic digestion, composting, or animal feed technology.

In 2022, CT DEEP reported 488,012 tons of food scraps in the waste stream. Of that, 26,030 tons–about 5 percent–were diverted. The diverted tonnages went to three destinations:

- Anaerobic digestion with beneficial reuse (79.56 percent),
- Animal feed technology (14.88 percent), and
- Composting (5.56 percent).

Summary of tonnage data used as inputs for SWEET.

Input	Value	Notes
Tons of Waste Diverted – Waste Combustion	1,617,253 tons	Sum of waste to Resource Recovery Facility
Tons of Waste Diverted – Composting	1,446 tons	
Tons of Waste Diverted – Anaerobic Digestion	20,710 tons	
Tons of Waste Disposed – Landfills	571,142 tons	Sum of waste to Landfill

SWEET also requires additional activity data to complete the analysis. The table below identifies additional data inputs that were used in the analysis. Data from 2022 were used to coincide with the 2022 data provided by CT DEEP.

Table 4 Appendix I #13. Additional Activity Data

Input	Value	Source
Population in formal collection zones	3,608,706	US Census Population Estimates, July 1, 2022, (V2022)
Average annual precipitation	43.79 in.	Statista (2022)
Mean annual temperature	49.9°F	NOAA National Centers for Environmental Information (2022)

14. Plant trees in urban areas to increase carbon storage and mitigate pollution in underserved communities

Description of climate action measure

This climate action measure, if implemented, would continue to support urban forestry projects that can help Connecticut increase carbon storage and sequestration by planting trees while simultaneously providing benefits to residents throughout the state. Through previous state funding through the Regional Greenhouse Gas Initiative and currently from the IRA and American Rescue Plan Act, the state's Urban and Community Forestry Program has built a robust grant program that provides funding to underserved communities to pursue urban forestry projects that address both environmental justice and climate change issues. These projects have the potential to reduce emissions by increasing tree cover in neighborhoods suffering from extreme heat. Increased tree cover is known to help reduce elevated temperatures and consequently has been linked to reductions in energy consumption. These projects can also help increase carbon storage by increasing tree and soil cover in urban areas. Moreover, urban trees provide additional key benefits to urban populations, including pollution reduction, flood mitigation, and improved health outcomes.

Estimates of the cumulative greenhouse gas emissions reductions

Climate action measure	Carbon storage (metric tons CO_2e)	
	2025–2030	2025–2050
Plant 5,000 trees in EJ areas	703	2,646

Climate action measure	Cumulative carbon sequestration (metric tons CO_2e)	
	2025–2030	2025–2050
Plant 5,000 trees in EJ areas	373	2,994

Estimates of co-pollutant emissions reductions

Co-pollutant	Reductions (lb)	
	2025–2030	2025–2050
O_3	158.6	241.3
PM_{10}	50.8	89.9
NO_2	30.9	49.8
CO	4.4	5.3
$PM_{2.5}$	3.4	6.3
SO_2	1.5	2.4

Anticipated benefits and disbenefits to Low Income and Disadvantaged Communities (LIDACs)

Trees provide natural shade and moisture evaporation, reducing the need for air conditioning and lowering energy costs for space cooling in urban areas, which is particularly important for lower-income households. Trees enhance the aesthetics of urban areas, providing green spaces and natural beauty that can improve the overall wellbeing and quality of life for residents. Additionally, trees act as carbon sinks, absorbing carbon dioxide and reducing greenhouse gas emissions. This helps mitigate climate change and air pollution, improving air quality in urban areas, which is particularly vital for the most vulnerable populations like children and seniors. Trees also help to mitigate stormwater run-off by promoting infiltration and storage in the soil. For example, the 1,034 trees planted through previous urban forestry sub-grants are collectively reducing run-off by an estimated 10.2 thousand gallons a year.

Tree planting and maintenance initiatives create employment opportunities, providing jobs for individuals involved in planting, pruning, and maintaining urban trees. CT DEEP's previous urban and community sub-grant programs fully or partially supported 99 paid positions from 2021-2022. Of the sub-grantees that supported urban forestry positions with grant funding, 29% were able to leverage funding to create and support new positions in their respective organizations.

LIDAC residents in Connecticut need solutions for exposure to extreme heat, air pollution, and flooding, as well as a lack of green spaces, shade-providing trees, and employment opportunities. Nationally, 92% of low income communities have less tree cover and higher temperatures than high income blocks. These disparities are

especially stark in Connecticut, which has five of the ten census blocks with the worst income-based disparities in tree cover in the nation (McDonald R et al. 2021). According to CT DEEP's survey on PCAP measures, LIDAC respondents support planting trees in urban areas to create green spaces, cleaner air, and new job opportunities while increasing resilience to climate threats while also contributing to community beautification.

Options to mitigate potential disbenefits:

- One of the potential disbenefits of increasing tree canopy is that falling trees and branches are a leading cause of power outages in Connecticut as one of the most heavily populated and forested states. Therefore, it is essential that the “right tree, right place" approach that has been promulgated by Connecticut be implemented. This concept is that tree selection should be matched to the particular conditions at a given site. This includes planting or favoring existing species that have short mature heights adjacent to utility infrastructure and roads, while allowing progressively taller species at increasing distances from roads and wires.
- More trees may not be desired by everyone in a neighborhood. Engagement and involvement of community members in the tree planting programs and supporting community-based organizations to undertake these programs can improve buy-in to a project.

Key implementing agency or agencies

State agencies and quasi-public agencies, including CT DEEP, which administers the Urban and Community Forestry Program.

Urban forestry projects and programs may also be administered by:

- Municipalities
- Councils of Governments
- Tribal Nations

Implementation schedule and milestones

- Year 1, Q1: Refine RFP and grant application
- Year 1, Q1-Q3: Communication and stakeholder engagement, host drop-in office hours and informational webinars
- Year 1, Q3: Issue Request for Proposals, convene review committee
- Year 1, Q4: Receive and review applications
- Year 2, Q1: Issue subawards
- Year 4, Q2-Q3: Document and analyze post-project outcomes/outputs

- Throughout the duration of the grant program provide ongoing support and technical assistance to grantees in their project implementation.
- Repeat grant rounds as necessary and funding available

Geographic scope

This measure would focus on Environmental Justice communities statewide.

Metrics for tracking progress

- Number, geolocation, species, and size of all trees planted
- Number of volunteers and community residents engaged
- Number of educational, outreach, and community engagement events hosted
- Number of positions supported, or new positions created through workforce development programs
- Amount sub-awarded
- Overseeing subrecipients, and/or contractors

Authority to implement

CT DEEP has historically run sub-grant programs through the Urban and Community Forestry program, see: Urban Forestry Grant Opportunities (ct.gov). Authority was granted to the agency to run this grant program per the authorization of the funding from the state legislature. The state can also accept federal funds for grant programs. This measure also aligns with the statutory goal in PA 23-206 that "in order to ensure that the benefits of open space and tree cover are enjoyed equitably by residents of the state, it shall be the goal of the state to increase the total percentage of environmental justice communities, as defined in section 22a-20a, that are covered by tree canopy, not later than January 1, 2040, by five per cent of the total area of such communities that have a current tree canopy cover of less than forty per cent."

Intersection with other federal funding availability

The Urban and Community Forestry Project is currently leveraging $500,000 from American Rescue Plan Act and an additional $2.65 million through IRA to implement tree planting focused sub-grant programs.

EPA's Environmental and Climate Justice Community Change Grants program (Community Change Grants) announced a Notice of Funding Opportunity (NOFO) for approximately $2 billion dollars in IRA funds in environmental and climate justice activities to benefit disadvantaged communities through projects that reduce pollution, increase community climate resilience, and build community

capacity to address environmental and climate justice challenges. These place-based investments will be focused on community-driven initiatives to be responsive to community and stakeholder input. They are designed to deliver on the transformative potential of the IRA for communities most adversely and disproportionately impacted by climate change, legacy pollution, and historical disinvestments.

