

# Taking Action on Climate Change 2014 Progress Report

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The Connecticut Department of Energy  
and Environmental Protection



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*Public Act 08-98: An Act Concerning Global Warming Solution*

## EXECUTIVE SUMMARY

Connecticut continues its position in the forefront of U.S. states responding to the increasingly urgent challenges posed by global climate change. This *2014 Progress Report*, part of a series of reports required every three years under the Global Warming Solutions Act of 2008 (GWSA), outlines the strong progress Connecticut is making through programs to systematically reduce emissions of greenhouse gases that are dangerously disrupting the global climate system.

***Connecticut has met its initial GHG emission reduction goal of returning to 1990 levels by 2010.*** After nearly two decades in which greenhouse gas emissions (GHG) rose significantly, the state succeeded in returning GHG emissions to 1990 levels by 2010, a goal set by the New England Governors and Eastern Canadian Premiers in 2001 as part of the first multi-national, multi-jurisdictional framework for climate change action.

***Connecticut is making good progress toward its further GHG reduction goals.*** In the next few years, the state is likely to achieve the first GHG emissions reduction mandate of the GWSA, reducing emissions to 10 percent below 1990 emissions levels well ahead of the 2020 deadline established by the Act. Driven, in part by significant emissions reductions from the electric power sector, Connecticut has achieved just over half the reductions necessary to meet its 2020 mandate.

***Connecticut has made significant progress in implementing critical GHG reduction strategies identified in the 2005 Climate Change Action Plan and the 2013 Comprehensive Energy Strategy.*** The recommended actions from the 2005 Climate Change Action Plan (2005 CCAP) that had the greatest potential to reduce greenhouse gas emissions have all been implemented and maintained. The Comprehensive Energy Strategy, which Governor Malloy's administration adopted in 2013, builds on the 2005 Climate Change Action Plan to advance progress toward the much more stringent goal of reducing statewide climate-disrupting emissions by 80 percent from 2001 levels by mid-century.

***Connecticut has established essential framework for climate resiliency.*** The Connecticut Climate Preparedness Plan, released in 2013, significantly advances legally mandated efforts to prepare the state to weather the impacts of climate change resulting from historical emissions of greenhouse gases.

There are strong indications that this climate progress is being and can continue to be accomplished while simultaneously assuring that Connecticut enjoys a cheaper, cleaner, and more reliable energy future, supporting economic growth and job growth, and providing improved quality of life.

## TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	2
TABLE OF CONTENTS .....	3
INTRODUCTION.....	4
CONNECTICUT’S GHG EMISSIONS, 1990-2010.....	6
PROGRESS ON IMPLEMENTATION OF GHG EMISSION REDUCTION STRATEGIES 2005 CLIMATE CHANGE ACTION PLAN AND THE 2013 COMPREHENSIVE ENERGY STRATEGY .....	14
ADAPTING TO A CHANGING CLIMATE.....	27
THE IMPORTANCE OF REGIONAL COLLABORATION.....	30
CONCLUSION: STRATEGIES TO REACH THE 2020 GOAL.....	31
BIBLIOGRAPHY.....	35
APPENDIX A: CONNECTICUT’S CLIMATE CHANGE LEADERSHIP MILESTONES.....	37
APPENDIX B: ASSESSMENT OF RECENT SCIENTIFIC FINDINGS ON CLIMATE CHANGE .....	40

## INTRODUCTION

Connecticut has been a national leader on climate change action since 2001, when the State helped to develop the first ever international, multi-jurisdictional climate change action plan. This plan, the *2001 New England Governors/Eastern Canadian Premiers (NEG/ECP) Climate Change Action Plan*, included an agreement on regional greenhouse gas (GHG) reduction goals designed to achieve climate stability by mid-century. Three years later, this commitment was solidified when the Connecticut General Assembly enacted state-specific GHG reduction targets matching the NEG/ECP regional goals. These targets include: reducing greenhouse gas emissions to 1990 levels by 2010; reducing emissions to 10% below 1990 levels by 2020; and to 75-85% below 2001 levels by 2050.

The State has built on its early leadership over the past decade through forward-thinking public policies and legislation and groundbreaking regional initiatives. After a robust stakeholder dialogue, the Department of Environmental Protection (DEP) issued the *2005 Connecticut (2005 CCAP)*. The 2005 CCAP identified a portfolio of actions to both meet and exceed the 2010 and 2020 goals. Significant climate change legislation was passed in Connecticut in 2004 and 2008, and energy legislation with important GHG reduction measures was passed in 2011 and 2013 (see *Appendix A: Connecticut's Climate Change Leadership Milestones*).<sup>1</sup> These State actions have been supplemented by the innovative actions of towns, businesses, schools and campuses, community organizations, and individuals.

More recently, under the leadership of Governor Dannel Malloy and the Department of Energy and Environmental Protection (DEEP), the successor agency to the Department of Environmental Protection, Connecticut has made significant progress in implementing policies and programs that are helping Connecticut achieve its greenhouse gas emission reduction goals by transitioning to a cheaper, cleaner, and more reliable energy future. Since Governor Malloy took office in 2011, the state has doubled its commitment to energy efficiency, encouraged the deployment of clean fuels and clean vehicles, and increased its deployment of in-state renewable energy ten-fold (compared with 2010 figures), all while driving down the cost of clean energy toward levels that are competitive with fossil fuel-based generation. Many of these policies were established in the *2013 Comprehensive Energy Strategy (2013 CES)*, released in February 2013. The recommendations put forward in the *2013 CES* provide a policy framework to ensure the continuity of this agenda going forward. The actions taken so far in the state have resulted in a complete shift in Connecticut's approach to energy and provide opportunities to further reduce GHG emissions.

From a climate change adaptation perspective, the *2013 Connecticut Climate Preparedness Plan* addresses projected impacts of climate change on Connecticut agriculture, infrastructure,

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<sup>1</sup> Public Acts include: Public Act (P.A.) 04-252 (*An Act Concerning Climate Change*), P.A. 08-98 (*An Act Concerning Global Warming Solutions*), P.A. 11-80 (*An Act Concerning the Establishment of the Department of Energy and Environmental Protection and Planning for Connecticut's Energy Future*), P.A. 13-298 (*An Act Concerning Implementation of Connecticut's Comprehensive Energy Strategy and Various Revisions to the Energy Statutes*), and P.A. 13-303 (*An Act Concerning Connecticut's Clean Energy Goals*).

## Taking Action on Climate Change 2014 Progress Report

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natural resources, and public health and recommends strategies to lessen those impacts. Governor Malloy has recently announced a set of actions designed to bolster the state's resiliency to climate impacts, including the nation's first statewide "microgrid" program to strengthen the electric grid, and the launch of the Connecticut Institute for Resilience and Climate Adaption (CIRCA), a joint DEEP/University of Connecticut (UConn) effort located at the UConn-Avery Point Campus.

This *2014 Progress Report* provides an overview of Connecticut's major public policy initiatives over the past decade to reduce GHG emissions and adapt to a changing climate, and presents the most up to date information available about the State's progress towards meeting its climate change goals.<sup>2</sup> The *2014 Progress Report* begins with a review of the most current GHG inventory for the state, which confirms that Connecticut reached its 2010 target of reducing greenhouse gas emissions below 1990 levels two years early, in 2008.

Following the GHG inventory assessment, this *2014 Progress Report* updates the status of actions taken under the *2005 CCAP* and the *2013 CES*. Recognizing that both mitigation and adaptation are paramount to Connecticut's climate-ready future, the actions taken and planned under the *2013 Connecticut Climate Preparedness Plan* and other readiness initiatives are also summarized at length. The *2014 Progress Report* concludes with a discussion regarding potential additional opportunities for future climate-related work in the state. Appendix B of the *Progress Report* includes an assessment of recent climate science, summarizing findings that form the basis for Connecticut's current and future climate change policy.

Connecticut has taken bold action mitigate climate change through the execution of its *2005 CCAP* and implementation of its *2013 CES*. These actions include the establishment and reauthorization of the Regional Greenhouse Gas Initiative, a doubling of investments in energy efficiency, a tenfold increase in the deployment of renewable energy in the state, and a commitment, to reduce emissions from the transportation sector through the *States' Zero Emission Vehicle Programs Memorandum of Understanding (ZEV MOU)* and DEEP's Path to Clean Fuels and Vehicles initiative. However, additional action will be required to achieve the state's target of an 80% GHG reduction by 2050 and to improve the resiliency of the state in the face of a changing climate.

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<sup>2</sup> The *2014 Progress Report* is issued pursuant to Public Act 08-98, the *Global Warming Solutions Act*, codified in Section 22a-200a(c) of the Connecticut General Statutes. The Global Warming Solutions Act is the foundation of Connecticut's implementing statutes to mitigate GHG emissions and combat climate change. The Act requires the Department of Energy and Environmental Protection (DEEP, or the Department) to report to the Legislature every three years on climate change progress made within the state.

## CONNECTICUT'S GHG EMISSIONS, 1990-2010

Connecticut's annual GHG emissions have declined significantly since the Department's last published GHG inventory, which reported annual emissions for the period of 1990 through 2007.<sup>3</sup> The most up to date information currently available shows that between 2007 and 2010, Connecticut's reported annual GHG emissions declined by more than 4 million metric tons (MMT) of carbon dioxide equivalent (CO<sub>2</sub>e).<sup>4</sup> The recent downward trajectory in emissions is due to a combination of factors, including actions taken to implement the Department's 2005 CCAP, significant investments in energy efficiency, shifts to consuming energy with lower carbon intensity (like natural gas), and the economic downturn. However, recent trends indicate a slight uptick in annual GHG emissions between 2009 and 2010.

The Department's most recent internal GHG inventory, conducted in June of 2013, tracks annual GHG emissions from 1990 through 2010, utilizing information from the U.S. Environmental Protection Agency's (EPA) State Inventory Tool (SIT).<sup>5</sup> Over this twenty-year period, there have been shifts in trajectory, though annual emissions have been steadily decreasing since a high in 2004 (Figure 1).

In comparison to 1990 GHG emissions, the state's 2010 emissions are more than 2 MMT of CO<sub>2</sub>e lower.

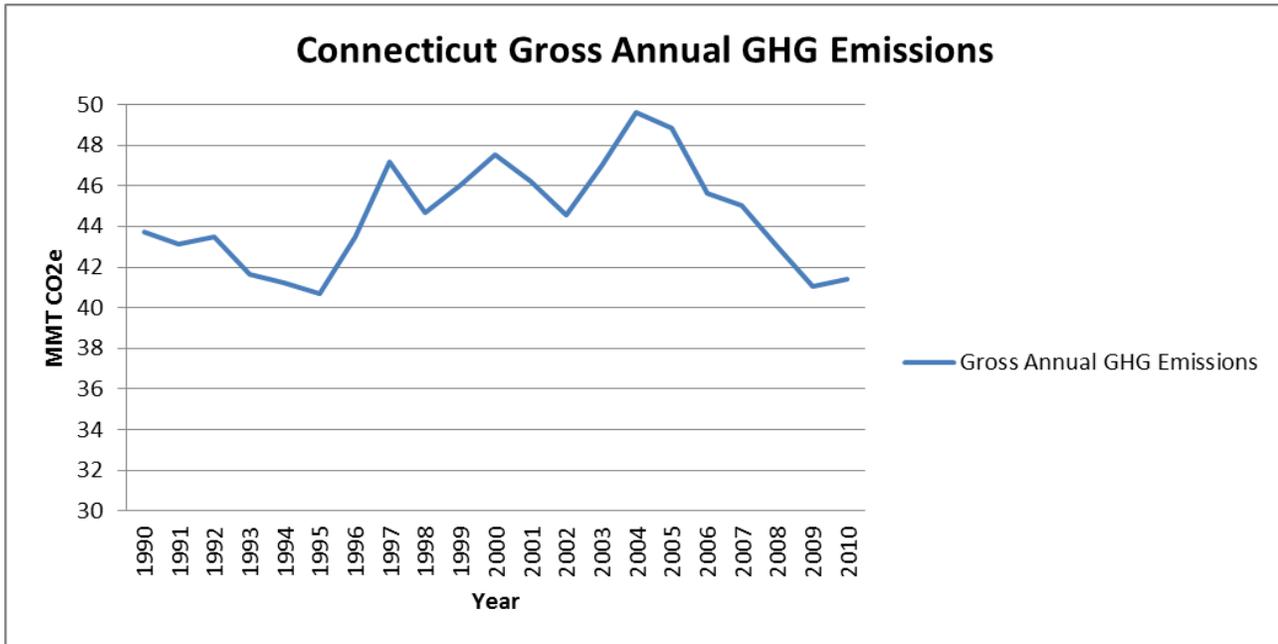
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<sup>3</sup> In January 2010, the Department published a GHG Inventory in accordance with Public Act 08-98, Connecticut's Global Warming Solutions Act. This remains the most recently published GHG inventory and shows emissions from 1990 through 2007. Consequently, the year 2007 is often used for comparison throughout this Progress Report. Additionally 1990 and 2001 emissions are used as points of comparison because they are the basis for Connecticut's emission reduction mandates under C.G.S. 22a-200.

