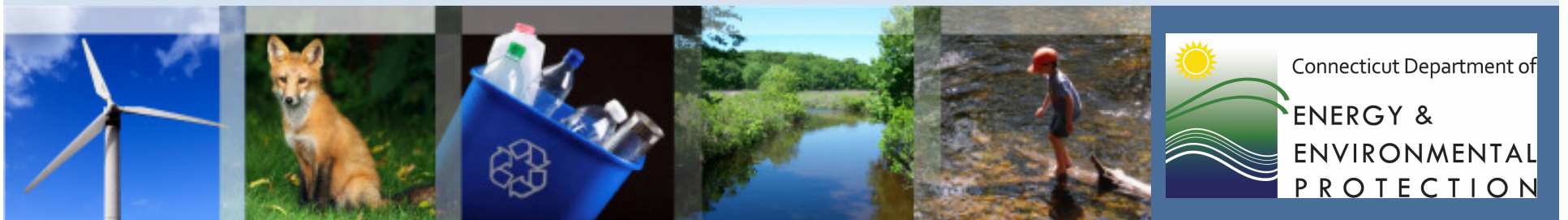
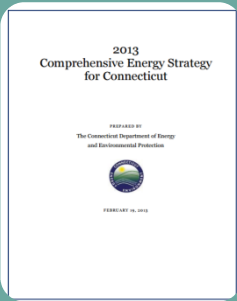




Connecticut Department of Energy and Environmental Protection

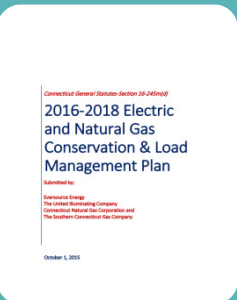


Energy Plans



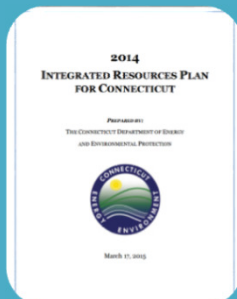
Comprehensive Energy Strategy

3 years, strategy for energy uses across all sectors in state. Should report findings of IRP



Conservation & Load Management Plan

3 years, investment plan for CT Energy Efficiency Fund



Integrated Resources Plan

2 years, assessment of electricity supply/demand



Background of the CES Proceeding

Statutory Authority

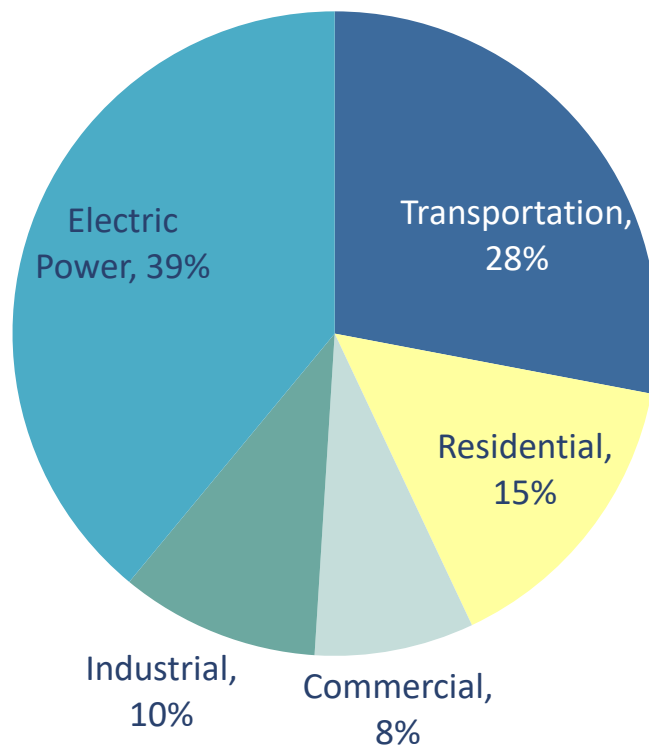
(C.G.S. § 16a-3d) requires DEEP to develop a CES every three years that incorporates:

- A plan for the state's energy needs
- IRP, Green Bank renewables plan, and Energy Assurance Plan
- Assessment of current energy supplies, demands, and costs
- Factors likely to affect the energy future
- Statement of progress toward achieving 2013 CES goals
- Statement of energy policies, objectives, and strategies
- Recommendations for legislative and administrative actions
- Assessment of potential cost savings/benefits to ratepayers
- Benefits, costs, obstacles, and solutions to expanding natural gas

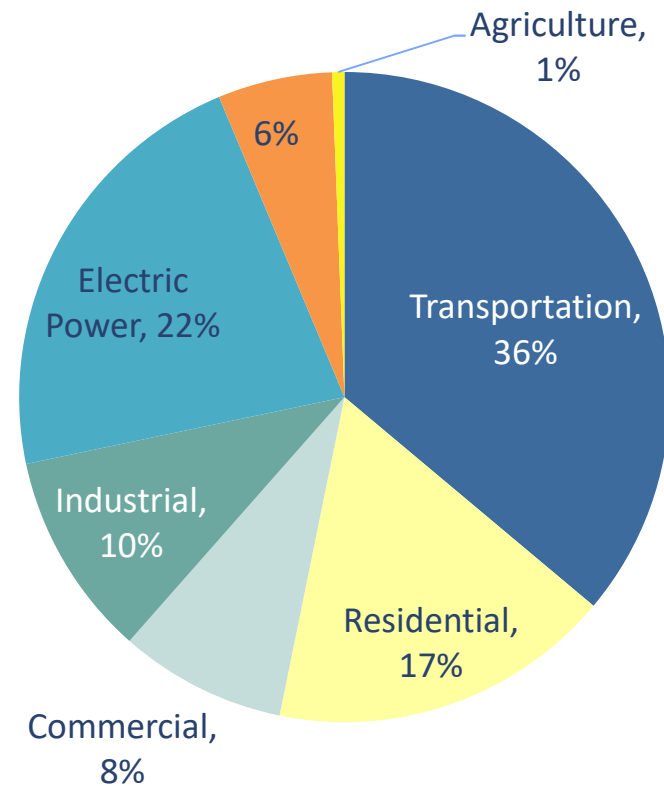


Current Consumption and Emissions Trends

Energy Consumption by Sector



GHG Emissions by Sector



2017 CES Chapters

Electric Power

Buildings

Transportation



CES Electric Power Sector Chapter



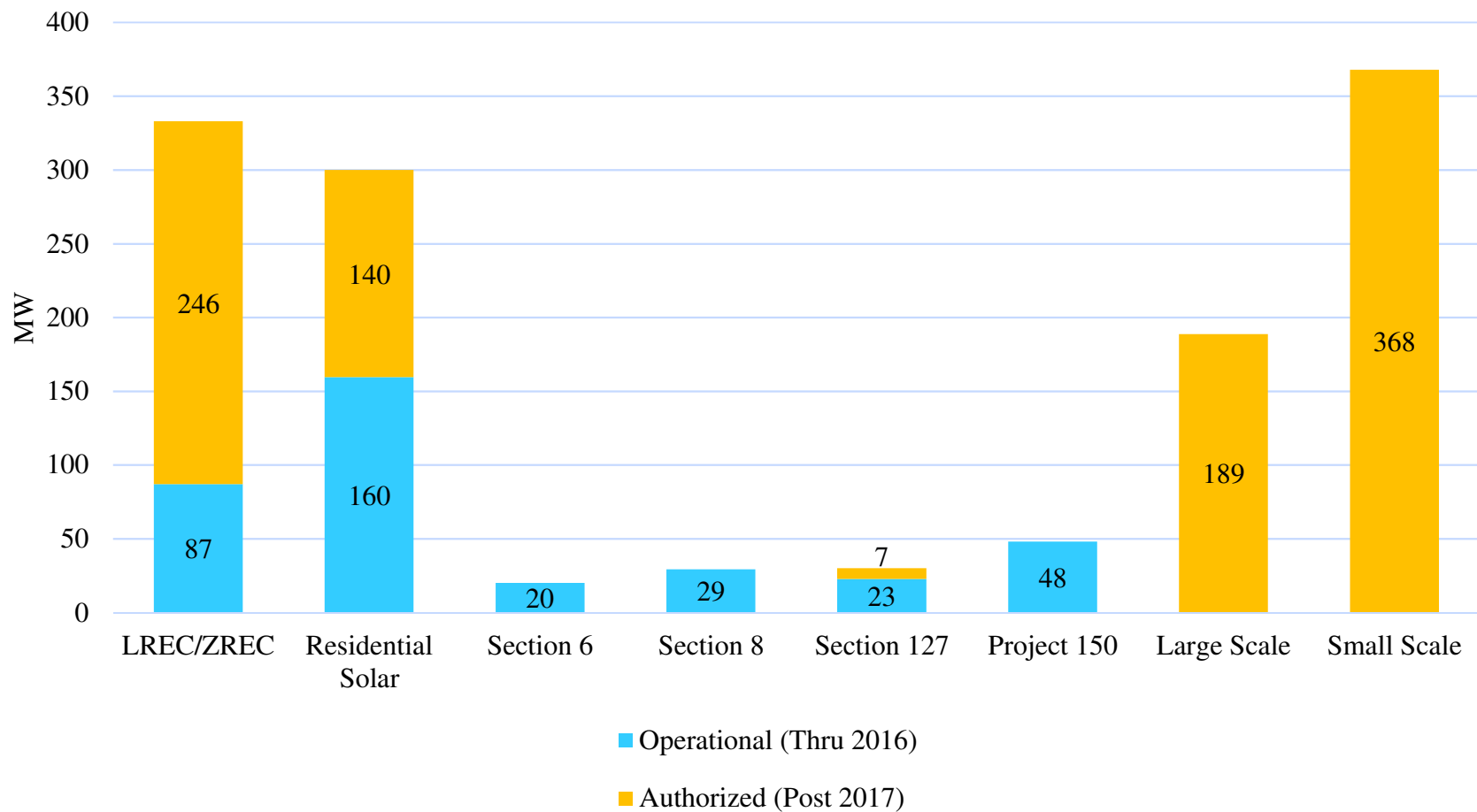
2013 CES: Key Accomplishments

- Virtual net metering expanded to included municipal, state and agricultural hosts
- Micro-grid deployment throughout the state
 - First in the country
 - 5 operational; 5 in development
 - Program will result in up to 20 microgrids statewide
- Waste to energy RPS restructuring in 2017



2013 CES: Key Accomplishments

Grid Scale and Behind the Meter Capacity Under CT Programs



Electric Power Sector Goals and Strategies

Goal 1: Align renewables programs with Renewable Portfolio Standard (RPS) and Global Warming Solutions Act (GWSA).

Goal 2: Continue to support regional and state reliability/resiliency.



Electric Power Sector Goals & Strategies

Goal 1: Align existing programs supporting renewable and zero carbon resources with renewable portfolio standards and Global Warming Solutions Act goals.

E.1.1 Expand RPS to 30% by 2030.

E.1.2 Phase down biomass and landfill methane gas REC values.

E.1.3 Achieve a sustainable balance between behind-the meter and grid-scale.

E.1.4 Increase transparency and certainty in the cost structure for net energy billing by creating renewable energy tariffs.

E.1.5 Evaluate the conditions around sustaining diverse zero-carbon generation to meet Connecticut GHG reduction goals.

E.1.6. Pursue goals of the Shared Clean Energy Facilities (SCEF) through multiple avenues, based on lessons learned from the pilot program

E.1.7 Strengthen voluntary REC product verification for competitive suppliers.