Technical information

Method for estimating greenhouse gas reductions:
Using data from previous rounds of the Urban and Community Forestry sub-grant program in 2021-2022, we were able to estimate current and projected future carbon storage, sequestration, and pollution reduction provided by planted trees. These estimates are based on 20 projects that took place in environmental justice communities in 15 municipalities. These projects collectively planted 1,034 trees supported by roughly $430,000 awarded through the urban forestry's sub-grant programs. GHG reductions are extrapolated for a 5-year sub-grant program awarding $2.1 million to plant 5,000 trees.

Models/tools used:
I-Tree Eco, a software application designed to use data collected in the field along with local hourly air pollution and meteorological data to quantify forest structure, environmental effects, and value to communities.
Measure implementation assumptions:
The following key assumptions about measure implementation were used to quantify emissions reductions for this measure:

- Assumes 5,000 trees planted of similar species, size, and stock from previous sub-grant rounds

Modeling assumptions:
The following key assumptions about emission reductions were used to quantify emission reductions for this measure:

- Assumes a 3.0% annual mortality rate for healthy trees*
- Assumes a 13.1% annual mortality rate for sick trees*
- Assumes a 50.0% annual mortality rate for dying trees*
- Assumes 150 days per year without frost*

*These are all standard forecast configurations built into i-Tree Eco

Reference case scenario:
The reference case scenario for this measure is planting zero trees, in which case none of the associated benefits would be derived.

Measure-specific activity data and implementation tracking metrics:

- Documentation of the number, species, size, and geolocation of all trees planted
- Amount of funding sub-awarded

Appendix II. 2020 Inventory of Criteria Pollutant and HAP Emissions Inventory by Sector, County and Pollutant Data from EPA 2020 Co-pollutants Inventory

Sector: Agriculture	**NOx (tons)**	**$PM_{2.5}$ (tons)**	**SO_2 (tons)**	**VOC (tons)**	**HAP (tons)**
Fairfield County		8.15546		18.51590	2.50443
Hartford County		29.38377		9.63579	1.96384
Litchfield County		64.06523		19.45911	5.86067
Middlesex County		5.55222		4.79892	0.85515
New Haven County		16.71286		6.98930	1.22551
New London County		39.96004		14.00838	6.65090
Tolland County		24.77396		15.14711	6.07134
Windham County		34.29499		15.53882	6.98657
State Total		**222.89852**		**104.09333**	**32.11841**

Sector: Biogenics	**NOx (tons)**	**$PM_{2.5}$ (tons)**	**SO_2 (tons)**	**VOC (tons)**	**HAP (tons)**
Fairfield County	65.21274			7,274.10100	476.32426
Hartford County	156.12310			8,909.94600	626.15997
Litchfield County	97.36710			11,348.02000	833.52130
Middlesex County	50.33704			6,271.26300	368.03384
New Haven County	86.15405			7,438.40700	478.29594
New London County	76.31118			9,098.00800	520.11615
Tolland County	61.71480			6,812.28900	423.34289
Windham County	62.83611			7,997.58200	471.79203
State Total	**656.05612**			**65,149.61600**	**4,197.58638**

Sector: Bulk Gasoline Terminals	**NOx (tons)**	**$PM_{2.5}$ (tons)**	**SO_2 (tons)**	**VOC (tons)**	**HAP (tons)**
Fairfield County				0.69100	0.03340
Hartford County				23.52000	1.13954
Litchfield County					
Middlesex County					
New Haven County				1.81000	0.08748
New London County				6.37000	0.30863
Tolland County					
Windham County					
State Total				**32.39100**	**1.56904**

Sector: Commercial Cooking	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)
Fairfield County		858.89275		125.91989	41.28814
Hartford County		608.15103		89.26233	29.26586
Litchfield County		127.24845		18.54336	6.07725
Middlesex County		118.12075		17.33087	5.68271
New Haven County		667.68976		98.47267	32.29667
New London County		167.96634		24.53553	8.04483
Tolland County		62.41505		9.24196	3.03130
Windham County		48.43643		7.23264	2.37252
State Total		**2,658.92054**		**390.53925**	**128.05927**

Sector: Dust	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)
Fairfield County		452.44459			
Hartford County		503.51085			
Litchfield County		260.66414			
Middlesex County		119.66172			
New Haven County		308.06402			
New London County		287.17687			
Tolland County		167.74285			
Windham County		174.53850			
State Total		**2,273.80353**			

Sector: Fires - Agricultural Field Burning, Prescribed Fires, Wildfires	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)
Fairfield County	0.26544	1.07046	0.11947	2.73403	0.59656
Hartford County	No NEI data	No NEI data	No NEI data	No NEI data	No NEI data
Litchfield County	1.60563	10.33458	0.89268	28.34350	4.46348
Middlesex County	0.94412	3.85592	0.42707	9.87276	2.13515
New Haven County	0.78642	4.30960	0.40409	11.58154	2.02050
New London County	2.00324	9.38910	0.95936	24.64193	4.79689
Tolland County	0.78016	4.73765	0.42124	12.90364	2.10625
Windham County	0.65391	5.06070	0.40107	14.14884	2.00541
State Total	**7.03892**	**38.75800**	**3.62498**	**104.22624**	**18.12424**

Sector: Fuel Combustion - Commercial	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)
Fairfield County	977.34987	80.42872	19.73318	52.79686	2.25957
Hartford County	1,023.42627	84.22046	20.66349	55.28592	2.36609
Litchfield County	104.00938	8.55921	2.10000	5.61863	0.23801
Middlesex County	130.60349	10.74771	2.63695	7.05526	0.30006
New Haven County	782.76181	64.41555	15.80435	42.28513	1.80949
New London County	223.28319	18.37457	4.50820	12.06185	0.51514
Tolland County	57.05078	4.69486	1.15188	3.08191	0.12949
Windham County	60.09376	4.94528	1.21332	3.24629	0.13640
State Total	**3,358.57854**	**276.38635**	**67.81138**	**181.43185**	**7.75424**

Sector: Fuel Combustion – Industrial	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)
Fairfield County	247.04557	177.29196	12.62936	15.41013	2.89841
Hartford County	361.25387	259.25342	18.46788	22.53418	4.23924
Litchfield County	65.13325	46.74281	3.32972	4.06286	0.76311
Middlesex County	63.79506	45.78246	3.26131	3.97939	0.74744
New Haven County	208.45958	149.60078	10.65679	13.00323	2.44546
New London County	91.66548	65.78364	4.68609	5.71788	1.07425
Tolland County	31.89503	22.88943	1.63052	1.98954	0.37290
Windham County	35.22034	25.27585	1.80052	2.19696	0.41205
State Total	**1,104.46818**	**792.62033**	**56.46218**	**68.89419**	**12.95288**

Sector: Fuel Combustion – Residential	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)
Fairfield County	1,505.24219	1,061.33091	36.49854	1,035.30146	371.83502
Hartford County	1,558.12757	1,148.31417	38.15499	1,145.99737	392.77352
Litchfield County	366.36376	733.83830	24.25217	710.39192	278.56430
Middlesex County	315.83305	466.33639	14.95234	455.86992	168.20449
New Haven County	1,400.95286	940.62025	32.69274	918.88472	326.97129
New London County	487.85835	685.20470	22.82575	660.05292	253.81069
Tolland County	274.49641	461.91943	14.85574	452.53725	169.68581
Windham County	209.04849	387.65489	12.73682	375.31397	146.59126
State Total	**6,117.92269**	**5,885.21903**	**196.96909**	**5,754.34952**	**2,108.43638**

Sector: Gas Stations	NOx (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)
Fairfield County				402.47559	31.41943
Hartford County				423.95167	33.66225
Litchfield County				78.83945	5.92871
Middlesex County				90.48504	7.23266
New Haven County				365.26215	29.49388
New London County				145.23640	11.37770
Tolland County				79.92402	6.14756