<sup>4</sup> CO<sub>2</sub>e = Carbon dioxide equivalent and is a standard way of representing the total mass of various greenhouse gases emitted by an activity and account for the fact that some greenhouse gases have worse climate impacts than others.

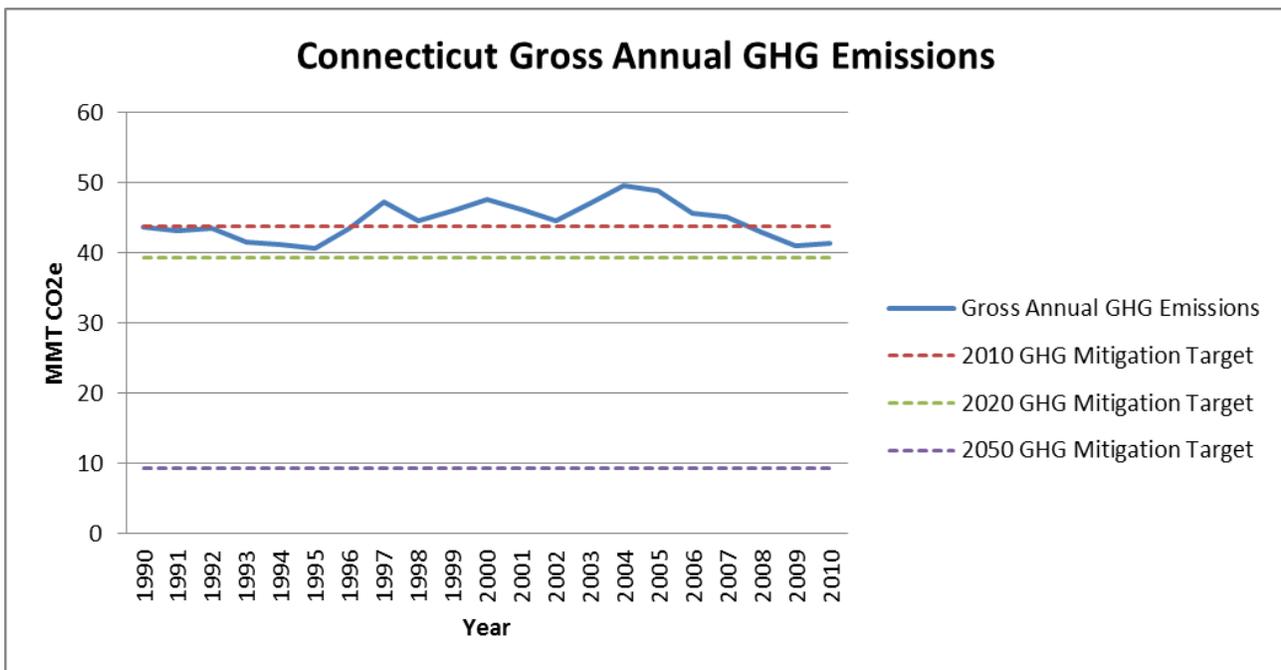
<sup>5</sup> Connecticut quantifies its GHG emissions using the U.S. Environmental Protection Agency's (EPA) State Inventory Tool (SIT). The SIT is the most commonly used tool for states to evaluate comprehensive statewide GHG emissions). The SIT provides an overview of GHG emissions as statewide gross emissions, statewide net emissions, and emissions on a sector-by-sector basis, beginning in 1990 through the year of latest data availability (typically the 2-3 years prior to the date of the SIT calculations are performed). GHG emissions are not directly measured across the various sectors of a state's economy. Therefore, the SIT calculates emissions based on data sources from the U.S. Energy Information Administration (EIA), U.S. Department of Energy (DOE), U.S. Department of Agriculture (USDA), U.S. Department of Transportation (USDOT), Connecticut Department of Transportation (CTDOT), and the U.S. Census Bureau. These sources provide high quality annual data, resulting in a consistent methodology for GHG and activity calculations. However, the most up-to-date data is typically two to three years old.

**Figure 1: Connecticut Gross Annual GHG Emissions**



Source: DEEP analysis using EPA SIT.

**Figure 2: Connecticut Gross Annual GHG Emissions and Emissions Reductions Targets**



Source: DEEP analysis using EPAs SIT.

## Taking Action on Climate Change 2014 Progress Report

Figure 2 shows the current GHG trajectory with 2010, 2020, and 2050 targets superimposed. Using emissions levels from 1990 as a baseline year, it is clear that Connecticut has met its first GHG target of reducing GHG emissions to 1990 levels by 2010. Connecticut’s annual GHG emissions in 1990 totaled 43.75 MMT CO<sub>2</sub>e, while 2010 GHG emissions totaled 41.38 MMT CO<sub>2</sub>e, or 5.4% below 1990 levels.

With this milestone complete, the state now must work towards its 2020 goal of reducing emissions to 10% below 1990 levels. Table 1, below, outlines the State’s aggressive timeline of GHG mitigation targets and progress. Connecticut’s *2005 CCAP* as well as the recent *2013 Comprehensive Energy Strategy* set a path to reaching the 2020 goal and lay the foundation for additional efforts necessary to attain the 2050 goal.

**Table 1: Connecticut Gross Annual Emissions of Select Years and GHG Reduction Targets**

	<b>1990</b>	<b>2001</b>	<b>2007</b>	<b>2010</b>	<b>2020</b>	<b>2050</b>
Total Emissions (MMT CO <sub>2</sub> )	43.75	46.25	45.06	41.38		
2010 Target (Attain 1990 Level)				✓		
2020 Target (10% Below 1990 Level)					39.38	
2050 Target (80% Below 2001 Level)						9.25

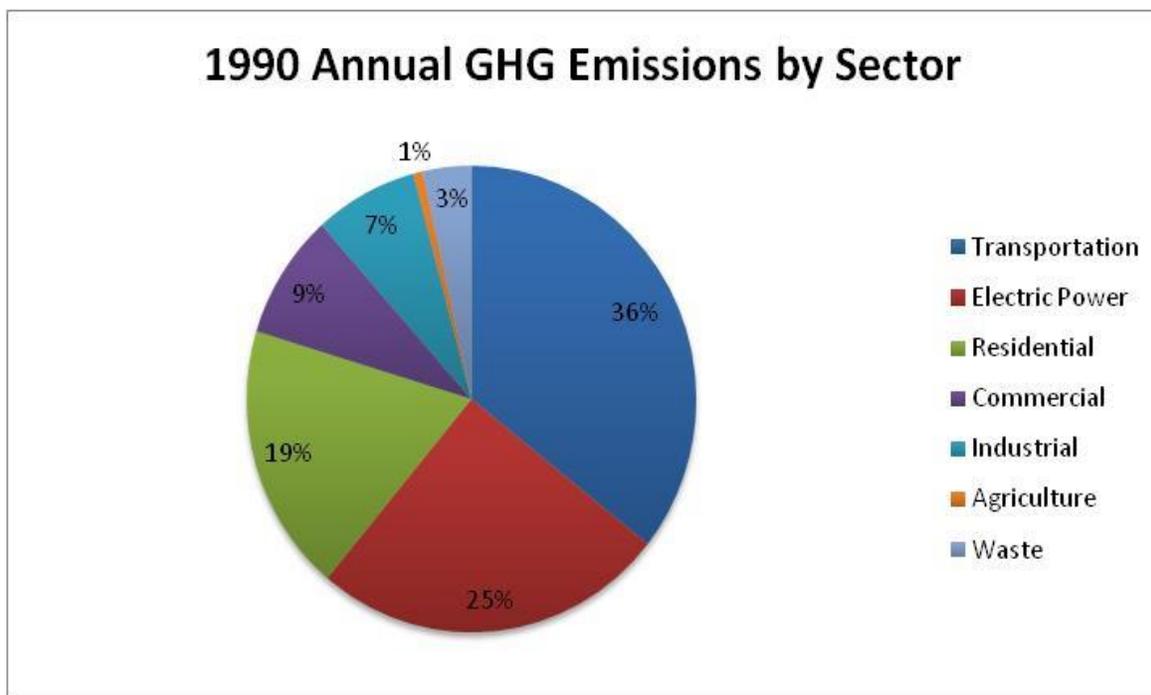
*Source: DEEP analysis using EPA’s SIT.*

## CONNECTICUT'S ANNUAL GHG EMISSIONS, BY SECTOR

As Connecticut has made progress overall in reducing its annual GHG emissions, the trends in specific sectors of the State's economy are varied. Some sectors such as transportation, electric power, and residential building energy produce more GHG emissions than others (*see* Figures 3 and 4). Some sectors have decreased their emissions since 1990—most notably the electric power sector, which reduced its emissions by a third. Other sectors have seen their emissions increase since 1990 (*see* Table 2).

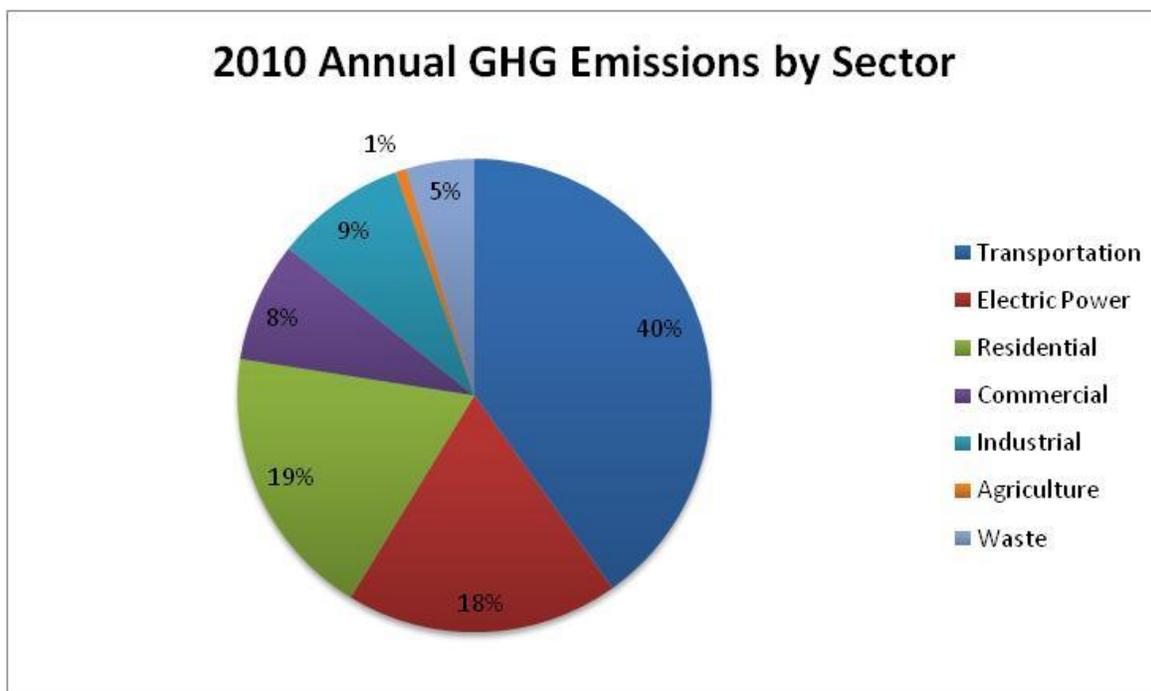
This section of the *2014 Progress Report* details the annual emission trends for the seven sectors that comprise statewide GHG emissions: transportation; electric power generation; residential, commercial, and industrial energy use; agriculture; and waste. Figures 3 and 4 depict relative shares of emissions in the years 1990 and 2010, respectively. Table 2 offers a comparative analysis between sectors during these years, including comparisons to 2001 and to 2007. These additional years are important points of comparison, as 2001 is a base year for the State's 2050 emission reduction mandate, and 2007 is the last year for which a GHG Inventory was widely distributed by the Department.

