Final Report

EVALUATION OF THE BUILDING OPERATOR TRAINING AND CERTIFICATION (BOC) PROGRAM IN THE NORTHEAST

Funded By:
Northeast Utilities, National Grid, NSTAR, KEYSPAN Energy Delivery, Long Island Power Authority, and Unitil Corporation

Submitted To:
Funding Organizations and Northeast Energy Efficiency Partnerships, Inc.

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September 6, 2002
ACKNOWLEDGEMENTS

We would like to thank Elizabeth Titus, of the Northeast Energy Efficiency Partnership (NEEP), and Kate Evans, of Northeast Utilities, for the technical direction that they provided to this evaluation of the Building Operator Training and Certification (BOC) program. Their ideas were sound and their feedback timely. We would also like to thank John da Silva and Alan Mulak of NEEP for their contributions to the research in its formative stages. We appreciate the utility program sponsors and BOC instructors who gave freely of their time during the telephone interviews we conducted in support of the research. Finally, we would like to thank the BOC students, their supervisors, and the nonparticipating supervisors we interviewed; we appreciate their willingness to answer our detailed questions.
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EXECUTIVE SUMMARY

OVERVIEW OF THE PROJECT AND PROGRAM

The Northeast Energy Efficiency Partnership (NEEP) is a regional non-profit organization supported by utilities, state government agencies, private foundations, and federal grants. It is committed to bringing affordable, energy-efficient products and services to the marketplace. In the fall of 1999, NEEP began its Resource-Efficient O&M Initiative, a market transformation effort to train operators in efficient building operations and management (O&M), establish recognition of and value for certified operators, support the adoption of resource-efficient O&M as the standard in building operations, and create a self-sustaining entity for administering and marketing the training in three years. NEEP and six northeastern utilities: KEYSPLAN Energy Delivery, Long Island Power Authority (LIPA), National Grid, NSTAR, Northeast Utilities, and Unitil Corporation provided sponsorship for the Initiative. In April 2000, the five utilities operating in Massachusetts, Connecticut, and Rhode Island began offering their customers the Building Operator Training and Certification (BOC) program as part of the market transformation effort. The sponsors provided grants to NEEP to license the BOC curriculum from the Northwest Energy Efficiency Council (NEEC), its developer.

At the end of 2001, the second year of operation, six utility sponsors contracted with Research Into Action, Inc. and GDS Associates, Inc. to conduct an evaluation of the regional BOC market transformation efforts, focusing on the BOC 100 Series implementation, impacts, and marketing. The study combines elements of process evaluation, business plan evaluation, and market assessment. The evaluation covers the process, market, and impact issues of the program (Chapters 1 through 7) and makes recommendations for program improvements and for a long-term evaluation plan (Chapter 8).

PROGRAM STATUS AND KEY EVALUATION FINDINGS

In its first two years of operations (2000-2001), over 500 students enrolled in the BOC; over half of the students received certification. Enrollment and certification activity in 2001 was about double that of 2000. In 2001, four BOC 200 Series courses were taught in three utility service territories in Massachusetts, Connecticut, and New Hampshire.
Executive Summary

The key evaluation findings from the regional market survey of nonparticipants and the analysis of the projected market for BOC training are the following:

- The market potential during the next three years for the BOC training is about 10,000 students. The market potential will grow as program awareness increases.

- Estimates for longer-term growth are about 14,500 facilities employing roughly 243,000 building operators.

- Awareness of the BOC among supervisors of building operators with no BOC experience has grown to 13% at the end of the second year of the program.

- Three-fourths of nonparticipants interviewed would consider sending staff to the BOC training – an average of 2.75 operators per facility.

- Average facility size for respondents willing to send staff to the BOC training is 340,000 square feet, with an average annual electricity consumption of 1.8 million kWh.

- Half of the supervisor respondents who said they were willing to pay a dollar amount indicated willingness to pay $1,200 or more.

- One-third of the supervisors of BOC students indicated a willingness to pay over $1,400.

- Half of the nonparticipating supervisors surveyed thought certification is important and have sent staff to receive certification in some area of building operations and maintenance.

Findings from the program influence and impact analysis indicate high levels of effectiveness and satisfaction:

- Ninety percent of the BOC students and students’ supervisors say students have improved comfort, saved energy, or saved money in their facilities.

- One-third of students report the BOC training has helped them advance their career.

- Eighty percent of students and their supervisors reported being satisfied with the BOC training as a whole.
Eighty percent of students and 90 percent of supervisors have recommended or would recommend the program.

Fifty percent of students plan to take, or have taken, the BOC 200 Series.

