



# **ENERGY EFFICIENCY IN STATE AND MUNICIPAL BUILDINGS**

## **LEGISLATIVE REPORT**

**July 2, 2012**



**SUBMITTED BY:**

**CONNECTICUT DEPARTMENT OF ENERGY &  
ENVIRONMENTAL PROTECTION  
AND  
CONNECTICUT DEPARTMENT OF ADMINISTRATIVE SERVICES**

## EXECUTIVE SUMMARY

### Connecticut's "Lead by Example" State and Municipal Building Energy Efficiency Program

Connecticut's "Lead by Example" program will help Connecticut reduce energy use in state facilities by 10% by January 1, 2013 and provide support for municipalities to achieve energy reductions in their buildings. The scale of this endeavor is significant. State building energy use was roughly 4.1 trillion British Thermal Units (BTUs) in FY 2011. "Lead by Example" has made progress towards the goals set forward in Public Act 11-80, but there is still a great deal of work to do.

The "Lead by Example" program is supported by a strong partnership that includes the Department of Administrative Services, Department of Energy and Environmental Protection, Department of Construction Services, Office of Policy and Management, Board of Regents, Office of the Treasurer, Attorney General's Office, and the program administrators of the CT Energy Efficiency Fund, with no expenses for outside consultants. During its first nine months, "Lead by Example" has implemented three major initiatives: Bond funding, performance contracting, and improved building operations.

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#### INCREASING ENERGY EFFICIENCY WITH BOND FUNDING

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\$15 million of bonded funds for energy efficiency upgrades in state buildings was made available in September of 2011. Of the \$15 million, \$8,302,237 has been committed to 37 different projects across the state, with an average payback of 5.45 years (all numbers current as of June 29, 2012). An estimated 75% of these projects, plus some additional projects funded by the program in the coming months, will be complete by January 2013. These projects will achieve energy reductions that are the annual equivalent of:

- ❖ 358,700 fewer gallons of gasoline used
- ❖ 1,460 homes in CT taken off of the electricity grid
- ❖ 3,530,900 fewer pounds of coal used
- ❖ 322,900 fewer gallons of home heating oil used

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#### ENERGY SAVINGS PERFORMANCE CONTRACTING

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Energy Savings Performance Contracting is the use of guaranteed savings from the maintenance and operations budget (utilities) as capital to make needed upgrades and modernizations to building environmental systems, financed over a specified period of time<sup>1</sup>. The "Lead by Example" program has developed a standardized Energy Savings Performance Contracting (ESPC) process that can reduce energy use in state and municipal facilities by 25% or more. This program enables state agencies and municipalities to implement multi-million dollar retrofit projects that are paid through future energy savings and can be structured to require no upfront capital investment. The program will repurpose wasted utility dollars to upgrade facilities with highly efficient energy systems, stabilize energy costs, create jobs, and stimulate Connecticut's economy. The standardized ESPC program provides the following key elements to allow state agencies and municipalities to implement successful projects:

- ❖ ESPC contract documents that have been pre-approved by the Attorney General's Office and other key agencies
- ❖ A pre-qualified list of energy services providers
- ❖ A Program Manager to provide oversight, support, and assistance
- ❖ A pool of vendors that will provide technical support on a project by project basis

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#### BUILDING OPERATIONAL IMPROVEMENTS

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The "Lead by Example" Program has contracted to provide energy monitoring services for approximately 100 state buildings. These energy monitoring services include real-time data on energy use, a web-based dashboard to manage a portfolio of buildings, and expert technical analysis to identify operational inefficiencies. Identification of operational inefficiencies will help state facilities save energy in the near term. State agencies will have the capability to benchmark and compare facilities, which will enable large, multi-site facilities to quickly identify buildings that are underperforming when compared to their peers or historical baselines

**CONNECTICUT LEAD BY EXAMPLE**  
**LEGISLATIVE REPORT**  
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Connecticut's "Lead by Example" program will reduce energy use in state agencies and municipal government buildings and operation

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The Department of Energy and Environmental Protection (DEEP) and the Department of Administrative Services (DAS) have developed a "Lead by Example" program to maximize energy efficiency in state and local government buildings. The goal of this program is to assist Connecticut in its quest to become the most energy efficient state in the nation. "Lead by Example" initiatives will help state agencies reduce energy use in state buildings 10% by 2013 and an additional 10% by 2018, in accordance with the targets established in Section 118 of Public Act No. 11-80, "An Act Concerning the Establishment of The Department of Energy and Environmental Protection and Planning for Connecticut's Energy Future." The "Lead by Example" program is also intended to satisfy the requirements of Section 123 of the Public Act.

