

# 2013 Connecticut Greenhouse Gas Emissions Inventory

This 2013 Connecticut Greenhouse Gas Emissions Summary (2013 Summary) provides an overview of the state's greenhouse gas (GHG) emissions from 1990 to 2013, the most recent year for which full data are available.<sup>1</sup> The statewide GHG emission inventory is an important tool for tracking Connecticut's progress toward the goals set by the Connecticut Global Warming Solutions Act (GWSA) of 2008. This law set targets of reducing emissions 10 percent below 1990 levels by 2020 and 80 percent below 2001 levels by 2050.

## Consumption-based and Generation-based Accounting of Electricity Sector Emissions

In prior GHG inventories, electricity sector emissions have been accounted for by calculating GHGs emitted by power plants operating within Connecticut's borders—an approach known as generation-based accounting. Based on emerging best practices among states that regularly report their GHG emissions, and reflecting the regional nature of the electric grid, in an Exploratory Report issued in March 2016 the Govern-

or's Council on Climate Change recommended employing a consumption-based accounting approach to track our state's electric sector GHG emissions.<sup>2</sup> A consumption-based approach calculates emissions based on Connecticut's share of electricity consumption in New England, using the emissions profile of the regional electric grid's generation fuel mix.

This 2013 Summary presents both the consumption-based and generation-based accounting approaches for the electricity sector from 1990 to 2013. The generation-based approach indicates lower carbon emissions for 2013 than the consumption-based approach, reflecting the fact that power plants operating within Connecticut have a "cleaner" generation mix than the region as a whole.

The consumption-based approach reflects significant historical and ongoing change in the mix of fuels used to generate electricity in New England. It also has the potential to better align Connecticut's GHG inventory with actions the state has taken and can take to reduce emissions by

## Governor's Council on Climate Change (GC3)

On Earth Day 2015, Governor Malloy issued Executive Order 46, creating the Governor's Council on Climate Change (GC3). The Council is composed of 15 members from state agencies, quasi-state agencies, companies, and nonprofits. Governor Malloy tasked the Council with:

- establishing interim goals that will guide the state to the 2050 emission reduction target;
- annually monitoring statewide GHG emissions to determine if the state is poised to meet its 2050 target and any established interim goal(s);
- examining the efficacy of existing policies and regulations designed to reduce GHG emissions; and
- recommending new policies, regulations, or legislative actions that will assist in achieving established emission reduction targets.

The Council's current efforts are focused on analyzing greenhouse gas emission reduction scenarios to inform its recommendations on strategies that lead to long-term emission reductions, ensuring the state is on a path to meet its Global Warming Solutions Act goal of 80 percent below 2001 levels by 2050.

For more information on GC3 activities: [www.ct.gov/deep/GC3](http://www.ct.gov/deep/GC3)

