

Leading by Example: Reducing Energy Use in State Facilities

PREPARED BY

The Connecticut Department of Energy
and Environmental Protection



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Report per Connecticut General Statutes §16a-37u
Submitted to the Connecticut General Assembly's
Energy and Technology Committee

Table of Contents

| | |
|--|---|
| Statutory Requirements | 3 |
| Overview of “Lead by Example” Program: Improving Energy Management in State Facilities | 3 |
| State Energy Use Reduction Plan | 3 |
| Results: Summary of Lead by Example Program Achievements through Calendar Year 2015 | 6 |
| Small-Scale Projects [Use of utility-administered incentives] | 6 |
| Medium-Scale Projects [Bond funded investments] | 6 |
| Large-Scale Projects [Guaranteed Energy Savings Performance Contracting] | 7 |
| Case Study of Leading By Example: CT State Park Renewables | 8 |
| Recommendations | 8 |
| Appendix | 9 |

Statutory Requirements

The Connecticut Department of Energy and Environmental Protection (DEEP) is submitting this report pursuant to Connecticut General Statutes (C.G.S.) Section 16a-37u(d), specifically:

On or before January 1, 2013, and annually thereafter, the commissioner [of the Department of Energy and Environmental Protection] shall report, in accordance with the provisions of section 11-4a, on the status of its implementation of the plan [required by C.G.S. §16a-37u(a)(1)] and provide recommendations regarding energy use in state buildings to the joint standing committee of the General Assembly having cognizance of matters relating to energy. Any such report may be submitted electronically.

While DEEP routinely updates information about implementation of the plan on DEEP's webpages, this report is intended to meet the reporting requirement for both 2014 and 2015. Reports for 2012 and 2013 have previously been provided.

Overview of “Lead by Example” Program: Improving Energy Management in State Facilities

Challenge: Energy efficiency and renewable initiatives can help lower energy bills, however, many government agencies lack the technical and financial resources to identify and implement sustainable investments in efficiency upgrades.

Initiative: Since 2013, the inter-agency team of DEEP, the Department of Administrative Services, the Attorney General's Office, the Office of the Treasurer, the Office of Policy and Management, the CT Green Bank, and others, have advanced the “Lead by Example” program, including the following initiatives and financing mechanisms to reduce energy use in state buildings:

1. Established master agreements with Connecticut's utilities to unlock the ability of state agencies to use utility-administered programs to complete small-scale energy efficiency investments in facilities;
2. Installed medium-scale energy equipment retrofits in state buildings using general obligation bond funded allocations; and
3. Initiated a standardized guaranteed Energy Savings Performance Contracting Program to plan for and implement large-scale, comprehensive projects with multiple energy savings measures at state buildings.

Results: Results of the “Lead by Example” approach from work completed in calendar years 2014 and 2015 are summarized in the “Results” section below.

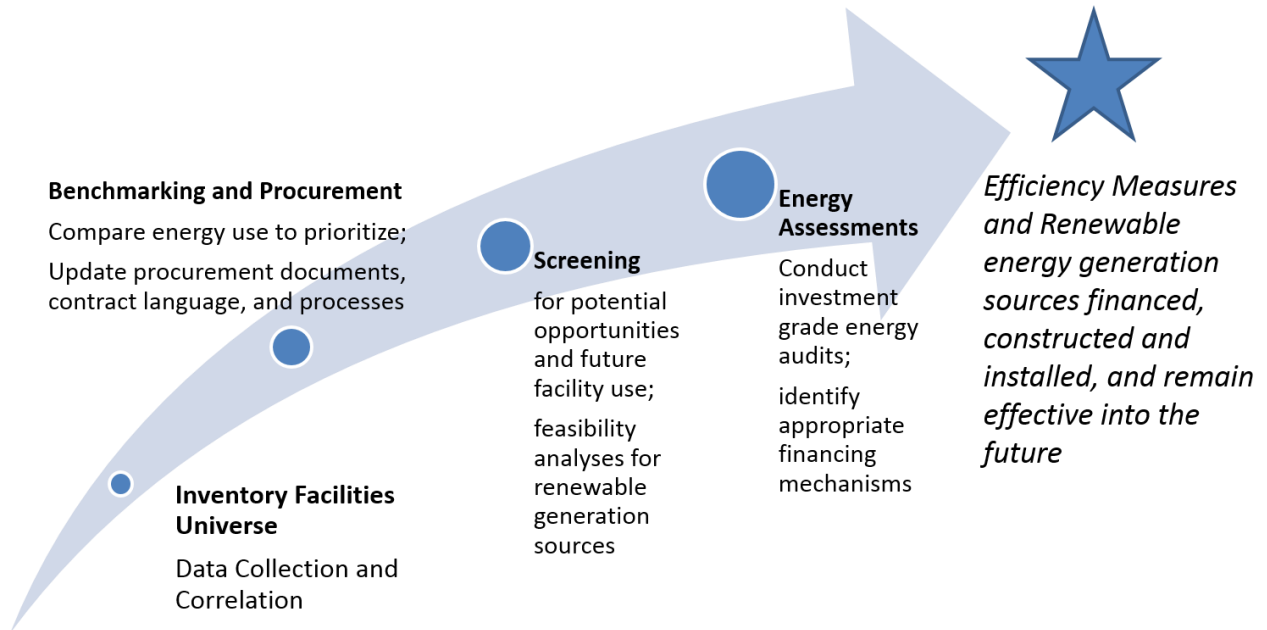
For more information: please refer to the [Lead By Example](#) page on DEEP's Energy website.