Windham County				67.55235	5.17154
State Total				**1,653.72666**	**130.43372**

Sector: Industrial Processes	**NOx (tons)**	**$PM_{2.5}$ (tons)**	**SO_2 (tons)**	**VOC (tons)**	**HAP (tons)**
Fairfield County		10.74858		384.43102	18.62481
Hartford County		31.43960		297.59703	14.41749
Litchfield County		58.31106		52.67587	2.55169
Middlesex County		1.88100		10.75065	0.52045
New Haven County		34.66418		178.30200	8.63737
New London County		3.49329		59.21320	2.86815
Tolland County		14.77930		1.77727	0.08546
Windham County		29.82732		9.95141	0.48165
State Total		**185.14433**		**994.69845**	**48.18708**

Sector: Miscellaneous	**NOx (tons)**	**$PM_{2.5}$ (tons)**	**SO_2 (tons)**	**VOC (tons)**	**HAP (tons)**
Fairfield County	5.97651	38.45566	0.48849	93.51550	22.39289
Hartford County	6.12355	38.73283	0.56080	80.02226	17.03683
Litchfield County	1.48082	9.48805	0.12466	106.72413	8.59954
Middlesex County	1.22992	7.90947	0.10092	19.14261	3.53533
New Haven County	5.87411	37.08376	0.54438	63.66097	14.76986
New London County	1.97431	12.75337	0.15688	133.36639	9.63230
Tolland County	1.00264	6.60967	0.06769	109.44963	6.85974
Windham County	0.85933	5.51685	0.07136	131.93916	7.80761
State Total	**24.52120**	**156.54964**	**2.11518**	**737.82065**	**90.63409**

Sector: Mobile Sources	**NOx (tons)**	**$PM_{2.5}$ (tons)**	**SO_2 (tons)**	**VOC (tons)**	**HAP (tons)**
Fairfield County	5,461.7748	360.93126	26.26740	4,677.99064	1,423.72511
Hartford County	4,984.10996	286.98329	25.92410	3,657.02437	1,084.33777
Litchfield County	1,045.13749	70.72914	4.40967	1,339.12608	412.13984
Middlesex County	1,246.54905	63.31180	5.72661	1,029.10159	310.19725
New Haven County	5,153.62232	264.92766	28.80591	3,586.52700	1,064.40634
New London County	2,302.98382	107.68342	10.73277	1,632.27591	492.40976
Tolland County	899.98162	45.41745	4.41372	630.80177	186.25961
Windham County	748.59855	38.75944	3.68435	643.56855	192.88376
State Total	**21,842.75766**	**1,238.74347**	**109.96454**	**17,196.41592**	**5,166.35944**

Sector: Solvent	**NOx (tons)**	**$PM_{2.5}$ (tons)**	**SO_2 (tons)**	**VOC (tons)**	**HAP (tons)**
Fairfield County				5,810.06570	829.68564
Hartford County				5,845.20577	842.09564
Litchfield County				1,084.71771	161.55786
Middlesex County				944.21928	140.83748
New Haven County				5,145.45742	741.78480
New London County				3,011.95104	847.58478
Tolland County				887.65091	134.36140

Windham County				736.70627	102.06993
State Total				**23,465.97412**	**3,799.97752**

Sector: Waste Disposal	**NOx (tons)**	**$PM_{2.5}$ (tons)**	**SO_2 (tons)**	**VOC (tons)**	**HAP (tons)**
Fairfield County	0.19921	0.52193	0.06614	66.45292	43.10060
Hartford County	0.45839	1.20097	0.15218	548.61637	164.41998
Litchfield County	0.74627	1.95523	0.24776	107.03760	83.63513
Middlesex County	0.38542	1.00980	0.12796	7.71111	2.73503
New Haven County	0.14880	0.38987	0.04940	107.43645	30.87745
New London County	0.67050	1.75670	0.22261	84.81416	18.85592
Tolland County	0.55305	1.44900	0.18361	8.88244	4.86471
Windham County	0.55865	1.46368	0.18547	10.39220	5.92814
State Total	**3.72029**	**9.74717**	**1.23514**	**941.34324**	**354.41696**

Appendix III. Low income and Disadvantaged Communities and Connecticut Environmental Justice Census Blocks

EPA IRA disadvantaged communities:
https://epa.maps.arcgis.com/home/item.html?id=f3be939070844eac8a14103ed6f9affd

CT EJ Communities:
https://portal.ct.gov/DEEP/Environmental-Justice/05-Learn-More-About-Environmental-Justice-Communities

Council of Government	Town	EPA IRA LIDACs (block group ID)	CT EJ Communities (block group ID)
Capitol Region	**Berlin**	090034001011, 090034001012, 090034001021, 090034001022	
	Bloomfield	090034711003	090034711003, 090034713001
	Columbia	090138601002	090138601002
	East Hartford	090035101001, 090035102001, 090035102002, 090035103001, 090035103002, 090035103003, 090035104001, 090035104002, 090035104003, 090035104004, 090035104005, 090035105001, 090035106001, 090035106002, 090035106003, 090035106004, 090035108002, 090035108003, 090035112001, 090035112002, 090035112003, 090035113001, 090035113002, 090035113003	090035101001, 090035102001, 090035102002, 090035103001, 090035103002, 090035103003, 090035104001, 090035104002, 090035104003, 090035104004, 090035104005, 090035105001, 090035105002, 090035106001, 090035106002, 090035106003, 090035106004, 090035107001, 090035107002, 090035107003, 090035107004, 090035108001, 090035108002, 090035108003, 090035109001, 090035109002, 090035109003, 090035110001, 090035110002, 090035110003, 090035111001, 090035111002, 090035111003, 090035112001, 090035112002, 090035112003, 090035113001, 090035113002, 090035113003, 090035114001, 090035114002
	Ellington		090135351011, 090135351023

	Enfield	090034806001, 090034806002, 090034806003, 090034806004, 090034807002	090034803001, 090034803002, 090034804001, 090034804002, 090034805001, 090034805002, 090034806001, 090034806002, 090034806003, 090034806004, 090034807001, 090034807002, 090034808001, 090034808002, 090034808003, 090034808004, 090034809001, 090034810001, 090034810002, 090034811001, 090034811002, 090034812001, 090034812002, 090034813001, 090034813002, 090035243001, 090035243002, 090035243003
	Farmington		090034602042
	Glastonbury		090035203021
	Hartford	090035001001, 090035001002, 090035002001, 090035003001, 090035003002, 090035004001, 090035005001, 090035005002, 090035009001, 090035012001, 090035012002, 090035013001, 090035013002, 090035014001, 090035014002, 090035014003, 090035015001, 090035015002, 090035017001, 090035018001, 090035018002, 090035018003, 090035023001, 090035023002, 090035023003, 090035023004, 090035023005, 090035024001, 090035024002, 090035024003, 090035025001, 090035026001, 090035026002, 090035027001, 090035027002, 090035027003, 090035028001, 090035028002, 090035028003, 090035029001, 090035029002, 090035029003, 090035030001, 090035030002, 090035031011, 090035031021, 090035031022, 090035031023, 090035033001, 090035033002, 090035033003, 090035035001, 090035037001, 090035037002, 090035038001, 090035040003, 090035041001, 090035042001, 090035042002, 090035042003, 090035043001, 090035045001, 090035045002, 090035045003, 090035048001, 090035048002,	090035001001, 090035001002, 090035002001, 090035003001, 090035003002, 090035004001, 090035005001, 090035005002, 090035009001, 090035012001, 090035012002, 090035013001, 090035013002, 090035014001, 090035014002, 090035014003, 090035015001, 090035015002, 090035017001, 090035018001, 090035018002, 090035018003, 090035021001, 090035021002, 090035023001, 090035023002, 090035023003, 090035023004, 090035023005, 090035024001, 090035024002, 090035024003, 090035025001, 090035026001, 090035026002, 090035027001, 090035027002, 090035027003, 090035028001, 090035028002, 090035028003, 090035029001, 090035029002, 090035029003, 090035030001, 090035030002, 090035031011, 090035031021, 090035031022, 090035031023, 090035033001, 090035033002, 090035033003, 090035035001, 090035037001, 090035037002, 090035038001, 090035039001, 090035039002, 090035039003, 090035039004, 090035040001, 090035040002, 090035040003, 090035041001, 090035042001,