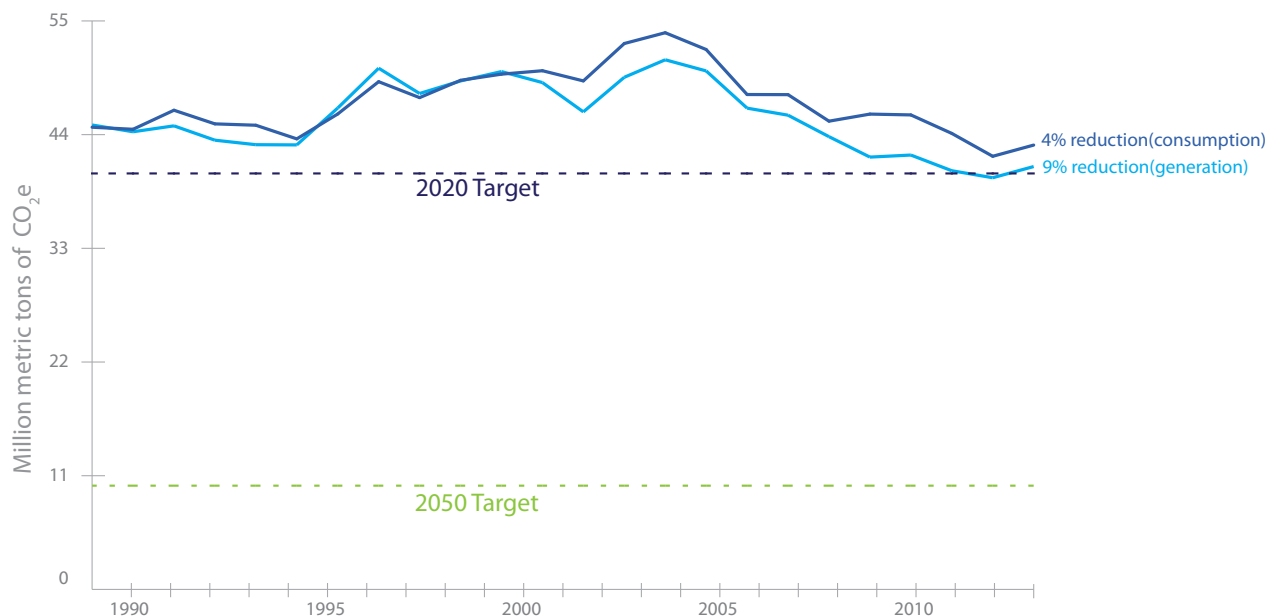


Connecticut Department of Energy and Environmental Protection

Office of Climate Change, Technology and Research

### Connecticut Statewide Greenhouse Gas Emissions 1990-2013

#### Comparison of Electricity Sector Generation and Consumption-based Accounting



\* Targets shown in this graph utilize the consumption-based 1990 baseline of 44.7 MMTCO<sub>2</sub>e. The generation-based 1990 baseline is 44.9 MMTCO<sub>2</sub>e.

investing in energy efficiency within our borders, and increasing generation of electricity from renewable energy sources both within the state and regionally through policies such as the Renewable Portfolio Standard and long-term contracting. Further refinement of this approach will be necessary going forward to ensure that a consumption-based approach can accurately account for the benefits of direct ratepayer investments in clean energy generation and/or transmission that may be made outside of Connecticut, without double-counting investments directly attributable to other states in the region. A number of other states, including Massachusetts and Rhode Island, have adopted a similar consumption-based approach for the electricity sector. Further discussion among New England states to harmonize consumption-based approaches will be necessary to avoid double counting and to maximize electric sector emission reductions across New England.<sup>3</sup>

As New England states work to harmonize electricity sector accounting methodologies, DEEP will continue to track both consumption- and

generation-based emissions in order to evaluate and ensure that a downward trend continues for both inventory approaches.

### 2013 GHG Emissions

Utilizing the consumption-based approach for the electricity sector, Connecticut's economy-wide GHG emissions in 2013 were 43 million metric tons (MMT) of carbon dioxide equivalent (CO<sub>2</sub>e), or 4 percent below 1990 levels.<sup>4</sup> In comparison, economy-wide GHG emissions using the generation-based approach were 41 MMT-CO<sub>2</sub>e, or 9 percent below 1990 levels. Emissions under both accounting approaches are closely paralleled with peak emissions occurring in 2004. Under both inventory approaches, emissions have shown an overall downward trend from the 2004 peak, putting the state on a trajectory to meet its short- and long-term carbon reduction targets.

Connecticut's largest reduction has occurred in the electric power sector — a 20.5 percent reduction under consumption-based accounting and a 39 percent reduction under generation-

based accounting (1990 baseline). This reduction correlates with state policies and programs that encourage investment in energy efficiency in homes and businesses, a shift to cleaner fossil fuels and more efficient generators, and increased deployment of renewable energy sources. Between 2008 and 2013, Connecticut invested more than \$77 million in proceeds from the Regional Greenhouse Gas Initiative in energy efficiency and clean energy. Investments through the Energy Efficiency Fund in 2013 alone were expected to yield a lifetime reduction of 2.3 million tons of carbon dioxide.