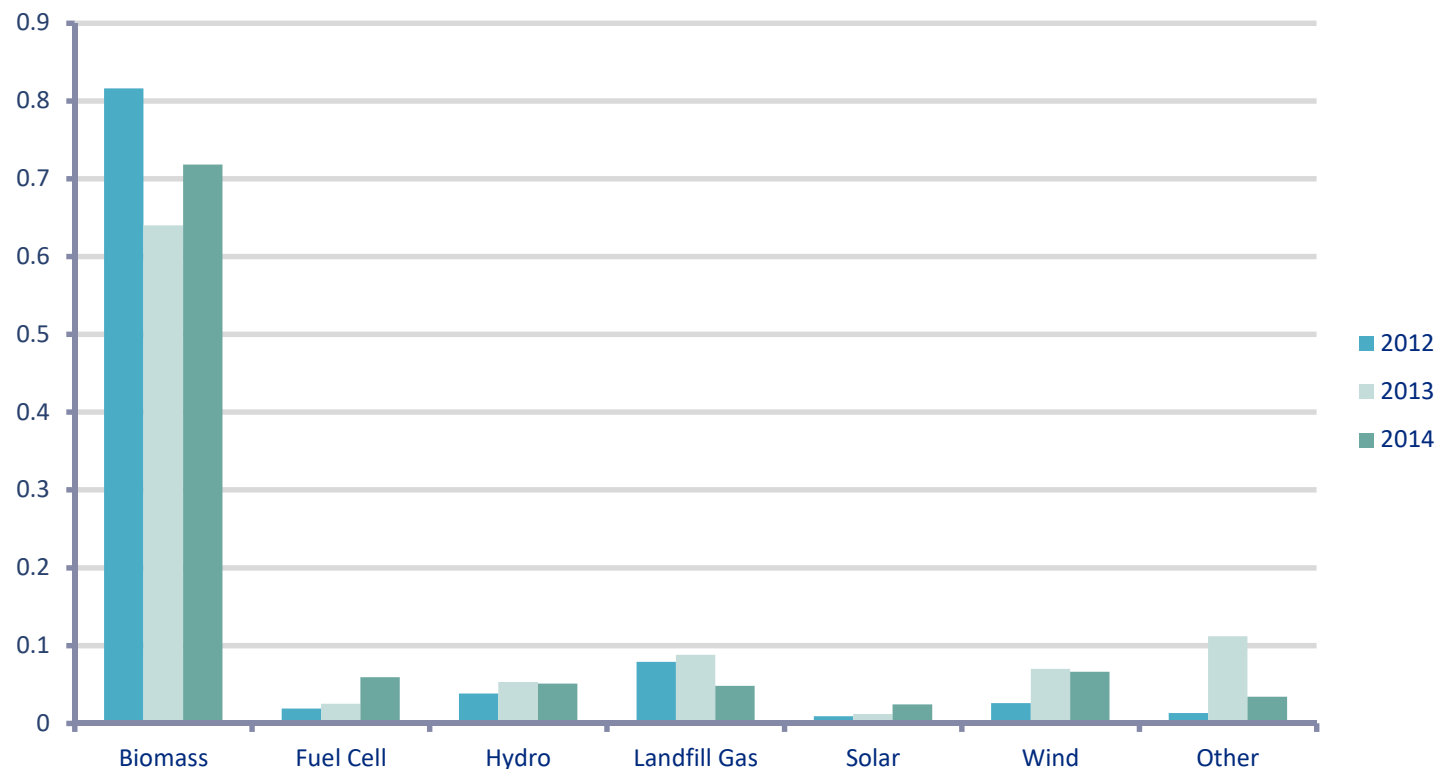
E.1.8 Convene renewable siting working group to implement best practices to optimize siting of renewable facilities on appropriate sites in Connecticut.



E.1.1 and E.1.2. Expand RPS to 30% by 2030 and Phase down biomass in Class I

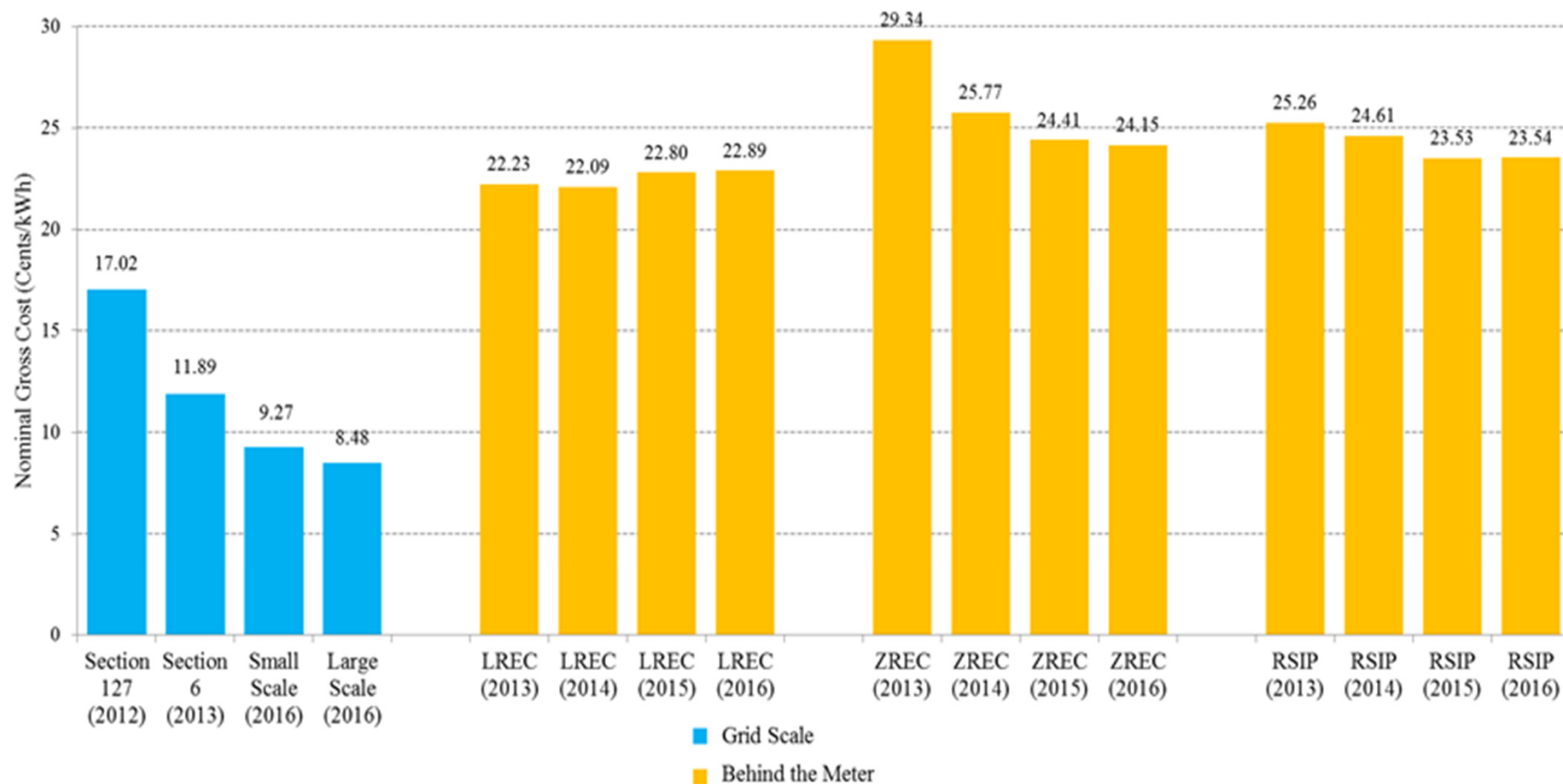
- Increase Class I RPS to 30% by 2030
- Phase down biomass and landfill methane gas
 - Reduce to 50% value for over 750 MW of biomass registered in CT (15 years for existing resource and 20 years for new resource)

RPS Class I Fuel Source



E.1.3 Achieve a sustainable balance between behind-the meter and grid-scale

Declining Cost of Clean Energy Programs, Behind the Meter and Grid Side (nominal dollars, 2012-2016)



** Average cost for RSIP was levelized over 20 years for Purchased Residential PV systems and not leased systems.*



E.1.3 Achieve a sustainable balance between behind-the meter and grid-scale

- Bring down cost of RPS achievement through emphasis on grid scale, defined space for BTM
 - Through new BTM tariff structure, solicit for 0.25% annual load procured from BTM in different customer segments (C&I, residential).
 - Results in additional 2.5% load by 2030
 - Remaining 7.5% by 2030 procured through grid-scale
- Re-examine 0.25% if BTM resource costs decline
- **Context:** Current installed BTM resources equal ~1.6% load
 - Net metering unlimited, but functionally limited by LREC/ZREC/RSIP programs now; virtual net metering capped



E.1.4 Increase transparency and certainty in the cost structure for net energy billing by creating renewable energy tariffs.

Context

- Current net energy billing not easily understood, can vary considerably for the same energy product.
- BTM resources provide benefits to the grid, but net metering rate is not based on any costs or benefits.
- CT has highest electric rates in continental US and overall BTM compensation with net energy billing is over 2.5x cost of recent grid-scale projects.



E.1.4 Increase transparency and certainty in the cost structure for net energy billing by creating renewable energy tariffs.

Transition to “renewable energy tariff” financial structure to replace net energy billing and give consistent market signal for RE growth.

- EDCs deliver fixed payment for energy and RECs for set term.
- BTM resources compensated based on:
 - Competitive reverse auction for larger BTM
 - Rate established by PURA for smaller BTM
- BTM resource mix defined by customer segment, technology in the IRP (See E.1.3)



E.1.5 Evaluate the conditions around sustaining diverse zero-carbon generation to meet Connecticut GHG reduction goals.