**Figure 3: Annual GHG Emissions by Sector in 1990**



Source: DEEP analysis using EPA SIT.

**Figure 4: Annual GHG Emissions by Sector in 2010**



Source: DEEP analysis using US EPA SIT.

**Table 2: Annual Emissions by Sector**

<b>Sector</b>	<b>1990 Emissions (MMT CO<sub>2</sub>e)</b>	<b>2001 Emissions (MMT CO<sub>2</sub>e)</b>	<b>2007 Emissions (MMT CO<sub>2</sub>e)</b>	<b>2010 Emissions (MMT CO<sub>2</sub>e)</b>	<b>% Change (1990- 2010)</b>
Transportation	15.61	17.84	18.14	16.60	6.38%
Electric Power	11.12	9.53	8.82	7.71	-30.68%
Residential	8.14	8.40	8.30	7.75	-4.80%
Commercial	3.80	4.29	3.35	3.39	-10.82%
Industrial	3.25	4.37	4.17	3.70	13.60%
Agriculture	0.29	0.28	0.37	0.30	3.21%
Waste	1.54	1.54	1.92	1.93	25.78%
<b>Total</b>	<b>43.75</b>	<b>46.25</b>	<b>45.07</b>	<b>41.38</b>	<b>-5.4%</b>

Source: DEEP analysis using EPA SIT.

### TRANSPORTATION

The transportation sector makes up the largest percentage of total GHG emissions in Connecticut. Emissions from this sector have fluctuated over time, increasing steadily until peaking in 2004. Since 2004, emissions have decreased each year to the point where 2010 emissions are nearly 17% lower than 2004. Transportation GHG emissions in 2010 are also 8.5% lower than those reported for the Department's 2007 GHG Inventory. While transportation emissions are steadily decreasing, they still remain 6.4% higher than the 1990 base year.

Transportation sector emissions are dominated by emissions from light duty vehicles (i.e., passenger cars and light trucks). Light duty vehicles account for more than 80% of the energy, consumed as fossil fuel, in the transportation sector.<sup>6</sup> The resulting emissions are a function of the fuels burned (primarily gasoline and diesel), the efficiency of the vehicles, and vehicle utilization, which is measured in Vehicle Miles Traveled (VMT).

The fuel efficiency and the emissions profile of light duty vehicles sold and operated in Connecticut continue to improve significantly due to state and federal regulation. Further reductions in light duty vehicle emissions are expected from the integration of alternative fuel and ZEVs into the state's vehicle fleet. Connecticut and 7 other states have established a goal to collectively deploy 3.3 million ZEVs by 2025 through the *ZEV MOU*. This effort involves placing the state on the *Path to Clean Fuels and Vehicles*<sup>7</sup> by highlighting the environmental, economic, and performance benefits of electric and hydrogen-fuel cell vehicles and aggressively deploying statewide hydrogen fueling and electric charging infrastructure through initiatives such as EVConnecticut.<sup>8</sup>

VMT in Connecticut declined steadily after 2007, coincident with an increase in mass transit ridership. Between 2007 and 2010 Connecticut's annual VMT declined by 2% from an all-time peak of 32 billion miles to 31.3 billion miles.<sup>9,10</sup> At the same time, mass transit ridership increased by 6.3% - from 38,970,000 trips (in 2007) to 41,456,600 trips (in 2010).<sup>11</sup> This trend

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<sup>6</sup> Connecticut Department of Energy and Environmental Protection, "2013 Comprehensive Energy Strategy for Connecticut," (February 19, 2013), (2013 CES), p. 162, available at <http://www.ct.gov/energystrategy>.

<sup>7</sup> More information on the *Path to Clean Fuels & Vehicles* at: [http://www.ct.gov/deep/cwp/view.asp?a=2684&q=538646&deepNav\\_GID=1619](http://www.ct.gov/deep/cwp/view.asp?a=2684&q=538646&deepNav_GID=1619)

<sup>8</sup> More information on EVConnecticut, the Department's initiative to assist public and private entities in deploying electric vehicle charging infrastructure and to promote electric vehicle adoption, can be found at <http://www.ct.gov/deep/evconnecticut>.

<sup>9</sup> U.S. DOT, Federal Highway Administration, "Highway Statistics 1990," available at <http://isddc.dot.gov/OLPFiles/FHWA/013263.pdf>.

<sup>10</sup> U.S. DOT, Federal Highway Administration, "Highway Statistics Series," available at <http://www.fhwa.dot.gov/policyinformation/quickfinddata/qftravel.cfm>.

<sup>11</sup> Federal Transit Administration, "National Transit Database," available at <http://www.ntdprogram.gov/ntdprogram/data.htm>.

mirrored VMT and transit ridership patterns at the national level: as a state and as a country we are driving less and utilizing public transportation more.<sup>12</sup>

Connecticut citizens have made use of expanded commuting options, including biking or walking, using public transportation options, and telecommuting. These are all means to reduce VMT. As noted in the *2013 CES*, several major statewide transportation projects—including the New Haven-Springfield rail line, the CTfastrak busway from New Britain to Hartford, and Metro-North rail enhancements—“provide an unparalleled opportunity to build vibrant, walkable, communities and maximize ridership and economic development within these transit corridors.”<sup>13</sup> The *2013 CES* goes further to state, “together, these new transit projects will make it possible for thousands more Connecticut residents to travel by rail or bus, cutting vehicle miles traveled by up to 240 million miles and saving nearly 9 million gallons of fuel annually.”<sup>14</sup> The Department prioritizes strong interagency coordination and support for municipalities to build walkable, bikeable, transit-oriented communities within these transit corridors.<sup>15</sup>

These projects and others will contribute to additional reductions in GHG emissions from the transportation sector. Promotion of additional VMT reduction strategies will be important to achieving further reductions within this sector.

### **ELECTRIC POWER**

In 2010, GHG emissions from the Electric Power Sector were much lower than in 2007 and in 1990. As shown on Table 2, 2010 emissions were 30.68% lower than 1990 and 7.71% lower than 2007. The carbon intensity of Connecticut’s electric power sector (i.e. the average amount of GHGs emitted per unit of energy generated) was also much lower in 2010 than in 2007 and 1990. U.S. Energy Information Administration (US EIA) data show that the carbon intensity of Connecticut’s electric power sector in 2010 was 13% lower than 2007 and 20% lower than 1990. Connecticut’s 2010 Electric Power Sector CO<sub>2</sub> emissions were the 9<sup>th</sup> lowest of all states in the country. Connecticut’s power sector had the 7<sup>th</sup> lowest emissions per unit of electricity generated in 2010.

This decrease in emissions is largely due to reductions in energy consumption and a shift to cleaner generation sources, catalyzed by successful state air quality regulations, including the Regional Greenhouse Gas Initiative (RGGI); improved economics and supply of natural gas as a fuel for power generation; investments in energy efficiency; and increased deployment of renewable energy sources through the Renewable Portfolio Standard, other market-based tools,

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<sup>12</sup> Davis, Benjamin. Frontier Group, “Transportation in Transition A look at Changing Travel Patterns in America’s Biggest Cities,” (2013, December), available at [http://www.uspirg.org/sites/pirg/files/reports/US\\_Transp\\_trans\\_scrn.pdf](http://www.uspirg.org/sites/pirg/files/reports/US_Transp_trans_scrn.pdf).

<sup>13</sup> Connecticut Department of Energy and Environmental Protection, “2013 Comprehensive Energy Strategy for Connecticut,” (February 19, 2013), (2013 CES), p. 175, available at <http://www.ct.gov/energystrategy>.

<sup>14</sup> *Ibid.*

<sup>15</sup> *Ibid.*

and programs promoting the installation of commercial and residential solar photovoltaic systems.

## **RESIDENTIAL ENERGY USE**

Burning fossil fuels for space heating, water heating, and cooking generates the overwhelming majority of GHG emissions from the residential sector. GHG emissions from this sector are primarily determined by the heating fuel used, the efficiency of home heating systems, the “weather tightness” of the household, and weather conditions.

As Table 2 above shows, 2010 GHG emissions from the residential sector were 6.6% lower than in 2007 and 4.8 % lower than 1990. The decrease in emissions corresponds to an 8.3% decrease in the total amount of energy (as fossil fuel) consumed in residences in 2010 versus 2007, as reported to the U.S. Energy Information Agency (US EIA). This decline is also coincident with milder weather over the same period, indicated by a decrease in “heating degree days,” which are a metric of anticipated home heating use due to weather.

## **COMMERCIAL & INDUSTRIAL ENERGY USE**

Combined GHG emissions from the commercial and industrial sectors in 2010 were nearly equal to emissions from Connecticut’s 1.4 million households, or emissions from Connecticut’s electric power sector. Commercial and industrial sector emissions are dominated by emissions from fossil fuel combustion to provide space heating and cooling for business and industry, as well as to provide heat and/or steam for a variety of industrial processes.

Between 2007 and 2010, the sum of GHG emissions from the commercial and industrial sectors decreased by 5.7%, 0.43 million metric tons (MMT) (Table 2). Emissions from these sectors in 2010 were nearly equivalent to their 1990 levels. The decrease in emissions corresponded to a 1.24% decrease in overall energy consumed as fossil fuel and an increase in fuel switching from oil to natural gas, resulting in less GHG emissions per unit of energy consumed across the sectors. To some degree the decrease in energy consumption and emissions was also influenced by the recent economic recession.

## **AGRICULTURE & WASTE**

As shown in Table 2, cumulative emissions from the agriculture and waste sectors accounted for approximately 5.4% of total GHG emissions in the state for 2010. According to Connecticut’s GHG Inventory, emissions within these sectors have remained relatively unchanged since 1990.

When comparing waste and agriculture sector emissions it is clear that waste sector emissions far outweighed agriculture sector emissions, representing 4.7% and 0.7% of Connecticut’s total GHG emissions respectively. Comparing 2010 emissions levels to those of 1990, each of these sectors saw increases. For example, waste sector emissions are 25.8% higher than 1990 levels. This is a significant increase. However, as of 2010 this sector represents less than 2 MMT CO<sub>2</sub>e. Over time the rate of emissions increase has slowed, in fact, during the period between 2007 and

2010, emissions from this sector remained relatively unchanged. Addressing the state's solid waste disposal on land, wastewater handling, and waste incineration practices in order to capture more economic value from "waste" materials and to reduce emissions associated those processes is a high priority for DEEP. The Department and other partners are launching initiatives (e.g., regulations for food waste collection and incentives for anaerobic digestion) that should lower emissions from this sector.

The agriculture sector has consistently represented less than 1% of total GHG emission for the state since 1990 and over time there have been relatively small changes in that share. Dominant sources of GHG emissions from the agriculture sector include enteric fermentation from livestock, manure management, and emissions from agricultural soils.

### PROGRESS ON IMPLEMENTATION OF GHG EMISSION REDUCTION STRATEGIES: 2005 CLIMATE CHANGE ACTION PLAN AND THE 2013 COMPREHENSIVE ENERGY STRATEGY

#### **2005 CLIMATE CHANGE ACTION PLAN**

In accordance with the requirements of Public Act 04-252, *An Act Concerning Climate Change*, the Governor's Steering Committee on Climate Change (GSC)<sup>16</sup> successfully completed development of the *2005 Climate Change Action Plan (2005 CCAP)*. The *2005 CCAP* represented a major milestone in the drive to reduce GHG emissions and achieve the regional goals set by the New England Governors/Eastern Canadian Premiers (NEG/ECP). While other states were beginning to take similar steps to reduce GHG emissions, Connecticut was the first state to address climate change in such a significant and comprehensive manner.

In creating this plan, the GSC relied to a large extent on the ideas and input it received from a stakeholder process. This process sought input from a diverse group of entities representing government, industry, nongovernmental organizations, academia and the public. The completion of this comprehensive plan was a major accomplishment. Through the successful implementation of this plan, Connecticut created opportunities to provide state residents a healthier environment, a more stable climate and a stronger economy. Yet GSC members recognized, from the outset, that the plan and actions to implement it formed a firm foundation that future efforts would have to build upon to achieve Connecticut's ambitions GHG reduction goals.

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<sup>16</sup> The Governor's Steering Committee on Climate Change was established in 2002 and is a multi-agency collaborative made up of leaders from key state agencies with an objective to advance the state's climate change mitigation and adaptation goals.