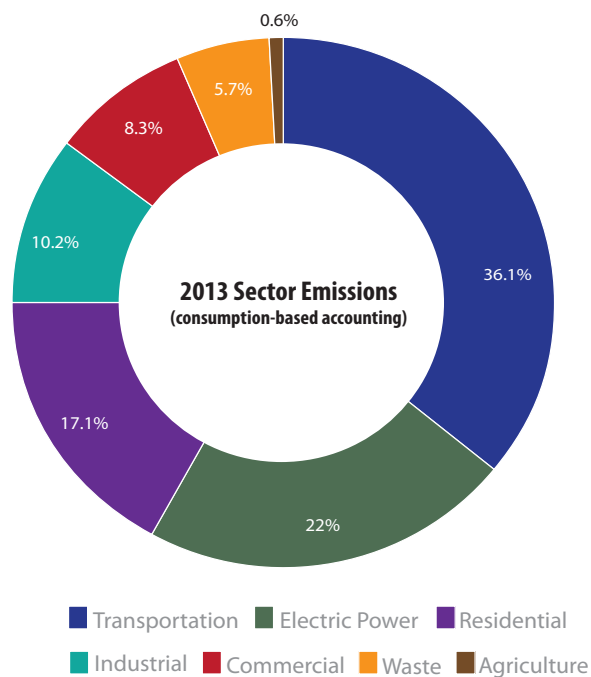
Additional improvements in this sector will come from further reducing reliance on oil and coal during periods of extreme electricity demand, from continuing improvements in the efficiency with which electricity is consumed, and through deploying additional renewable energy.

The transportation sector continues to be the single largest source of emissions in the state, contributing 36 percent, principally from the use of fossil fuels in passenger cars and light-duty trucks. Despite substantial improvements in vehicle efficiency, these emissions have dropped less than one percent since 1990 as the number of vehicle miles driven has increased. In the coming decades, improvements in vehicle fuel economy for all class sizes, deployment of low-emission vehicles, increased car and ride sharing, and expanded use of mass transit will be needed to significantly reduce emissions from this sector.

Between 2012 and 2013, there was a slight uptick in economy-wide emissions for both the consumption- and generation-based accounting methodologies. This is attributable primarily to increases in the residential, commercial, and industrial sectors. The emission increases in the residential and commercial sectors are almost entirely from increased heating demand, which is strongly

Connecticut Emissions by Sector (MMT<sub>CO<sub>2</sub>e</sub>)

	1990	2001	2013
Transportation	15.6	17.8	15.5
<b>Electric Power</b>			
Consumption	11.9	12.3	9.5
Generation	12.1	11.2	7.4
Residential	8.3	8.5	7.3
Industrial	3.3	4.6	4.4
Commercial	3.8	4.3	3.6
Waste	1.5	2.3	2.4
Agriculture	0.34	0.32	0.27
<b>Consumption-based Accounting Total</b>	<b>44.7</b>	<b>50.6</b>	<b>43.0</b>
<b>Generation-base Accounting Total</b>	<b>44.9</b>	<b>49.9</b>	<b>40.9</b>
<b>Consumption-based Accounting</b> 4% reduction from 1990 14% reduction from 2001			
<b>Generation-based Accounting</b> 9% reduction from 1990 16.5% reduction from 2001			



influenced by winter weather. The winter of 2012 was the mildest since recordkeeping began in 1905 — with 19 percent fewer “heating degree days” than the winter of 2013.