- Due to low natural gas prices, many generators face challenging economic conditions particularly zero-carbon generators like nuclear operators.
- **Next Step:** assess zero-carbon generation sustainability based on ratepayer and climate risks and impact
- Potential retention mechanisms to evaluate:
 - Procurement for zero-carbon resources (nuclear and hydro)
 - Standard service contracts
 - Clean energy standard



E.1.6. Pursue goals of the SCEF through multiple avenues, based on lessons learned from the pilot program

Use additional paths to achieve SCEF objectives

1. Strengthen customer choices to allow for new renewables projects, with changes to voluntary RECs in competitive supplier market (see E.1.7)
2. Integrate SCEF customers into new procurement bucket (functionally add as 4th virtual net metering customer segment)

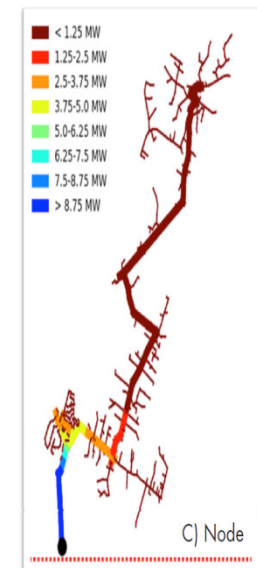
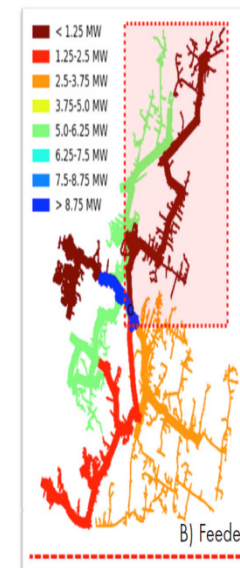
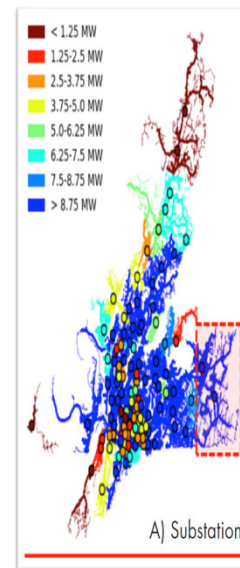
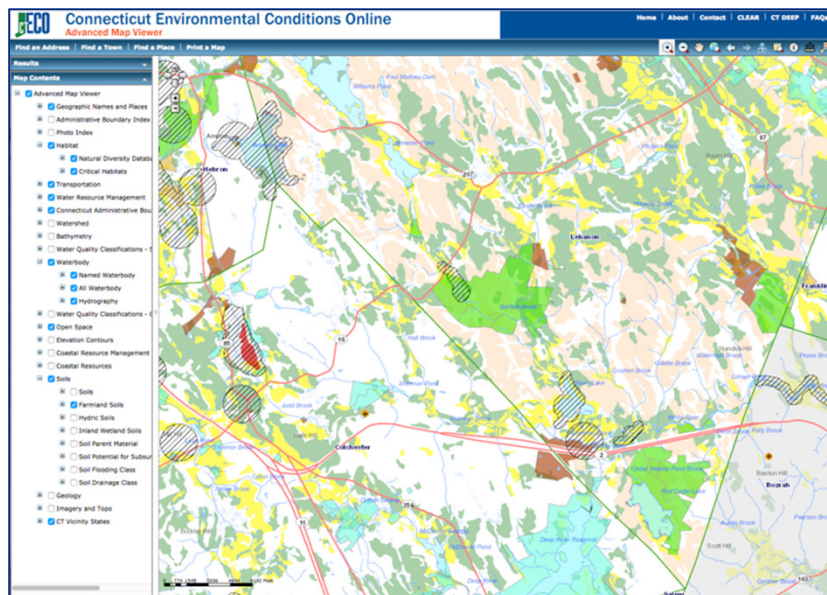
Key SCEF Features

1. Customer purchases percentage of facility or facility output, or enters into long-term lease with fixed monthly payment.
2. Declining cost cap



E.1.8 Convene a working group to implement best practices to optimize siting of renewable facilities on appropriate sites in Connecticut.

- New criteria for Siting Council in S.B. 943
- Future DEEP procurements prioritize positive site re-use (brownfields, landfills)
- Working group building on January 2017 workshop.



Electric Power Sector Goals & Strategies

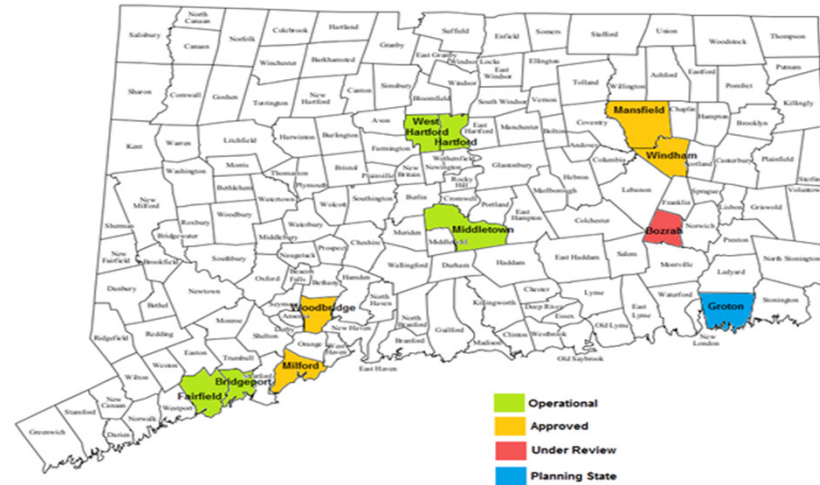
Goal 2: Continue to support regional and state reliability/resiliency

E.2.1 Support ISO-NE with winter reliability

E. 2.2 Deploy micro-grids in key locations

E.2.3. Ensure coastal resiliency of substations and other critical grid infrastructure to support DEEP's flood management goals.

E. 2.4 Identify and explore grid modernization initiatives



CES Transportation Sector Chapter



Transportation Sector Key Components

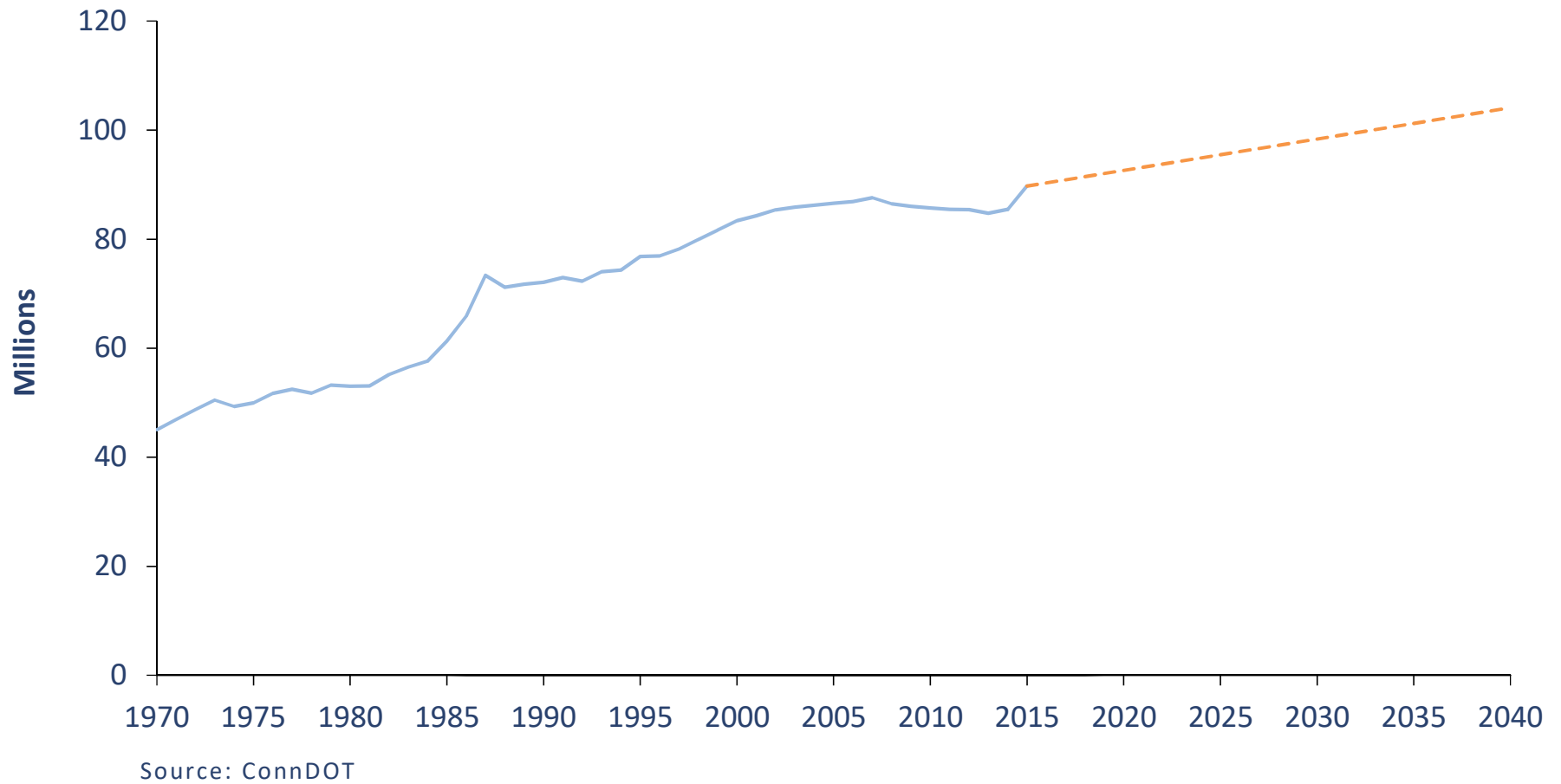
3 Primary Ways to Reduce Transportation Emissions & Energy Use

1. Encourage use of low-carbon fuel
2. Increase vehicle fuel efficiency
3. Reduce the number vehicle miles traveled



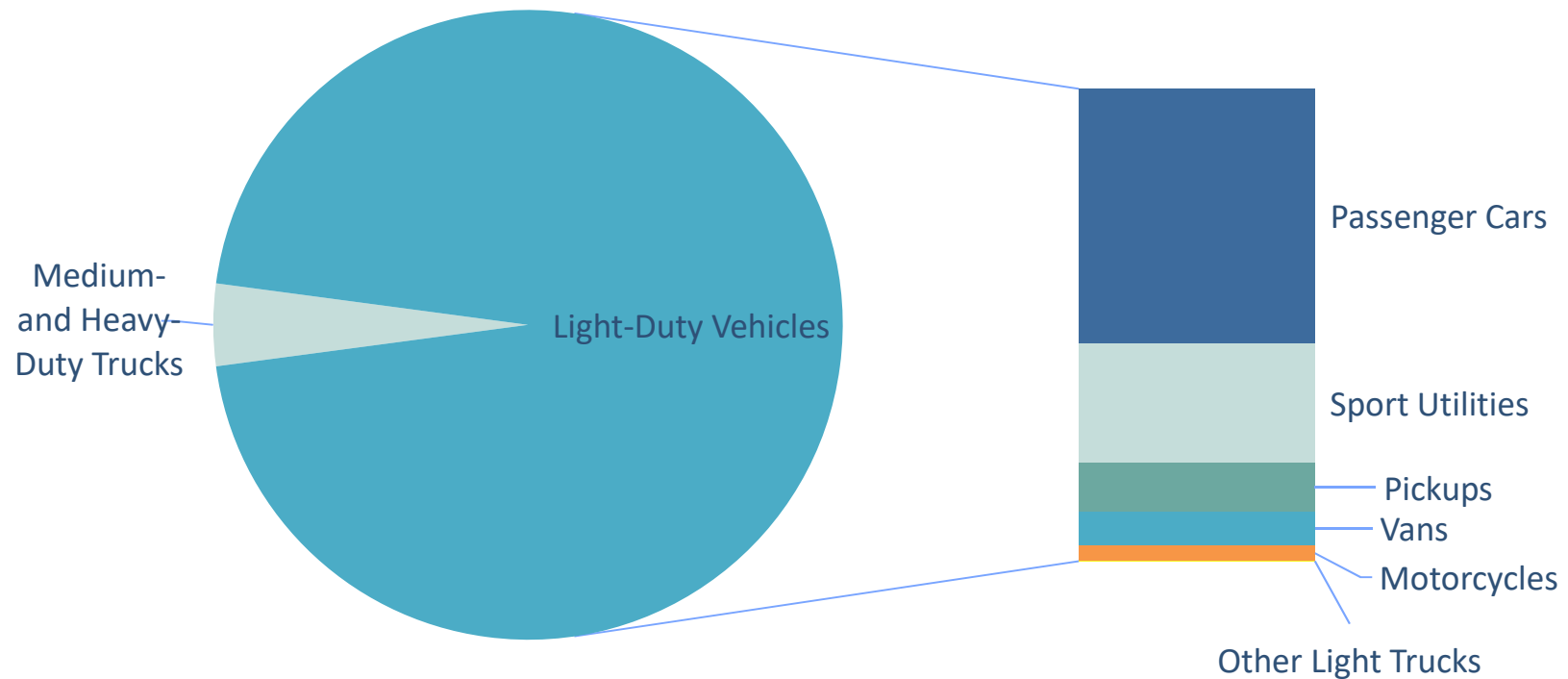
Transportation Context

Average Daily Vehicle Miles Traveled Statewide (All Vehicles Combined)



Transportation Context

Vehicle Registrations in CT in 2013



In 2013, Connecticut had about 1.47 million passenger cars and 1.17 million light trucks (vans, pickups and sport utility vehicles) on its roads, and about 120,000 buses, tractor-trailers, and other medium- and heavy-duty vehicles.