### 2013 COMPREHENSIVE ENERGY STRATEGY

Under the leadership of Governor Dannel Malloy, Connecticut's *2013 Comprehensive Energy Strategy* significantly advanced the progress made under the *2005 CCAP* by providing the state a more systematic basis for addressing energy opportunities and challenges. The *2013 CES* provides a framework for current policy, regulatory, and legislative decisions, and provides for better energy choices at the household and business level. The *2013 CES* covers all fuels in all sectors with a planning horizon out to 2050. By integrating energy, environmental, and economic goals, the *2013 CES* advances a broad and robust structure to improve the state's current energy circumstances and provides a set of recommendations designed to advance Governor Malloy's vision of moving Connecticut toward a cheaper, cleaner, and more reliable energy future.

At the heart of the *2013 CES* are a series of policy proposals aimed at expanding energy choices, lowering utility bills for Connecticut residents and businesses, improving environmental conditions, creating clean energy jobs, and enhancing the quality of life in the state. The Strategy offers recommendations in five major priority areas: energy efficiency; industrial energy needs; electricity supply including renewable power; natural gas; and transportation.

The Department's analysis suggests that the initiatives described in the State's *2013 CES* and enacted through subsequent legislation (e.g. Public Act 13-298 and Public Act 13-303) will build on the progress achieved by actions under the *2005 CCAP* and further reduce Connecticut's GHG emissions. Through the implementation of its *2013 CES*, Connecticut is taking decisive action to substantially reduce emissions from all sectors, with specific emphasis on the sectors that represent the largest shares of overall emissions – the Transportation, Electric Power, and Residential Sectors. These actions include:

- Expanding access to natural gas as a heating fuel for the residential, commercial, and industrial sectors;
- Cutting emissions from the electric power sector by reducing the regional cap and state emissions budgets under the RGGI cap and trade program;
- Increasing investments to pursue all cost effective energy efficiency measures in the commercial, residential, institutional and industrial sectors under the State's Conservation and Load Management Plan;
- Procuring additional sources of renewable energy to ensure fulfillment of the State's Renewable Portfolio Standards and supplant fossil fuel generating units;
- Expanding investments in energy efficiency and renewable energy through the Connecticut Clean Energy Finance and Investment Authority (CEFIA), the nation's first "green bank", and innovative financing tools, such as Commercial Property Assessed Clean Energy (C-PACE).

# Taking Action on Climate Change 2014 Progress Report

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- Promoting sales and use of electric and alternative fuel vehicles by building out fueling/charging infrastructure to alleviate “range anxiety” and adopting stricter vehicle fleet emissions standards;
- Developing and expanding efforts to improve the energy efficiency of State and municipal facilities through Lead by Example and Energy Saving Performance Contracting programs;
- Pursuing aggressive weatherization goals for state residences;
- Investing in transportation infrastructure projects that will reduce VMT and congestion on Connecticut highways;
- Promulgating energy efficient state building codes for new construction, and adopting stricter energy efficiency standards for many household appliances.

These actions are expected to drive Connecticut toward a cheaper, cleaner, more reliable energy future for its citizens, achieve attainment of the 2020 GHG goals and create a solid foundation upon which to build efforts to meet the 2050 GHG goals.

## ACCOMPLISHMENTS TO DATE

The *2005 CCAP* identified a portfolio of strategies to meet and ultimately exceed the 2010 GHG reduction target. The analyses indicated that through the implementation of the *2005 CCAP*, Connecticut could achieve an 8.66 MMT reduction in emissions from a projected 2010 baseline, resulting in lower actual 2010 emissions than 1990 emissions. As discussed above, Connecticut’s 2010 emissions were lower than 1990 emissions and as shown in Table 3, below, Connecticut achieved approximately 6.76 MMT of the 8.66 MMT possible projected reductions from the actions recommended in the *2005 CCAP*.

**Table 3: Comparison of Actual to Projected 2010 Reductions from 2005 CCAP. Comparison based on data in Table ES-2 of the 2005 CCAP**

<b>2005 CCAP Projected 2010 Emissions Baseline</b>	<b>48.14 MMT</b>
2005 CCAP Projected Reductions by Sector from Projected 2010 Emissions baseline:	
Transportation	0.35 MMT
Residential, Commercial, Industrial	4.03 MMT
Agriculture, Forestry, Waste	1.21 MMT
Electricity	3.07 MMT

# Taking Action on Climate Change

## 2014 Progress Report

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Total 2005 CCAP Projected Reductions from Projected 2010 Emissions Baseline	8.66 MMT
2010 GHG Emissions	41.38 MMT
Actual Reductions from the 2010 Emissions Baseline Projected in 2005 CCAP	6.76 MMT

The *2005 CCAP* identified the actions with the greatest GHG reduction potential by 2010 and 2020. Almost all of these actions have been successfully implemented and many of them have been expanded to achieve even greater GHG reductions. Connecticut's progress with respect to the implementation of these actions is summarized below.

### **MODERNIZING CONNECTICUT'S RENEWABLE PORTFOLIO STANDARD**

In 1998, Connecticut made a significant statutory commitment to supporting the deployment of regional clean energy generation through enactment of a Renewable Portfolio Standard (RPS), which requires an increasing percentage of the electricity consumed in the state to be generated by renewable resources. The RPS is designed to achieve multiple objectives: (1) diversify the state's energy resource mix to promote reliability; (2) provide a hedge against volatile fossil fuel prices; (3) improve environmental conditions by reducing GHG and air emissions; (4) create clean energy jobs and economic development; (5) minimize the overall cost of renewable energy to Connecticut's electric ratepayers; and (6) enhance the quality of life in the state. The *2005 CCAP* recommended extending and expanding the RPS from 7% renewable content in the year 2010 to 20% renewable content in 2020. Through subsequent legislative action, RPS requirements were expanded to 27% by 2020 and have since been further revised to both increase renewable content and expand what is considered renewable.<sup>17</sup> Implementation of the RPS over time has resulted in ever-increasing, expanding renewable content of electricity consumed in Connecticut.

Since 2011, under the leadership of Governor Malloy, Connecticut has experienced exponential growth in the deployment of in-state RPS-eligible, renewable energy sources. Installed solar capacity increased by nearly tenfold, due to a variety of policy tools and innovative thinking aimed at driving up the deployment of renewable energy sources with limited ratepayer funding. One example of that innovative thinking is the Low Emissions Renewable Energy Credit/Zero Emission Renewable Energy Credit (ZREC/LREC) Program, which enables Connecticut's Electric Distribution Companies (EDCs) to provide a funding stream to solar photovoltaic and other Class I no emission, or Class I low emission fuel cell projects throughout the state by purchasing Renewable Energy Credits (RECs) from such projects at very reasonable rates through reverse auctions. Those RECs can either be used by the EDCs for compliance with the

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<sup>17</sup> As a result, both combined heat and power (CHP) and energy efficiency can qualify as Class III renewable energy sources.

RPS or sold on the market to recoup some of the costs of the program. As a result of the LREC/ZREC program, Connecticut has added 80 megawatts (MW) of solar photovoltaic capacity and more than 17 MW of fuel cell capacity.<sup>18</sup>

Another example of forward thinking involved the procurement of two 5 MW solar parks located in Connecticut under long term power purchase agreements in accordance with Section 127 of Public Act 11-80. Both parks are expected to be operational in 2014, providing cheaper, cleaner more reliable power.

Capitalizing on the successes of these policies and the findings of a comprehensive study of the RPS, Governor Malloy signed Public Act 13-303 into law in summer 2013. This law also allows for large-scale procurement of regional renewable power to serve all Connecticut's customers, using a variety of policy tools to ensure that projects get built at the lowest possible cost to ratepayers.

In accordance with Public Act 13-303, Connecticut's EDCs recently procured renewable energy from a 250 MW wind farm to be constructed in Maine and a 20 MW solar park to be constructed in Connecticut. Connecticut also recently procured long-term contracts for RECs from two biomass facilities, further ensuring cost-effective compliance with the RPS and providing opportunities to sell RECs into the market to reduce ratepayer costs.

Public Act 13-303 allows for additional procurements that could include low carbon sources such as hydropower. The continued procurement of renewable and low carbon sources of energy offers opportunities to displace fossil fuel plants within the state and the region, which will reduce local and regional GHG emissions. The state's annual RPS requirements have consistently been met (though at times alternative compliance payments have substituted for a very small percent of this requirement) and Connecticut is on track to meet the 2020 RPS, partly as a result of the procurement provisions in Public Act 13-303.

### **ADVANCING CLEAN CAR INITIATIVES AND CALIFORNIA LOW EMISSION VEHICLE STANDARDS**

Connecticut has been actively engaged in bringing less polluting passenger vehicles to market for nearly a decade. In 2004, Connecticut was one of just thirteen states to sign on to California's Low Emission Vehicle (LEV) Program. In accordance with Public Act 04-84, the Department was directed to amend its regulations from time to time, in accordance with any changes in the standards made by the State of California. Connecticut promulgated its version of the California's LEV II program regulations in 2004 and revised them in 2009 to adopt California's tailpipe GHG emissions standards, beginning with the 2009 model year.

In 2013, Connecticut adopted its version of the CA LEV III regulations and GHG emissions standards. Continued enforcement of these vehicle emission standards over the past decade has resulted in even greater GHG reductions than those anticipated in the 2005 CCAP. Under the

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<sup>18</sup> Data provide by Northeast Utilities and United Illuminating.

recently adopted regulations, Connecticut is expected to achieve similar reductions to those projected for California: GHG emissions from passenger cars in California are projected to decrease by 12% in 2025 and 27% in 2035 relative to business as usual levels in the state.<sup>19</sup>

In 2012, the nation adopted a new Corporate Average Fuel Economy (CAFE) standard, which sets fuel economy standards at an average of 54.5 mpg by Model Year 2025. This newly adopted standard is in addition to the previous CAFE standard requiring cars and light trucks to achieve 35.5 mpg by 2016. However, Connecticut adopted the California emission standards on top of the CAFE standards because California's LEV III program is more protective of public health and the environment than federal emission standards.<sup>20</sup> Moreover, widespread adoption of California clean car standards has encouraged automakers to agree to more stringent federal pollution, GHG, and fuel economy standards, with additional positive impacts nationally.

In the 2013 CES, the Department outlined the State's commitment to a Path to Clean Fuels & Vehicles. In addition to supporting increased fuel efficiency standards under CAFE and the adoption of the California LEV Program, the 2013 CES promotes the use of highly efficient and alternative fuel vehicles (AFVs), envisioning that by 2030 49% of the passenger fleet mix is powered by AFVs or ZEVs, increasing to 53% by 2050. Achieving this vision would result in a reduction of approximately 2.2 million metric tons of CO<sub>2</sub>e in 2050.<sup>21</sup>

To support this vision, Governor Malloy and the governors of 7 other states, including California, committed to deploying 3.3 million ZEVs by 2025, under the ZEV MOU, signed in October 2013. Signatory states committed to developing a collective action plan and individual strategies to foster and accelerate ZEV adoption in their states. Connecticut's individual action plan and the signatory states' collective action plan are expected to be finalized in spring 2014.

As part of its individual efforts to support the LEV III regulations and the ZEV MOU, Connecticut launched its EVConnecticut campaign in 2013. Through EVConnecticut, the Department provided grant funding to public and private entities to build out publicly available infrastructure for electric vehicle charging. Due, in part, to these efforts, Connecticut saw explosive growth in the deployment of charging infrastructure and the number of electric vehicles in the state.

### **STRENGTHENING THE REGIONAL GREENHOUSE GAS INITIATIVE**

Connecticut became a national leader in developing and participating in a regional carbon dioxide cap-and-trade program for the electricity generation sector, as recommended in the

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<sup>19</sup> California Air Resources Board, "Draft Environmental Analysis Prepared for the Advanced Clean Cars Program, Appendix B," (2011). Available at: <http://www.arb.ca.gov/regact/2012/leviiighg2012/levappb.pdf>.

<sup>20</sup> DEEP, "Connecticut Low Emissions Vehicle II (LEV II) Program," (2009, December 16). Available at: [http://www.ct.gov/deep/cwp/view.asp?a=2684&Q=398686&deepNav\\_GID=1619](http://www.ct.gov/deep/cwp/view.asp?a=2684&Q=398686&deepNav_GID=1619).