Interviews with stakeholders regarding program strategy, marketing, administration, and instruction yield the following findings:

- Sponsors, staff, and instructors believe the 100-level series materials and program delivery meet students’ needs.
- Communication among members of the Working Group is good.
- Each utility sponsor has employed a different set of marketing methods and has conducted their marketing with a different level of effort.
- Tools and systems used by program administration staff have been adequate for the tasks associated with delivering the program with utility marketing and sponsorship.
- The program database is difficult for staff to use.
- Program efforts are understaffed in comparison with the projected activity level; staffing allocated to marketing is especially low.
- The business plan does not address the lag between establishing relationships with organizations and obtaining students and revenue.
- The full market price has not been tested in the market place to date; students have paid discounted course fees.

CONCLUSIONS

The conclusions build on the findings and discuss the quality, direction, and progress of the BOC program:
Executive Summary

- The BOC program has reduced electricity, gas, oil, and water consumption in the region. The annual resource savings from the average BOC student certified in 2000 or 2001 are:
  - 238,490 kWh (demand savings were not estimated)
  - 930 MMBtu of oil or gas
  - 77,095 gallons of water
  - $20,000 in annual resource cost savings at resource prices current in Massachusetts from 2001.
- The program approach of offering certification in combination with training is a sound one.
- Students and their supervisors have indicated high levels of satisfaction with BOC training received.
- In the near term, the potential market is about 10,000 students, coming from about one-third of all C & I facilities in the region that have building operators on staff.
- Potential customers for the BOC are the larger facilities from all commercial and industrial activity sectors.
- It is likely that the market will bear a program cost of $1,400, although the current study is inconclusive.
- The level of participant satisfaction, number of kilowatt-hours saved, and growth in market awareness for the NEEP 2000-2001 BOC program are similar to that for the Northwest Energy Efficiency Council (NEEC) 1999-2001 BOC program.

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1. These annual savings are expected to flow for five years from the time of training.

2. The baseline study conducted for the Pacific Northwest indicated that the market would bear a cost of $1,200, but that study was conducted during a time of economic expansion, in contrast to the current study, and used a different survey instrument, which also may have some bearing on the difference in findings. Current plans are to offer the course at $1,400, which has not been tested.
Executive Summary

- The program administration has met the challenge of supporting program activities in its first two years.
- The marketing activities have been highly successful, resulting in 13% market awareness and 518 enrolled students in two years.
- The current analysis suggests self-sustainability is not possible in the next one to three years, may not ever be possible, and likely is not desirable.
- Financial autonomy by 2003 is not feasible for the program. The program expenses have been estimated to fit within the identified funding sources and do not match the level of effort implied by the business plan.
- Marketing that is helped by, but not largely dependent on, the founding utilities is not feasible by 2003.
- The high levels of participant satisfaction, market interest, and resource savings indicate the program should move ahead.

RECOMMENDATIONS

1. **Rethink the desirability of the goal of “self-sustainability.”** To date, the program’s “place” or home has been with the utility sponsors. Marketing to date has associated the utility with the course.

2. **Both utilities and NEEP should market the program.** NEEP and the sponsors can best promote the program to different markets and by using different means. Utilities are reluctant to share their customer lists and, even were they to do so, NEEP cannot conduct the relationship marketing with these customers that the utilities can do. Both efforts are needed to reach a high level of market awareness in the next five years.

3. **Recognize that marketing to facility management associations is not likely to generate many students until the end of 2003, at the earliest.**

4. **Increase funding for the program by moving quickly to charging students the full fee.** Utility funding for the program should be in addition to course fees paid by participants, not a substitute. Utilities that want to demonstrate that they “stand behind” the program can offer a $100 rebate coupon.
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5. **Have a uniform price throughout the region.** Subsidized course fees should be offered customers on an as-needed basis as warranted by criteria established by the Working Group.

6. **Sponsoring utilities should move to justify continued financial support on the basis of the resources saved in their jurisdiction from the successful operation of the program there.** Regional promotion is important. Utilities throughout the region should be encouraged to participate.

7. **NEEP should conduct an analysis of the FTE required to successfully offer the program to 435 students a year.** These activities include (1) delivering the program in disparate locations, (2) conducting the development activities associated with new geographical markets, enhanced course materials, marketing materials, and so forth, and (3) marketing the program. A reasonable estimate of the program’s financial requirements should then be compared with the revenue stream expected from a uniform tuition of $1,400. NEEP should then approach the working group to determine how the sponsors can fund the shortfall. If program cost-effectiveness under a resource acquisition model precludes the sponsors from fully funding the shortfall, NEEP should determine the size of program (number of students) at which projected revenues and expenses balance.