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	Manchester	090035144005, 090035145001, 090035146001, 090035146004, 090035146005, 090035147001, 090035147002, 090035147003, 090035147004, 090035148001, 090035148002, 090035151022	090035144001, 090035144003, 090035144004, 090035144005, 090035145001, 090035145002, 090035146001, 090035146002, 090035146003, 090035146004, 090035146005, 090035147001, 090035147002, 090035147003, 090035147004, 090035148001, 090035148002, 090035151022
	Mansfield	090138812001, 090138813002, 090138813003	090138811001, 090138811002, 090138811003, 090138811004, 090138811005, 090138812001, 090138813001, 090138813002, 090138813003, 090138813004, 090138815001, 090138815002, 090138815003, 090138815004
	New Britain	090034153001, 090034153002, 090034154001, 090034154002, 090034154003, 090034154004, 090034154005, 090034155001, 090034155002, 090034155003, 090034156001, 090034156002, 090034156003, 090034157001, 090034158001, 090034158002, 090034159001, 090034159002, 090034160001, 090034160002, 090034160003, 090034160004, 090034161001, 090034161002, 090034161003, 090034162001, 090034162002, 090034162003, 090034163001, 090034163002, 090034163003, 090034164001, 090034165001, 090034165003, 090034166001, 090034166002, 090034167001, 090034167002, 090034167003,	090034153001, 090034153002, 090034154001, 090034154002, 090034154003, 090034154004, 090034154005, 090034155001, 090034155002, 090034155003, 090034156001, 090034156002, 090034156003, 090034157001, 090034157002, 090034157003, 090034158001, 090034158002, 090034159001, 090034159002, 090034160001, 090034160002, 090034160003, 090034160004, 090034161001, 090034161002, 090034161003, 090034162001, 090034162002, 090034162003, 090034163001, 090034163002, 090034163003, 090034164001, 090034164002, 090034164003, 090034165001, 090034165002, 090034165003,

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	Newington	090034941001, 090034941002, 090034941003, 090034941004, 090034941005, 090034942011, 090034942012, 090034942013, 090034942021, 090034942022, 090034943001, 090034943002, 090034943003, 090034945004	090034941004, 090034944003, 090034945004
	Plainville	090034205004, 090034206012	090034205004, 090034206012, 090034207003
	Rocky Hill	090035242005	090035242003, 090035242005
	Simsbury	090034662011	090034662011
	Southington	090034306031, 090034306032, 090034306042	090034301003, 090034306031, 090034306032, 090034306042
	Stafford		090138901002
	Vernon	090135302001, 090135302002, 090135302003, 090135302004, 090135303014, 090135303021	090135301001, 090135302001, 090135302002, 090135302003, 090135302004, 090135303013, 090135303014, 090135303021, 090135304003, 090135305002
	West Hartford	090034961001, 090034961002, 090034963001, 090034968001, 090034969005, 090034975002	090034961001, 090034961002, 090034963001, 090034967002, 090034967003, 090034971003, 090034971004, 090034973001, 090034975002
	Wethersfield	090034926001	090034923004, 090034926001
	Willington		090138401002, 090138401003
	Windsor	090034737003, 090034738002	090034734001, 090034735012, 090034737005, 090034738002
	Windsor Locks	090034761002, 090034763001	090034761002, 090034763004

CT Metropolitan	**Bridgeport**	090010701004, 090010702001, 090010702002, 090010702003, 090010703001, 090010704001,	090010701001, 090010701002, 090010701003, 090010701004, 090010702001, 090010702002,

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	Fairfield	090010607001, 090010610002, 090010612001, 090010612002, 090010614001, 090010615001	090010604003, 090010607001, 090010610002, 090010614001
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	Stratford	090010801002, 090010801003, 090010801004, 090010802001, 090010802003, 090010804002, 090010804003, 090010808002, 090010808004	090010801001, 090010801002, 090010801003, 090010801004, 090010802001, 090010802002, 090010802003, 090010804001, 090010804002, 090010804003, 090010805001, 090010805002, 090010806001, 090010806002, 090010807001, 090010807002, 090010808001, 090010808002, 090010808003, 090010808004, 090010808005, 090010809001, 090010809002, 090010809003, 090010809004, 090010810001, 090010810002, 090010810003, 090010811001, 090010811002, 090010811003, 090010812001, 090010812002, 090010812003, 090010812004, 090010813001, 090010813002, 090010813003, 090010813004

Lower CT River Valley	**Clinton**		090076102001
	Cromwell	090075703001	090075703001
	East Haddam		090075951022
	East Hampton		090075501003
	Essex		090076301011
	Haddam	090075901021	090075901021
	Killingworth		090076401002
	Middletown	090075411001, 090075411002, 090075412001, 090075414024, 090075416001, 090075416002, 090075417001, 090075417002, 090075421003, 090076802002, 090076802005	090075411001, 090075411002, 090075412001, 090075414024, 090075415001, 090075416001, 090075416002, 090075417001, 090075417002, 090075421001, 090075421003, 090076802002, 090076802005
	Old Saybrook		090076702004
	Portland	090075602001	090075602001
	Westbrook	090076801023	

Naugatuck Valley	**Ansonia**	090091252001, 090091252002, 090091252003, 090091253001, 090091253002, 090091253003, 090091254001, 090091254002	090091251001, 090091251002, 090091252001, 090091252002, 090091252003, 090091253001, 090091253002, 090091253003, 090091254001, 090091254002
	Bristol	090034054021, 090034055001, 090034055004, 090034056001, 090034057001, 090034057002, 090034060011, 090034061001, 090034061002, 090034061003, 090034061004	090034051001, 090034051002, 090034052001, 090034052002, 090034052003, 090034052004, 090034053001, 090034053002, 090034053003, 090034053004, 090034054011, 090034054012, 090034054013, 090034054021, 090034054022, 090034054023, 090034055001, 090034055002, 090034055003, 090034055004, 090034056001, 090034056002, 090034056003, 090034056004, 090034056005, 090034056006, 090034056007, 090034057001, 090034057002, 090034058011, 090034058012, 090034058021, 090034058022, 090034059001, 090034059002, 090034059003, 090034060011, 090034060012, 090034060021, 090034060022, 090034061001, 090034061002, 090034061003, 090034061004
	Derby	090091201003, 090091201004, 090091202001, 090091202002, 090091202003, 090091202004	090091201001, 090091201002, 090091201003, 090091201004, 090091202001, 090091202002, 090091202003, 090091202004
	Naugatuck	090093451001, 090093451002, 090093452014, 090093454002, 090093454006	090093451001, 090093451002, 090093451003, 090093452011, 090093452012, 090093452013, 090093452014, 090093452015, 090093452023, 090093453001, 090093453002, 090093453003, 090093453004, 090093453005, 090093454001, 090093454002, 090093454003, 090093454004, 090093454005, 090093454006
	Plymouth		090054253001, 090054253002, 090054253003, 090054253004, 090054254001, 090054254002, 090054254003, 090054254004, 090054255001, 090054255002, 090054255003
	Seymour	090091301011	090091302021, 090091302022