The following "Lead by Example" initiatives are reducing energy use in state and municipal buildings:

- 1.) "Lead by Example" Bond Funding
- 2.) Standardized Energy-Savings Performance Contracting Process
- 3.) Building Operational Improvements Through Energy Monitoring

In addition, the "Lead by Example" program has created a consistent framework for benchmarking energy use and tracking savings.

The "Lead by Example" program addresses all aspects of efficiency in state buildings, and provides assistance to municipalities seeking to reduce their energy use. Bond funding and energy monitoring allow the state to quickly address the obvious targets for efficiency upgrades. Energy savings performance contracting gives state agencies and municipalities a tool to dramatically reduce energy use through major upgrades to a building's mechanical systems, windows, insulation, etc. Energy monitoring and benchmarking identify targets for efficiency upgrades that may not be immediately apparent.

This report provides a summary of "Lead by Example" progress, in fulfillment of the requirements of Public Act 11-80, Section 118:

<b>Public Act No. 11-80</b>	
<b>Lead by Example Energy Reduction Plan and Requirements</b>	
❖	<b>Reduce energy consumption by 10% by January 1, 2013 and an additional 10% by 2018</b>
❖	<b>Assess current energy consumption of all fuels used in state owned buildings</b>
❖	<b>Identify the top one hundred energy consuming buildings</b>
❖	<b>Establish targets for conducting energy audits in state buildings</b>
❖	<b>Determine which energy efficiency measures are most cost effective in state buildings</b>
❖	<b>Establish programs that utilize performance contracting, bonding, or other means</b>

## SECTION I

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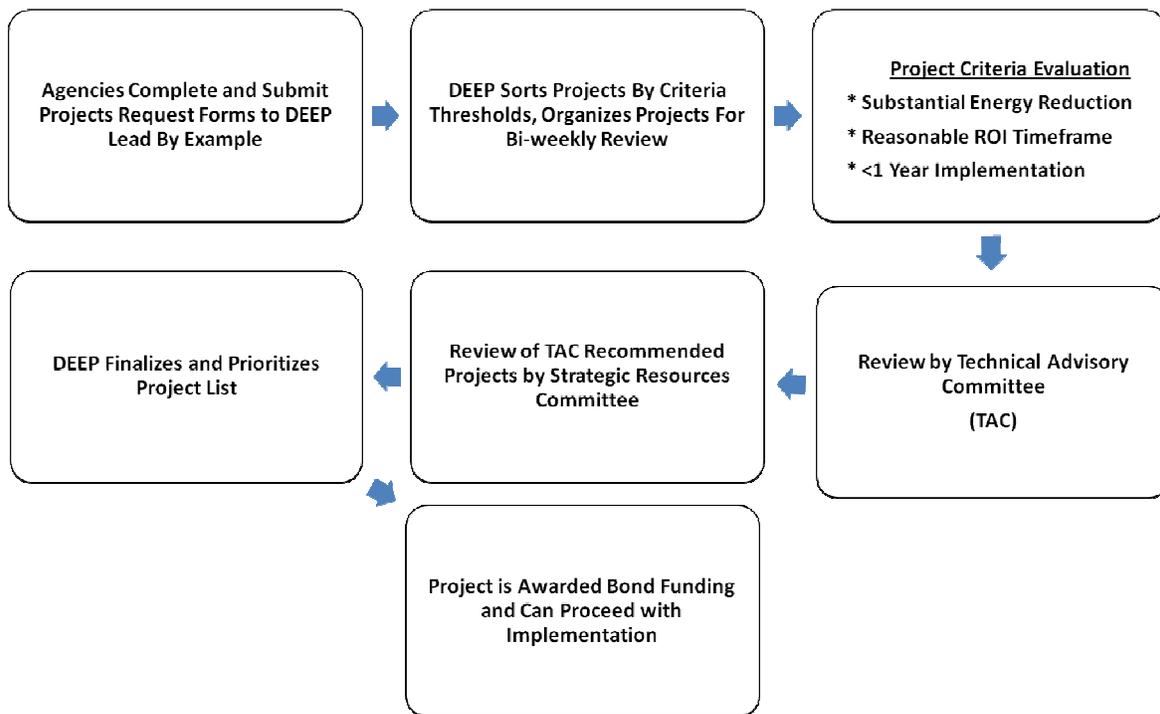
### INCREASING ENERGY EFFICIENCY WITH BOND FUNDING

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#### Overview

In September 2011, the Bond Commission authorized \$15 million in bond funds to increase energy efficiency in state buildings. DEEP and DAS formed the “Lead by Example” program to manage these bond funds and other funds for state and municipal energy efficiency upgrades. “Lead by Example” created a project application and review process (see diagram below). Projects selected for funding must result in significant energy reductions, have a reasonable payback, and be able to be implemented quickly. Projects are reviewed by the Technical Advisory Committee (TAC), comprised of energy experts and engineers from the Department of Construction Services (DCS), Department of Administrative Services (DAS), Higher Education, Connecticut Energy Efficiency Fund (CEEF), and “Lead by Example” program administrators within the Department of Energy and Environmental Protection (DEEP) and the Clean Energy Finance and Investment Authority (CEFIA). After TAC approval, the proposed project moves on for approval by the Strategic Resources Committee (SRC), which looks at the project through a state budgetary lens. Since September 2011, the TAC and SRC have reviewed project requests every two weeks to approve the most promising and impactful projects.