<sup>21</sup> Connecticut Department of Energy and Environmental Protection, "2013 Comprehensive Energy Strategy for Connecticut," (February 19, 2013), (2013 CES), p. 186 and 189, available at <http://www.ct.gov/energystrategy>.

*2005 CCAP.* Connecticut helped spearhead the development of the Regional Greenhouse Gas Initiative (RGGI), the first mandatory market-based regulatory program in the United States to reduce GHG emissions.

RGGI is a cooperative effort among the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont to cap and reduce CO<sub>2</sub> emissions from the power sector. Participating states sell nearly all emission allowances through auctions and invest proceeds in consumer benefits: energy efficiency, renewable energy, and other clean energy technologies. RGGI is spurring innovation in the clean energy economy and creating green jobs in member states.

The *2005 CCAP* projected Connecticut GHG reductions from RGGI of 1.98 million metric tons CO<sub>2</sub>e by 2010 (without leakage) and 5.13 million metric tons CO<sub>2</sub> by 2020. Since 2005, annual emissions of CO<sub>2</sub> from the RGGI sources in Connecticut decreased by more than 40%, or nearly 3.64 million metric tons. From its inception in 2008 through the end of 2013, RGGI has provided the State of Connecticut more than \$68.8 million that have been invested in energy efficiency and more than \$22.8 million that have funded renewable energy. Each dollar invested results in more than \$3 of net economic value to Connecticut's economy through the creation of green jobs, the increase in business and personal disposable income resulting from lower energy costs, and increased overall demand for energy efficiency and renewable energy development.

In 2012, the RGGI states performed a rigorous review of the program, to harmonize the future carbon dioxide allowance budget with declining emissions trends. As a result of this analysis, the RGGI states proposed a reduction of the regional carbon dioxide cap from approximately 165 million short tons to 91 million short tons for calendar year 2014. The regional cap will decline by 2.5% each year until 2020, resulting in a projected reduction of regional CO<sub>2</sub> emissions by a cumulative 86 million short tons (78.2 MMT) by 2020. In addition, the reduced cap is expected to raise the price of CO<sub>2</sub> allowances, which will create greater revenue for the states to invest in energy efficiency, renewable energy projects, GHG mitigation strategies, and initiatives to adapt to climate change which in turn reduces emissions. Connecticut completed a regulatory process to amend its RGGI rule to incorporate these proposed changes, which became effective on December 9, 2013.

### **ENERGY EFFICIENCY: ELECTRICITY AND NATURAL GAS**

Connecticut has long recognized that of all energy savings strategies energy efficiency is the most cost effective. In recognition of that fact, Public Act 98-28 created a statutorily funded Connecticut Energy Efficiency Fund. The fund provides financing for residential, commercial, and industrial energy efficiency measures through utility-administered Conservation & Load Management programs (C&LM Programs). The EDCs and gas local distribution companies (LDCs) are required to develop a plan to implement cost-effective conservation and load management (C&LM) programs, pursuant to Conn. Gen. Stat. § 16-245m, as amended by Public Act 13-298.

## Taking Action on Climate Change 2014 Progress Report

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Connecticut’s C&LM programs are showing impressive results. For every \$1 spent on energy efficiency, Connecticut receives electric, gas, fuel oil, and propane system benefits valued at nearly \$2.40. This return on investment demonstrates that C&LM programs are a very cost effective way to reduce customer costs, generate jobs, and help make the state’s businesses more competitive.

The 2005 CCAP was developed in a period of budget uncertainty for the C&LM programs. As a result, a key recommendation in the 2005 CCAP was to restore and expand funding for the C&LM programs as well as the creation of natural gas and oil conservation funds. Since 2005, the C&LM programs have not only seen their funding restored, but also increased.<sup>22</sup>

Under the leadership of Governor Malloy, the state’s investment in C&LM efficiency programs has doubled, to help Connecticut homes and businesses take advantage of cost-effective opportunities available to reduce their energy bills, which helps the state reduce its GHG emissions overall. In 2013, consistent with the statutory requirement in Public Act 07-242 to pursue all cost-effective energy efficiency, and with the clarifications of funding sources in Public Act 13-298, the Department approved a three-year C&LM program budget for 2013-2015. In accordance with Public Act 11-80 the EDCs and LDCs submitted a combined C&LM Plan for calendar years 2013-2015. Following technical evaluation and stakeholder comment, DEEP approved budgets of \$220,077,812; \$222,342,881; and \$223,246,524 for 2013, 2014, and 2015, respectively.

These significant increases in efficiency investments are anticipated to result in emissions reductions commensurate with those resulting from previous program investments. For 2013, the measures installed under the Connecticut Energy Efficiency Fund’s electric and gas conservation programs resulted in the avoidance of 2.1 MMT tons of carbon dioxide over the lifetime of the measures, which is equivalent to removing more than 345,780 cars from the road. Over time, these conservation programs have yielded significant state environmental, economic and energy savings benefits. The benefits of the measures implemented through the Connecticut Energy Efficiency Fund from 2007 through 2012 are summarized in Table 4 below.

**Table 4: The Environmental, Economic and Energy Savings Benefits of the Connecticut Energy Efficiency Fund**

	<b>Total CO<sub>2</sub> Avoided (Metric Tons)</b>	<b>Total Energy Savings (Millions kWh)</b>	<b>Projected Annual Savings (\$/year)</b>	<b>Total CEEF Investment</b>
2012	200,526	322.1	\$53,800,000.00	\$142,967,827.00
2011	244,091	394	\$72,000,000.00	\$144,387,507.00
2010	241,058	423	\$79,300,000.00	\$161,636,889.00

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<sup>22</sup> Connecticut Energy Efficiency Fund, “Connecticut Statewide Energy Efficiency Dashboard,” available at <http://www.ctenergydashboard.com/Public/PublicHome.aspx>.

## Taking Action on Climate Change 2014 Progress Report

2009	154,229	237	\$45,600,000.00	\$90,373,661.00
2008	203,124	368	\$66,110,000.00	\$141,712,425.00
2007	212,452	355.4	Not Reported	\$131,917,204.00

*Source: Energize Connecticut, "Energy Efficiency Board Annual Legislative Reports," available at <http://www.energizect.com/about/eeboard/annualreports>.*

### COMBINED HEAT AND POWER

The 2005 CCAP recommended the development of new, clean, combined heat and power (CHP) electricity generation, with a focus on reducing barriers to development of CHP projects (e.g., permitting and interconnection hurdles, standby power rates) and exploring further mechanisms to promote CHP (such as a CHP portfolio standard). Since 2005, these goals have been addressed through numerous programs, including those established under Public Act 05-01 and Public Act 11-80. Under those Acts, the State has offered the following support for deployment of CHP projects:

- Grants and loans to reduce capital costs, leading to 91 MW of new CHP capacity between 2005 and 2011, more MW than any state in the New England region and 2.9% of statewide electric generating capacity, contributing to a decrease in emissions of GHG from the commercial and industrial sectors by nearly 12%.
- Standardized procedures for connecting CHP to gas lines and to the electricity grid;
- Elimination of electric backup rates;
- Reduced demand ratchets;
- Waiver of natural gas distribution charges;
- Creation of a CHP portfolio standard through the introduction of Class III renewable energy RPS credits for CHP, bringing in additional revenue to support CHP;
- CHP and anaerobic digestion pilot program incentives; and
- CHP projects that satisfy the definition of Class I renewable energy source may also receive Low and Zero Emission Renewable Energy Credits (LRECs/ZRECs) as an additional stream of income.

The 2013 CES recommended several additional actions to support CHP deployment, including: legislative changes to allow larger projects to participate in current CHP grant programs and consider larger grants, if appropriate; changes to submetering and net metering laws, if necessary, to encourage CHP development; and a current assessment of remaining CHP potential in Connecticut.

## RECYCLING AND SOURCE REDUCTION

The 2005 CCAP recommended increasing recycling and source reduction to 40%. The 2006 revision to Connecticut's *Solid Waste Management Plan* exceeds that by setting a recycling/source reduction goal of 58%. Achieving this goal by 2024 would result in projected GHG reductions of 1.6 MMT CO<sub>2</sub>e. However, since the current rate is about 30%, the Department has undertaken a comprehensive overhaul of the state's existing solid waste management system. The goal of this multi-step transformation is to capture more value out of the current waste stream and to increase recycling and source reduction. These efforts should capture the level of GHG emissions reduction articulated in the 2005 CCAP.

## CLEAN ENERGY OPTIONS

Allowing ratepayers to choose electricity derived from renewable energy sources is yet another GHG reduction strategy outlined in the 2005 CCAP. Since 2005, clean energy choice options have been available to Connecticut electric customers, starting with two suppliers in the CT CleanEnergyOptions program. Consumer choice has been expanded to include many electric suppliers, with a variety of energy mixes and prices. As a result, kWh of clean energy purchased has increased. For instance, cumulative kWhs sold in 2007 totaled 127,169,307. By 2010, the number of kWhs sold increased to 229,439,458, and in 2012 the program sold 254,830,692 kWh. Clean energy suppliers can derive additional income from the sale of renewable energy credits.

## CLEAN ENERGY FINANCE AND INVESTMENT AUTHORITY (CEFIA) – THE NATION'S FIRST GREEN BANK

The 2005 CCAP promoted the restoration of the Clean Energy Fund, which is a source of ratepayer funding to promote clean and renewable energy deployment through a system of rebates and incentives. Under Public Act 11-80, the Clean Energy Fund was transformed from a rebate and incentive based model to the Clean Energy Finance and Investment Authority (CEFIA), the nation's first "green bank." CEFIA leverages more than \$25 million in annual ratepayer funds with private capital to spur Connecticut's clean energy economy.

Through CEFIA's various innovative financing mechanisms, installed solar capacity within the state grew dramatically from less than 5 MW installed in 2010 to over 35 MW added in 2013. By the end of 2013, Connecticut had over 32 MW of solar photovoltaic installations deployed or under development, financed in part by CEFIA programs. CEFIA has also employed its model of leveraging state funding to attract private capital and investment in clean energy to ramp up the deployment of fuel cells throughout Connecticut. CEFIA programs also work cooperatively with local banks to create financing products that enable homeowners the opportunity to dramatically improve the energy efficiency of their homes. Furthermore, CEFIA provides opportunities to install comprehensive energy improvements in commercial properties through its innovative, C-PACE Program.

CEFIA serves as a state and national model in the conversation on advancing clean energy deployment through “green banks” and other market mechanisms designed to drive clean energy to be cost and performance competitive with fossil fuel alternatives.

### **TRANSIT, SMART GROWTH, AND REDUCTION IN VMT**

The *2005 CCAP* recommended reducing growth in VMT by 3% by doubling transit ridership by 2020; investing in new transit; establishing a coordinated, interagency program to promote smart growth; redirecting at least 25% of new development to growth-appropriate locations; studying a potential road user pricing pilot; and implementing complementary VMT reduction incentives (e.g., commuter choice, location-efficient mortgages, and mileage-based insurance). Recent analyses show that VMT has been declining and transit ridership in Connecticut and nationwide has been increasing. While progress has been made, changing land development patterns and travel methods remain among Connecticut’s largest GHG challenges.

*The 2013 CES* updated the recommendations of the *2005 CCAP* by promoting transit-oriented development and increased mobility options. For the first time in decades, the state is initiating major public transit projects (CTfastrak, New Haven-Springfield rail, and Metro-North passenger rail enhancements). The *2013 CES* recommends leveraging those investments to maximize transit use and reduce vehicle travel demand, aligning state infrastructure spending to support strategic growth within these corridors. Aggressive light duty VMT reductions through transit and smart growth actions could reduce GHGs by 1.8 million metric tons CO<sub>2</sub>e.<sup>23</sup>

### **LAND PRESERVATION**

The State of Connecticut has a long-standing goal of having a total of 21% of the state’s land preserved as open space by the year 2023. This goal was reiterated in the *2005 CCAP*, to “preserve existing forest and agriculture land.” These lands provide important carbon sequestration benefits to the state, as well as many other benefits. The State has multiple programs to preserve and manage agricultural and forest land. As of October 2010, 73% of this goal has been achieved through the direct purchase of open space by the State and through State support for local acquisitions.<sup>24</sup> The *Connecticut Forest Resource Assessment and Strategy 2010* acknowledges the important role of Connecticut forests in sequestering carbon. Carbon is stored both in the trees, root systems, forest leaf litter, and soils as well as in urban trees. The plan calls for preservation and active management of Connecticut’s forest land.