	Shelton	090011101001, 090011101002, 090011102013, 090011102022	090011102013, 090011102022
	Thomaston		090053492002
	Waterbury	090093501011, 090093501012, 090093501013, 090093501014, 090093502001, 090093502002, 090093502003, 090093502004, 090093503001, 090093503002, 090093504001, 090093504002, 090093505001, 090093505002, 090093508001, 090093508002, 090093508003, 090093508004, 090093509001, 090093509002, 090093510001, 090093510002, 090093510003, 090093511001, 090093511002, 090093511003, 090093512001, 090093512002, 090093512003, 090093513001, 090093513002, 090093513003, 090093513004, 090093514001, 090093514002, 090093514003, 090093515001, 090093515002, 090093515003, 090093515004, 090093516011, 090093516013, 090093516014, 090093517001, 090093517002, 090093518001, 090093519002, 090093520001, 090093521001, 090093521002, 090093521003, 090093522001, 090093523001, 090093523002, 090093524001, 090093524002, 090093525001, 090093526001, 090093526002, 090093526003, 090093527011, 090093527013, 090093527021, 090093527022, 090093528001, 090093528003	090093501011, 090093501012, 090093501013, 090093501014, 090093502001, 090093502002, 090093502003, 090093502004, 090093503001, 090093503002, 090093504001, 090093504002, 090093505001, 090093505002, 090093508001, 090093508002, 090093508003, 090093508004, 090093509001, 090093509002, 090093510001, 090093510002, 090093510003, 090093511001, 090093511002, 090093511003, 090093512001, 090093512002, 090093512003, 090093513001, 090093513002, 090093513003, 090093513004, 090093514001, 090093514002, 090093514003, 090093515001, 090093515002, 090093515003, 090093515004, 090093516011, 090093516012, 090093516013, 090093516014, 090093516021, 090093516022, 090093516023, 090093516024, 090093517001, 090093517002, 090093518001, 090093518002, 090093518003, 090093519001, 090093519002, 090093519003, 090093520001, 090093520002, 090093520003, 090093521001, 090093521002, 090093521003, 090093522001, 090093523001, 090093523002, 090093524001, 090093524002, 090093525001, 090093525002, 090093526001, 090093526002, 090093526003, 090093527011, 090093527012, 090093527013, 090093527021, 090093527022, 090093527023, 090093527024, 090093528001, 090093528003
	Watertown		090053601004

Northeastern CT	**Brooklyn**	090159051011	090159051011
	Chaplin		090158150001, 090158150002, 090158150003

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	Plainfield	090159073001	090159071001, 090159071002, 090159071003, 090159072001, 090159072002, 090159072003, 090159072004, 090159073001, 090159073002, 090159073003, 090159073004
	Putnam	090159031012, 090159031022	090159031011, 090159031012, 090159031013, 090159031021, 090159031022, 090159032001, 090159032002
	Sterling		090159081001, 090159081002, 090159081003, 090159081004
	Thompson		090159002004
	Voluntown		090117081001, 090117081002, 090117081003, 090117081004

Northwest Hills	**Canaan**		090054256021
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	Winchester		090053201011, 090053201012, 090053201021, 090053201022, 090053201023, 090053201024, 090053201025, 090053202001, 090053202002, 090053202003, 090053202004, 090053202005, 090053202006

South Central CT	**East Haven**	090091801021, 090091803001, 090091804001, 090091805001, 090091805002	090091801011, 090091801012, 090091801021, 090091801022, 090091801023, 090091802001, 090091802002, 090091802003, 090091802004, 090091802005, 090091803001, 090091803002, 090091804001, 090091805001, 090091805002, 090091806011, 090091806012, 090091806013, 090091806021, 090091806022
	Hamden	090091651002, 090091655001, 090091655002, 090091655003, 090091656001, 090091660024, 090091660042	090091651002, 090091654003, 090091654004, 090091655001, 090091655002, 090091655004, 090091656001, 090091656003, 090091658022, 090091658023, 090091660024, 090091660025, 090091660042, 090091660043
	Meriden	090091701001, 090091701002, 090091702001, 090091702002, 090091703001, 090091703002, 090091706001, 090091706002, 090091707001, 090091708001, 090091708003, 090091708004, 090091708005, 090091709001, 090091709002, 090091710001, 090091711003, 090091714001, 090091714002, 090091715001, 090091715002, 090091715003, 090091716001, 090091716002, 090091716003	090091701001, 090091701002, 090091702001, 090091702002, 090091703001, 090091703002, 090091704001, 090091705001, 090091705002, 090091705003, 090091705004, 090091706001, 090091706002, 090091707001, 090091707002, 090091708001, 090091708002, 090091708003, 090091708004, 090091708005, 090091709001, 090091709002, 090091710001, 090091711001, 090091711002, 090091711003, 090091711004, 090091712011, 090091712012, 090091712013, 090091712021, 090091712022, 090091713001, 090091713002, 090091713003, 090091713004, 090091714001, 090091714002, 090091715001, 090091715002, 090091715003, 090091716001, 090091716002, 090091716003, 090091717001, 090091717002, 090091717003

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Southeastern CT	**Colchester**		090117141033
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	Lisbon		090117101001, 090117101002, 090117101003, 090117101004, 090117101005

	Montville	090118705011, 090118705012, 090118705013	090116952011, 090116952012, 090116952013, 090116952014, 090116952015, 090116952021, 090116952022, 090116952023, 090116952024, 090118705021, 090118705022
	New London	090116903001, 090116903002, 090116903003, 090116903004, 090116903005, 090116904001, 090116904002, 090116905001, 090116905002, 090116905003, 090116907001, 090116908001, 090116908002, 090116908003, 090118703001, 090118703002, 090118703003, 090118703004	090116903001, 090116903002, 090116903003, 090116903004, 090116903005, 090116904001, 090116904002, 090116905001, 090116905002, 090116905003, 090116907001, 090116908001, 090116908002, 090116908003, 090116909001, 090116909002, 090116909003, 090116909004, 090118703001, 090118703002, 090118703003, 090118703004
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	Norwich	090116961003, 090116964011, 090116964012, 090116964013, 090116964014, 090116967011, 090116967012, 090116967013, 090116968001, 090116968002, 090116968003, 090116968004, 090116970001, 090116970002, 090116970003, 090116970004	090116961001, 090116961002, 090116961003, 090116961004, 090116962001, 090116962002, 090116962003, 090116962004, 090116963001, 090116963002, 090116964011, 090116964012, 090116964013, 090116964014, 090116965001, 090116965002, 090116965003, 090116966001, 090116966002, 090116966003, 090116967011, 090116967012, 090116967013, 090116967014, 090116968001, 090116968002, 090116968003, 090116968004, 090116970001, 090116970002, 090116970003, 090116970004
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	Sprague		090117111001, 090117111002, 090117111003, 090117111004
	Stonington	090117051023	090117051022, 090117051023, 090117051024
	Waterford	090116934002	090116934002, 090116935001

	Windham	090158003001, 090158003002, 090158003003, 090158005011, 090158005012, 090158005013, 090158005021, 090158005022, 090158005023, 090158006001, 090158006002, 090158006003, 090158007002	090158003001, 090158003002, 090158003003, 090158004001, 090158004002, 090158004003, 090158005011, 090158005012, 090158005013, 090158005021, 090158005022, 090158005023, 090158006001, 090158006002, 090158006003, 090158007001, 090158007002, 090158007003

Western CT	**Bethel**	090012002004	090012002001, 090012002004
	Danbury	090012101011, 090012101012, 090012101021, 090012101022, 090012102011, 090012102012, 090012102021, 090012102022, 090012102023, 090012103001, 090012103002, 090012103003, 090012104023, 090012105011, 090012106001, 090012106002, 090012106003, 090012106004, 090012107011, 090012107012, 090012107013, 090012107021, 090012107022, 090012114002	090012101012, 090012101021, 090012101022, 090012102011, 090012102012, 090012102021, 090012102022, 090012102023, 090012103001, 090012103003, 090012104023, 090012105011, 090012106001, 090012106003, 090012106004, 090012107011, 090012107012, 090012107021, 090012110001, 090012112012, 090012114002
	Darien	090010302001, 090010302002, 090010302003, 090010303001, 090010303002, 090010303003, 090010304001, 090010304002, 090010304003, 090010305001, 090010305002, 090010305003	
	Greenwich	090010105001, 090010105003, 090010107001, 090010107003, 090010109001, 090010109002, 090010109003, 090010109004, 090010110001, 090010110002, 090010110003, 090010111001, 090010111002, 090010111003, 090010113001, 090010113002	090010105003, 090010107003, 090010108001, 090010113002
	New Fairfield		090012201003
	New Milford	090052531001, 090052531002, 090052531003	090052531003, 090052535002, 090054257002