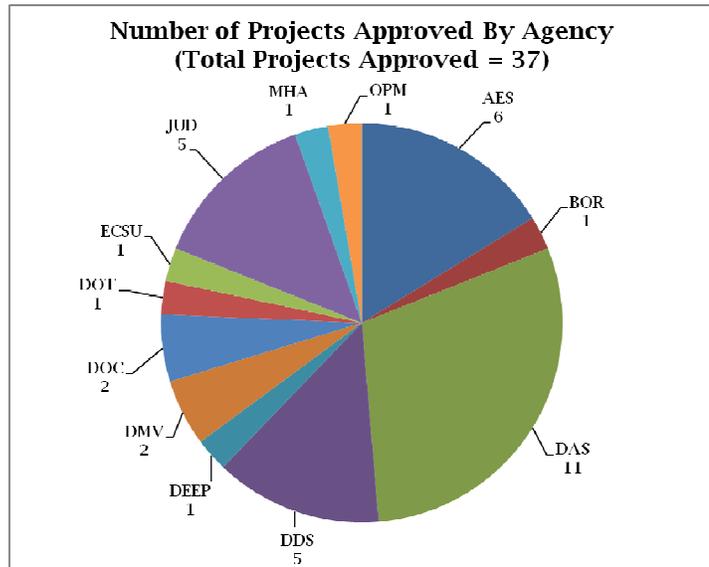
#### Flow of the Bond Funds Process



**Results: Part I**

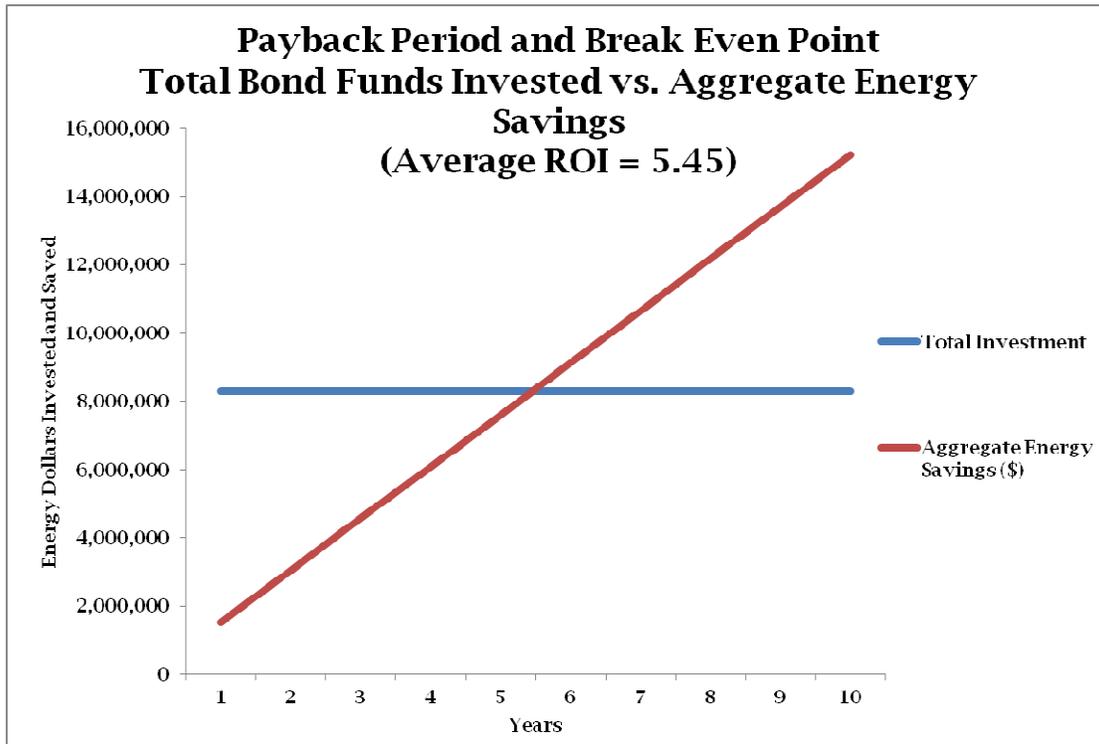
As of June 29, 2012, 37 projects have been approved for a total commitment of \$8.302 million with an average payback of 5.45 years. “Lead by Example” estimates that bond-funded projects will save agencies approximately 45 billion BTUs, an amount which will measurably reduce the state’s overall energy consumption, and will save approximately \$1.523m/year.