Source: Atlas Public Policy and The Cadmus Group, Inc., Moving Forward with Green Energy: Market Potential Assessment for Alternative Fuel Vehicles in Connecticut, p. 16, September 2016.



Transportation Context

Congestion-related Costs and Hours Wasted

Urban Area	Average Cost of Congested-related Delays per Driver	Average Number of Hours Wasted in Traffic
Bridgeport/Stamford	\$1,174/year	49 hours/year
Hartford	\$1,038/year	45 hours/year
New Haven	\$932/year	40 hours/year

Source: Texas A&M Transportation Institute, 2015 Urban Mobility Scorecard, p. 20, August 2015.



2013 CES: Key Accomplishments

Alternative fuel vehicles

- ✓ ZEV Memorandum of Understanding
- ✓ Launch of CHEAPR program

Alternative fuel vehicle infrastructure

- ✓ EVConnecticut municipal and business charging station grants program

Smartgrowth/Transit Oriented Development(TOD)

- ✓ Let's Go CT!
- ✓ Ctfastrak
- ✓ ConnDOT adopted a Complete Street policy and Community Connectivity Program.
- ✓ TOD Planning Grant Program and the Responsible Growth and TOD Grant Program

Heavy Duty Vehicles & Freight

- DEEP partnered with the EPA's SmartWay®



2013 CES: Key Achievements



On October 24, 2013, Connecticut Governor Malloy along with the governors of seven other states (CA, MD, MA, NY, OR, RI and VT) announced a groundbreaking initiative to put 3.3 million ZEVs on the roads in these states by 2025.

Multi-state ZEV Action Plan: Eleven Key Actions

Action #1 Promote the availability and effective marketing of all plug-in electric vehicle models in our states and support these efforts

Action #2 Provide consumer incentives to enhance the ZEV ownership experience

Action #3 Lead by example through increasing ZEVs in state, municipal, and other public fleets

Action #4 Encourage private fleets to purchase, lease, or rent ZEVs

Action #5 Promote workplace charging

Action #6 Promote ZEV infrastructure planning and investment by public and private entities

Action #7 Provide clear and accurate signage to direct ZEV users to charging and fueling stations and parking

Action #8 Remove barriers to ZEV charging and fueling station installations

Action #9 Promote access, compatibility, and interoperability of the plug-in electric vehicle charging network

Action #10 Remove barriers to retail sale of electricity and hydrogen as transportation fuels and promote competitive plug-in electric vehicle charging rates

Action #11 Track and report progress toward meeting the goal of 3.3 million ZEVs on our roadways by 2025



2013 CES: Key Achievements



The Connecticut Hydrogen and Electric Automobile Purchase Rebate (CHEAPR) offers point-of-sale rebates of up to \$5,000 for Connecticut residents who purchase or lease a new eligible battery electric, plug-in hybrid electric or fuel cell electric vehicle.

Center for Sustainable Energy (2017). Connecticut Department of Energy and Environmental Protection Connecticut Hydrogen and Electric Automobile Purchase Rebate, Rebate Statistics. Data last updated May 30, 2017. Retrieved June 1, 2017 from: <http://ct.gov/deep/cwp/view.asp?a=2684&q=565018>

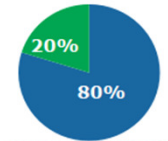
Data last updated: June 13, 2017

Filter By: Home Zip Code: All

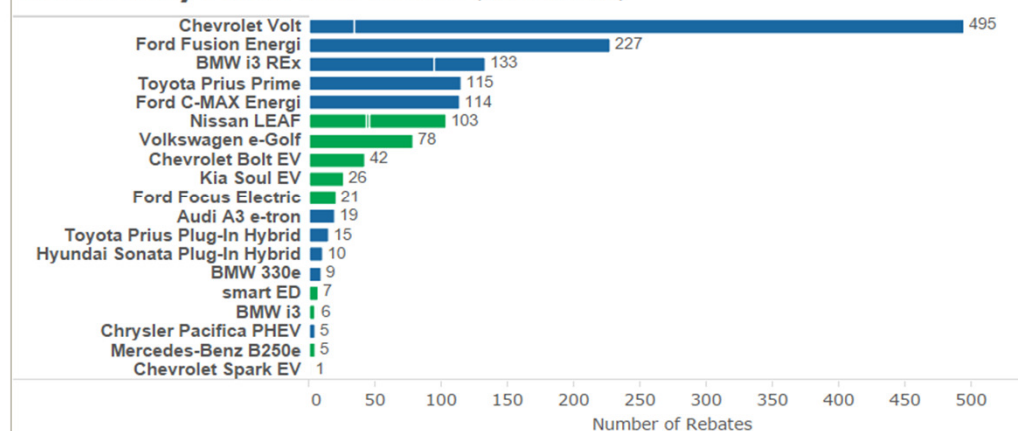
Application Date: 5/19/2015 to 6/6..

Program Summary (select to filter)

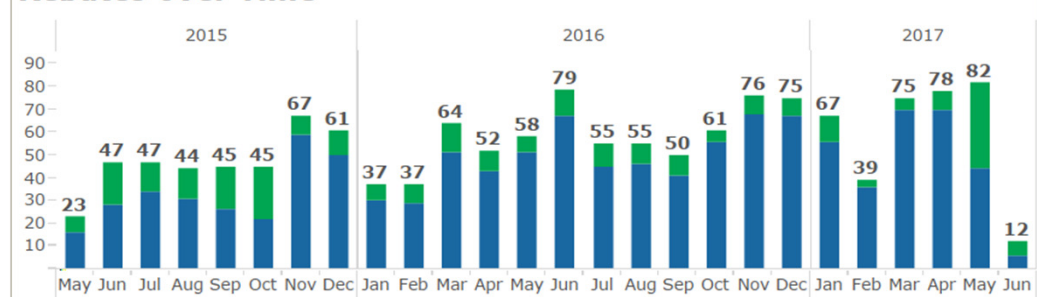
		Rebate Dollars	Rebates
PHEV	Plug-in hybrid electric vehicle (electricity and gasoline)	\$2,397,750	1,142
BEV	Highway capable, four-wheeled, all-electric vehicle	\$828,000	289
Total		\$3,225,750	1,431



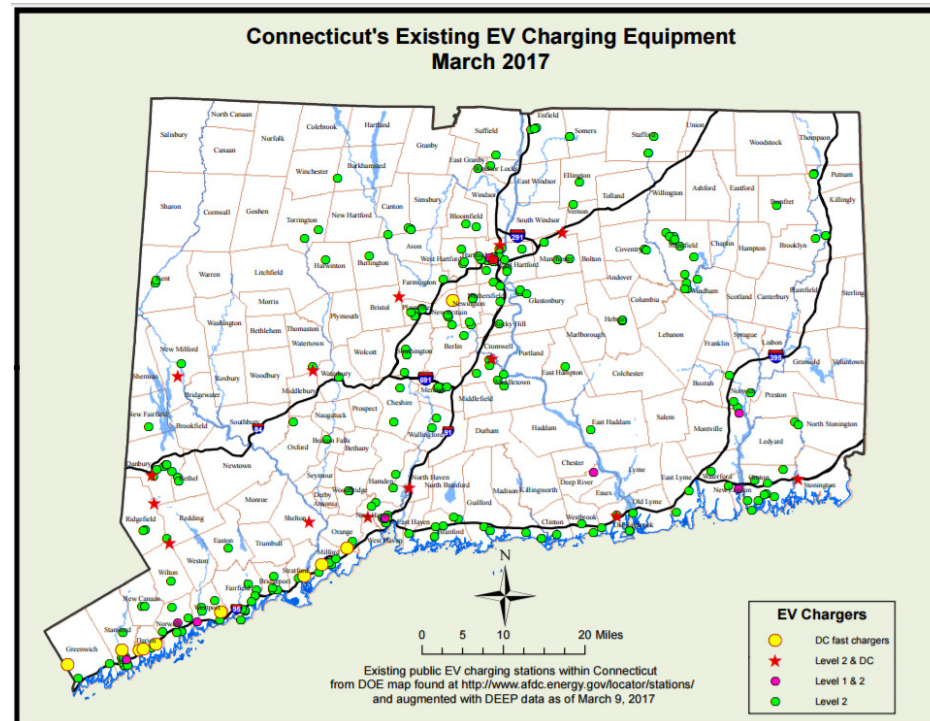
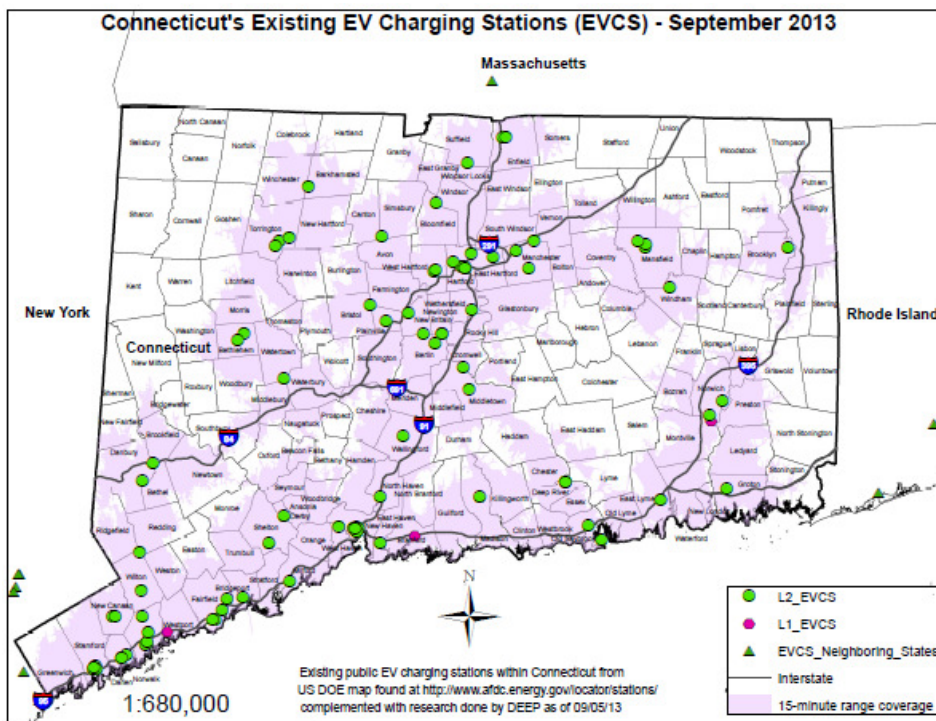
Rebates by Make and Model (select to filter)



Rebates over Time



2013 CES: Key Achievements



Fuel Type	Public	Private
Biodiesel	1	1
CNG	9	12
EVSE	298	46
E85 (Ethanol)	3	1
Hydrogen	1	1
LNG	1	0
LPG (Propane)	20	1

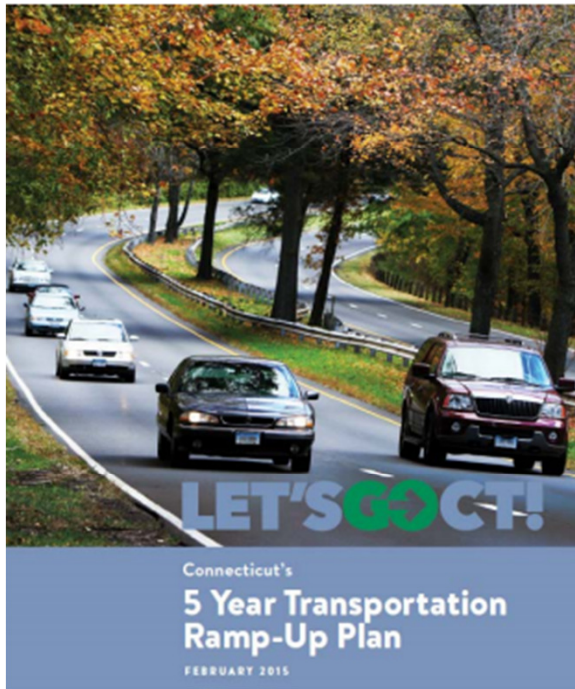
Source: DOE, Alternative Fuels Data Center



2013 CES: Key Accomplishments

Lets Go CT!