	Norwalk	090010427004, 090010430002, 090010432001, 090010432002, 090010434002, 090010438003, 090010438005, 090010438006, 090010439002, 090010440001, 090010440002, 090010440003, 090010440004, 090010440005, 090010441001, 090010441002, 090010442001, 090010442002, 090010442003, 090010442004, 090010444001, 090010444002, 090010445001, 090010445002, 090010446001, 090010446002	090010426002, 090010430002, 090010432001, 090010434002, 090010436003, 090010438003, 090010438005, 090010438006, 090010439002, 090010440001, 090010440002, 090010440003, 090010440004, 090010440005, 090010441001, 090010442003, 090010444002, 090010445001, 090010445002
	Ridgefield		090012456001, 090012456003
	Stamford	090010201011, 090010201021, 090010201022, 090010201023, 090010205001, 090010205002, 090010205003, 090010206001, 090010206002, 090010206003, 090010208001, 090010208002, 090010208003, 090010209001, 090010210001, 090010210002, 090010211001, 090010211002, 090010211003, 090010211004, 090010212001, 090010212002, 090010212003, 090010213001, 090010213002, 090010213003, 090010214011, 090010214012, 090010214013, 090010214021, 090010214022, 090010214023, 090010215011, 090010215012, 090010215013, 090010215021, 090010215022, 090010216011, 090010216012, 090010216021, 090010216022, 090010216023, 090010217011, 090010217012, 090010217021, 090010217022, 090010217023, 090010217024, 090010218011, 090010218012, 090010218021, 090010218022, 090010218023, 090010219001, 090010219002, 090010219003, 090010219004, 090010220001, 090010220002, 090010221011, 090010221012, 090010221021, 090010221022, 090010221023, 090010222011, 090010222012, 090010222013, 090010222021, 090010222022, 090010222023, 090010223001, 090010223002, 090010223003, 090010224001, 090010224002	090010201021, 090010201022, 090010209001, 090010209002, 090010211001, 090010211003, 090010214012, 090010214013, 090010214021, 090010214022, 090010214023, 090010215012, 090010215013, 090010215021, 090010215022, 090010216021, 090010216022, 090010217011, 090010217021, 090010217022, 090010218012, 090010218023, 090010220002, 090010221011, 090010221012, 090010222011, 090010222012, 090010222021, 090010223001, 090010223003

Appendix IV. Summary of Feedback from LIDAC Advisory Group

The review and feedback sessions with the LIDAC Advisory Group covered all climate actions included in this PCAP. The Advisory Group was able to review the actions with CT DEEP and provide feedback and recommendations on benefits, potential barriers and negative impacts, and ways to mitigate those barriers and impacts and/or improve the implementation of these measures. The feedback and recommendations are summarized below:

Measure: Replace existing school buses with zero-emission vehicle school buses in environmental justice (EJ) communities:

- Label electric buses to distinguish between electric versus diesel.
- Provide tax credits to bus fleets that pay taxes to city when they use renewable energy to charge school buses.
- Include battery replacement in budgets.
- Avoid converting school buses to diesel buses in EJ communities.

Measure: Transit bus electrification—purchase buses based on the next 5-year Battery Electric Bus program:

- Extend fleet operation hours as this would reduce pollution.
- Enhance bus stop information for increased ridership.

Measure: Establish electric vehicle incentive pathways for advanced technology vehicles (full battery electric, plug-in hybrid and fuel cell electric vehicles—collectively "ZEVs"):

- Evaluate the existing programs to look at whether the incentives are currently reaching the people who need them.
- Expand CHEAPR programs to include used ZEVs.
- Consider incentives for private and emergency fleets.
- Understand how clean energy sources will scale up to meet ZEVs charging demands.

Measure: Expand funding for the Residential Energy Preparation Services program to address health and safety barriers to weatherization:

- Provide incentives for multi-unit dwellings (funding is needed to weatherize whole buildings and at the same time convert to energy efficient heating and cooling).

- Have trusted community groups with known relationships as intermediaries.
- Provide workforce development in weatherization such as providing state credits to companies that enlist workers in weatherization training.
- This action has co-benefits for LIDACs like increasing eligibility for solar. Investing in low income home ownership is one of the most direct restorative justice measures. To address the needs of low income households, REPS needs to be accessible to multi-family dwellings, landlord ownerships, and condo associations.

Measure: Expand energy efficiency programs under the Conservation and Load Management Program:

- The HES-IE program should be a priority when it comes to housing.
- Investing in energy efficiency is a one-time expense that reduces GHG emissions in the long term.

Measure: Support deployment of networked geothermal system:

- Identify and prioritize Justice40 communities for pilot projects.
- Consider state buildings to use geothermal.

Measure: Reduce electric sector emissions while maintaining electric system reliability using demand response and/or energy storage:

- Cover costs upfront for LIDACs since battery costs are high even after incentives. Households might not be able to purchase batteries for storage given the costs.
- Matching battery storage with solar to make it affordable for LIDACs.
- Provide a report of the performance of the Home Energy Solutions Programs.

Measure: Develop a pilot project to use hydrogen for port operations and long duration electric storage using hydrogen:

- The preference for electrification over hydrogen was expressed, suggesting hydrogen for hard-to-convert uses.

Measure: Provide funding for enforcement and to municipalities to implement food scraps diversion programs, including grants to construct the infrastructure necessary to divert food scraps from landfills and incineration:

- Co-benefits include turning waste into energy and reducing rodent population.
- Prioritize renovating existing facilities to avoid building more incinerators

Measure: Plant trees in urban areas to increase carbon storage/sequestration and mitigate pollution and other climate change impacts in underserved communities:

- Survey communities to understand where heat is perceived and where trees are needed.
- Other green solutions including green roofs, bioswales should also be considered.

Additional Comments:

- Prioritize getting medium and heavy-duty vehicles converted to ZEVs in urban areas (e.g., school buses, garbage trucks, transits buses).
- Consider funding community organizations to support engagement efforts by educating, surveying, and training other groups during all phases of program development and implementation. These community groups should be geographically diverse.
- Include funding for an outreach plan to gather substantial data and stories.
- Avoid using the term “disbenefits”. Instead use other words such as burdens, risks and drawbacks.

Appendix V. Responses to Public Comment Survey

The following tables include responses to community challenges, priorities and benefits of proposed climate actions. The first set of tables shows all responses and the second set show responses submitted by respondents self-identified as residents of low income and disadvantaged communities (LIDACs).For a complete report of responses to the public comment survey visit: https://portal.ct.gov/DEEP/Climate-Change/PCAP. The report includes all written comments submitted in the public comments survey and written comments sent via email to deep.climatechange@ct.gov.

All responses

Question: Tell us what are the most significant challenges that you or your community faces.

For this question, respondents could select one answer for each challenge. Respondents could also submit a written response in a comment box.

	NOT CHALLENGING AT ALL	SLIGHTLY CHALLENGING	NEUTRAL	SOMEWHAT CHALLENGING	EXTREME CHALLENGING	TOTAL
Lack of access to green spaces such as parks and natural areas	180	31	31	22	16	280
Lack of trees that can provide shade	155	41	27	37	21	281
Distance between where I live and work (commuting time or distance)	117	29	57	49	26	278
Lack of access to good paying job	110	33	67	44	22	276
Lack of access to community services and amenities	108	55	67	31	20	281
Substandard housing conditions (e.g., old roof, lack of inefficient AC, old windows)	101	50	43	47	38	279
Unable to afford a newer or more reliable vehicle	86	43	66	54	31	280
Exposure to extreme heat	85	55	61	59	22	282
Living close to a major roadway, industrial facility, wastewater treatment plant, landfill, or brownfield	82	38	43	71	44	278

High levels of noise	78	58	49	57	38	280
Exposure to air pollution (e.g., air that is not clean, smoke)	68	51	48	64	48	279
Exposure to flooding	64	64	35	67	50	280
Lack of access to reliable, convenient, safe and affordable public transportation or mobility options	53	40	42	77	69	281

Question: Tell us about how important these emissions reductions benefits are for you.