Reducing the state’s energy consumption by 45 billion BTUs is the annual equivalent of:<sup>1</sup>



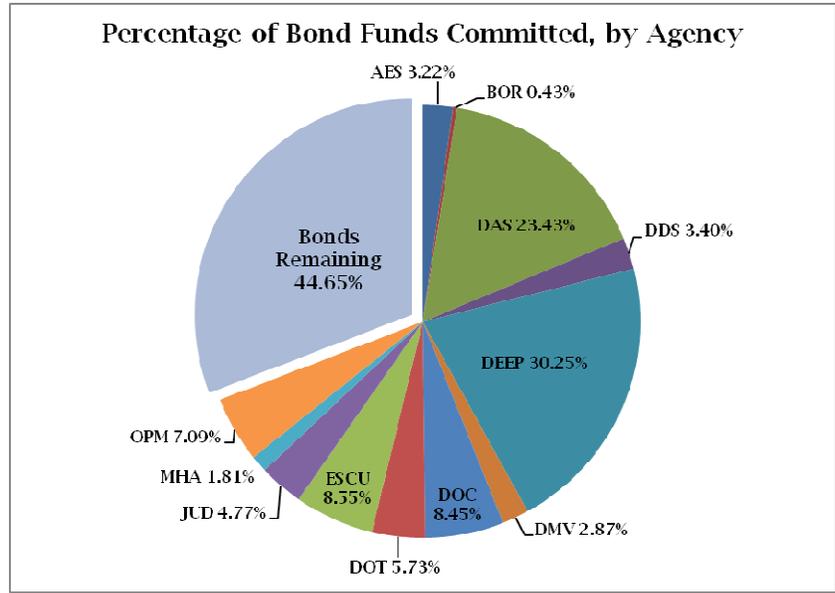
- ❖ 358,700 fewer gallons of gasoline used
- ❖ 1,460 homes in CT taken off of the electricity grid.
- ❖ 3,530,900 pounds of coal used
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The bond funds used to pay for these energy efficiency retrofits and upgrades are a prudent investment for the state. The projects are projected to collectively pay for themselves in 5.45 years (see below).



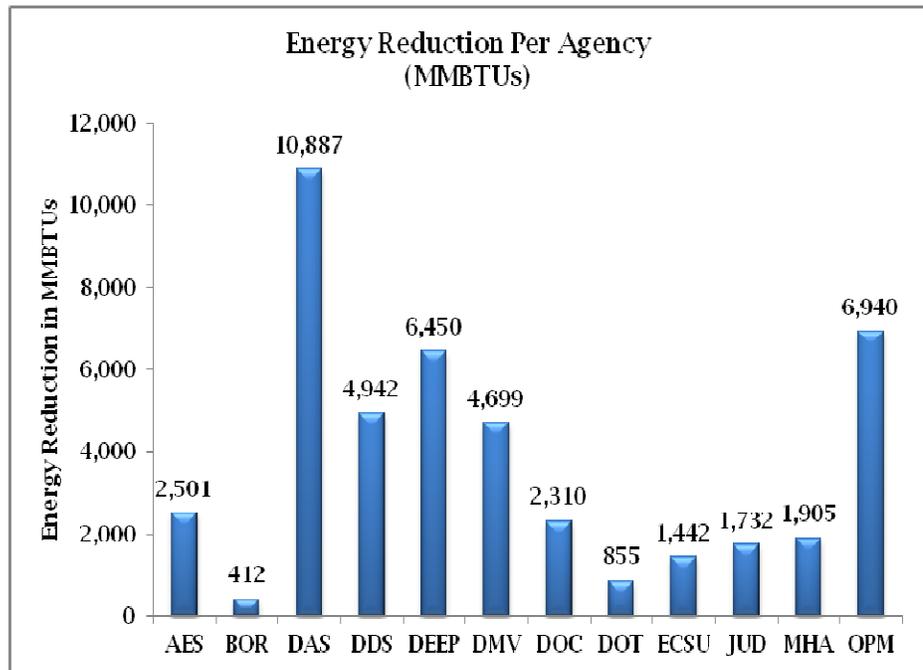
<sup>1</sup> Conversions factors can be found in Appendix, Table III.

Although a majority of the \$15 million in bond funds has been allocated, agencies still have a chance to request funding for additional energy efficiency upgrades. Approximately 45% (or \$6.7 million of the authorized \$15 million) is still available for allocation and requests are still being accepted until all bond funds are fully committed. A sample project request form has been provided in the Appendix, Table II, which serves as an overview of selected details and information that are required to request bond funding.