State Energy Use Reduction Plan

DEEP has made substantial progress in assessing energy use at state facilities as part of the implementation plan to reduce energy use in state buildings. As shown in Figure 1, the process begins with the development of a comprehensive inventory of all state facilities, by contacting each state agency to get a list of all their owned buildings and comparing their list with the Office of Policy and Management state building inventory database to see which buildings still exist, what are new buildings, what buildings no

longer exist, and what is no longer state property. Along with inventorying state facilities, energy accounts must be correlated to the correct building. This will allow us to identify the energy consumption and cost for a specific state building.

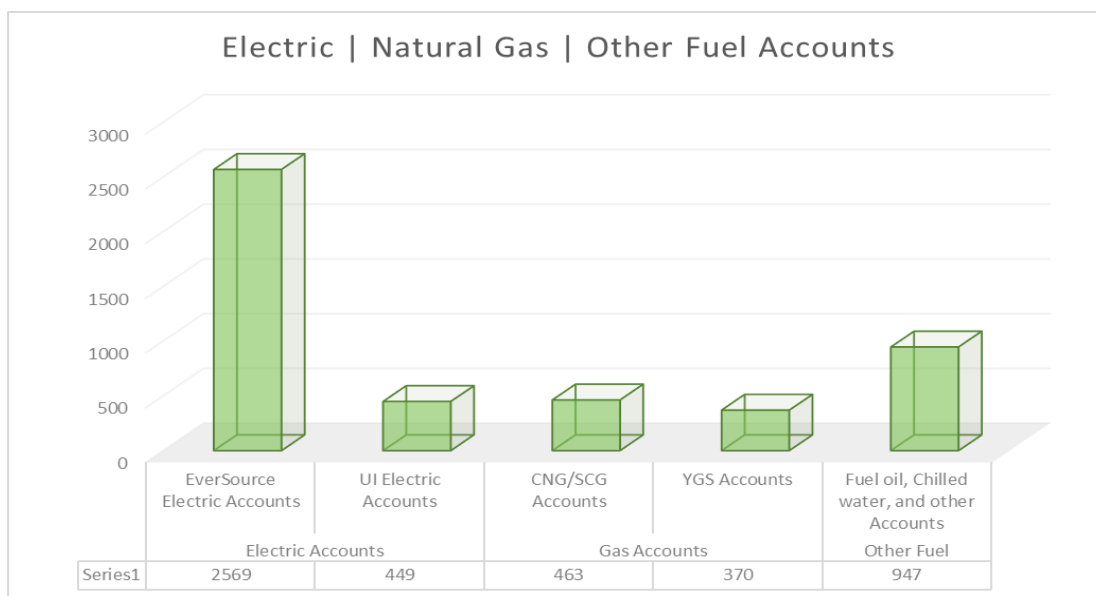
Figure 1: Implementation of State Facilities Energy Use Reduction Plan



Inventorying Facilities, Collecting Data, and Correlating Energy Data with Buildings