For this question, respondents could select one answer for each challenge. Respondents could also submit a written response in a comment box.

	NOT IMPORTANT AT ALL	SLIGHTLY IMPORTANT	NEUTRAL	MODERATELY IMPORTANT	EXTREMELY IMPORTANT	TOTAL
Creating new job opportunities	19	32	40	86	95	272
Increasing my community's resilience to storms, heats, and flooding	16	13	18	62	165	274
Community beautification	23	28	52	104	67	274
Protecting the environment, including water sources, biodiversity and other	10	3	10	51	200	274
Reducing greenhouse gas emissions that warm the planet	28	13	15	24	194	274
Decreasing energy costs	10	8	30	79	147	274
Having more reliable power	12	20	41	88	112	273
Improved health (e.g., decreased risk of asthma)	16	13	28	61	157	275
Having access to reliable and affordable public transportation	31	20	37	71	114	273
Increased access to services/amenities in my community	32	24	90	76	52	274
Increasing community awareness of strategies for reducing greenhouse gases	32	16	24	55	147	274
Having cleaner air where I live/work/play	15	22	27	64	146	274
Reducing noise affecting my community	36	30	58	65	86	275

Question: Tell us what you think the potential BENEFITS of reducing climate pollution are.

For this question, respondents could select multiple benefits per each proposed action.

	Reduced greenhouse gas emissions that warm the planet	Cleaner air	Increased resilience to storms, heats and flooding	Improved health (e.g., decreased risk of asthma)	New job opportunities	Improved access to services and amenities	Decreased energy costs	Reliable power	Reduced noise pollution	Green space and community beautification	Access to reliable and affordable public transportation	Improved housing quality, comfort, and safety	Other benefits	Not applicable	Not sure	Total respondents
Establish electric vehicle incentive pathways	152	158	31	109	95	35	68	34	120	13	24	10	17	22	5	207
Deploy chargers statewide for light, medium and heavy-duty trucks	147	146	26	106	100	47	66	41	99	12	16	10	15	21	7	203
Replace school buses with zero-emission vehicle school buses in environmental justice communities	165	164	30	134	69	31	59	24	117	14	50	12	19	20	5	205
Transit bus electrification	164	161	26	121	65	52	60	25	119	16	80	15	15	18	5	204
Idle Reduction ZeroRPM® for truck mounted attenuators (TMAs)	139	135	18	106	41	12	49	10	90	9	14	7	8	18	22	195
Expansion of the Microtransit Program with a	94	88	25	65	87	103	33	11	43	11	113	20	9	21	19	192

focus on rural areas																
Support increased adoption of heat pumps statewide	145	128	60	102	116	21	128	71	21	12	2	111	15	13	10	195
Expand funding to address health and safety barriers to weatherization	106	83	94	98	109	51	131	37	14	9	3	132	19	14	11	193
Expand energy efficiency programs under the Conservation and Load Management Program	130	116	70	90	111	38	135	78	19	14	6	90	18	14	13	192
Support deployment of networked geothermal systems	139	126	78	95	117	28	122	86	31	20	3	92	17	16	12	188
Demand response and/or energy storage to reduce emissions while maintaining reliability	128	118	81	84	92	21	99	128	24	11	9	26	17	15	13	183
Pilot project to use hydrogen for port operations and long	93	90	43	54	73	11	56	75	19	3	7	2	9	16	38	165

duration electric storage using hydrogen																
Provide funding for enforcement and to municipalities to implement food scraps diversion programs	117	75	26	75	114	49	46	12	8	50	3	15	57	15	9	179
Plant trees in urban areas to increase carbon storage/sequestration and mitigate pollution and other climate change impacts in underserved communities	136	155	115	123	106	32	64	12	64	153	7	45	41	10	4	189

Responses only by respondents self-identified as LIDACs residents

Question: Tell us what are the most significant challenges that you or your community faces.

For this question, respondents could select one answer for each challenge. Respondents could also submit a written response in a comment box.

	NOT CHALLENGING AT ALL	SLIGHTLY CHALLENGING	NEUTRAL	SOMEWHAT CHALLENGING	EXTREME CHALLENGING	TOTAL
Living close to a major roadway, industrial facility, wastewater treatment plant, landfill, or brownfield	8	3	5	16	18	50
Lack of access to reliable, convenient, safe and affordable public transportation or mobility options	10	8	7	13	14	52
Exposure to extreme heat	9	9	10	13	11	52
Lack of access to green spaces such as parks and natural areas	16	9	8	11	7	51
Lack of trees that can provide shade	10	11	5	16	10	52
Substandard housing conditions (e.g., old roof, lack of inefficient AC, old windows)	11	7	8	10	15	51
Exposure to flooding	12	11	2	13	13	51
Unable to afford a newer or more reliable vehicle	10	5	12	14	10	51
Distance between where I live and work (commuting time or distance)	20	4	11	8	9	52
Lack of access to good paying job	15	7	10	8	11	51
Exposure to air pollution (e.g., air that is not clean, smoke)	7	7	8	13	16	51
High levels of noise	8	4	10	12	17	51
Lack of access to community services and amenities	13	10	13	9	7	52

Question: Tell us about how important these emissions reductions benefits are for you.

For this question, respondents could select one answer for each challenge. Respondents could also submit a written response in a comment box.

	NOT IMPORTANT AT ALL	SLIGHTLY IMPORTANT	NEUTRAL	MODERATELY IMPORTANT	EXTREMELY IMPORTANT	TOTAL
Creating new job opportunities	1	4	8	13	24	50
Increasing my community's resilience to storms, heats and flooding	3	1	6	11	29	50
Community beautification	4	3	6	19	18	50
Protecting the environment, including water sources, biodiversity and other	1	0	5	9	35	50
Reducing greenhouse gas emissions that warm the planet	4	1	3	9	33	50
Decreasing energy costs	1	2	7	15	25	50
Having more reliable power	0	8	12	15	15	50
Improved health (e.g., decreased risk of asthma)	2	4	5	11	28	50
Having access to reliable and affordable public transportation	4	4	5	10	27	50
Increased access to services/amenities in my community	5	5	10	19	11	50
Increasing community awareness of strategies for reducing greenhouse gases	5	5	5	9	26	50
Having cleaner air where I live/work/play	2	2	5	10	31	50
Reducing noise affecting my community	4	4	5	15	22	50

Question: Tell us what you think the potential BENEFITS of reducing climate pollution are.

For this question, respondents could select multiple benefits per each proposed action.

	Reduced greenhouse gas emissions that warm the planet	Cleaner air	Increased resilience to storms, heats and flooding	Improved health (e.g., decreased risk of asthma)	New job opportunities	Improved access to services and amenities	Decreased energy costs	Reliable power	Reduced noise pollution	Green space and community beautification	Access to reliable and affordable public transportation	Improved housing quality, comfort, and safety	Other benefits	Not applicable	Not sure	Total respondents
Establish electric vehicle incentive pathways	27	30	5	19	16	8	9	4	21	4	4	2	6	3	0	35
Deploy chargers statewide for light, medium and heavy-duty trucks	25	28	3	18	17	4	7	3	19	2	3	2	5	3	0	34
Replace school buses with zero-emission vehicle school buses in environmental justice communities	32	32	5	22	11	5	6	3	21	4	7	0	7	2	0	35
Transit bus electrification	30	31	3	19	13	8	6	2	19	2	14	1	5	2	0	35
Idle Reduction ZeroRPM® for truck mounted attenuators (TMAs)	24	24	2	17	9	3	5	1	13	2	3	1	3	2	4	32
Expansion of the Microtransit Program with a	17	17	7	11	15	18	4	3	8	3	19	4	5	2	4	32

focus on rural areas																
Support increased adoption of heat pumps statewide	24	21	10	19	17	5	22	12	3	1	0	21	4	2	1	34
Expand funding to address health and safety barriers to weatherization	18	14	16	16	19	10	24	4	2	2	0	26	7	2	0	34
Expand energy efficiency programs under the Conservation and Load Management Program	21	16	12	16	21	8	24	16	4	3	1	19	5	2	3	34
Support deployment of networked geothermal systems	20	17	9	14	17	3	16	15	4	2	0	15	5	2	3	32
Demand response and/or energy storage to reduce emissions while maintaining reliability	18	17	10	9	13	3	13	21	2	0	1	3	5	2	3	31
Pilot project to use hydrogen for port operations and long	14	13	3	7	9	1	6	13	3	0	0	0	2	3	10	28

duration electric storage using hydrogen																
Provide funding for enforcement and to municipalities to implement food scraps diversion programs	20	12	3	13	20	8	7	4	1	10	0	3	11	2	1	32
Plant trees in urban areas to increase carbon storage/sequestration and mitigate pollution and other climate change impacts in underserved communities	26	28	24	21	22	7	13	2	12	27	1	7	8	2	1	34

Appendix VI. Outreach and Coordination Documentation

Log of outreach and coordination with interested parties associated with the development of the PCAP.