8. **Staff the program at levels commensurate with the activities to be accomplished.** We estimate that a reasonable staffing level for the program in 2002 is:

   - 1-plus FTE for strategy and decision-making, marketing—including developing marketing materials and negotiating with potential sponsors—and enhancing the product. (The program manager full-time, plus some support.)

   - 1 FTE to deliver the program in Massachusetts, Connecticut, and Rhode Island—conducting scheduling of classes, arranging for all materials to be brought to the facility, providing attending the classes, maintaining the database, and related activities.

   - 1 FTE to deliver the program in each geographic area comparable in size and students to that of the initial three sponsors. The markets in Long Island (NY) and New Jersey might need 1 FTE now or by 2003.
Executive Summary

and each might need 1 FTE thereafter. The markets in New Hampshire, Vermont and Maine might need 1 FTE.

9. Revise the program database to increase the efficiency of program administrative efforts. Recommendations for revising the database are given in Appendix D.

10. Market both the BOC 100 Series and the 200 Series as courses for line staff, as designed. Position them as high-quality training for a reasonable price.

11. Do not target contract O&M firms for marketing efforts.

12. Postpone new product development (e.g., a customized course series) until after the core products (the two course series) have attained a secure place in the market.

13. Ensure that goals regarding each party’s responsibilities are observable or measurable. It is not possible to identify which students came from what marketing effort and thereby allocate the accomplishment to a utility or to NEEP.

14. Due to the consistency in findings between the Northeast and Northwest BOC 100 Series programs in impacts and participants satisfaction, these facets of the program can be accepted as sufficiently “proven.” That is, further research on these subjects would cost more than likely would be warranted by any changes in findings or improvement in accuracy. However, an evaluation of these facets would be useful if the program implementation or content significantly changes.

15. Assess student and supervisor response to the BOC 200 Series. Determine accuracy of staff and sponsor’s current views that the 200 Series is too simple. If their views are accurate, determine the appropriate balance between the corrective actions of revising the course materials and marketing the course to less experienced operations staff (e.g., line staff instead of supervisors).

16. Progress toward the resolution of the strategic issues raised herein (and discussed under the marketing concepts of product, price, promotion, positioning, place and measurement) should be assessed through subsequent evaluations.
17. The following performance indicators reflect the program’s history of accomplishments to date and should be tracked in future evaluations and assessments of program activity and market transformation results. The three resource savings indicators (for electricity, gas or oil, and water use) do not need to be re-estimated unless the content of the BOC training undergoes considerable change. Two other indicators—average square footage and average number of staff sent per organization—are also used in calculating program-wide savings. If tracking indicates that these numbers have changed by more than 10%, the formula for calculating program-wide savings should be adjusted to reflect the change in these values.

### Table ES.1

**BOC Program Performance Indicators**

<table>
<thead>
<tr>
<th>PERFORMANCE INDICATOR</th>
<th>BASELINE RESULTS</th>
<th>EOY 2001 RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Awareness</td>
<td>0%</td>
<td>13%</td>
</tr>
<tr>
<td>Number of 100 Series Taught</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td>Number of 200 Series Taught</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Students Enrolled in 100 Series</td>
<td>0</td>
<td>518</td>
</tr>
<tr>
<td>Students Certified for 100 Series</td>
<td>0</td>
<td>268</td>
</tr>
<tr>
<td>Students Enrolled in 200 Series</td>
<td>0</td>
<td>67</td>
</tr>
<tr>
<td>Students Certified for 200 Series</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>Drop-Out Rate</td>
<td>NA</td>
<td>4% (7) in 2000 0 in 2001</td>
</tr>
<tr>
<td>States Participating</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Utility Sponsors</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>Professional Association Sponsors</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Institutions Giving Academic or CEU Credit for the BOC</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Newsletters Published</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Case Studies Published</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Continued*
## PERFORMANCE INDICATOR | BASELINE RESULTS | EOY 2001 RESULTS
--- | --- | ---
Average Number of Students per Class in 100 Series | 0 | 21.3
Average Number of Students per Class in 200 Series | 0 | 17
Planned Courses Cancelled Due to Lack of Registrants | NA | 0
Average Number of Times Planned Start Date is Postponed | NA | Not tracked
Organizations Sending Staff to the BOC | 0 | 143
Average Number of Staff Sent | 0 | 1.4
Electric and Gas Utilities Sending Staff to the BOC | 0 | 10
Average Size of Facility Space | NA | 671,804 SF
Annual kWh Savings per Student per Square Foot of Space Student Operates | NA | 0.5
Annual MBtu (Gas, Oil) Savings per Student per Square Foot of Space Student Operates | NA | 1.95
Annual Gallons Water Savings per Student per Square Foot of Space Student Operates | NA | 0.162
Executive Summary
1. INTRODUCTION

This is the first evaluation of the Building Operator Training and Certification (BOC) program conducted in the Northeast. This research is sponsored by the Northeast Energy Efficiency Partnership, Inc. (NEEP) and six northeastern utilities: KEYSPAN Energy Delivery, Long Island Power Authority (LIPA), National Grid, NSTAR, Northeast Utilities, and Unitil Corporation. The utilities hired Research Into Action, Inc. and GDS Associates, Inc. to conduct the research.