DEEP currently is collecting energy data for each utility or delivered fuel account and correlating the data to state buildings to determine which utility account numbers and meter numbers are associated with each state building. Some state agencies have completed this for their own accounts while many have not. The current annual estimate for energy consumption by the state is approximately 611 million kWh in electricity and 2.5 million DTh of natural gas. Additionally, many agencies consume deliverable fuels for heating and processes at their facilities as shown in Table 1. DEEP is currently in the process of establishing a system to collect energy consumption data in a consolidated format so that energy information can be understood for each agency, for individual buildings, and for the state as a whole. DEEP anticipates completing the process of matching energy consumption for most fuels to individual buildings and agencies as well as establishing electronic data feeds of this information on an ongoing basis for most electricity and natural gas accounts by the end of calendar year 2017.

Table 1: Currently Identified State Energy Accounts



Source: CT DEEP records, 2016

Benchmarking Buildings

As energy usage is correlated between energy accounts and each state building, DEEP is benchmarking the largest buildings in order to compare energy usage on a square foot basis to better prioritize the buildings that will yield significant savings from energy efficiency measures. This process includes electronically and/or manually entering data into the Environmental Protection Agency (EPA) Energy Star Portfolio Manager. This nationally used tool compares buildings of similar characteristics across the country that are benchmarked and identifies an individual building an Energy Usage Index score or Energy Star rated score, depending upon whether the building is eligible to have an Energy Star rating. To date, DEEP has benchmarked approximately 27 million square feet across 274 state buildings and facilities. To “lead by example,” DEEP benchmarked all DEEP-owned buildings that are over 4,000 square feet. DEEP is working with other large agencies to benchmark the largest buildings and facilities over the next two to three years.

Screening, Assessing, Prioritizing

At the portfolio level, DEEP will screen the benchmarked facilities that have poor rating scores in Portfolio Manager, beginning in Fiscal Year 2018, and, in consultation with other key agencies, prioritize which state buildings represent the greatest opportunity for potential retrofit opportunities and assess the feasibility for installation of renewable generation sources. In addition to this proactive portfolio manager approach, DEEP and other key agencies confer with agencies whose capital or operating plans call for investment in energy management and therefore prompt those agencies to pursue energy management improvements.

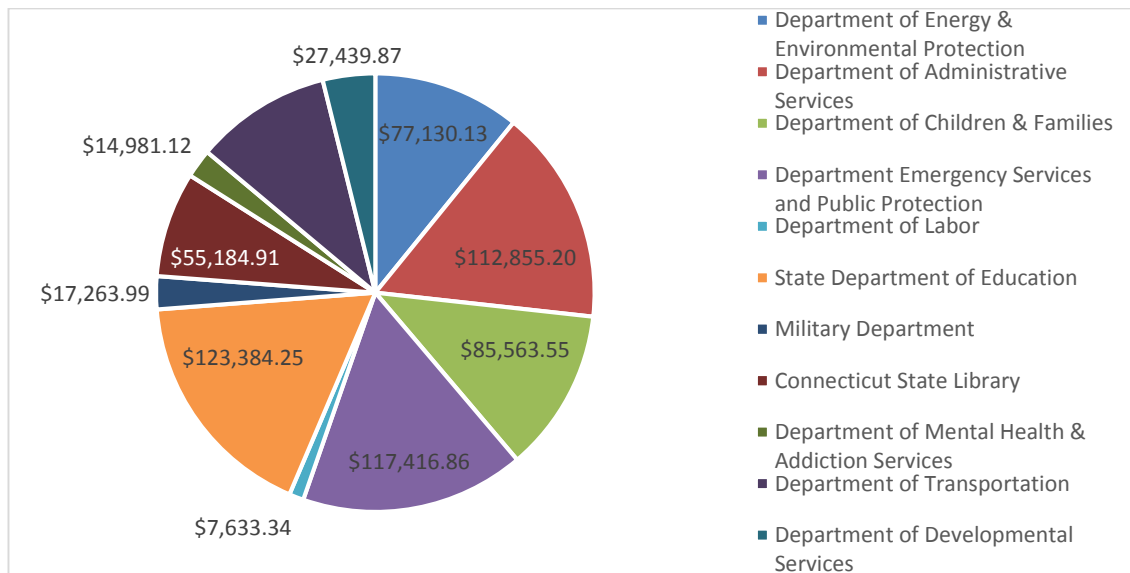
Results: Summary of Energy Use Reduction Achievements through Calendar Year 2015