Best in Class Vision



- **30-year plan:** all critical preservation & enhancement needs
- **5-year ramp-up:** projects within the 5-year budget cycle to jump start investment
- **Lock Box**
- **Cost:**
 - 30-year **Vision:** **\$100 Billion** investment
 - 5-year ramp up: **\$10 Billion** investment
 - **Base Capital Program** is **\$7.2 Billion** (fed + state)
 - **Ramp-Up** funds **\$2.8 Billion** (additional state)

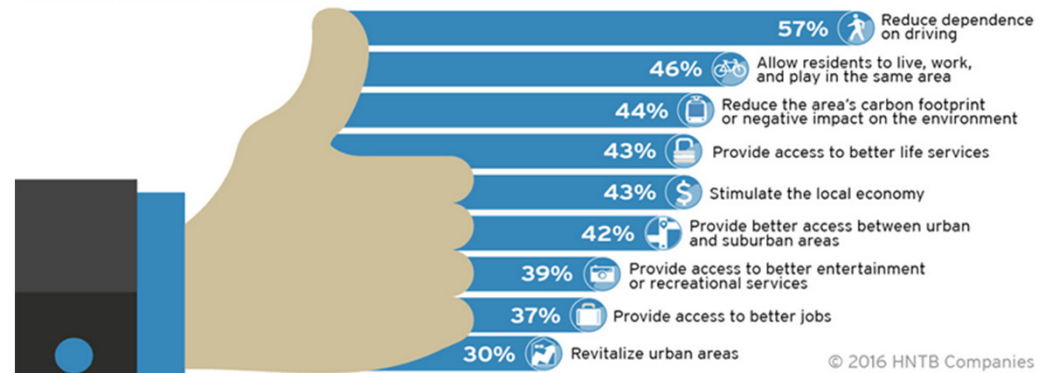


2013 CES: Key Accomplishments



BENEFITS OF TRANSIT ORIENTED DEVELOPMENT

Americans believe transit oriented development provides an array of benefits ranging from lifestyle to environmental to economic.



Transit Oriented Development

- CT FastTrack, New Haven and Hartford lines
- Office of Policy and Management TOD Planning Grant Program
- Conservation & Development Policies: The Plan for Connecticut 2013-18



Transportation Sector Goals & Strategies

- **Goal 1:** Put the State on a strategic pathway to decarbonize the transportation sector.
- **Goal 2:** Facilitate state planning to advance smart-growth, transit-oriented development, and mixed-use planning that leads to energy and emission reductions.
- **Goal 3:** Develop and support strategic partnerships to improve access to a wider array of clean transportation options.



Transportation Sector Goals & Strategies

Goal 1: Put the State on a strategic pathway to decarbonize the transportation sector.

T.1.1. Develop an Electric Vehicle Roadmap to accelerate the adoption of low and zero-emissions vehicles and strengthen alternative fueling infrastructure.

T.1.2. Advocate for the implementation of federal vehicle fuel economy standards and maintaining LEV, ZEV, and GHG programs.

T.1.3. Educate and engage citizens and employers on the benefits of clean and efficient transportation options.



Hypothetical Scenario: EV Deployment

	2020	2030	2050
35% below 2001 by 2030			
# of ZEVs	35,000	450,000	2,600,000
% of Fleet	1%	18%	92%
45% below 2001 by 2030			
# of ZEVs	70,000	750,000	2,600,000
% of Fleet	3%	32%	95%
55% below 2001 by 2030			
# of ZEVs	113,000	1,000,000	2,700,000
% of Fleet	5%	43%	96%

Note: numbers are approximate based on modeling assumptions



Roadmap Considerations

- Develop a Lead by Example (LBE) program that accelerates the adoption of EV/Hydrogen vehicles for the state fleet.
- As appropriate, expand EV infrastructure including access for suburban and urban areas, single and multi-unit dwellings, business and recreational facilities.
- Evaluate appropriate time of use rate structures and demand charges.
- Evaluate appropriate role of utility companies in the deployment of electric charging stations, including ownership and other models.
- Pursue sustainable funding for CHEAPR program until the market matures.
- Investigate strategic approaches to address equity and access to EV technologies for low to moderate income residents .
- Review targeted approaches to medium- and heavy-duty vehicle electrification.
- Identify opportunities to expand current consumer awareness and education efforts to a wider audience.
- Evaluate and identify potential opportunities to submit proposals to Electrify America's investment Cycle 2 (Q3 2019—Q4 2021 \$300 million).



2017 Transportation Goals & Recommendations

Goal 2: Facilitate state planning to advance smart-growth, transit-oriented development, and mixed-use planning that leads to energy and emission reductions.



T.2.1 Implement Let's Go CT! initiatives and its long-term vision to create a best-in-class transportation system.

T.2.2 Improve connectivity and accessibility to public transit



2017 Transportation Goals & Recommendations









Goal 3: Develop and support strategic partnerships to improve access to a wider array of clean transportation options.

T.3.1 Embrace technological advances, shared mobility services, and transportation demand partnerships that improve mobility and access to clean modes of transportation.

T. 3.2 Participate in regional partnerships and initiatives to advance a clean and efficient transportation system.



Shared-use mobility is defined as mobility services that are shared among users including:

-   Traditional public transportation services, such as buses and trains;
-   Vanpools, carpools, shuttles, TNCs;
-   Carsharing, bikesharing, scooter sharing in all its forms; and
-   Flexible goods movement

Definitions

What is shared-use mobility?



CES Buildings Sector Chapter



2013 CES: Key Accomplishments

PA 13-298 established Conservation Adjustment Mechanisms increasing 2014 Energy Efficiency Fund by 47%, total of \$223 million, subsequently increasing annual savings by about 50% as well

2013

CT became a partnering state in NEEP's HELIX real estate data project

Utilities begin collecting data on health & safety barriers in homes

2015

CT surpassed 21,000 DOE Home Energy Scores

CT efficiency programs have saved residents & businesses (2014-2016):

- \$245 million
- 1.29 billion kWh
- 19.6 million CCF gas
- 976 thousand tons CO2

2014

Green Bank, CHFA, utilities began multifamily partnership to address challenges in ee to multifamily buildings

Energize CT, CHIF, and the Green Bank began offering a variety of integrated and aligned financing options for energy upgrades, including payment plans and on-bill repayment

2016

CT moved from 2009 IECC to the 2012 IECC

CT became first state to offer DOE Home Energy Score on a large scale

Today

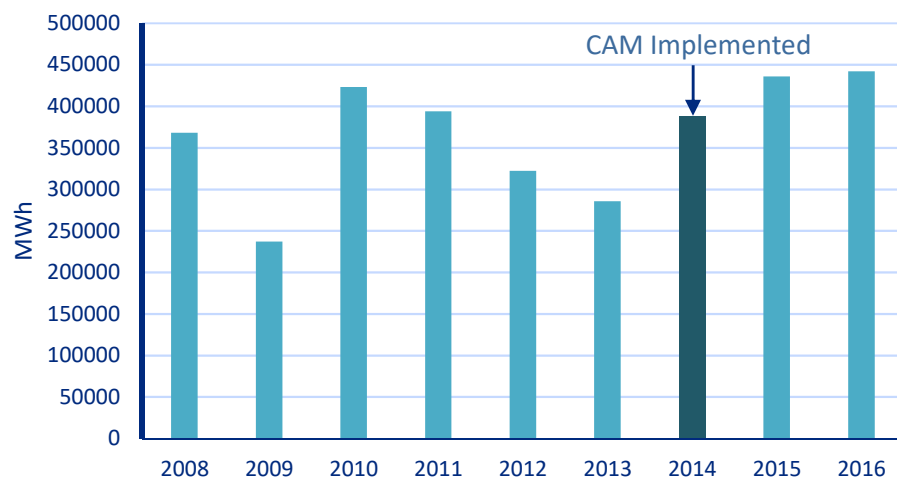
Piloting demand reduction strategies to better manage peak demand

Completing inventory of state energy usage to reduce waste

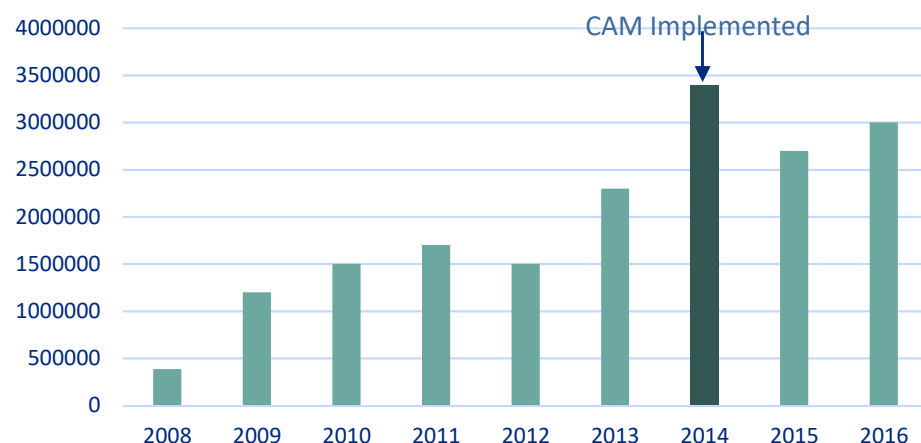


Efficiency Investment Plan Progress

CT Statewide Annual MWh Savings



CT Statewide Annual CCF Savings (Natural Gas)



Targets for 2016-2018:

\$700M portfolio for customers

129k residential homes weatherized

9.7 M residential products distributed

All 169 communities actively engaged

28k businesses more efficient

Three year energy savings equivalent to the output of a 262 MW power plant

[Link to energy efficiency annual report](#)