Organization(s)	Frequency/Date	Topic/Description	Links
DEEP and MSA leads	Bi-weekly organized by MSA leads & Monthly Organized by DEEP	Planning and coordination calls.	
DEEP	7/27/2023	Individual meetings with DEEP directors to collect preliminary ideas on implementation-ready actions.	
Air and Climate directors in Northeast state agencies (CT, MA, ME, NH, NJ, NY, RI & VT)	8/14/2023	Joint Air Directors and Climate Leads organized by the Northeast States for Coordinated Air Use and Management (NESCAUM). Discuss coalition grant proposals.	
State Implementation Plan Revision Advisory Committee (SIPRAC) & DEEP	10/12/2023	SIPRAC is the Air Bureau's standing advisory committee on Connecticut's implementation of the Clean Air Act. Presentation of CPRG program at SIPRAC meeting.	https://portal.ct.gov/DEEP/Air/Outreach/Archived-SIPRAC-Materials-and-Docs
Dept. of Administrative Service (DAS), Dept. of Transportation (DOT) and DEEP	10/13/2023	Meeting with CTDAS & CTDOT to review reduction measures (from existing state planning efforts) to be included in the PCAP.	
Northwest Hills Council of Government (NHCOG) & Southeastern Connecticut Council of Governments (SCCOG)	10/20/23 & November 2023	Meetings with NHCOG & SCCOG executive directors to review CPRG requirements. Most towns in NHCOG & SCCOG are covered by the State's PCAP only. Invitation for collaboration and feedback on priority measures.	

Established LIDAC Advisory Group	November 2023	DEEP established the LIDAC advisory group to support the LIDAC benefits analysis of CPRG.	
Connecticut Conference of Municipalities (CCM), MSAs and DEEP	11/14/2023	Webinar on Climate Action Plans organized by MSAs. DEEP presented the plan in a state breakout group for town representatives covered only by the state's PCAP to provide feedback. DEEP experts for each sector were present.	
American Council for an Energy-Efficient Economy	11/21/2023	Discussion on pre-weatherization activities (health, safety, structural, and wiring/panel upgrades that enable weatherization and electrification projects to move forward).	
New Haven-Milford MSA	11/28/23	DEEP presented at the New Have-Milford MSA Implementation Grant Workshop	
Kick-off meeting with LIDAC Advisory Group	12/6/23	Discussion to present and finalize draft charge of the LIDAC Advisory Group.	
CT Equity and Environmental Justice Advisory Council Public meeting	12/11/2023	CPRG state leads presented to the council on PCAP process.	https://portal.ct.gov/-/media/DEEP/environmental_justice/CEEJAC-Meetings/CEEJAC-Agenda---Quarterly-Meeting-Dec-2023.pdf
CT DEEP & Environmental Advocates/Organizations in Connecticut	12/12/2023	DEEP presented to Environmental Advocates and Organizations in Connecticut about the CPRG process.	
CT DEEP & MSAs Public Meeting	12/18/2023	State's public meeting on CPRG and priority GHG measures. 274 registrants. Public meeting had Spanish live translation.	https://portal.ct.gov/DEEP/Climate-Change/PCAP
New Haven-Milford MSA	12/19/2023	DEEP representation on Designing a Regional Application for CPRG Implementation in New Haven County.	
CT DEEP Public Survey	12/22/2023 – 1/12/2024	Feedback collected via public survey on priority climate actions. The survey was created in order	https://portal.ct.gov/-/media/DEEP/climatechange/

		to have an accessible and easy to fill form to submitting public comments. Over 300 survey participants.	CPRG/CPRG-Request-for-Public-Comments-122223.pdf
The North Hartford Partnership, Energize CT & CT DEEP	1/23/2024	Prep meeting for upcoming heat pumps 101 workshops in February.	
Bridgeport Regional Energy Partnership (BREP), DEEP & Metropolitan Council of Governments (MetroCOG)	1/25/2024	Discussion on project ideas, challenges, and needs identified by BREP for the City of Bridgeport.	
Letter to Tribal Nations	2/23/2024		
Heat pumps 101 Workshop North Hartford Partnership, Energize CT & CT DEEP	2/27/2024	Two workshops (1 pm and 6 pm - to increase audience participation and target different groups). Discussion on programs available for energy efficiency and for heat pumps installation.	

Appendix VII. Works Cited

Citations

American Lung Association. (2024). State of the Air. Report Card: Connecticut. https://www.lung.org/research/sota/city-rankings/states/connecticut

Boomhower, Judson & Davis, Lucas. (2020). Do Energy Efficiency Investments Deliver at the Right Time?. *American Economic Journal: Applied Economics*. 12. 115-139. 10.1257/app.20170505. https://www.aeaweb.org/articles?id=10.1257/app.20170505

Datahaven. (2023). Health Equity in Connecticut 2023. https://www.cthealth.org/publication/health-equity-in-connecticut-2023/#:~:text=In%20Connecticut%20health%20inequities%20may%20have%20led%20to,having%20asthma%20compared%20to%20adults%2065%20and%20over

Federal Emergency Management Agency (FEMA) (2023). National Risk Index: Wildfire. https://hazards.fema.gov/nri/wildfire

Goddard E, Lin C, Ma Y, Chen K (2023). The mortality burden of extreme heat in Connecticut: A time series analysis. *PLOS Clim* 2(5): e0000164. https://doi.org/10.1371/journal.pclm.0000164.

McDonald RI, Biswas T, Sachar C, Housman I, Boucher TM, Balk D, et al. (2021) The tree cover and temperature disparity in US urbanized areas: Quantifying the association with income across 5,723 communities. *PLoS ONE* 16(4): e0249715. https://doi.org/10.1371/journal.pone.0249715

Shoreman-Ouimet E, DiCairano J, Lachlan K, Burton C, Walters A, Ouimet W, Barrett J. (2024). On the brink: Examining preemptive indicators of preparedness inequity and social vulnerability to climate change hazards in Connecticut, USA, *International Journal of Disaster Risk Reduction*(101):104276, ISSN 2212-4209. https://doi.org/10.1016/j.ijdrr.2024.104276.
U.S. EPA. (2021). Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts. U.S. Environmental Protection Agency, EPA 430-R-21-003. https://www.epa.gov/cira/social-vulnerability-report

World Meteorological Organization (WMO) Air Quality and Climate Bulletin No. 3 - September 2023. https://wmo.int/publication-series/wmo-air-quality-and-climate-bulletin-no-3-september-2023

Yale School of Public Health. The Air Quality Health Benefits of Climate Action in Connecticut A Yale Center on Climate Change and Health Issue Brief. https://ysph.yale.edu/yale-center-on-climate-change-and-health/policy-and-public-health-practice/yccch%20air%20quality%20issue%20brief_412616_48542_v1.pdf

portal.ct.gov/DEEP