(1) Small-Scale Projects [Use of utility-administered programs to simplify equipment installation]

The Utility Administered Incentive program is designed to provide cost effective, turnkey energy-saving services to utility customer accounts, also known as the Small Business Energy Advantage program. The program offers utility administered funding incentives and on-bill financing for the balance of project cost, eliminating the need for up front capital investment. The reduction in energy usage and costs, in conjunction with the ability to utilize on-bill financing, ideally results in net-positive cash flow from day one. Once the on-bill financing period has ended (2 to 4 years), the reduction in energy use will result in decreased operational energy costs over the remaining life of the installed measures. Under this program, proposed measures are focused primarily on quick payback energy efficient lighting. Under a Master Agreement between both Eversource and United Illuminating and the Department of Administrative Services [on behalf of all state agencies] the SBEA program was rolled out to state agencies in 2014.

To date, **108 projects at state facilities have been approved with an estimated annual cost reduction of \$700,000 and electricity use reduction of 3.9 million kilowatt-hours [Table 2].**

Table 2: \$700,000 Estimated Annual Cost Savings from Small-Scale Projects 2014-2015



Source: CT DEEP records, 2015

(2) Medium-Scale Projects [Bond funded investments]

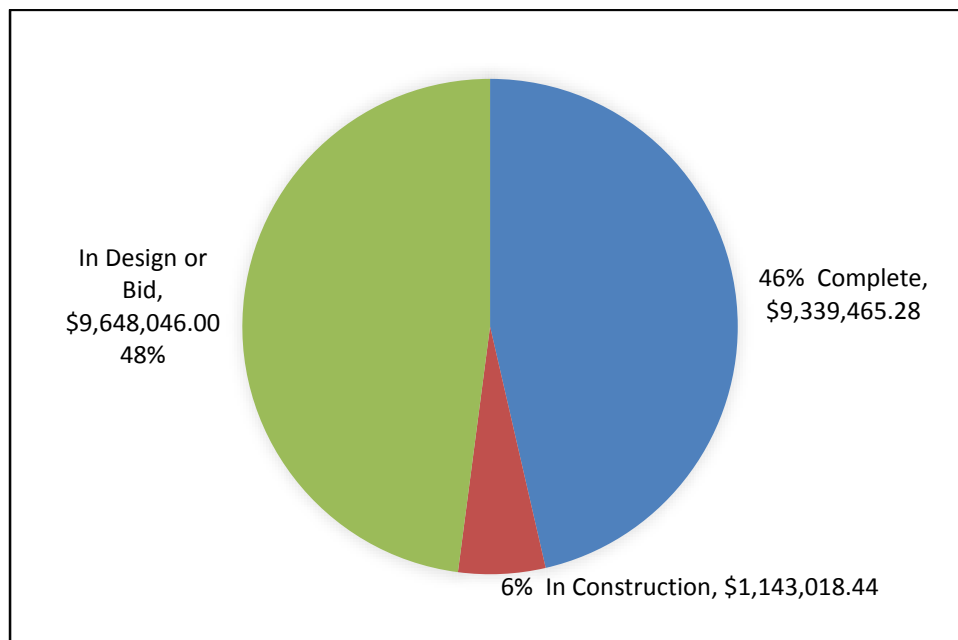
In September 2011, \$15 million of bonded funds for energy efficiency upgrades in states buildings were allocated, with an additional \$5 million allocated in January 2015. As of July 21st, 2016, **70 bond-funded energy efficiency retrofits in state buildings have been approved for a total commitment of \$20.1 million with an average payback of 6.7 years and a total cost reduction of more than \$2.8 million annually.** For information

on the list of approved projects, please see the [Lead By Example for State Agencies](#) webpage on DEEPs website or refer to the appendix to this report.

