

Boston - EE Workforce Training

**City of Boston, Environment Department
Adam Jacobs, Energy Manager**



Energy Efficiency in Massachusetts

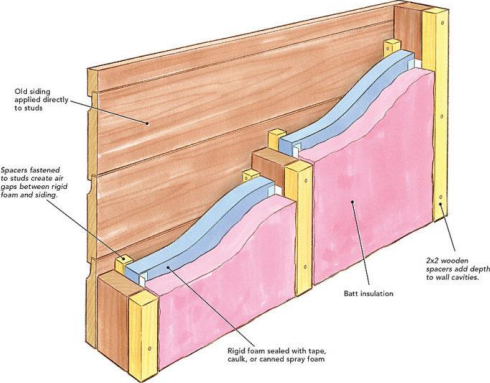
M.G.L. ch. 25, § 21 - Section 21. (a) To mitigate capacity and energy costs for all customers, the department shall ensure that (...) electric and natural gas resource needs shall first be met through all available energy efficiency and demand reduction resources that are cost effective or less expensive than supply.

Utility Type	Electric	Gas
Energy Savings % of Forecasted Sales (2016-2018)	2.93%	1.24%
Energy Savings (MWh for electric, Dth for gas)	4,117,539	8,580,962
Performance Incentive at Design Level	\$100 million	\$18 million



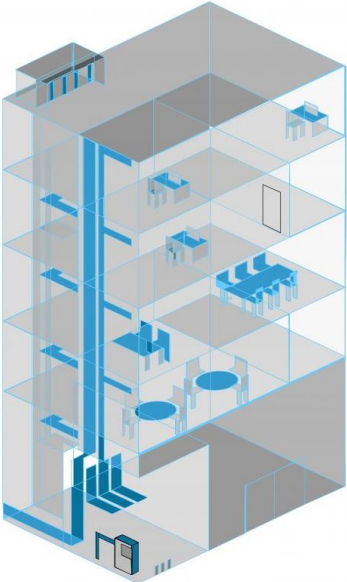
Energy Efficiency Incentive Programs

Prescriptive...



Custom...

BUILDING MANAGEMENT SYSTEM



- Web Based
- BACNet™ and LonWorks® HVAC controllers
Air Quality and Comfort
- Lighting Control: Indoor, Outdoor, Signage
- Security: Access Control and CCTV
- Wireless, Battery-less Sensing,
Wireless Mesh Networks
- Energy Management and Metering
- Multi-Site and Campus Solutions
- Other Building Systems and Applications -
Elevators, Networked Equipment, Etc.



Building Operator Certification (BOC) Training



PILOT Utility-Sponsored Building Operator Certification (BOC) Training

- **74 hour energy efficiency training (delivered over 8 days)**
- **Each class covers a different building system or subject**
 - **HVAC, lighting, controls, electrical, IEQ, benchmarking, etc.**
- **30 public sector building engineers and facilities staff from Boston and surrounding communities**

Building Operator Certification (BOC) Training - Courses

CORE

- ▶ BOC 1001 Energy Efficient Operation of Building HVAC Systems
- ▶ BOC 1002 Measuring and Benchmarking Energy Performance
- ▶ BOC 1003 Efficient Lighting Fundamentals
- ▶ BOC 1004 HVAC Controls Fundamentals
- ▶ BOC 1005 Indoor Environmental Quality
- ▶ BOC 1006 Common Opportunities for Low-Cost Operational Improvement

SUPPLEMENTAL CLASSES (1 OFFERED PER COURSE SERIES)

- ▶ BOC 1007 Facility Electrical Systems
- ▶ BOC 1008 Operation & Maintenance Practices for Sustainable Buildings
- ▶ BOC 1009 Building Scoping for Operational Improvement
- ▶ BOC 1010 Energy Efficient Ventilation Strategies and High Performance Heating and Cooling Equipment
- ▶ BOC 1011 Energy Efficient Ventilation Strategies and Energy Savings through Energy Recovery
- ▶ BOC 1012 High Performance Heating and Cooling Equipment and Energy Savings through Energy Recovery

Building Operator Certification (BOC) Training - Assignments

BOC® Level I Project Workbook

Assignment 3: Lighting Survey

Lighting Survey Project Rubric

Part I: Lighting Surveys (10 points)	Check if Complete
Includes the following:	
1 Name of surveyed facility	1. _____
Lighting Power Survey	
2 Identify one space type within facility per worksheet	2. _____
3 Each designated space lists: Space Square Footage, fixture type; number of fixtures per type; wattage per fixture; total wattage; watts per square feet; recommended LPD; control type;	3. _____
4 Calculations are accurate for Total Wattage (columns D xE)	4. _____
5 Calculations are accurate for Watts/ft2 (columns F / B)	5. _____
Lighting Energy Use Survey	
6 Space type, square footage, and total wattage (per fixture type) was carried over from the Lighting Power survey.	6. _____
7 Calculations are accurate for Watt Hrs per Month (columns CxD)	7. _____
8 Conversion to kWh is accurate (column E/1000)	8. _____
9 Cost Per Month is accurate (columns F x G)	9. _____
10 Cost Per Month per NET ft2 is accurate (columns H / B)	10. _____
Part II: Research (5 points)	Check if Complete
Utility Incentive Research:	
11 Local incentive resources are identified	11. _____
12 Steps taken to apply for incentives	12. _____
Part III: Lighting Retrofit Case Study (25 points)	Check if Complete
Current information, Proposed Retrofit and Calculations:	
13 Total points earned from the worksheet	13. _____