PROGRAM DESCRIPTION

Program Overview

Building operation and maintenance activities have long been identified as critical components for the efficient operation of commercial and industrial buildings. While building operations and maintenance (O&M) staff often demonstrate a wide range of skills and experience, they are often among the least-educated about energy issues and sometimes the staff in companies that are offered the least opportunities for training and advancement. In 1998, eight utilities sponsored a market study of Massachusetts, Rhode Island, Connecticut and New Jersey to assess the O&M practices of commercial and industrial customers that affect energy efficiency. The study recommended, as one approach to increasing the energy efficiency of typical O&M practices, training and certification of maintenance technicians—the *nuts and bolts* operation and maintenance staff.

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3 Information in this chapter describing the program and its status has been drawn from NEEP’s RFP for this research project and from its Building Operation and Maintenance Training and Certification Program, Business and Marketing Plan, 2002-2003. A number of passages and all of the tables have been taken verbatim from the Marketing Plan document.


1. Introduction

NEEP followed up with a workshop in 1999 to explore options for a strategy to establish resource-efficient O&M as a sustained practice in the region. In the fall of 1999, NEEP launched its Resource-Efficient O&M Initiative. The goals of the Resource-Efficient O&M Initiative are to:

- Train and certify building operators to optimize the operations of their facilities both during the classes and after certification has been attained;
- Demonstrate the value of trained and certified building operators;
- Increase confidence of building owners and facility managers when hiring new staff;
- Build market demand for resource-efficient O&M services;
- Transform the market so that resource-efficient O&M is the standard; and
- Establish a self-sustaining resource-efficient building operation and maintenance initiative by the end of 2003.

As part of that initiative, in 2000, NEEP began the first year of the Building Operator Training and Certification (BOC) in Massachusetts, Connecticut, and Rhode Island. In early 2001, PSNH in New Hampshire joined the BOC initiative, and utilities in Long Island (New York) and New Jersey began to offer the BOC program to O&M staff in late 2001.

The Building Operators Certification training curriculum was originally developed by the Northwest Energy Efficiency Council (NEEC). It teaches operators the basics of building operation and maintenance, building systems, and techniques for achieving energy-efficiency. The target student audience is staff working in commercial and industrial buildings that regularly operate and maintain energy systems that are less sophisticated than those governed by whole-building controls. The program consists of extensive classroom training, on-site studies, and a market-valued certification. It is “fuel-blind,” addressing users of electricity, natural gas, oil, and water.

The Level I course or 100 Series includes the seven classes below. The target audience for the 100 Series courses is building operators with two or more years experience in operating or maintaining building systems and equipment. Students in the program gain a basic understanding of building systems, functions and operations. With supervision from journey level staff, a certified student is able to
establish or review for effectiveness a facility preventive maintenance and operations program.

- BOC 101 – *Building Systems Overview*
- BOC 102 – *Energy Conservation Techniques*
- BOC 103 – *Heating, Cooling, Air Systems and Controls* (2 days)
- BOC 104 – *Lighting Fundamentals*
- BOC 105 – *Maintenance and Related Codes*
- BOC 106 – *Indoor Air Quality*
- BOC 107 – *Facility Electrical Systems*

The Level II course or **200 Series** includes the following five core classes and two electives:

- BOC 201 – *Preventive Maintenance*
- BOC 202 – *Electrical Diagnostics*
- BOC 203 – *Heating, Cooling, and Air Systems Troubleshooting* (day 1)
- BOC 203 – *Heating, Cooling, and Air Systems Troubleshooting* (day 2)
- BOC 204 – *Heating, Cooling, and Air Systems Controls*

The following sponsors provided marketing support, tuition reimbursement programs, and facilities for class sessions in 2000. Three of them (National Grid, Northeast Utilities, NSTAR) also provided grants to NEEP in 1999 to purchase the program operation license from NEEC.