Table 3 summarizes the status of these projects, which are projected to save agencies approximately 75.6 billion British Thermal Units annually, which is equivalent to:

- ✓ **605,797 fewer gallons of gasoline used, or;**
- ✓ **2,555 homes in CT taken off of the electricity grid, or;**
- ✓ **363,724 fewer pounds of coal used, or;**
- ✓ **546,242 fewer gallons of home heating oil used.**

Table 3: LBE Bond Funds Invested 2012-Present
Resulting in \$2.8 million in annual savings



Source: CT DEEP records, 2016

(3) Large-Scale Projects [Guaranteed Energy Savings Performance Contracting]

Initial projections for the Energy Savings Performance Contracting projects being planned and implemented at the Department of Correction, Connecticut Valley Hospital, and the Department of Motor Vehicles estimate an **investment of approximately \$80 million in energy savings measures across these three agencies, all of which will be paid back within 15 to 20 years through guaranteed future energy savings.** These projects and those that follow will result in rigorous measurement and verification to ensure the energy performance and cost savings match the guarantees provided. Ongoing monitoring and verification will allow facility managers to continuously improve building energy use. Construction and installation of these large-scale investments will support green jobs in Connecticut. The total estimated cost reduction or avoidance is currently estimated at \$6.0 million annually for the initial three projects. In consultation with other key agencies, a pipeline of

additional large-scale projects for different agencies is in development, contingent upon a sustainable financing mechanism being established.

Case Study of Leading by Example: State Park Renewables

As part of the Lead by Example approach, the Department of Energy and Environmental Protection is also implementing a State Parks Renewable Energy Technology Initiative. This initiative is funded with \$1.0 million in Merger Settlement Funding and includes the installation of geothermal heating and cooling, solar photovoltaic, solar thermal hot water, solar lighting, and other renewable technologies. This initiative will:

- ✓ Increase state government's use of clean energy alternatives;
- ✓ Increase the reliability of the state's energy infrastructure by reducing strain on the electric grid, particularly during peak usage periods;
- ✓ Increase energy surety by reducing dependence on fossil fuel sources and utilizing distributed onsite generation technologies; and
- ✓ Demonstrate alternative energy technologies in high visibility venues to educate the public.

To date the following projects have been implemented or are in construction under this initiative:

- ✓ Solar photovoltaic and solar thermal hot water at the Sherwood Island State Park pavilion;
- ✓ Geothermal heating and cooling and solar photovoltaic electricity generation at the new Hammonasset State Park Nature Center;
- ✓ Solar photovoltaic electricity generation at the new West Beach bath house, Hammonasset State Park; and
- ✓ Solar photovoltaic electric cash registers at 11 state park facilities that do not otherwise have electricity.

Recommendations

To build on the success of the achievements in energy use reduction to date, DEEP recommends the following:

1. Continue to invest in energy data management improvements, specifically the completion of electronic data transfer between major utilities and the state to accelerate analysis of energy usage.
2. Implement a standard reporting platform for state agencies so that statewide energy consumption and expenditures may be aggregated and analyzed to inform energy management decisions.
3. Benchmark state buildings using the US EPA Energy Star Portfolio Manager.
4. Support the CT Green Bank in identifying sustainable financing approaches for medium-scale projects.
5. Support the CT Green Bank's issuance of Green Bonds or other financing mechanisms to finance large-scale comprehensive energy management improvement projects.
6. Identify a financing mechanism to conduct a feasibility analysis of potential renewable energy generation sources at state facilities that have completed energy efficiency investments.
7. Once financing for large-scale projects is in place, identify and plan for supporting a pipeline of large-scale projects, using the information from benchmarking and feasibility analyses.