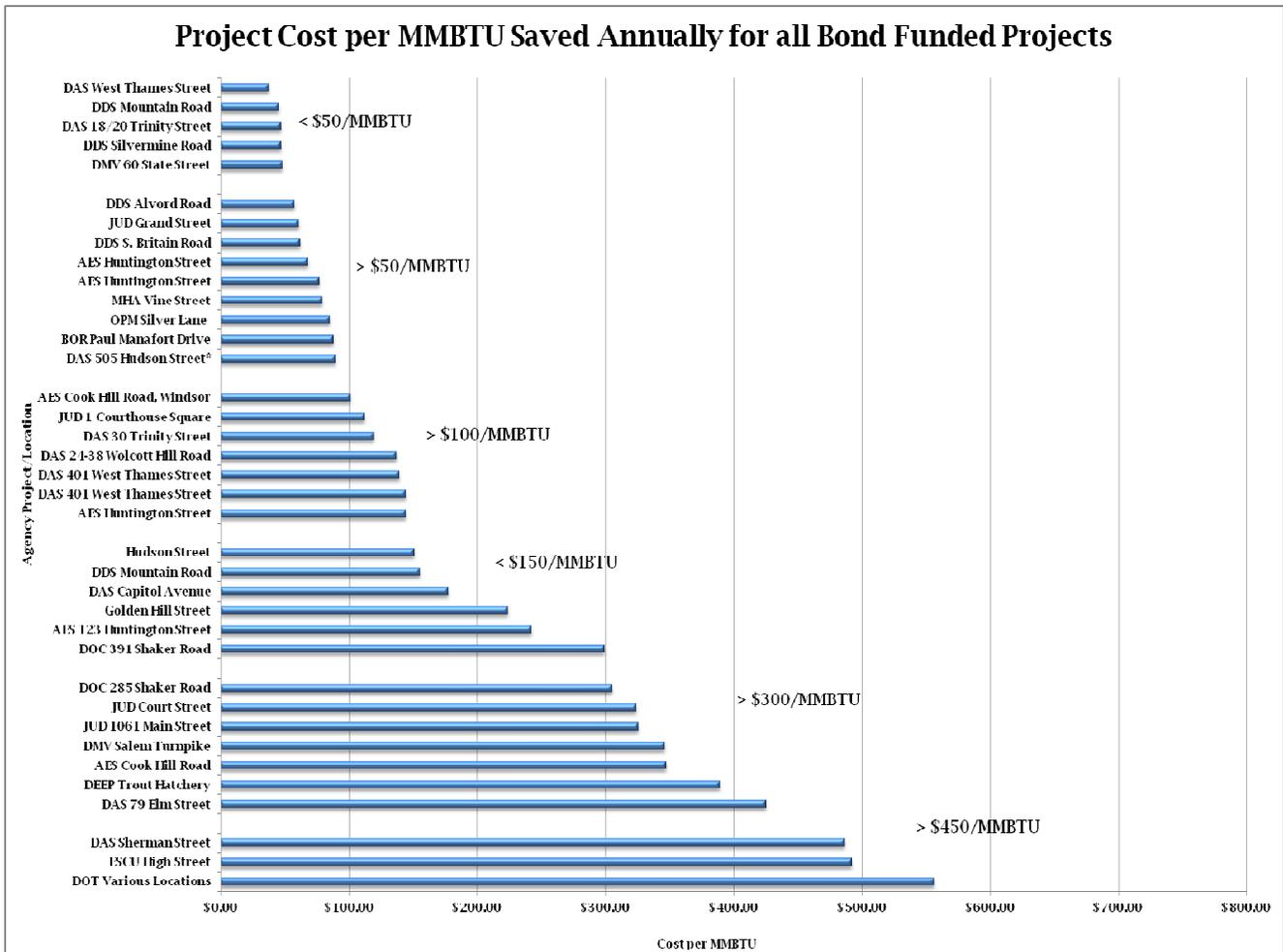


**Results: Part II**

The “Lead by Example” program has demonstrated a commitment to not only “light” efficiency (harvesting easy savings such as lighting-only projects), but also “deeper” projects. These broad scope, comprehensive efficiency projects sometimes cost more per MMBTU saved, but yield higher total energy savings. This “deep” efficiency strategy will yield benefits in the long term, and will serve the taxpayers of Connecticut well for years to come.



The bar chart below demonstrates the program’s commitment to “deeper” efficiency. The projects at the bottom of the chart (>\$300 per MMBTU saved annually) include far-reaching and comprehensive efficiency measures, which will increase the long-term impact of the program.