Buildings Sector Goals & Strategies

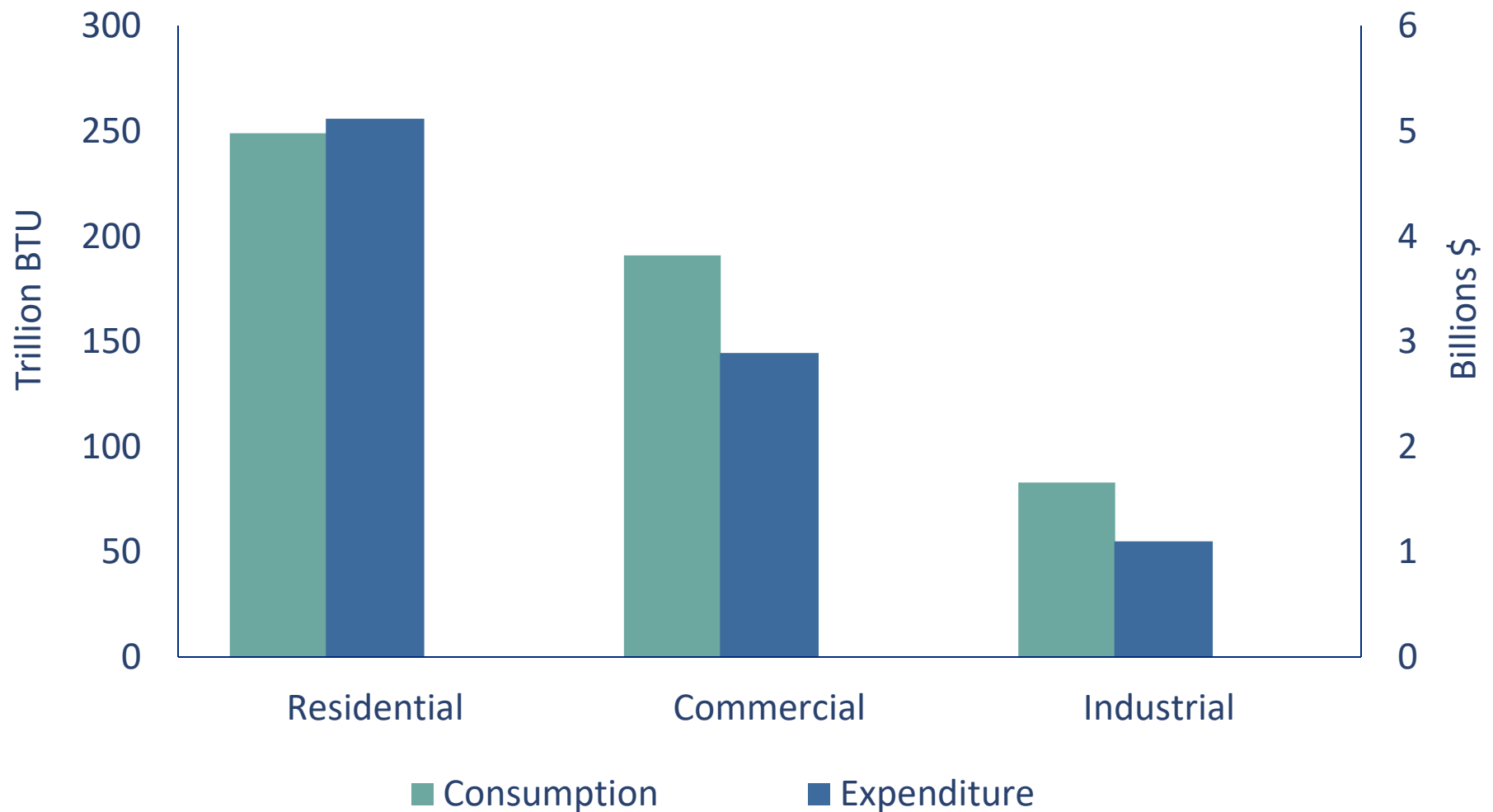
Goal 1: Prioritize energy savings as a financial and energy resource

Goal 2: Improve performance and productivity of buildings and industrial processes

Goal 3: Reduce peak demand



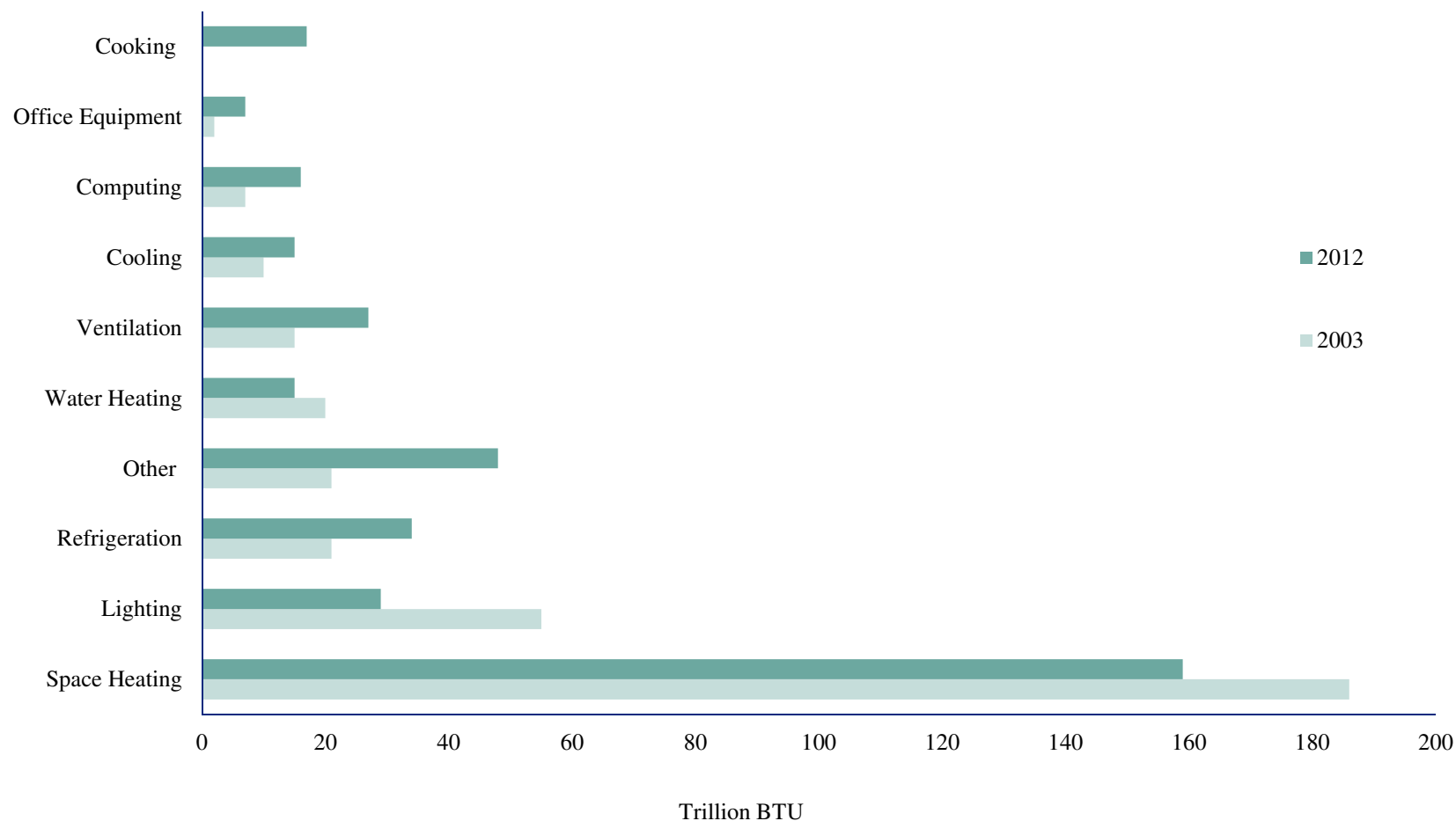
Current State: CT Consumption & Expenditures



Source: United States Energy Information Administration, 2017 [2014 data]



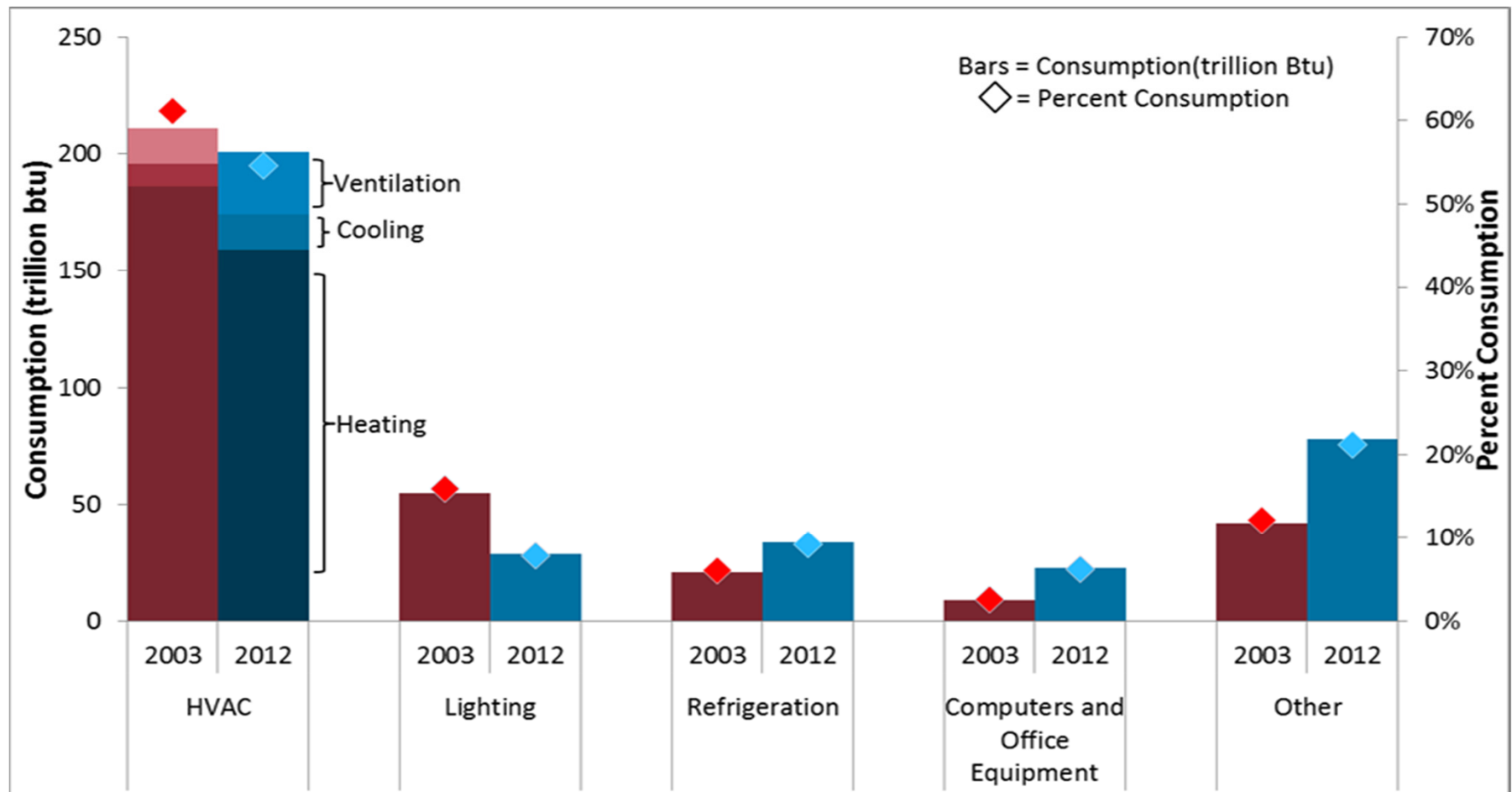
Context: How We Currently Use Energy



Source: (United States Energy Information Administration, 2003) (United States Energy Information Administration, 2016)