Appendix

Table 4: Lead By Example Bond-Funded Projects Are Saving \$2.8 Million Annually

Lead By Example - State Facilities

Approved Bond Funded Projects as of August 9, 2016

| ID | Agency | Building Address | Project Name | Estimated Annual Energy Cost Reduction | Estimated or Actual Project Cost | Simple Payback (yrs.) | Project Status |
|----|--------|---|--|--|----------------------------------|-----------------------|----------------|
| 30 | DAS | 18/20 Trinity Street | Replace VFDs and Pumps - Tie into BMS | \$28,000.00 | \$16,243.00 | 0.58 | Complete |
| 31 | DAS | 30 Trinity Street | VFD Installation and Tie into BMS | \$13,800.00 | \$24,468.00 | 1.77 | Complete |
| 32 | DDS | 67-87 Mountain Rd Newington CT 06111 | Installation of EMS | \$24,796.00 | \$79,529.00 | 3.21 | Complete |
| 33 | DDS | 146 Silvermine Road Norwalk, Ct 06850 | Installation of EMS | \$49,227.00 | \$86,184.00 | 1.75 | Complete |
| 34 | MHA | 1635 Central Avenue, Bridgeport, CT 06610 | Control System/Gas Condensing Boilers/Condensers | \$115,495.00 | \$1,198,737.00 | 10.38 | In Process |
| 37 | DOC | 285 Shaker Road, Enfield, CT 06082 | Robinson HVAC Rooftop Replacement | \$79,397.00 | \$401,214.20 | 5.05 | Complete |
| 38 | DAS | 505 Hudson Street, Hartford CT | High Efficiency Gas Fired Boilers | \$11,279.00 | \$137,100.00 | 12.16 | Complete |
| 39 | DDS | 195 Alvord Rd Torrington CT 06850 | Installation of EMS | \$20,214.06 | \$67,485.00 | 3.34 | Complete |
| 42 | DOC | 391 Shaker Road, Enfield | HVAC Rooftop Unit Replacement | \$22,137.00 | \$150,690.00 | 6.81 | Complete |
| 43 | DAS | 79 Elm Street, Hartford, CT 06106 | VAVs/FTUs/VFDs | \$131,000.00 | \$349,750.00 | 2.67 | Complete |

| | | | | | | | |
|----|------|--|---|--------------|--------------|-------|------------|
| 44 | OPM | 615 Silver Lane East Hartford, CT 06118 | Aggregated Efficiency Measures Project | \$168,010.00 | \$280,702.10 | 1.67 | Complete |
| 50 | DDS | 1450 S Britain Rd Southbury CT | Lighting at Power House | \$8,707.00 | \$13,811.18 | 1.59 | Complete |
| 77 | DAS | 401 West Thames Street, Norwich, CT | Uncas Domestic Hot Water Boiler | \$2,645.17 | \$12,850.00 | 4.86 | Complete |
| 79 | DAS | 401 West Thames Street, Norwich, CT | Uncas Control Valves | \$6,701.49 | \$16,780.00 | 2.50 | Complete |
| 80 | DAS | 401 West Thames Street, Norwich, CT | Uncas TVCCA Windows | \$9,854.61 | \$98,978.40 | 10.04 | Complete |
| 81 | JUD | 1 Courthouse Square, Norwich, CT 06360 | LED Lighting Retrofit | \$6,933.79 | \$15,595.00 | 2.25 | Complete |
| 1 | ECSU | High Street, Willimantic, CT 06226 | ECSU - Allerton Building Automation System | \$76,065.66 | \$709,818.00 | 9.33 | Complete |
| 19 | AES | 123 Huntington Street, New Haven, CT 06511 | Windows | \$31,921.00 | \$209,574.00 | 6.57 | In Process |
| 21 | AES | 123 Huntington Street, New Haven, CT 06511 | Dual Fuel Burners | \$18,968.00 | \$46,900.00 | 2.47 | Complete |
| 24 | AES | 153 Cook Hill Road, Windsor, CT 06095 | Lighting & Occupancy sensors | \$3,806.00 | \$9,123.12 | 2.40 | Complete |
| 25 | AES | 123 Huntington Street, New Haven, CT 06511 | Windows | \$23,988.00 | \$210,426.00 | 8.77 | In Process |
| 26 | DAS | 24-38 Wolcott Hill Road, Wethersfield, CT 06109 | EMS, RA Conversion, Central Plant Fixture Replace | \$152,988.00 | \$915,453.00 | 5.98 | In Process |
| 27 | DAS | 110 Sherman Street, Hartford CT | Digital Electronic Control System | \$18,039.16 | \$308,522.00 | 17.10 | Complete |