### **ADDITIONAL GHG REDUCTION STRATEGIES IN THE 2013 CES**

As discussed above, Connecticut’s *2013 Comprehensive Energy Strategy* expanded upon and updated many of the recommendations in the *2005 CCAP*. The *2013 CES* also included new

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<sup>23</sup> Connecticut Department of Energy and Environmental Protection, “2013 Comprehensive Energy Strategy for Connecticut,” (February 19, 2013), (2013 CES), p. 189, available at <http://www.ct.gov/energystrategy>.

<sup>24</sup> DEEP, “Open Space,” (2013, November 20), available at [http://www.ct.gov/deep/cwp/view.asp?a=2706&q=323838&deepNav\\_GID=1641&deepNavPage=%7C](http://www.ct.gov/deep/cwp/view.asp?a=2706&q=323838&deepNav_GID=1641&deepNavPage=%7C).

recommendations in the area of energy efficiency that were not specifically addressed by the *2005 CCAP*. The recommendations call for expanding efficiency programs into all sectors and buildings, delivering deeper more comprehensive energy savings, providing consistent and long-term funding for efficiency programs, and leveraging private capital to finance further efficiency investments. Some of the key, specific programs include:

- The creation of C-PACE, an innovative financing program that enables commercial, industrial, and multi-family property owners to access upfront financing for energy improvements that are paid back on property tax bills;
- The state's Lead by Example program, which includes a standardized energy savings performance contracting program to reduce energy use in state and municipal facilities, will enable tens of millions of dollars of energy efficiency upgrades in state buildings paid for through guaranteed future energy savings;
- Efforts to ensure that energy efficiency programs address all fuels, including fuel oil and propane used for heating;
- Financing programs to make residential energy efficiency investments more affordable;
- Programs to promote energy efficiency in low income communities;
- Decoupling (separating utilities' revenues from their sales volumes) and expanded performance incentives to give utilities stronger incentives to help customers optimize energy efficiency and cost savings;
- Adoption and enforcement of the latest building codes to ensure high-performance buildings; and
- Implementation of "Energize Connecticut," a marketing campaign that promotes all energy efficiency programs in the state and empowers Connecticut residents and businesses to make smart energy choices.

The *2013 CES* also included a significant focus on GHG emission reduction opportunities available through cost-effective conversion from fuel oil to natural gas for the residential, commercial and industrial sectors. The *2013 CES* focused on expansion of the state's natural gas distribution system as a means to achieve cheaper, cleaner, and more reliable energy and provide greater choice for Connecticut consumers. Since 2009, natural gas consumption in Connecticut has increased by 24%, mostly attributable to an increased use for electricity generation.<sup>25</sup> Acknowledging that only 31% of Connecticut homes currently heat with gas, the *2013 CES* recommends making gas available to over 280,000 additional Connecticut homes and businesses.

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<sup>25</sup> Connecticut Department of Energy and Environmental Protection, "2013 Comprehensive Energy Strategy for Connecticut," (February 19, 2013), (2013 CES), p. 119, available at <http://www.ct.gov/energystrategy>.

The Department projects that the conversion to natural gas from heating fuel oil and from gasoline or diesel for transportation can result in a 25-27% reduction in CO<sub>2</sub> emissions at the point of use.<sup>26</sup> The impacts of “upstream” emissions (from production and transmission) are not conclusive and require further study. Assuming that upstream impacts from natural gas production and transmission are not dramatically different than oil, the conversion of on main (on gas lines but not hooked up) and potential off main (more than 150 feet from a gas main) customers could reduce the state’s GHG emissions by 8%.<sup>27</sup>

As called for in the 2013 CES, Connecticut’s natural gas distribution companies developed a plan to expand natural gas infrastructure and conversions over the next ten years, which was approved by the Public Utilities Regulatory Authority in 2013.<sup>28</sup> The 2013 CES also recommends developing financing mechanisms to reduce upfront costs of fuel switching, incentives to encourage high efficiency natural gas furnaces, and regulatory constructs that reduce customer costs.

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<sup>26</sup> *Ibid* p. 140.

<sup>27</sup> *Ibid*, p. 141.

<sup>28</sup> *Ibid*, p. 147.

## ADAPTING TO A CHANGING CLIMATE

In recent years, Connecticut has also sought to address climate change adaptation and resilience as well as mitigation through GHG reduction. Through its 2010 *Connecticut Natural Hazard Mitigation Plan* (approved by the Federal Emergency Management Agency), Connecticut was one of only two states (the other being California) to include climate change as an important risk consideration in its plan. The plan is currently being updated and will build on the climate change risk components.

In 2011, Connecticut was pummeled by two severe storms, Tropical Storm Irene and the Halloween Nor'easter (Winter Storm Alfred). As a result Governor Malloy initiated a "Two Storm Panel," and the Speaker of the House formed the bipartisan Shoreline Preservation Task Force. Each group completed a report with assessments of the storm events, the state's response, and recommendations for future actions to ready Connecticut for impacts associated with the more frequent severe weather events associated with climate change. In addition, a long-range group, the Long-Term Recovery Committee was established. This group has four work groups—Natural & Cultural Resources, Community and Capacity Building, Economic, and Individual Assistance (Including Housing and Volunteer Organizations Active in Disasters)—working to attain long-term, sustained, and holistic recovery.

In 2013, the Department released the *Connecticut Climate Preparedness Plan* as required by the *Global Warming Solutions Act*. There are five principle themes in the Plan:

- Intensify efforts to ensure preparedness planning;
- Integrate climate change adaptation into existing plans;
- Update existing standards to accommodate change expected during infrastructure design life;
- Plan for flexibility and monitor change; and
- Protect natural areas and landscape features that buffer potential impacts from climate change.

The Plan builds on a previous plan, *The Impacts of Climate Change on Connecticut Agriculture, Infrastructure, Natural Resources and Public Health*. This impacts report outlines anticipated effects from climate change on key sectors of Connecticut society. Four working groups convened to determine the vulnerabilities within each of four sectors, agriculture, infrastructure, natural resources and public health, as they relate to temperature and precipitation changes, as well as sea level rise.

2013 also marked the passage of two important adaptation bills: Public Act 13-179 *An Act Concerning the Permitting of Certain Coastal Structures by the Department*, and Special Act

## Taking Action on Climate Change 2014 Progress Report

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13-9, *An Act Concerning Climate Change Adaptation and Data Collection*. Public Act 13-179 contains updated sea level rise considerations and planning procedures, including the projected impacts on coastal development and permitting. Special Act 13-9 calls for a plan to establish a Connecticut Center for Coasts as well as for significant data collection, monitoring requirements, and reporting guidelines.

In accordance with the passage of Public Act 12-148, *An Act Enhancing Emergency Preparedness and Response* and findings in the 2013 CES, the Department initiated an \$18 million microgrid grant program to help communities establish distributed generation networks to keep critical infrastructure operational when the power goes down. Governor Malloy's first-in-the-nation microgrid grant program provided funds to nine different projects located in Bridgeport, Fairfield, Groton, Hartford, Middletown, Storrs, Windham, and Woodbridge. The build-out of microgrids at key areas around the state will reduce system and community vulnerabilities to power outages from extreme weather and to help mitigate human suffering, and enable faster recoveries after-storm recoveries events. This pioneering program will provide power for critical government services and businesses such as police, fire, and emergency response teams, hospitals and health care facilities, state and municipal emergency response centers, grocery stores and gas stations and to help support recovery efforts. Given the success of the first round of the microgrid grant program, a second round of at least \$15 million is authorized as part of the FY14- FY15 Biennial Budget. The Request for Proposals for this second round is currently open and closes in August 2014.<sup>29</sup>

Connecticut has also played a major role in local, regional, and federal adaptation planning. In 2010 the Department held a landmark workshop series, "Groton Coastal Climate Change Adaptation Workshops," using the town as a model for what a community-wide climate adaptation process would look like. More than 100 people from multiple levels of government, academia, and non-profit organizations attended the series of workshops that focused on climate science, vulnerabilities and modeling, and developing recommendations. Through the workshop a network of climate change adaptation practitioners was established that guided the development of the Connecticut Adaptation Resource Toolkit (CART), a website that features one-stop shopping for climate adaptation information and resources.

The Department offers trainings and events to support and inform local adaptation efforts, as well as to help coordinate and oversee funding opportunities for municipal adaptation work in the region through various regional and federal collaborations. The Department has provided and continues to provide multiple channels of assistance for city and town planners incorporating adaptation measures into their local activities and hosts a Coastal Hazards and Management Planning (CHAMP) tool on its website. The CHAMP tool has inundation mapping for various sea level rise scenarios for all 169 Connecticut municipalities. It also provides information on what can be done at the state and municipal levels for preparation and response.

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<sup>29</sup> Interested parties can following the proceeding at:  
[http://www.dpuc.state.ct.us/DEEPEnergy.nsf/\\$EnergyView?OpenForm&Start=1&Count=30&Expand=7.4&Seq=2](http://www.dpuc.state.ct.us/DEEPEnergy.nsf/$EnergyView?OpenForm&Start=1&Count=30&Expand=7.4&Seq=2)

## Taking Action on Climate Change 2014 Progress Report

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At the regional and federal level, the Department has been at the forefront of monitoring climate change and associated impacts with “Sentinel Monitoring for Climate Change in Long Island Sound.” Sentinel Monitoring is a multidisciplinary scientific approach to provide early warning of climate change impacts to ecosystems, species and processes in order to facilitate appropriate responses including adaptation. Using historic and additional monitoring where possible, the state and federal partnership program involves cross-collaboration with multiple disciplines and bi-state teams of dozens of scientists. This program is tied to policy making, as data gathered is used to guide policymakers as they plan for the Sound’s future. The Sentinel Monitoring program has been so successful that it has been scaled up for the entire Northeast and Gulf of Maine region through the Ecosystem Health Committee of the Northeast Regional Ocean Council and the Northeast Regional Association of Coastal and Ocean Observing Systems. The Department is a leader of this region-wide initiative. Additionally, the Department participates in the Coastal States Organization to craft new policy regarding climate adaptation and coastal hazards and in proposing supporting principles to “guide national legislation and policies associated with managing shorelines and reducing community vulnerability to coastal hazards.”

The Connecticut Climate Preparedness Plan brings climate preparedness and resiliency into focus in the state. Influenced by several significant storms in the past two years, a report by the Governor’s “Two Storm Panel,” and the work of the General Assembly’s Climate Change & Shoreline Preservation Taskforce, the Department partnered with the University of Connecticut and recently launched the Connecticut Institute for Community Resilience and Climate Adaptation (CIRCA). CIRCA, located at the University’s Avery Point campus in Groton, will be a multi-disciplinary, regional center of excellence, bringing together experts in the natural sciences, engineering, economics, political science, finance, and law to provide practical solutions to a changing climate. These solutions will help coastal and inland floodplain communities in Connecticut and throughout the Northeast better adapt to the changing climate and to improve the future resilience and sustainability of the state’s highly developed – yet habitat and natural resource-rich – coastline and inland watersheds.

In addition to its work with UConn at CIRCA, the Department will work to accomplish the following action items over the next 18 months:

- Update the State Natural Hazards Mitigation Plan in cooperation with the Division of Emergency Management and Homeland Security of the Department of Emergency Services and Public Protection;
- Incorporate the considerations of climate change and sea level rise into the recently adopted *2013 - 2018 Plan of Conservation and Development* as the Office of Policy Management and State agencies implement the new Plan;
- Develop and monitor action plans for ensuring a resilient energy infrastructure (e.g., microgrids and hardening of poles, wires and substations);
- Collaborate with municipalities in adapting publicly owned sewage treatment facilities to reduce potential for system failures;

- Assist the Department of Transportation as they implement a pilot program to resize culverts to accommodate increases in storm flows;
- Support Storm Sandy recovery efforts to ensure that rebuilding along the coastline is done in a sustainable manner;
- Collaborate with the Department of Insurance and the insurance industry to reduce loss of life and property and to promote adoption of more storm protective building practices;
- Incorporate adaptation planning into the prioritization of State and local open space protections and ensure that consideration of ecosystem services is included in the revision to the State's Green Plan;
- Include adaptation strategies in the statewide Wildlife Management and Forestry action plans as these plans are revised; and
- Support and provide technical assistance to municipalities interested in developing local adaptation plans.