Context: How We Currently Use Energy

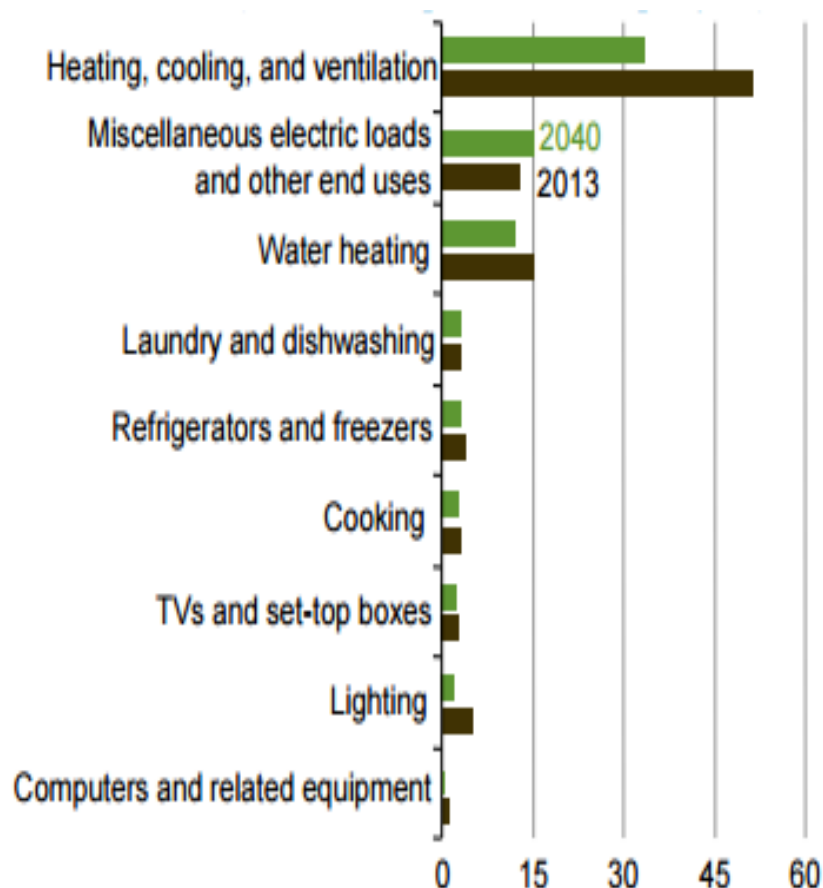


Source: (United States Energy Information Administration, 2003 & 2016)



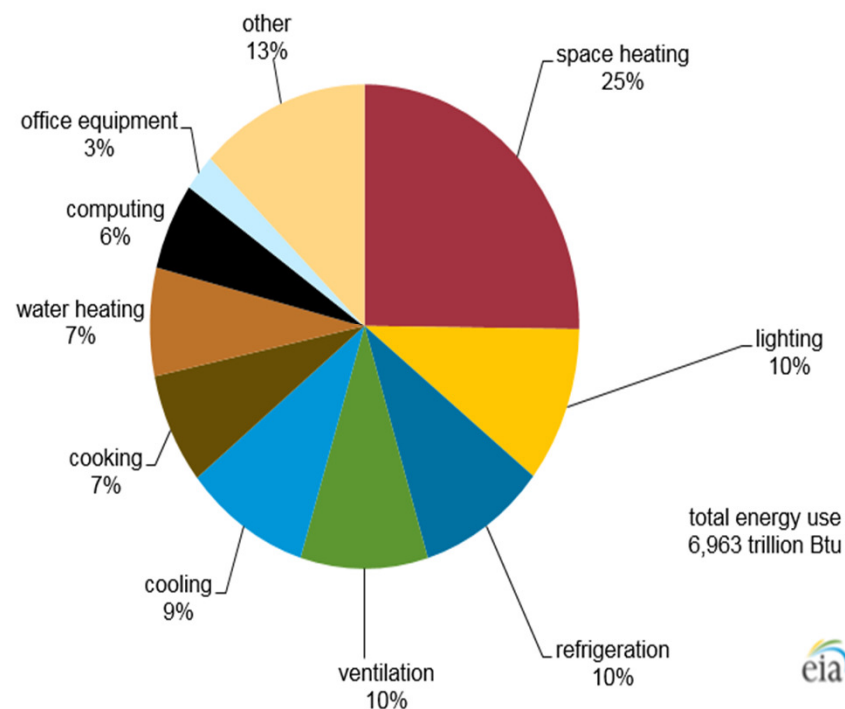
Current State: Energy End Uses

Residential



Commercial and Industrial

Figure 5. Space heating demanded the most overall energy use in commercial buildings in 2012, followed by other uses



Source: U.S. Energy Information Administration, 2012 Commercial Buildings Energy Consumption Survey.



Buildings Sector Goals & Strategies

Goal 1: Prioritize Energy Savings as a financial and energy resource

B.1.1 Procure energy efficiency as a resource

B.1.2 Enhance competitiveness of CT's businesses with customized energy efficiency investments and increased energy productivity

B.1.3 Reduce the affordability gap in low income households

B.1.4 Improve finance tools and programs to increase access to energy efficiency improvements

B.1.5 Maximize consumer demand for energy efficiency by increasing awareness and understanding of its value

B.1.6 Evaluate current cost-effectiveness testing approach for accurate reflection of all resource costs and benefits

B.1.7 Ensure equitable efficiency investment across fuel types through equitable conservation charges



Policy Focus: Financing Partnerships

Partnerships Critical to Achieving Deeper Energy Improvements in Affordable Housing

Housing Agencies



State of Connecticut



Utility Companies

EVERSOURCE



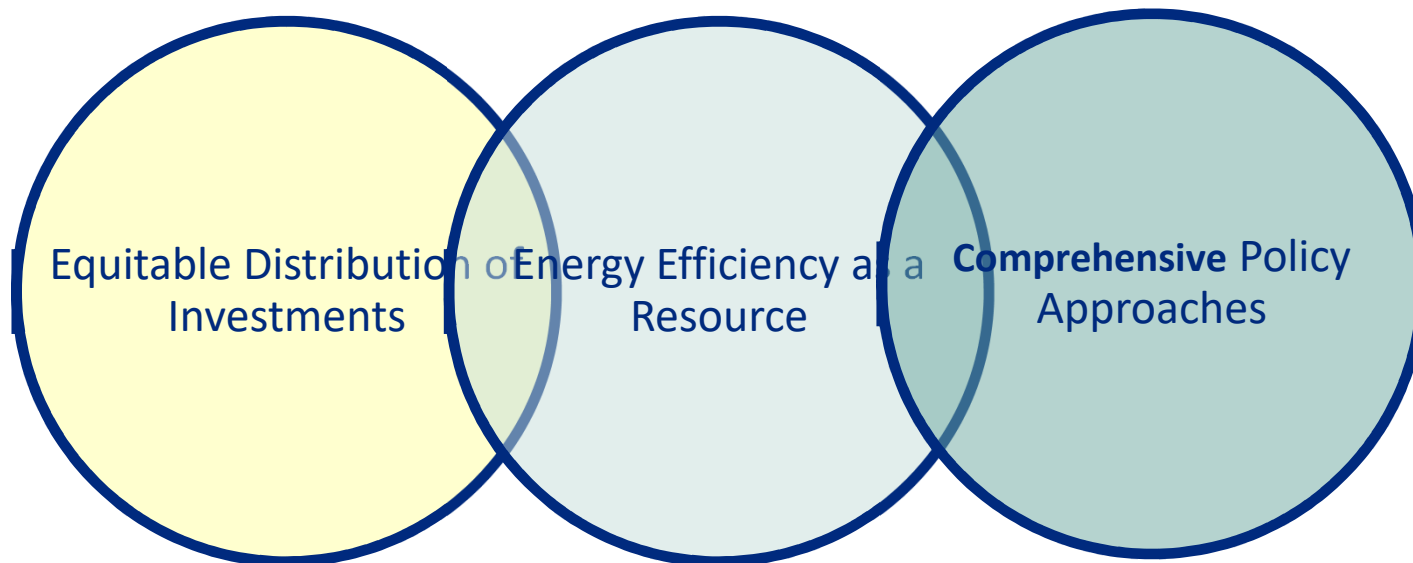
energize CONNECTICUT 

Common Goal: to achieve comprehensive, deeper energy improvements that help owners and tenants save energy, reduce costs, increase property values, and provide healthier housing.



Policy Focus: Equitable Distribution of Investments

- Regular evaluation of statewide distribution of CT Energy Efficiency Fund and CT Clean Energy Fund to ensure equity across ratepayers.
- Census tract by census tract basis, compared by % of SMI
- Ratio of proportion of contribution to the fund, to proportion of total incentives for completed projects



Buildings Sector Goals & Strategoes

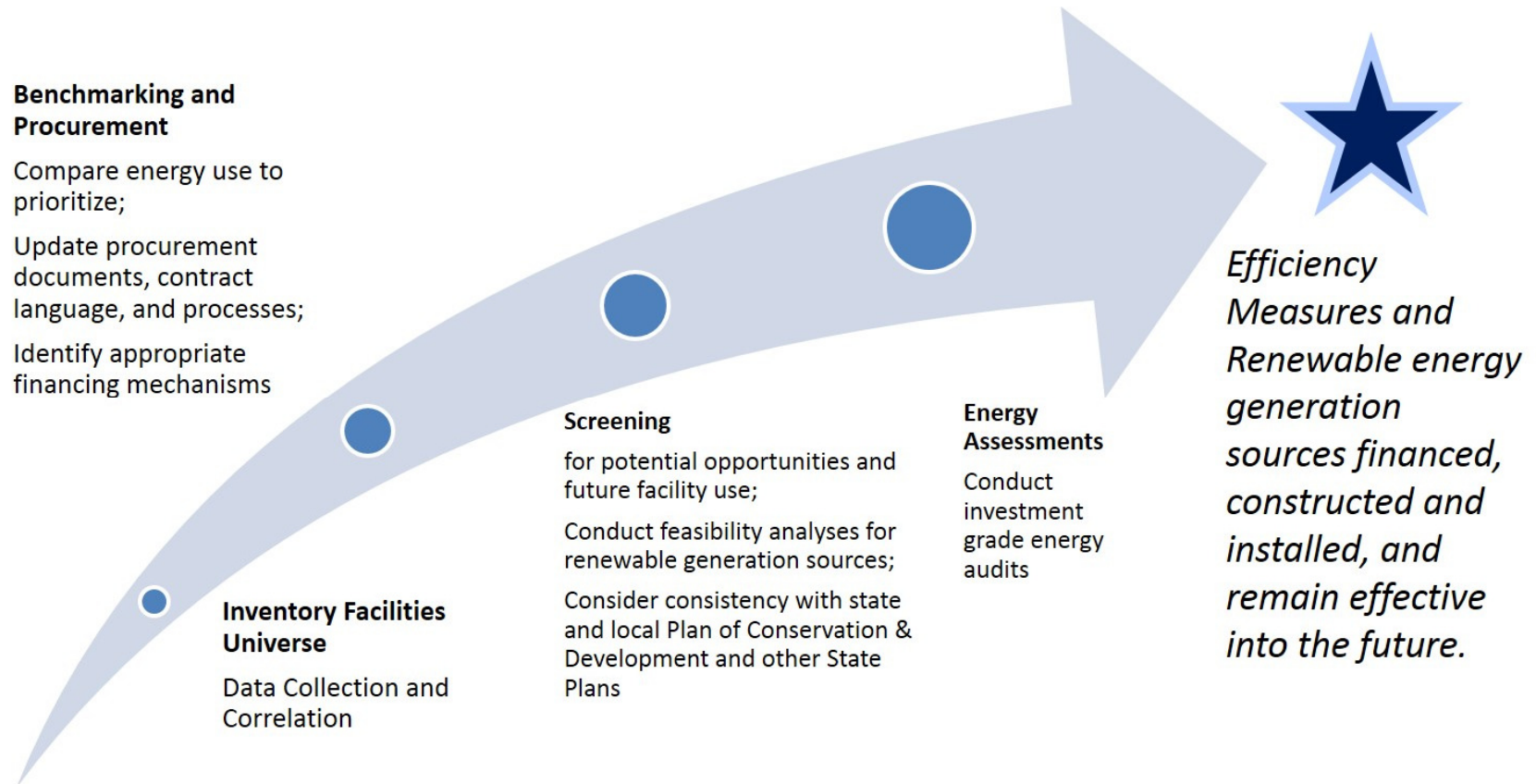
Goal 2: Improve Performance And Productivity of buildings and industrial processes