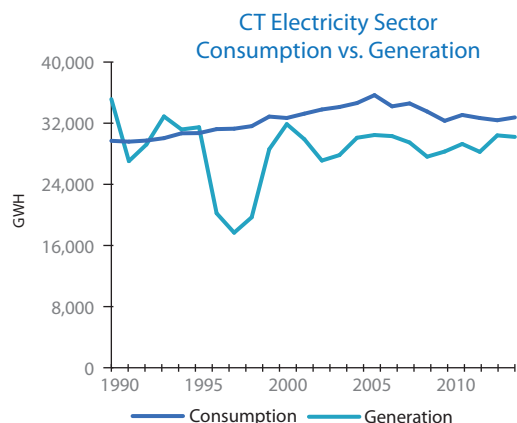
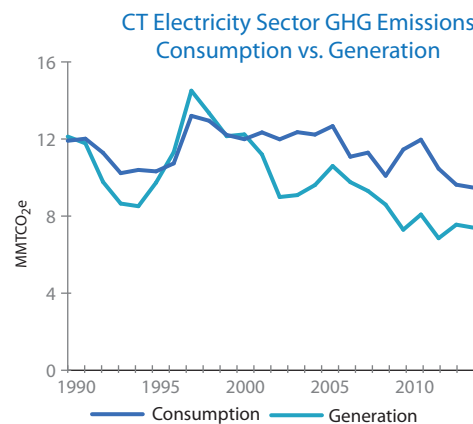
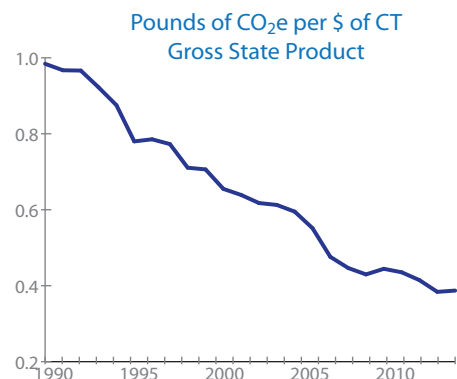
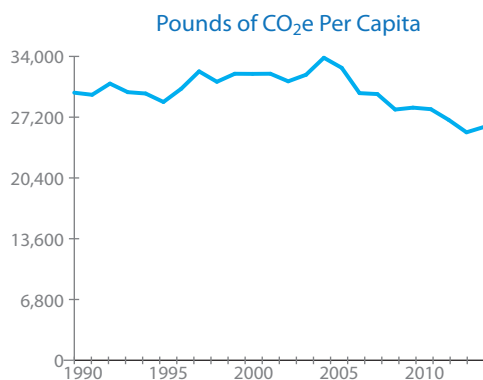
Overall trends in the inventory demonstrate that the carbon intensity of Connecticut’s economy has declined dramatically, from nearly 1 pound of CO<sub>2</sub>e per dollar of state gross domestic product in 1990 to 0.4 pounds per dollar of state gross domestic product in 2013. This demonstrates significant decoupling of economic activity and carbon pollution.

Connecticut’s 2013 per capita emissions per year were 26,000 pounds per person, well below the national average of 37,500 pounds per person. Connecticut’s per capita emissions have declined 18 percent since 2000 and an average of 0.5 percent per year since 1990. Connecticut’s commitment to cutting carbon pollution through energy efficiency, switching to low-carbon fuels, increasing use of renewable energy, and other means is transitioning the state to a low-carbon economy.

### Inventory Methodology & Continuous Improvement

A federal standard for economy-wide GHG accounting does not currently exist. In the absence of a federal standard, Connecticut DEEP is committed to continuous improvement of its accounting methodology. This includes identifying improvements in both the quality of data and methods utilized to calculate annual GHG emissions.

Like several states across the country that regularly perform GHG inventories, Connecticut relies heavily on the U.S. Environmental Protection Agency’s State Inventory Tool (SIT). The tool calculates sector-by-sector GHG emissions based on numerous state-level data sets (e.g., number of gallons of fuel oil sold in CT), including energy-related data provided by the Energy Information Administration. In its guidance documents on SIT, EPA recommends that states employ their own data when these are likely to be more reliable than the tool’s default figures. For the waste sector, the state’s inventory is based on wastewater data from SIT; but the 2013 inventory for the first time draws on solid-waste data collected by the



DEEP's municipal waste program, data that the agency believes to be more accurate than the default SIT data.