- Bay State Gas Company
- Berkshire Gas Company
- Fall River Gas Company
- KEYSPAN Energy
- National Grid
1. Introduction

- New Hampshire Business and Industries Association
- New Hampshire Governor’s Energy Office
- Northeast Utilities, including Public Service of New Hampshire
- NSTAR
- Unitil/Fitchburg Electric and Gas

In 2001, the sponsors included:
- Bangor Hydro
- Cape Light Compact
- Central Maine Power
- Conective Power Delivery
- Fall River Gas Company
- KEYSPAN Energy
- Long Island Power Authority
- Maine Public Service
- National Grid
- NH Electric Coop
- Northeast Utilities, including Public Service of New Hampshire
- NSTAR
- NYSERDA
- Public Service Electric & Gas
- Rockland Electric
- Unitil/Fitchburg Electric and Gas
Program Accomplishments and Status: 2000-2001

In its first two years of operations (2000-2001), over 500 students enrolled in BOC training; over half of the students received certification (see Table 1.1). Enrollment and certification activity in 2001 was about double that of 2000. In 2000, NEEP conducted seven courses in Massachusetts, Rhode Island, New Hampshire, and Connecticut. In 2001, NEEP taught 17 classes and expanded the program to Long Island and New Jersey. In addition, in 2001 NEEP taught four BOC 200 Series courses.

Table 1.1
CERTIFIED AND ENROLLED OPERATORS BY STATE AND YEAR

<table>
<thead>
<tr>
<th>STATE</th>
<th>CERTIFIED OPERATORS*</th>
<th>ENROLLED OPERATORS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2000</td>
<td>2001</td>
</tr>
<tr>
<td>Connecticut</td>
<td>20</td>
<td>35</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>60</td>
<td>81</td>
</tr>
<tr>
<td>New Jersey</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>3</td>
<td>62</td>
</tr>
<tr>
<td>Long Island, NY</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>83</td>
<td>185</td>
</tr>
</tbody>
</table>

* Certification lags enrollment.

Table 1.2 shows students work in a variety of commercial and industrial facilities. Almost two out of five students worked in industrial buildings. Municipal and schools buildings provided approximately one-third of the students.
1. Introduction

Table 1.2
STUDENTS ENROLLED BY TYPE OF FACILITY

<table>
<thead>
<tr>
<th>FACILITY TYPE</th>
<th>PERCENT OF TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Industrial</td>
<td>22%</td>
</tr>
<tr>
<td>Small Industrial</td>
<td>16%</td>
</tr>
<tr>
<td>Schools</td>
<td>16%</td>
</tr>
<tr>
<td>Municipal Facilities</td>
<td>13%</td>
</tr>
<tr>
<td>Hotels</td>
<td>9%</td>
</tr>
<tr>
<td>Property Management</td>
<td>8%</td>
</tr>
<tr>
<td>Hospitals</td>
<td>6%</td>
</tr>
<tr>
<td>Utility</td>
<td>10%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

Additional program accomplishments during its first two years include the following. NEEP and the BOC Working Group:

- Recruited a number of experienced instructors sufficient to meet the current frequency and location of course offerings – these instructors have taught courses and demonstrated that they are a good fit for the program;
- Worked with NEEC, modified the course materials (both the BOC 100 and 200 Series) to better address conditions in the Northeast;
- Developed marketing materials, including publishing two newsletters;
- Established procedures and systems for processing students; and
- Obtained academic credit at the University of New Hampshire for the 100 Series.

Utility sponsors aggressively marketed the program through direct mail and account representatives. The high number of enrollments is due to the efforts of the utilities, which had primary responsibility for marketing the program during its first two years. The utilities subsidized the cost of the program during these years, reducing
tuition from its stated cost of $1,200 by 50% the first year and 33% the second year. For a few key accounts, utilities paid the entire tuition. In addition to filling the classes, the utilities provided meeting space and refreshments for the students and, in some cases, provided a person to serve as the on-site coordinator for the day.

**Program Plans: 2002-2003**

According to the Business and Marketing Plan 2002-2003, in 2002, NEEP plans to increase the student enrollment and establish a measurable presence and recognition in the Northeast market (see Table 1.3).

<table>
<thead>
<tr>
<th>TABLE 1.3</th>
<th>TARGETED NUMBER OF COURSES BY STATE AND YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STATE</strong></td>
<td><strong>2002</strong></td>
</tr>
<tr>
<td></td>
<td>BOC 100</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>6</td>
</tr>
<tr>
<td>Connecticut</td>
<td>1</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>1</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>2</td>
</tr>
<tr>
<td>New Jersey</td>
<td>3</td>
</tr>
<tr>
<td>Long Island, NY</td>
<td>1</td>
</tr>
<tr>
<td>Vermont</td>
<td>0</td>
</tr>
<tr>
<td>Maine</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>15</td>
</tr>
</tbody>
</table>

Its plans call for 20 courses of 435 students (18 students per BOC 200 Series and 23 students per BOC 100 Series) in 2002 and again in 2003 (see Table 1.4).
1. **Introduction**