**SECTION II**

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**STANDARDIZED ENERGY SAVINGS PERFORMANCE CONTRACTING**

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**Overview**

Energy Savings Performance Contracting is the use of guaranteed savings from the maintenance and operations budget (utilities) as capital to make needed upgrades and modernizations to building environmental systems, financed over a specified period of time<sup>ii</sup>. The “Lead by Example” program has developed a standardized Energy Savings Performance Contracting Process (the Process) that has the potential to reduce energy use in state and municipal facilities by 25% or more. The Process will repurpose wasted dollars spent on utility bills and upgrade facilities with highly efficient energy systems, stabilize energy costs, create

jobs, and stimulate investment in Connecticut's economy. The Process enables state agencies and municipalities to implement multi-million dollar energy retrofit projects that are paid for by future energy savings and can be structured to require no upfront capital costs. The Process will be formally launched in July 2012.

### **Energy Reduction Potential and Benefits**

The National Association of Energy Service Companies estimates that current state facility energy expenditures in Connecticut are approximately \$200 million. Municipal energy expenditures in the state are greater than \$200 million. Through the Process, state and municipal governments can achieve up to 25% in energy reductions, which translates to roughly \$120 million in total savings. Performance contracting drives economic growth because it allows agencies and municipalities to focus on energy efficiency in the long-term and tap into the private capital markets, creating partnerships between state agencies or municipalities and private companies. This can reduce state agencies' and municipalities' reliance on state aid and financing for energy efficiency projects.

The following types of state and local government facilities can benefit significantly from performance contracting:

- ❖ Higher Education
- ❖ Primary and Secondary Schools
- ❖ Waste Water Treatment Facilities
- ❖ Campuses and Dormitories
- ❖ Correctional Facilities
- ❖ Health Care Facilities
- ❖ Office Buildings

### **Results**

Since October 2011, "Lead by Example" has worked in close partnership with the following key state agencies to develop the standardized Process:

- ❖ The Department of Energy and Environmental Protection
- ❖ The Department of Administrative Services
- ❖ The Department of Construction Services
- ❖ The Office of Policy and Management
- ❖ The Office of the Attorney General
- ❖ The Office of the Treasurer

The resulting Process is streamlined, repeatable, and transparent. The standards and requirements set forth in this Process will mitigate risk for state agencies and municipalities and cultivate successful projects with guaranteed energy and cost savings. A thorough vetting of the program by these agencies not only provides confidence for user agencies and municipalities, but also creates a level playing field for energy service companies as well.

The framework created by the Process addresses areas that are critical to the execution of an efficient, effective, and successful performance contracting experience:

1. A standardized set of contractual documents that have been pre-approved by agencies with jurisdiction over energy, procurement, legal, and fiscal decisions.
2. Financing templates in the form of tax-exempt municipal leases and loans as guidance for municipalities in third party financing agreements.
3. Allotment of bond funding for initial state agency projects.

4. A Program Manager who will provide program management, outreach, and technical and analytical support to state agencies and municipalities.
5. Additional third-party technical support for individual projects during key stages of project development.

### SECTION III

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## **BUILDING OPERATIONAL IMPROVEMENTS THROUGH ENERGY MONITORING**

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### Overview

The “Lead by Example” program has contracted for the installation of energy monitoring software on approximately 100 state buildings. The contractor will also provide expert technical analysis of energy use patterns in these buildings, which will allow energy managers to target and address inefficiencies in state facilities. This contract is paired with an existing demand response program for state agencies, which was established to voluntarily shed electric load during times of peak energy demand in exchange for quarterly payments.

### Energy Reduction Potential and Benefits

#### **Sophisticated Energy Monitoring Systems**

This “Lead by Example” initiative will install energy monitoring systems at approximately 100 of the highest energy consuming state-owned buildings. This system will provide value to the state in four ways:

- 1.) Single Metering System: Sub-meters will be installed, where necessary, to isolate individual building energy use
- 2.) Real-Time Data: A web-based dashboard offers a clear view of real-time energy use across a portfolio of buildings
- 3.) Benchmark and Compare Facilities: This tool will enable large, multi-site facilities to quickly identify buildings that are underperforming when compared to their peers or historical baselines
- 4.) Technical Analysis: This will include system tools, energy analysis, and energy efficiency solutions. The solutions provide facilities managers with specific, concrete actions to reduce energy consumption at low or no cost

Energy Efficient Monitoring System	
Benefits	
❖	<b>Reduce Energy Usage</b>
❖	<b>Mitigate Peak Demand Charges</b>
❖	<b>Address Utility Bill Overcharges</b>
❖	<b>Enhance Measuring and Verification Efforts</b>
❖	<b>Optimize Energy Efficiency Investments</b>

### Results

“Lead by Example” has conducted outreach to state agencies, including all sites currently enrolled in demand response. “Lead by Example” and the contractor are working with these agencies to identify specific buildings that are good candidates for the energy monitoring system. “Lead by Example” expects to have at least 80 buildings participating in energy monitoring system by January 1, 2013. The new monitoring systems will highlight, for example,

if lights are left on overnight, if building temperatures are too high or low, or if HVAC units are kept running over the weekend in unoccupied facilities. The technical analysts will help interpret energy use trends and recommend improvements to building operations and energy management that will reduce energy use and minimize operating costs for the state.