### THE IMPORTANCE OF REGIONAL COLLABORATION

Connecticut actively participates in numerous regional initiatives geared to collectively address climate change issues. These initiatives are of critical importance to achieving meaningful GHG reductions. Some of these efforts are discussed in detail above: RGGI, the Conference of New England Governors and Eastern Canadian Premiers (NEG/ECP), the California "Clean Car" Program, the Transportation and Climate Initiative, and the Sentinel Monitoring for Climate Change in Long Island Sound program.

As mentioned in the Executive Summary, the NEG/ECP established climate change as an issue of regional importance in 2001 and produced the first international climate change action plan in the world. This effort between the United States and Canada has continued to be a successful example of cross-state and cross-country collaboration. There have been action resolutions for, revised long-term planning, and updated work plans that guide state climate change policy formation. In fact, Connecticut's own climate change policy and establishment of its mandatory GHG emission reduction goals have been strongly influenced by its involvement in the NEG/ECP.

Connecticut is also a participant in the Transportation and Climate Initiative (TCI), which was formed in 2011. This regional group is made up of ten other states and Washington D.C. There are four areas of focus for TCI: "1) developing clean vehicles and alternative fuels; 2) creating more sustainable communities; 3) adopting innovative communication and technologies; and 4)

advancing more efficient freight movement.”<sup>30</sup> Participation with regional transportation efforts through TCI is important as the siting of infrastructure, branding of new fuel sources, and facilitating of a regional build-out of sustainable transportation options requires constant collaboration.

In addition, Connecticut engages actively in regional and federal regulatory processes. The *2013 CES* recommends that the state engage vigorously in the regional and federal energy regulatory process through the newly created DEEP Bureau of Energy and Technology Policy. This arm of DEEP can help shape the policy direction and creation of FERC and ISO New England rules that in turn will directly impact how the State can shape its energy future. The *2013 CES* also calls for more active participation by Connecticut with regional organizations to support stricter federal product efficiency standards for appliances, equipment, and consumer products.

### STRATEGIES TO REACH THE 2020 GOAL

Connecticut’s attainment and maintenance of its 2020 GHG emissions goals will be dependent upon a combination of reductions in emissions from the electric power, residential, commercial, industrial and transportation sectors. Using the following portfolio of strategies, Connecticut is likely to achieve the reductions necessary to meet the 2020 goal:

#### TRANSPORTATION

- Committing with 7 other states to the deployment of more than 3 million ZEVs by 2025 under the ZEV MOU;
- Establishing “range confidence” and promoting electric vehicle use by spearheading the development of a statewide network of charging stations under the EVConnecticut Program;
- Building out filling station infrastructure to support vehicles and fleets that operate on low carbon and “no carbon” alternative fuels like compressed natural gas, liquefied natural gas, and hydrogen;
- Reducing the air pollutant and GHG emissions profile of the fleet of new, light duty passenger vehicles offered for sale in the state;
- Increasing outreach and education to promote the purchase of high fuel efficiency vehicles and alternative fuel vehicles and to encourage the pursuit of alternate modes of transportation;

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<sup>30</sup> Transportation & Climate Initiative, “Transportation & Climate Initiative of the Northeast and Mid-Atlantic States,” available at <http://www.georgetownclimate.org/sites/default/files/TCI%20brochure.pdf>.

# Taking Action on Climate Change

## 2014 Progress Report

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- Working cooperatively with the Department of Transportation to implement its Strategic Plan to increase mass transit opportunities and reduce traffic congestion; and
- Completing the CTfastrak, New Haven-Hartford-Springfield Rail Line, and enhancements to the Metro-North service between New Haven and New York City.

### **ELECTRIC POWER**

- Continuing to deploy unprecedented numbers of in-state renewable energy projects through the Low Emissions and Zero Emissions Renewable Energy Credit (LREC/ZREC) and innovative financing for residential, commercial and municipal solar photovoltaic projects;
- Procuring grid-scale Class I Renewable Energy to ensure compliance with the State's Renewable Portfolio Standard and to provide opportunities to displace fossil fuel generation within Connecticut and the New England Region;
- Reducing CO<sub>2</sub> emissions budgets for generating units under the Regional Greenhouse Gas Initiative (RGGI);
- Implementing programs outlined in the 2013-2015 Conservation and Load Management Plan and increasing funding to the Conservation and Load Management Fund to reduce statewide electricity demand, electricity consumption and emissions; and
- Coordinating and pursuing the New England States' regional initiative to accelerate regional cooperation on expanding renewable energy and infrastructure for electric transmission and natural gas pipelines in New England.

### **RESIDENTIAL, COMMERCIAL AND INDUSTRIAL SECTORS**

- Executing a natural gas expansion plan designed to make this cheaper, cleaner burning fuel available to more than 280,000 new customers and potentially reduce the state's overall GHG emissions by 8% over the next seven years;
- Expanding the flow of funding for energy efficiency measures that dramatically reduce fossil fuel consumption in state, municipal, commercial, industrial, and institutional facilities through Lead-By-Example, Energy Savings Performance Contracting, and C-PACE programs;
- Pursuing aggressive goals to weatherize 80% of state housing units by 2030 through programs like Home Energy Solutions and the Federal Weatherization grants;
- Promulgating energy efficient state building codes for new construction;
- Adopting energy efficiency standards for many household appliances; and

- Promoting the development of financing programs to make residential energy efficiency investments more affordable.

## **AGRICULTURE/WASTE**

- Promoting efforts under the State's Solid Waste Management Plan to increase recycling and source reduction;
- Exploring opportunities to use anaerobic digestion and combined heat and power systems to capture carbon emissions and cost effectively generate energy.

## **Conclusion**

Connecticut can be proud of its progress to date on not only achieving GHG emission reductions, but for creating the regulatory and institutional framework needed to support continued progress—including the enactment of climate change legislation, the creation of an integrated energy and environment agency (DEEP), the establishment and strengthening of the RGGI program, the significant increases in energy efficiency investments, the vigilant pursuit of a lower emitting transportation sector, the tremendous gains in the deployment of renewable energy, and the launch of the nation's first Green Bank which is using creative financing models to further leverage ratepayer investments in efficiency and renewable energy. This framework will enable the state to achieve its 2020 mandates sooner than 2020, and provides a strong foundation for developing the additional strategies that will be needed to establish a trajectory to meet the even more ambitious 2050 mandate.

Moving forward, over the coming months, the state will continue to explore opportunities to further capitalize on the job creation and other economic benefits of a clean energy economy; and, DEEP will explore setting thoughtful, achievable, interim goals to motivate and monitor the state's continued progress toward achieving the 2050 GWSA 80% reduction mandate.

Connecticut's process for planning and evaluating its climate future should be aligned with President Obama's Climate Change Action Plan. In addition we should continue to work with other leadership states to demonstrate the economic, environmental and public health benefits of advancing measures that mitigate climate change - as well as those needed to better adapt to changes that are already occurring. While Connecticut remains strongly committed to dramatically reducing its own GHG emissions, we know that we must be equally focused on lessening the human and environmental toll of the impacts from a changing climate.

To that end Governor Malloy recently announced the creation of CIRCA, a collaborative effort between UConn and DEEP. This multi-disciplinary, regional center of excellence at UConn's Avery Point campus is bringing together experts in the natural sciences, engineering, economics, political science, finance, and law to provide practical solutions to a changing climate that will help coastal and inland floodplain communities in Connecticut and throughout the Northeast

## Taking Action on Climate Change 2014 Progress Report

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better adapt to the changing climate and to improve the future resilience and sustainability of the state's highly-developed – yet habitat and natural resource-rich – coastline and inland watersheds. While the CIRCA's immediate attention will be on Connecticut and the Northeast, the Institute will also be a model for comprehensive approaches to climate change and its impacts at the national and international scales.

Connecticut's dual focus on mitigation, as set forth in the GWSA, and adaptation needs, as outlined in the GSC's 2011 Climate Change Preparedness Plan and advanced by the creation of CIRCA at UConn's Avery Point campus clearly position the state as a national leader in addressing climate change.

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Taking Action on Climate Change  
2014 Progress Report – APPENDIX A

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APPENDIX A: CONNECTICUT’S CLIMATE CHANGE LEADERSHIP MILESTONES

Year	CT Accomplishments
2014	<ul style="list-style-type: none"> <li>CT launches the Connecticut Institute for Resiliency and Climate Adaptation on the UConn’s Avery Point Campus</li> </ul>
2013	<ul style="list-style-type: none"> <li>December 2013 – CT and the RGGI States revise and strengthen their individual Carbon Dioxide Budget Emission Trading Programs</li> <li>CT procures 270 MW of emissions-free solar and wind power under Public Act 13-303</li> <li>CT doubles investments in energy efficiency under Public Act 13-298</li> <li>October 2013 – CT and 7 other states sign the ZEV MOU, committing to the deployment of 3.3 million ZEVs by 2013</li> <li>2013 Comprehensive Energy Strategy Released</li> <li>Connecticut Climate Change Preparedness Plan Released</li> </ul>
2011	<ul style="list-style-type: none"> <li>Department of Energy and Environmental Protection Established Integrating Environmental and Energy Policy</li> <li>CEFIA, the nation’s 1<sup>st</sup> Green Bank, established</li> </ul>
2010	<ul style="list-style-type: none"> <li>CT Greenhouse Gas Emissions: Mitigation Options Overview and Reduction Estimates is Published by NESCAUM</li> <li>CT Initiates Modeling and In-Depth Analysis of Strategies to Meet CT GHG Targets</li> <li>CT DEP and CT Business and Industry Association Hold CT Summit on Business Sustainability</li> <li>Governor's Steering Committee on Climate Change (GSC) Adaptation Subcommittee Issues The Impacts of Climate Change on Connecticut Agriculture, Infrastructure, Natural Resources and Public Health</li> <li>GSC Holds Municipal Summit on Climate Action</li> <li>CT is One of Eleven States and the District of Columbia to Launch the Transportation and Climate Initiative (TCI)</li> </ul>

## Taking Action on Climate Change 2014 Progress Report – APPENDIX A

2009	<ul style="list-style-type: none"> <li>• 2009 CT GHG Inventory Published</li> <li>• Governor's Steering Committee on Climate Change (GSC) Adaptation Subcommittee Formed</li> <li>• GHG Labeling Program for Cars Goes Into Effect</li> <li>• US EPA Approves Waiver Allowing CA a GHG Emissions Standard for Cars to be Implemented in the 14 States that it was Adopted, Including CT</li> <li>• Northeast and Mid-Atlantic States Including CT Sign a Memorandum of Understanding on a Low Carbon Fuel Standard</li> <li>• Connecticut Signs the Governors' Energy and Climate Coalition Statement of Principles and the Global Climate Solutions Declaration</li> </ul>
2008	<ul style="list-style-type: none"> <li>• CT Global Warming Solutions Act (Public Act 08-98) Reaffirms CT's Commitment to GHG Targets for 2020 and 2050</li> <li>• CT and Northeastern States Participate in the First Auction of the Regional GHG Initiative (RGGI), the First Cap and Trade Program in the Nation</li> <li>• CT Signs the Governors' Declaration on Climate Change at Yale University</li> </ul>
2007	<ul style="list-style-type: none"> <li>• A 6-Month Stakeholder Dialogue Reviews Progress of Implementing the CT Climate Change Action Plan and Develops Additional GHG Reduction Strategies</li> <li>• An Act Concerning Electricity and Energy Efficiency (Public Act 07-242) Requires Energy Efficiency to be Treated as a Resource of 1st Choice in Meeting Electricity Demand, Increases the Renewable Portfolio Standard to 20% from Class I Resources, Creates a Home Heating Oil Efficiency Program, and Expands Appliance Efficiency Standards</li> </ul>
2006	<ul style="list-style-type: none"> <li>• CT GHG Inventory 2006 Update is Published</li> </ul>
2005	<ul style="list-style-type: none"> <li>• Governor's Steering Committee on Climate Change Finalizes the CT Climate Change Action Plan and Submits it to the General Assembly</li> </ul>
2004	<ul style="list-style-type: none"> <li>• An Act Concerning Climate Change (Public Act 04-252) Establishes CT-Specific GHG Goals that Align with the New England Governors and Eastern Canadian Premiers (NEG/ECP) Goals</li> <li>• 9-Month Stakeholder Dialogue Develops Recommended Actions to Reduce CT GHG Emissions, the 2004 Connecticut Stakeholder Recommendations</li> </ul>
2003	<ul style="list-style-type: none"> <li>• CT Publishes the first Statewide GHG Inventory</li> </ul>

## Taking Action on Climate Change 2014 Progress Report – APPENDIX A

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2002

- CT State Agencies Hold Forum to Establish Framework for State Climate Change Program to meet New England Governors and Eastern Canadian Premier (NEG/ECP) Goals

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2001

- CT Helps Spearhead First International, Multi-Jurisdictional Climate Change Initiative in the World by Signing the NEG/ECP 2001 Climate Change Action Plan and Agreeing to Regional GHG Reductions

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## APPENDIX B: ASSESSMENT OF RECENT SCIENTIFIC FINDINGS ON CLIMATE CHANGE

In accordance with C.G.S. Section 22a-200a, the Department, the Office of Policy and Management, and the Governors Steering Committee on Climate Change (GSC) is charged with producing a report that includes an assessment of the most recent scientific findings regarding climate change. As one of, if not the most, studied areas of scientific research, climate change science is becoming more definitive and encompassing each passing day. The most recent report by the Intergovernmental Panel on Climate Change (IPCC), the international scientific body charged with synthesizing and reporting climate change science, states “warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of GHGs have increased.”<sup>31</sup> Furthermore, the IPCC report makes clear, with 95-100% probability, that humans are the cause of this warming. Attribution of climate warming to human causes has grown in certainty from the previous Assessment Report, the AR4.