In conducting both the consumption-based and generation-based electricity sector inventories, DEEP draws on three data sources: Energy Information Administration, ISO New England Energy, Load, and Demand Report, and regional-grid carbon intensity data developed by the Massachusetts Department of Environmental Protection (MA DEP).<sup>5</sup> MA DEP's data take into account the carbon intensity of electric generation within the ISO New England grid as well as electricity imported into the region from Canada, New York, and other jurisdictions.<sup>6</sup>

Finally, because SIT data on land use, land use change, and forestry appear unreliable, they have not been included in the inventories of emissions in 2013 and prior years. The state aims to develop an alternative means to estimate GHG impacts of land use and forestry for use in preparing future inventories.

### **GHG Emission Reduction Strategies Currently Underway**

Connecticut is implementing a suite of complementary strategies to ensure that the state is on a course to achieve its near-term 2020 reduction goal. The range of GHG reduction actions include direct regulations, monetary and non-monetary incentives, market-based mechanisms, and recognition for voluntary actions.

The following programs, strategies, and policy initiatives are just a few examples of current efforts driving the state's emissions down between now and 2020. These initiatives offer a foundational framework to build upon as additional strategies are developed to further reduce emissions beyond 2020.

### ***Energy Efficiency***

The Connecticut Energy Efficiency Fund supports a variety of programs that provide financial incentives to help Connecticut consumers reduce the amount of energy used in their homes and businesses. Investment in energy efficiency programs has doubled since 2013, implementing a key recommendation of the 2013 Comprehensive Energy Strategy. At this increased level of investment, expected lifetime GHG reductions from the state's energy efficiency programs will be 3.2 MMTCO<sub>2</sub>e.

### ***Connecticut Hydrogen and Electric Automobile Purchase Rebate (CHEAPR)***

Through the CHEAPR program, DEEP offers rebates of up to \$5,000 for Connecticut residents who purchase or lease a new eligible battery electric, plug-in hybrid electric, or fuel cell electric vehicle. In just over a year's time, these rebates have supported purchases of more than 750 vehicles.<sup>7</sup>

### ***Zero Emission Vehicle (ZEV) Memorandum of Understanding***

Connecticut is one of seven states committed to putting 3.3 million ZEVs on the road by 2025. Connecticut is implementing the steps laid out in the Multi-State Action Plan which focuses on developing ZEV infrastructure and supporting policies, codes, and standards to advance the deployment of ZEVs. With the implementation of the revised travel provision, ZEV sales in Connecticut and other New England states are expected to increase beginning in 2017.<sup>8</sup>

### ***Competitive Regional Procurements for Grid-Scale Clean Energy***

The Malloy Administration has embraced the use of open, competitive procurements of renewables and large-scale hydropower through long-term contracts as the best way to secure



investment in new clean generation at the least cost to the state's ratepayers. A new, 20 MW solar facility in Sprague, CT, that was contracted under Section 6 of Public Act 13-303 is expected to come online in January 2017. Currently, DEEP is considering more than 100 bids submitted in two historic RFPs for clean energy projects of different size classes that could be selected for long-term contracts pursuant to Public Acts 13-303 and 15-107. Under those statutes, DEEP has the authority to contract for up to 4,250 GWh, or approximately 15% of the state's electricity demand, from clean energy resources. Bid selections are expected in the fall of 2016, and winning projects must be online by 2020.

### ***Accelerating Rooftop Solar Deployment***

The Connecticut Green Bank, established in 2011, has pioneered multiple programs to expand the deployment of rooftop solar photovoltaics (PV) in Connecticut, while driving down installed costs and ratepayer incentives. A program goal of installing 30 MW of rooftop solar PV under the Residential Solar Incentive Program was met in 2015, 8 years early. Public Act 15-194 requires the Connecticut Green Bank to offer incentives to support the deployment of 300 MW of residential solar by 2022. The Green Bank is partnering with the state's electric utilities in the Solar Homes Renewable Energy Credit program to enable purchase of long-term contracts for Renewable Energy Credits produced from a homeowners' solar system, making solar more accessible and affordable to ratepayers throughout the state.