## COMPLEMENTARY MEASURES

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### **PORTFOLIO MANAGER: ENERGY BENCHMARKING AND MEASUREMENT**

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#### **Overview**

In order to track energy reductions statewide, “Lead by Example” has established master accounts for the State of Connecticut in the U.S. Environmental Protection Agency’s Portfolio Manager online tool, and has made participation in this master account a requirement for all buildings receiving “Lead by Example” funding. Portfolio Manager is an online energy management tool that allows agencies and municipalities to track and assess energy consumption across their entire agency’s or municipality’s portfolio of buildings. It can also help identify investment priorities, find under-performing buildings, and verify efficiency improvements. State agencies and municipalities are required to share their data with the appropriate Connecticut master account as a condition of receiving “Lead by Example” funds. In addition to sharing building accounts with the state master account, state agencies and municipalities participating in the “Lead by Example” program must update their portfolio manager account with monthly energy usage data. This monthly update will enable “Lead by Example” to generate aggregate energy reports on energy use and reduction.

#### **Energy Reduction Potential and Benefits**

State of Connecticut master accounts in Portfolio Manager have been set up for the following categories of government buildings:

- ❖ K-12 schools
- ❖ Other (non-school) local government buildings
- ❖ Board of Regents Higher Education Institutions
- ❖ University of Connecticut Facilities
- ❖ Other State Agencies (non-higher education)

In partnership with the US Environmental Protection Agency, “Lead by Example” has established a pilot program with Connecticut Light & Power and United Illuminating to institute the electronic transfer of electric energy usage information to Portfolio Manager. This program will allow for more efficient tracking of energy usage and eliminate the paperwork burden of having to manually input the tracked information into Portfolio Manager.

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## NEXT STEPS

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- ❖ “Lead by Example’s” performance contracting program will be rolled out to state agencies and municipalities in July of 2012
- ❖ The program will integrate into the state’s “Energize Connecticut” marketing campaign
- ❖ “Lead by Example” will work with the Clean Energy Finance and Investment Authority (CEFIA) to develop longer-term financing options for performance contracting
- ❖ The program will evaluate its progress against Public Act 11-80’s 10% energy reduction requirement in state buildings on January 1, 2013, as well as against other goals
- ❖ “Lead by Example” will institute a real-time data collection program in partnership with the utilities for state agencies and municipalities

**Appendix**

**Table I**

**Lead by Example Bond Fund Projects**

ID Number	Agency	Building Address	Project Name	Project Cost	Projected Annual Energy Cost Savings	ROI
19	AES	123 Huntington Street, New Haven, CT	Windows	\$63,550.00	\$31,921.00	1.99
20	AES	123 Huntington Street, New Haven, CT	Windows	\$36,881.00	\$5,475.00	6.74
21	AES	123 Huntington Street, New Haven, CT	Dual Fuel Burners	\$46,900.00	\$18,968.00	3.42
22	AES	153 Cook Hill Road, Windsor, CT	Windows	\$20,300.00	\$4,999.00	4.06
24	AES	153 Cook Hill Road, Windsor, CT	Lighting & Occupancy sensors	\$16,012.34	\$3,806.00	2.99
25	AES	123 Huntington Street, New Haven, CT	Windows	\$83,863.00	\$23,988.00	3.50
103	BOR	55 Paul Manafort Drive, New Britain CT	Charter Oak Occupancy Sensor Installation and HVAC Upgrades	\$36,000.00	\$21,137.00	1.70
26	DAS	24-38 Wolcott Hill Road, Wethersfield, CT	EMS, RA Conversion, Central Plant Fixture Replace	\$915,453.00	\$152,988.00	5.63
27	DAS	110 Sherman Street, Hartford, CT	Digital Electronic Control System	\$308,522.00	\$18,039.16	13.86
28	DAS	505 Hudson Street, Hartford	Lighting Upgrade - Upper & Lower Garage	\$19,246.76	\$5,400.78	6.21
30	DAS	18/20 Trinity Street, Hartford, CT	Replace VFDs and Pumps - Tie into BMS	\$16,243.00	\$28,000.00	1.56
31	DAS	30 Trinity Street, Hartford, CT	VFD Installation and Tie into BMS	\$24,468.00	\$13,800.00	1.82
38	DAS	505 Hudson Street, Hartford CT	High Efficiency Gas Fired Boilers	\$124,080.00	\$11,279.00	10.28
43	DAS	79 Elm Street, Hartford, CT	VAVs/FTUs/VFDs	\$349,750.00	\$131,000.00	2.45
77	DAS	401 West Thames Street, Norwich, CT	Uncas Domestic Hot Water Boiler	\$12,850.00	\$2,645.17	4.86
79	DAS	401 West Thames Street, Norwich, CT	Uncas Control Valves	\$18,480.00	\$6,701.49	3.08
80	DAS	401 West Thames Street, Norwich, CT	Uncas TVCCA Windows	\$98,736.00	\$9,854.61	10.02
85	DAS	165 Capitol Avenue, Hartford, CT	SOB - Occupancy Sensors, Basement, Ground, First	\$57,427.46	\$14,241.34	3.43
32	DDS	67-87 Mountain Rd Newington CT	Installation of EMS	\$73,169.00	\$24,796.00	3.21