Thus, current science indicates that climate change is an unquestioned result of human activities. Connecticut and its neighboring states have not escaped the impacts of climate change.

Figures B-1, B-2, and B-3 highlight relatively recent (1980-2012) annual trends in average surface air temperature, precipitation, and average near surface water temperatures (for Long Island Sound). In each, trend lines depict slight increases in temperature and precipitation over time.

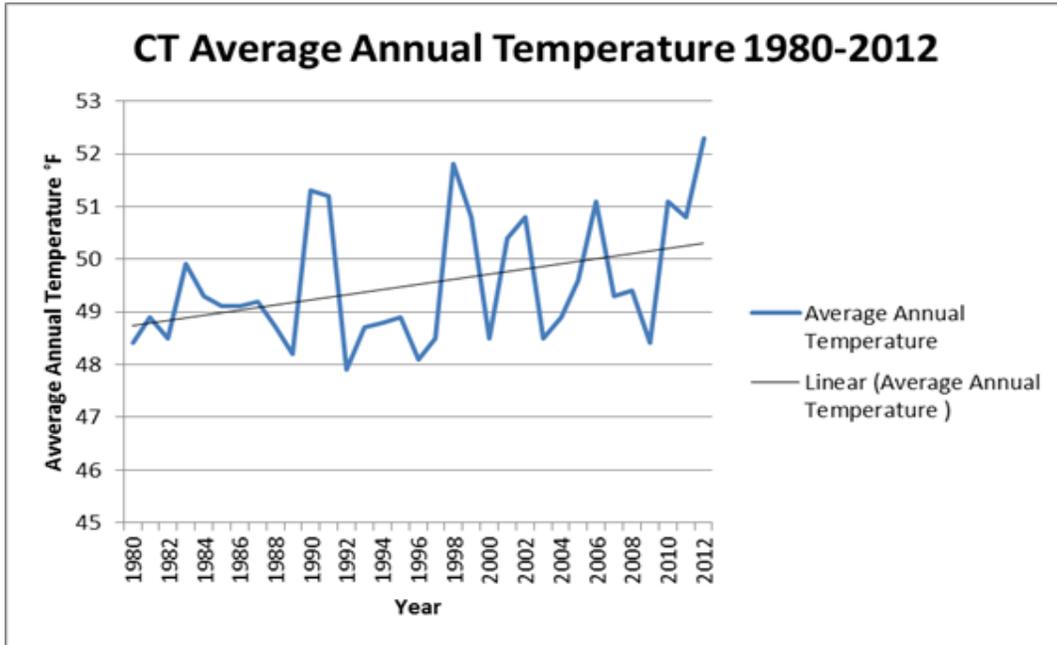
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<sup>31</sup> Intergovernmental Panel on Climate Change, “Summary for Policymakers, Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change,” (p.2). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

# Taking Action on Climate Change 2014 Progress Report – APPENDIX B

**Figure B-1. Average annual temperatures recorded in Connecticut from 1980-2012.**

From 1901-2000 the state’s average temperature was 48.5°F.<sup>32</sup> In 2012 the average annual temperature reached 52.3°F.<sup>33</sup>



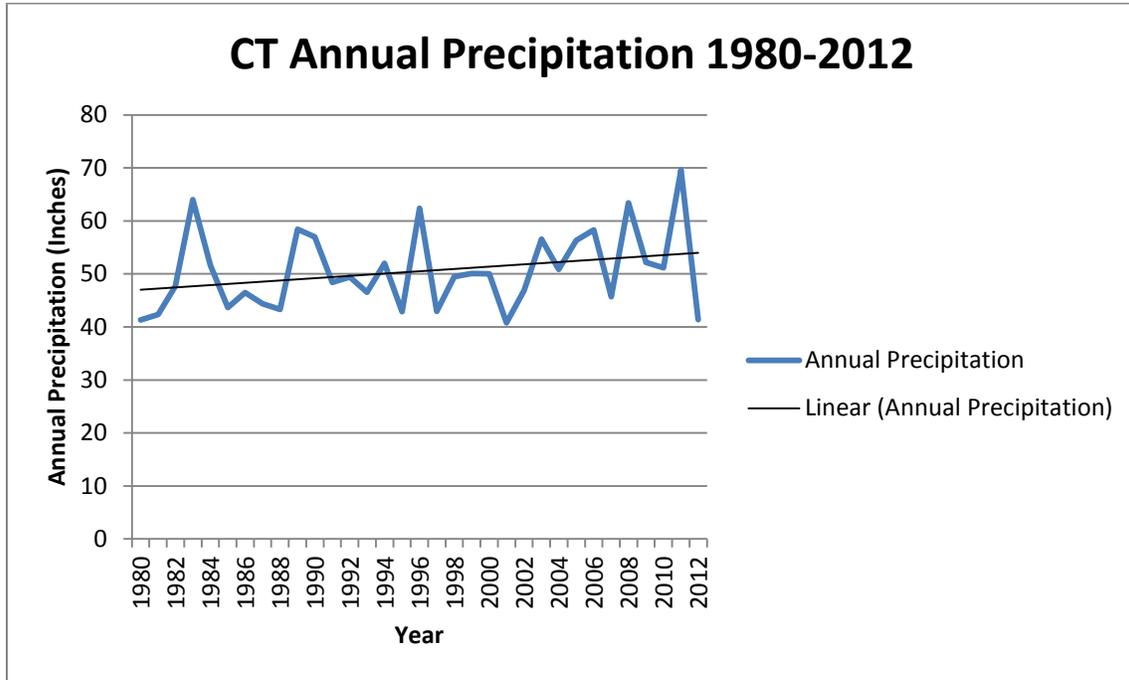
Source: NOAA, *Climate at a Glance*, National Climatic Data Center

<sup>32</sup> NOAA, National Climatic Data Center, “Climate at a Glance,” Available at <http://www.ncdc.noaa.gov/cag>.

<sup>33</sup> *Ibid.*

**Figure B-2. Annual precipitation amounts in Connecticut from 1980-2012.**

From 1901-2000 the state’s average annual precipitation was 45.31”.<sup>34</sup>

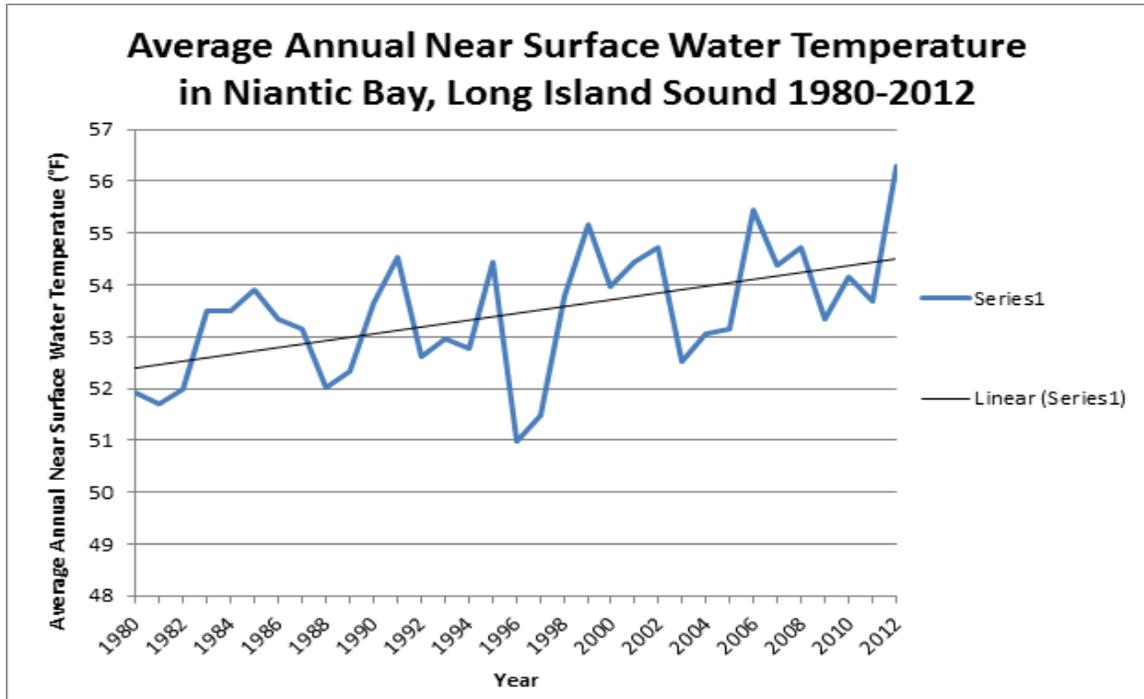


Source: NOAA, *Climate at a Glance*, National Climatic Data Center.

<sup>34</sup> *Ibid.*

**Figure B-3. Average annual near surface water temperature for Niantic Bay, Long Island Sound from 1980-2012.**

Niantic Bay is located east of the Connecticut River and 4.5 miles west of New London Harbor.



Source: DEEP Analysis.

Figures B-1, B-2, and B-3 depict observed temperature and precipitation recordings for the State of Connecticut. The state does not currently make projections on how climate change will impact these factors or any other. As such, climate projections for CT will be extrapolated from neighboring locations within our region. For this report, New York City is used as a proxy.

The New York City Panel on Climate Change (NPCC2) recently convened in January of 2013 to reassess and recalculate observed and as well as anticipated effects from climate change. The work of the NPCC2 builds on earlier work of the group released in 2009.<sup>35</sup> The NPCC2 reports that over the last century (1900-2011) mean annual temperature in New York City increased by 4.4°F, mean annual precipitation increased 7.7 inches over the same period, and sea level (at the Battery in NYC) increased 1.1 feet. The middle range projections of the NPCC2 report predict that in NYC average temperature will increase 2.0-3.0°F by the 2020s and 4.0-5.5°F by the 2050s. Middle range projections for precipitation anticipate an increase of 0-10% by the 2020s and 5-10% increase by the 2050s. The report expects sea level to rise 4-8 inches by the 2020s

<sup>35</sup> The 2009 NPCC report was cited in the CT Global Warming Steering Committee Adaptation Subcommittee reports, *The Impacts of Climate Change on Connecticut Agriculture, Infrastructure, Natural Resources, and Public Health (2010)* and the *Connecticut Climate Change Preparedness Plan (2013)*.

## Taking Action on Climate Change 2014 Progress Report – APPENDIX B

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and 11-24 inches by the 2050s. Finally, with greater than 90% probability, the NPCC2 predicts that heat waves and heavy downpours will increase in frequency, intensity and duration; and coastal flooding (with greater than 90% probability) will increase in frequency, extent, and height.

Both the 2010 report *The Impacts of Climate Change on Connecticut Agriculture, Infrastructure, Natural Resources, and Public Health* and the *Connecticut Climate Change Preparedness Plan*, published in 2013, indicate that the state would benefit from dedicated, statewide climate change research and modeling. At the time of publication of this CAP, this observation remains true. It would be advantageous for Connecticut climate change policy, especially adaptation policy, to have a solid state base from which to be built. State-specific information on the projected impacts of climate change will be critical to design, implement, and measure the success of refined climate policy measures.