Table 1.4

**PROJECTED STUDENT ENROLLMENT BY STATE AND SOURCE**

<table>
<thead>
<tr>
<th>STATE</th>
<th>2002</th>
<th></th>
<th>2003</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SPONSORS</td>
<td>NEEP</td>
<td>TOTAL</td>
<td>SPONSORS</td>
<td>NEEP</td>
<td>TOTAL</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>150</td>
<td>42</td>
<td>192</td>
<td>65</td>
<td>127</td>
<td>192</td>
</tr>
<tr>
<td>Connecticut</td>
<td>18</td>
<td>5</td>
<td>23</td>
<td>14</td>
<td>27</td>
<td>41</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>18</td>
<td>5</td>
<td>23</td>
<td>14</td>
<td>27</td>
<td>41</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>50</td>
<td>14</td>
<td>64</td>
<td>23</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>New Jersey</td>
<td>69</td>
<td>0</td>
<td>69</td>
<td>46</td>
<td>0</td>
<td>46</td>
</tr>
<tr>
<td>Long Island, NY</td>
<td>46</td>
<td>0</td>
<td>46</td>
<td>46</td>
<td>0</td>
<td>46</td>
</tr>
<tr>
<td>Vermont</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>23</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>Maine</td>
<td>23</td>
<td>0</td>
<td>23</td>
<td>23</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>374</td>
<td>66</td>
<td>440</td>
<td>254</td>
<td>181</td>
<td>435</td>
</tr>
</tbody>
</table>

Utilities will continue to subsidize the course fee in 2002, yet the percentage subsidization will fall to 33%. In 2003, plans call for the utilities to give no subsidies. In 2002, the fee per enrolled student goes up to $1,400 in all states except Massachusetts, Rhode Island, and Connecticut, where the fee remains $1,200. In 2003, the program will be offered for $1,400 in all states.

In 2003, NEEP’s plans call for taking most of the responsibility to market the program in the states of Massachusetts, Connecticut, and Rhode Island. NEEP expects that sponsors in states outside of these three states will provide the main marketing support for the program in 2002 and 2003. NEEP has set, through its business plan, a marketing target of achieving, through its own efforts, 15% of the enrollment in 2002 (66 students) and 41% in 2003 (181 students).

According to NEEP’s marketing plan for the program, a focus for both 2002 and 2003 is partnering directly with private industry to make the BOC training and

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6 For an analysis of the 2003 marketing plan, see Chapter 7.
certification an industry requirement. In particular, NEEP will target trade associations associated with facility operations and maintenance.

### EVALUATION APPROACH

In 2002, NEEP conducted an evaluation to determine the market acceptance of the BOC program and identify ways in which the program can be improved. The evaluation includes the development of written case studies demonstrating how BOC training has added value for building owners.

#### Objectives

In January 2002, six utility sponsors contracted with Research Into Action, Inc. and GDS Associates, Inc. to conduct an evaluation of the regional BOC market transformation efforts during the program’s first two years of operation. The study combines elements of process evaluation, business plan evaluation, and market assessment. The main evaluation activities include the following:

- Follow-up interviews with participating students and their supervisors for the BOC 100 Series;
- Interviews with NEEP staff involved in the BOC venture, BOC program instructors, and utility sponsors;
- A survey of supervisors of nonparticipating building operators throughout the five-state region (Connecticut, Massachusetts, New Hampshire, Long Island (NY), Rhode Island);
- Analysis of survey data to determine BOC energy and non-energy benefits, participant’s perception of the value of the program, assessment of potential market size, and related issues;
- Review of the BOC database and related documents;
- Review of the program marketing plan, marketing materials, and marketing strategy; and
- Preparation of four case studies for use in marketing.
1. Introduction

Interview Guide and Survey Development

Guides for telephone interviews with BOC venture staff, program instructors, and utility sponsors were modeled on interviews conducted of the NEEC BOC for the Northwest Energy Efficiency Alliance. The interview guides were revised to reflect changes in the BOC program and issues unique to its implementation by NEEP and the sponsoring utilities. These changes and issues were identified through the project kick-off meeting attended by the evaluation lead, through ongoing telephone communication with NEEP and the sponsors, and through a review of the program documents.

Similarly, the telephone survey instruments for students, students’ supervisors, and regional supervisors of nonparticipating building O&M staff were based on those used for the Alliance and modified to meet the needs of the current project. In this way, the current research built on the experience gained from seven market progress evaluations conducted for the Alliance during various phases of the BOC program in the Pacific Northwest. In addition to reaping the benefit of experience, this approach enables a comparison between results obtained for the BOC program in the Northeast and Northwest.