33	DDS	146 Silvermine Road Norwalk, CT	Installation of EMS	\$79,104.00	\$49,227.00	1.75
39	DDS	195 Alvord Road, Torrington, CT	Installation of EMS	\$60,765.00	\$20,214.06	3.34
50	DDS	1 1450 S Britain Rd Southbury CT	Lighting at Power House	\$14,278.00	\$8,707.00	1.64
111	DDS	71 Mountain Road, Newington, CT	Interior and Exterior Lighting Retrofit	\$55,305.00	\$18,033.00	3.07
104	DEEP	141 Trout Hatchery Road, Central Village, (Plainfield) CT	Energy Conservation Improvements	\$2,511,259.00	\$288,669.61	8.70
91	DMV	173 Salem Turnpike, Norwich, CT	Lighting upgrade	\$16,500.00	\$2,517.00	6.56
108	DMV	60 State Street, Wethersfield, CT	Revised Wethersfield- Lighting 5/24/12	\$221,708.00	\$40,344.00	5.50
37	DOC	285 Shaker Road, Enfield, CT	Robinson HVAC Rooftop Replacement	\$551,000.00	\$79,397.00	6.94
42	DOC	391 Shaker Road, Enfield	HVAC Rooftop Unit Replacement	\$150,690.00	\$22,137.00	6.81
94	DOT	Various Locations	Energy Efficiency Improvement at DOT Commuter Parking	\$475,668.00	\$32,172.00	14.79
1	ECSU	High Street, Willimantic, CT	Allerton Building Automation System	\$709,818.00	\$76,065.66	9.33
81	JUD	1 Courthouse Square, Norwich, CT	LED Lighting Retrofit	\$15,599.50	\$6,933.79	2.25
96	JUD	1 Court Street, Middletown, CT	Middletown Courthouse Garage Lighting Retrofit	\$55,631.00	\$8,550.00	6.51
105	JUD	172 Golden Hill Street, Bridgeport, CT	Lighting Retrofit	\$135,000.00	\$86,988.00	1.55
106	JUD	400 Grand Street, Waterbury, CT	Waterbury Courthouse Garage Lighting Retrofit	\$17,500.00	\$14,406.00	1.21
109	JUD	1061 Main Street, Bridgeport, CT	Fairfield JD Lighting Retrofit	\$172,000.00	\$26,343.00	6.53
87	MHA	500 Vine Street, Hartford, CT	Hot Water DDC Controls	\$150,000.00	\$45,286.00	3.31
44	OPM	615 Silver Lane East Hartford, CT	Aggregated Efficiency Measures Project	\$588,500.00	\$168,010.00	3.50
*** Summary Figures for all Projects***				Total Cost	Annual Projected Savings	Average ROI
Totals				\$8,302,257	\$1,523,040	5.45



**Table III**

**Conversion Factors**

<b>Energy Type</b>	<b>BTU's per Energy Type Original Unit</b>	<b>Original Unit</b>
<b>Motor Gasoline</b>	<b>125,000.00</b>	<b>Gallons</b>
<b>Residential Oil</b>	<b>149,690.00</b>	<b>Gallons</b>
<b>Anthracite Coal</b>	<b>12,700.00</b>	<b>Pounds</b>
<b>Electricity</b>	<b>3,412.34</b>	<b>KWh</b>
<b>Natural Gas</b>	<b>1,031.00</b>	<b>Cubic Foot</b>
<b>Fuel Oil</b>	<b>138,874.36</b>	<b>Gallons</b>

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<sup>i</sup> Federal Department of Energy

<sup>ii</sup> Federal Department of Energy