Building Operator Certification (BOC) Training - Assignments

BOC® Level I Project Workbook

Assignment 3: Lighting Survey

Lighting Retrofit Worksheet

First complete the top section by filling in each line with current lighting system information and proposed retrofit data provided, and then perform the calculations.

	Current	Proposed
Watts per fixture (A)	<u>148</u> watts	<u>90</u> watts
Operating hours (B)	<u>6,000</u> hours	<u>6,000</u> hours
Number of fixtures (C)	<u>250</u>	<u>250</u>
Annual consumption (A) x (B) x (C)	<u>222,000</u> kWh/year	<u>135,000</u> kWh/year
Note: divide the total by 1,000 to get kilowatt-hours		
Cost per year Note: kWh/year x \$.10	<u>\$ 22,200</u>	<u>\$ 13,500</u>

	Calculations	
Energy savings	<u>222,000</u> kWh Current annual consumption	minus <u>135,000</u> kWh Proposed annual consumption
		<u>87,000</u> kWh Annual energy savings (kWh)
Cost savings	<u>87,000</u> kWh Annual energy savings (kWh)	X <u>\$0.10</u> Energy rate per kWh
		<u>\$ 8,700</u> Annual cost savings
Utility Incentive	<u>87,000</u> kWh Annual energy savings (kWh)	X <u>\$0.20</u> Utility incentive in \$/kWh
		<u>\$ 17,400</u> Utility incentive
Net Project cost	<u>\$ 28,500</u> Project capital cost	minus <u>\$ 17,400</u> Utility incentive
		<u>\$ 11,100</u> Net project cost
Payback period	<u>\$ 11,100</u> Net project cost	divided by <u>\$ 8,700</u> annual dollar savings
		<u>1.27</u> years Payback in years
Return on investment (ROI)	<u>1</u>	divided by <u>1.27</u> Payback in years
		<u>78</u> % ROI

Note: ROI is 1 divided by the payback

Building Operator Certification (BOC) Training - Utility Support

Tuition Reimbursement Award Application (continued)



Up to 50% Tuition Reimbursement Available

National Grid will pay up to 50% tuition reimbursement to one facilities management professional per commercial customer facility within a five-year period provided that the facilities management professional graduates from a Building Operator Certification ("BOC") Level 1 course and commercial customer facility meets the requirements. Tuition reimbursement is available for facilities management professionals who (i) graduate from the BOC Level 1 course; (ii) are National Grid commercial customers or employed by one of those commercial customers; and (iii) have not taken the BOC Level 1 course within the last 5 years. Facility management professionals of public and private K-12 schools in Rhode Island may be eligible for 100% reimbursement with a limit of one reimbursement per school system within a five-year period.

Facility management professionals must work at a commercial customer facility in a facilities management position, e.g., as a facility manager, energy manager or in a role to reduce building-wide energy consumption. The commercial customer facility must have a minimum of 50,000 sq. ft. of conditioned building space. National Grid may, in its sole discretion, modify or terminate this offer for tuition reimbursement at any time without notice. Reimbursements are provided to companies or organizations and cannot be dispersed to individuals only.

Support

- **National Grid 50% tuition reimbursement to customers >50k SQFT**
- **Eversource 50% tuition reimbursement to city facilities staff as pilot**

Result

- **100% tuition support (~\$1795/student) @ no cost**
- **Studies show up to 2-3% in savings from trained facilities staff**
- **Persistence of savings for other ECM investments**

Other Workforce Development Initiatives in Boston

- **BHCC - Energy & Sustainability Management Certificate Program**
 - Co-op students/interns available!
- **Madison Park Voc Tech - Green Building Tech Club (by USGBC)**
 - Co-op students/interns available!
- **Asian American Civic Association - Building Energy Efficient Maintenance Skills (BEEMS)**
 - 22 Week Training Course Includes: hands-on training, english for the maintenance industry, construction math, job readiness training
- **Stacks and Joules @ Madison Park Voc Tech**
 - By learning to program banks of wireless LEDs, students gain a deep understanding of the fundamentals of computerized building automation systems.
- **RCC Building Management System Technology**
 - Potential 2 + 2 program partnership with Mass Maritime
- **YouthBuild Boston - Facilities Tech Apprenticeship**
 - Boston Office of Workforce Development partnership



THANK YOU

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