Each student was asked a series of questions about their experience since completing the BOC course. The questions included a request for the name and phone number of the student’s supervisor. Subsequently, the supervisors were called and asked a similar set of questions, as well as questions about the value of the BOC to their firms. Most of the questions in these surveys related to the BOC. However, all questions not directly relating to the BOC were also included in the regional supervisors’ questionnaire, enabling a comparison of responses between program participants (including their supervisors) and the supervisors of nonparticipating staff.

The questionnaire for regional supervisors of nonparticipating building operators focused on questions to support a market assessment analysis. The regional supervisors were contacted from a random list of utility customers in the region, as described below. They provide the nonparticipant view.

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1. Introduction

To assess the impact of the BOC program, we asked all groups to describe the actions of building operators (themselves or those that they supervise) in the previous six months. A six-month time frame was necessary to support comparisons across the groups. We selected the previous six months to ensure that we were referring to a period after all of the students we spoke with would have completed the course.

Copies of all data collection instruments are provided in Appendix F.

Sample Framework and Data Collection Approach

This report provides an assessment of the BOC 100 Series courses offered by NEEP in Massachusetts, Rhode Island, Connecticut, and New Hampshire in 2000 and 2001. All students interviewed for the evaluation had received certification by November 1, 2001.

We interviewed 49 randomly selected certified BOC students, exceeding our target of 46 completes. We interviewed every supervisor for whom we had contact information and who agreed to be interviewed, for a total of 15 completes.

We consistently attempted to contact students from unique facilities to get a good cross-section of views. We made multiple contact attempts until we reached our quota. We asked each interviewed student to provide the name of his or her supervisor. Half (25 of 49) of the students we interviewed were themselves their own supervisors. (Nineteen of the 49 students had the word “manager” or “director” in their title.) These students said that the person that they report to is not knowledgeable about building operations. We attempted contact with each identified non-student supervisor in order to achieve the goal or interviewing the supervisors of half of the interviewed students. We interviewed 15 supervisors from the list of 22 names we collected. Appendix A provides a disposition of the samples of BOC students and students’ supervisors.

The report also provides an assessment of the potential market for training building operators in the same four-state region as the students, plus Long Island. The sample size for the regional survey, which provides the comparison group of nonparticipating building operators, was set based on statistical and budget considerations at 70 facilities per state or two-state pair. The two states with populations of less than 2 million (Rhode Island and New Hampshire) had quotas of 35 completes each and Massachusetts, Long Island, and Connecticut had quotas of 70 completes each. These samples totaled 280 respondents.
1. Introduction

The respondents for each state (the nonparticipant group) came from a random sample of the utilities’ commercial and industrial (C&I) customers, which the utilities provided to the study. For a description of the C&I populations from which the samples were drawn and for a disposition of the sample, see Appendix A. Among the 280 randomly selected utility customers, two supervisors reported that they had received BOC certification and one supervisor reported that one employee had received BOC certification. These respondents were not excluded from the sample. They represent 1% of the regional group that is providing the nonparticipant view.

To assess program implementation and strategy, we interviewed by telephone four of the eleven instructors, four NEEP staff (two of whom were also instructors), and six people from the sponsoring utilities. The six utility staff to be interviewed were determined in consultation with the NEEP evaluation manager.

The findings and conclusions in this report are based on:

- Telephone interviews with program staff, sponsors and instructors;
- Phone surveys with certified BOC students, their supervisors, and supervisors from randomly selected utility customers in the region (this latter group comprises the nonparticipant or comparison group for the study); and
- A review of program documents and databases.

ORGANIZATION OF THE REPORT

This report addresses the region-wide BOC program. Following this introductory chapter:

- Chapter 2 describes the estimated size of the potential market for building operator training as well as the awareness of and interest in the BOC among the non-participating supervisors.
- Chapter 3 describes the projected market for BOC training, as well as market penetration at the close of the program’s second year.
- Chapter 4 examines the influence of the BOC program among students and their supervisors and estimates energy impacts by comparing student actions with those reported for nonparticipants.
Chapter 5 is an assessment of the BOC training from the perspective of students and students’ supervisors.

Chapter 6 discusses program implementation.

Chapter 7 assesses the program strategy.

Chapter 8 concludes the report and offers recommendations.

Appendix A contains firmographic information gathered from the participants to date and nonparticipants, as well as information on the disposition and sample sizes for BOC students, students’ supervisors, and nonparticipants.

Appendix B provides additional information on the impact methodology.

Appendix C presents the three case studies developed to support marketing efforts.

Appendix D contains a memorandum written by the project team that reviews the program database.