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|-----|------|---|--|-------------|--------------|-------|------------|
| 28 | DAS | 505 Hudson St., Hartford | Lighting Upgrade - Upper & Lower Garage | \$5,400.78 | \$24,058.00 | 4.45 | Complete |
| 85 | DAS | 165 Capitol Avenue, Hartford | SOB - Occupancy Sensors, Basement, Ground, First | \$14,241.34 | \$57,427.46 | 4.03 | Complete |
| 87 | MHA | 500 Vine Street, Hartford | Hot Water DDC Controls | \$45,286.00 | \$131,732.00 | 2.91 | Complete |
| 91 | DMV | 173 Salem Turnpike, Norwich, CT | Lighting upgrade | \$2,517.00 | \$12,316.81 | 4.89 | Complete |
| 92 | CRDA | 100 Columbus Boulevard, Hartford | Convention Center Retro- Commissioning Upgrade | \$61,626.00 | \$406,701.00 | 6.60 | Complete |
| 94 | DOT | Various locations located throughout the State of Connecticut | Energy Efficiency Improvement at DOT Commuter Parking | \$32,172.00 | \$345,000.00 | 10.72 | Complete |
| 96 | JUD | 1 Court Street, Middletown, CT 06457 | Middletown Courthouse Garage Lighting Retrofit | \$8,550.00 | \$55,630.80 | 6.51 | Complete |
| 103 | BOR | 55 Paul Manafort Drive, New Britain CT 06053 | Charter Oak - Occ. Sensor Install and HVAC Upgrades | \$21,137.00 | \$25,309.00 | 1.20 | Complete |
| 104 | Deep | 141 Trout Hatchery Road, Central Village, (Plainfield) CT 06332 | Quinebaug Valley Trout Hatchery Phase I | \$55,879.61 | \$304,780.00 | 5.45 | In Process |
| 105 | JUD | 172 Golden Hill Street, Bridgeport | GA 2 Lighting Retrofit | \$86,988.00 | \$216,600.00 | 2.49 | Complete |
| 109 | JUD | 1061 Main Street, Bridgeport | Fairfield JD Lighting Retrofit | \$26,343.00 | \$253,631.00 | 9.63 | Complete |

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|-----|------|--|---|-------------|--------------|-------|----------|
| 111 | DDS | 71 Mountain Road, Newington CT | Interior/Exterior Lighting Retrofit | \$18,033.00 | \$55,305.00 | 3.07 | Complete |
| 113 | DCS | 1000 Silver Street | DCS Juvenile Training School Fuel cell Study | | \$21,000.00 | 0.00 | Complete |
| 119 | MHA | 1000 Holmes Drive, Middletown, CT 06457 | RVS - Dutton Home Attic Insulation | \$14,214.85 | \$16,500.00 | 1.16 | Complete |
| 122 | JUD | 400 Grand Street, Waterbury, CT 06702 | Waterbury Courthouse Garage Lighting Retrofit | \$14,068.00 | \$59,972.45 | 4.26 | Complete |
| 123 | JUD | 231 Capitol Avenue, Hartford, CT 06106 | Supreme Court/State Library Lighting Retrofit | \$8,876.00 | \$53,147.80 | 5.99 | Complete |
| 126 | MHA | 162 Cedar Lane, Middletown, CT 06357 | CVH - Water Treatment Plant - Pump Upgrades | \$14,635.00 | \$71,073.70 | 4.86 | Complete |
| 127 | DMV | 150 Torrington Road, Winsted, CT 06098 | Lighting and Occupancy Sensors | \$6,648.90 | \$30,606.99 | 4.60 | Complete |
| 128 | AES | 123 Huntington Street, New Haven, CT 06511 | CAES - Exterior Lighting Upgrades | \$6,400.00 | \$19,875.08 | 3.11 | Complete |
| 130 | DEEP | 422 Watertown Road, Thomaston, CT 06787 | Thomaston Garage - Lighting and HVAC Upgrade | \$4,239.51 | \$32,097.00 | 7.57 | Complete |
| 146 | DAS | 50 & 55 Farmington Avenue, Hartford | Mechanical Renovations 55 Farmington Ave | \$52,513.00 | \$662,817.40 | 12.62 | Complete |
| 147 | DAS | 50 & 55 Farmington Avenue | DAS 55 Farmington Ave- Light/Cool | \$34,853.76 | \$520,532.00 | 14.93 | Complete |