### ***Shared Clean Energy Facilities***

Public Act 15-113 requires DEEP to establish a two-year pilot program for shared clean energy facilities, including solar, fuel cells, geothermal, hydroelectric and other renewables. Multiple customers will be able to contract a percentage or set amount of the electricity produced from these facilities. Projects selected in this pilot program must be online by 2019.

### ***Clean Energy Communities***

The Clean Energy Communities program encourages and supports municipal efforts to promote and adopt energy efficiency strategies and clean energy technologies. Through the implementation of three simple steps, community leaders, households, and local businesses work together to set clean energy goals and are rewarded for their achievements.

### ***2016 Comprehensive Energy Strategy***

Connecticut will need to continue to scale investments that drive down GHG emissions in order to meet the ambitious requirements of the Global Warming Solutions Act, both in the near- and long-term (2020 and 2050), particularly in light of the updated 2013 Summary showing an uptick in 2013 emissions. The 2016 Comprehensive Energy Strategy will evaluate GHG mitigation options on all of these time horizons, and will emphasize any additional near term strategies that may be needed to ensure compliance with the 2020 goal.

## Notes

1 The Department of Energy and Environmental Protection greenhouse gas inventory relies in part on emissions data from U.S. EPA's State Inventory Tool. EPA released data from January-December 2013 in April 2016.

2 Governor's Council on Climate Change Exploratory Report [http://www.ct.gov/deep/lib/deep/climatechange/gc3/gc3\\_exploratory\\_report\\_2016.pdf](http://www.ct.gov/deep/lib/deep/climatechange/gc3/gc3_exploratory_report_2016.pdf)

3 Due to the interconnected nature of the electricity grid, a state implementing an energy efficiency or renewable energy program or policy may reduce electricity generation and associated emissions from electric generating units in neighboring states. The state taking credit for the associated emission reductions may vary depending on each state's GHG accounting approach. This is known as the "inter-state effect."

4 Emissions are reported in terms of carbon dioxide equivalence (CO<sub>2</sub>e). Carbon dioxide is the primary greenhouse gas. Emissions of other chemicals are expressed on the basis of their potential to contribute to global warming, relative to carbon dioxide's potential.

5 ISO NE Energy, Load, and Demand Reports, Generation & Load Data for ISONE & States (2000-2015) <http://www.iso-ne.com/isoexpress/web/reports/load-and-demand/-/tree/net-ener-peak-load>.

6 MA DEP's approach takes into account the Renewable Portfolio Standard of each New England state. For further details on how the regional emission factor were calculated see "Statewide Greenhouse Gas (GHG) Emissions Baseline & Projection Update" and Appendices L-P, <http://www.mass.gov/eea/agencies/massdep/news/comment/ghg-emissions-update.html>

7 Center for Sustainable Energy (2016). Connecticut Department of Energy and Environmental Protection Connecticut Hydrogen and Electric Automobile Purchase Rebate, Rebate Statistics. Data last updated August 30, 2016. Retrieved September 5, 2016; from: <http://ct.gov/deep/cwp/view.asp?a=2684&q=565018>

8 The California ZEV regulation includes a travel provision, which allows vehicle manufacturers to earn credits in all ZEV states for vehicles sold in any of those states. This has the effect of limiting the availability of ZEVs at dealerships in states outside California, because it is often easier to meet ZEV requirements by focusing on California or other Section 177 states with higher vehicle sales. The travel provision is expected to expire after the 2017 model year, and in model year 2018 automobile manufacturers will be required to place increasing numbers of ZEV's in other Section 177 states.