- B.2.1 Ensure application of and compliance with the current building energy codes and product efficiency standards
- B.2.2 Encourage cleaner and more cost-effective thermal fuel choice to transition buildings from fossil fuels
- B.2.3 Continue assessing and weatherizing homes statewide
- B.2.4 Address the unique needs of multifamily buildings for implementing cost-effective, clean and efficient energy upgrades
- B.2.5 Use Energy Productivity as a metric to measure success of efficiency in commercial and industrial buildings
- B.2.6 Reduce energy waste through combined heat and power in commercial and industrial applications
- B.2.7 Reduce energy waste at water and wastewater treatment facilities
- B.2.8 Evaluate applicability of district heating/ thermal loops in high density areas
- B.2.9 Inventory state buildings and their energy usage patterns to identify greatest energy savings opportunities and quantify financing opportunity
- B.2.10 Support diversification of the heating oil delivery industry's products and services



Policy Focus: Government Leading By Example

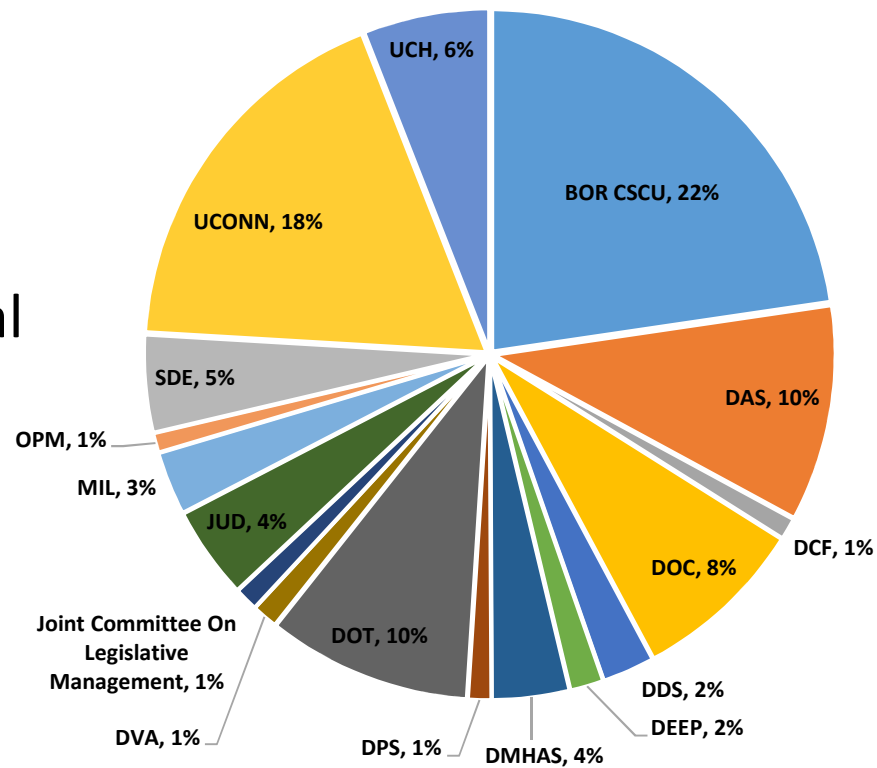
Plan for Reducing Energy Use in State Buildings



Connecticut's State Government Opportunity

- Approximately 70 million square feet
- Roughly 3800 buildings
- Nearly ½ are educational facilities

Gross Square Feet of Floor Space
by Agency



Source: CT Office of Policy and Management, JESTIR database 2016



Lead By Example Recent Results



Small Projects: Since 2014, 147 projects planned or completed statewide are expected to result in annual energy cost avoidance over \$1 million.



Medium Projects: Since 2012, 72 projects financed with General Obligation Bonds

Typical payback period 5.9 years

Almost \$3 million annual energy cost avoidance; fully expended bond authorization



Large Projects: Currently, one project executed in 2016; two projects in development. Anticipated annual energy cost avoidance for initial three projects, once fully implemented, are \$6.0 million.

- CVH & DMV, financed with General Obligation Bonds
- DOC, financed with Green Bonds via the Connecticut Green Bank; financing to be determined for future projects



Buildings Sector Goals & Strategies

Goal 3: Continue to Prioritize Grid Load Management to Reduce Peak Demand

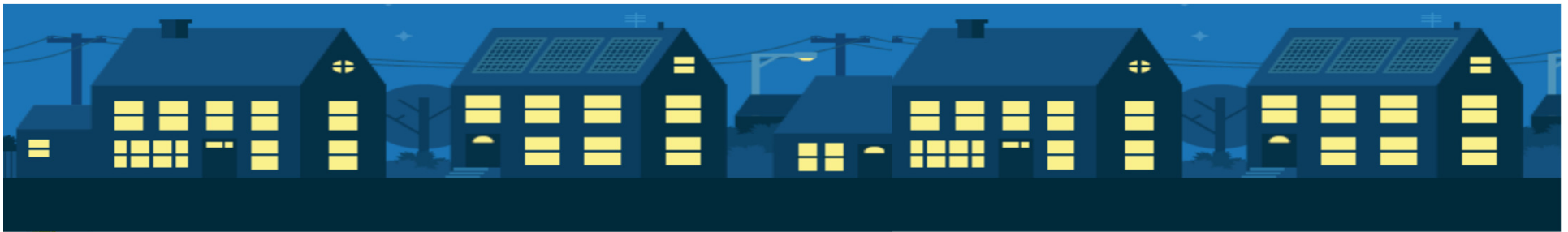
3.1 Target Peak Demand Reductions

3.2 Increase and standardize two-way advanced meter communication

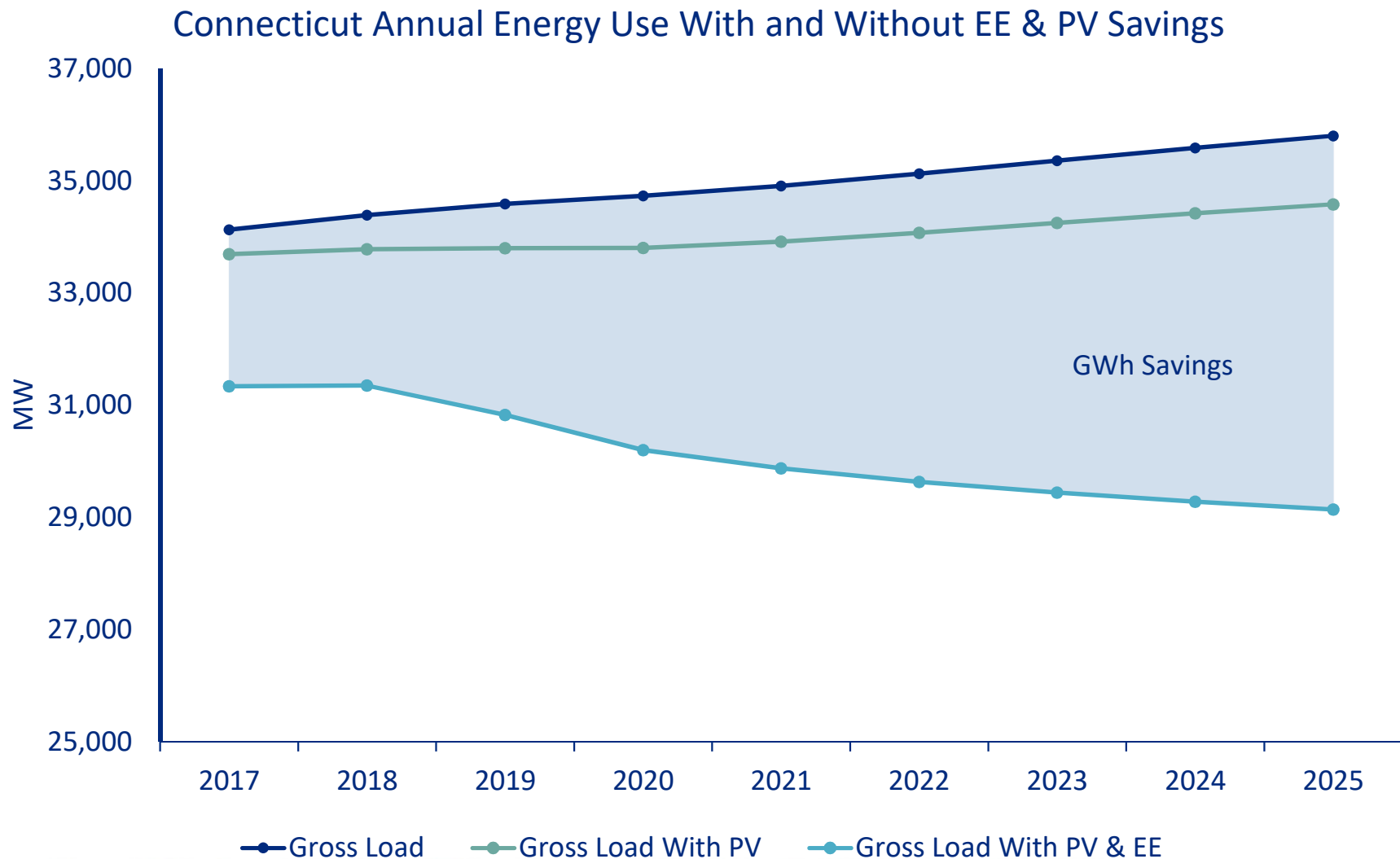
- Phase in deployment of advanced meters
- Promote use of smart grid standards to protect ratepayers and infrastructure

3.3 Optimize economic signals and incentives for demand response

- Promote dynamic Time of Use rates and Peak Time incentives
- Assess real time DR pilots and their scalability
- Promote onsite generation
- Evaluate and begin preparing for energy storage



Overall Demand Projections



Source: ISO New England, *Final Energy-Efficiency Forecast for 2021-2026* and *Final 2017 PV Forecast* (May 2017)