| | | | | | | | |
|-----|------|---|--|--------------|----------------|-------|------------|
| 180 | DOC | 177 Weston Street, Hartford, CT 06120 | Hartford CC Roof Top Unit Replacement | \$45,905.00 | \$338,509.00 | 7.37 | Complete |
| 158 | DDS | 67-87 Mountain Rd Newington CT 06111 | DDS HRC Mechanical Systems Energy Upgrades | \$51,276.00 | \$369,132.00 | 7.20 | In Process |
| 175 | JUD | 20 Franklin square, New Britain, CT 06051 | New Britain Retro-Commissioning | \$18,271.00 | \$97,382.00 | 5.33 | Complete |
| 177 | SDE | 600 Orange Ave Milford CT 06460 | Platt Tech Shop Lighting and Weather-stripping | \$26,762.00 | \$74,481.50 | 2.78 | In Process |
| 178 | DOC | 285 Shaker Road, Enfield, CT 06082 | 2015 Lighting Upgrade - Library and Gym Areas | \$14,885.00 | \$28,480.37 | 1.91 | Complete |
| 155 | CRDA | 100 Columbus Blvd., Hartford, CT 06103 | LED Lighting | \$190,508.00 | \$1,805,825.90 | 9.48 | Complete |
| 160 | JUD | 95 Washington Street, Hartford, CT 06106 | Retro Commission Program | \$39,082.00 | \$134,618.00 | 3.44 | In Process |
| 163 | DOC | 59 Hartford Road, Brooklyn, CT 06234 | Chiller Replacement | \$19,196.00 | \$171,800.00 | 8.95 | Complete |
| 167 | DOC | 986 Norwich-New London Turnpike, Uncasville, CT 06382 | Chiller Replacement | \$9,446.00 | \$95,300.00 | 10.09 | Complete |
| 168 | DEEP | 141 Trout Hatchery Road, Central Village, (Plainfield) CT 06332 | Quinebaug Trout Hatchery Phase II | \$232,790.00 | \$2,512,479.00 | 10.79 | In Process |
| 169 | SDE | 600 Orange Avenue, Milford | Platt Tech Lighting | \$20,716.00 | \$97,960.89 | 4.73 | Complete |
| 179 | MHA | 51 Coventry Street, Hartford | Boiler Replacement & Heating | \$9,680.00 | \$96,790.00 | 10.30 | Complete |

| | | | | | | | |
|-----|-----|---|--|-----------------------------|-------------------------|-------|------------|
| | | | System Upgrades | | | | |
| 181 | DOC | 177 Weston Street, Hartford, CT 06120 | Boiler Room Pump Replacement | \$13,348.00 | \$44,117.94 | 3.30 | In Process |
| 182 | JUD | 111 Phoenix Ave, Enfield | Roof and HVAC Upgrades | \$66,763.37 | \$760,000.00 | 11.40 | In Process |
| 183 | DOC | 285 Shaker Road, Enfield, CT 06082 | Laundry Consolidation and Upgrades | \$135,390.00 | \$302,326.00 | 2.20 | Complete |
| 186 | DOT | 2800 Berlin Turnpike, Newington | Headquarters Building Lighting Improvement | \$265,141.56 | \$1,332,083.00 | 5.00 | In Process |
| 187 | DOC | 285 Shaker Road, Enfield, CT 06082 | Rooftop Unit Replacement | \$31,957.00 | \$294,252.67 | 9.20 | Complete |
| 188 | DOC | 900 Highland Ave, Cheshire | A&B Dining Areas Roof Top Unit Replacement | \$6,660.00 | \$59,832.91 | 9.00 | Complete |
| 189 | DDS | 67-87 Mountain Rd Newington CT 06111 | RTU AC and Window Replacement HRC | \$17,274.91 | \$199,868.00 | 11.60 | In Process |
| 190 | DOC | 986 Norwich-New London Turnpike, Uncasville, CT 06382 | Radgowski Kitchen Hood Controls | \$7,222.00 | \$23,367.00 | 3.20 | Complete |
| 195 | DOC | 201 West Main Street, Niantic, CT 06357 | Laundry Ozone System | \$27,528.00 | \$38,090.00 | 1.40 | Complete |
| 196 | MHA | 460 Silver Street, Middletown, CT 06457 | Boiler Replacement & Heating System Upgrades | \$5,000.00 | \$60,000.00 | 12.00 | In Process |
| | | | | \$2,813,397.52 | \$17,672,742.67 | | |
| | | | | Total Annual Savings | Total Investment | | |