Appendix E contains a memorandum written by the project team reviewing the first BOC business plan (the Revised Version of February 2001).

Appendix F contains copies of all survey instruments and interview guides.
1. Introduction
2. REGIONAL MARKET ASSESSMENT

ESTIMATED SIZE OF BUILDING OPERATOR MARKET

The utilities in the five states reported a total of 44,545 large commercial and industrial (C&I) accounts (see Table 2.1). From the survey responses of a random sample of nonparticipating large C&I customers, about one-third of these customers have building operators on staff. We consider the facilities of these customers to be “qualifying” with respect to the BOC program and estimate there are about 14,500 qualifying facilities in the five-state region. Just under 17 building operators, on average, work in each qualifying facility.\(^8\) We estimate the five-state region has about 243,000 building operators working in their own facilities.

Table 2.1

<table>
<thead>
<tr>
<th>STATE</th>
<th>LARGE C&amp;I CUSTOMER POPULATION</th>
<th>PERCENT WITH BUILDING OPERATORS</th>
<th>ESTIMATED NUMBER OF QUALIFYING FACILITIES</th>
<th>AVERAGE NUMBER OF OPERATORS PER FACILITY</th>
<th>ESTIMATED NUMBER OF BUILDING OPERATORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut</td>
<td>8,973</td>
<td>37%</td>
<td>3,341</td>
<td>16.0</td>
<td>53,500</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>21,853</td>
<td>26%</td>
<td>5,645</td>
<td>14.6</td>
<td>82,500</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>1,382</td>
<td>83%*</td>
<td>1,152</td>
<td>14.5</td>
<td>16,700</td>
</tr>
<tr>
<td>Long Island, NY</td>
<td>4,945</td>
<td>44%</td>
<td>2,177</td>
<td>20.6</td>
<td>44,800</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>7,392</td>
<td>30%</td>
<td>2,211</td>
<td>17.0</td>
<td>37,700</td>
</tr>
<tr>
<td>Total</td>
<td>44,545</td>
<td>33%</td>
<td>14,526</td>
<td>16.7</td>
<td>243,000</td>
</tr>
</tbody>
</table>

* Sample comprised of customers with account executives. The sampled facilities had been invited to participate in the BOC program, yet had not participated at the time of the study.

2. Regional Market Assessment

The utility-provided sample data indicates that customers with building operators on staff are much larger than those without such staff. Customers with building operators have average electricity demands of 390 kW and usage of 1,831,387 kWh, compared with customers without building operators who have average demands of 203 kW and usage of 656,638 kWh.

Facilities in the public sector have roughly two times more building operators, on average, than those in the private sector (see Table 2.2). Public sector facilities use 75% more electricity, on average, than private facilities (2,302 MWh versus 1,318 MWh) and have demands that are 40% higher (463 kW versus 325 kW).

### Table 2.2

<table>
<thead>
<tr>
<th>FACILITY TYPE</th>
<th>SAMPLE SIZE</th>
<th>AVERAGE NUMBER OF OPERATORS PER FACILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ownership</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>105</td>
<td>24.2</td>
</tr>
<tr>
<td>Private</td>
<td>172</td>
<td>12.2</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School/College</td>
<td>57</td>
<td>27.1</td>
</tr>
<tr>
<td>Grocery</td>
<td>8</td>
<td>24.9</td>
</tr>
<tr>
<td>Government</td>
<td>20</td>
<td>24.6</td>
</tr>
<tr>
<td>Retail</td>
<td>22</td>
<td>20.3</td>
</tr>
<tr>
<td>Medical</td>
<td>29</td>
<td>13.9</td>
</tr>
<tr>
<td>Other</td>
<td>29</td>
<td>12.5</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>76</td>
<td>11.9</td>
</tr>
<tr>
<td>Lodging</td>
<td>9</td>
<td>7.6</td>
</tr>
<tr>
<td>Office</td>
<td>13</td>
<td>6.7</td>
</tr>
<tr>
<td>Public Utility</td>
<td>10</td>
<td>5.6</td>
</tr>
<tr>
<td>Wholesale/Warehousing</td>
<td>6</td>
<td>4.3</td>
</tr>
</tbody>
</table>
Among building uses, schools and colleges, groceries, government, and retail facilities each have more building operators per facility than the average large C&I building has. As expected, public enterprises are primarily comprised of schools, colleges, government facilities, and public utilities.

**AWARENESS OF AND INTEREST IN THE BOC**

At the end of the BOC program’s second year, regional awareness of the program among supervisors whose staff have not participated is roughly 13%. Table 2.3 shows that awareness is highest in Massachusetts and Rhode Island, each at 14.3%, and lowest in Connecticut, at 10%.

<table>
<thead>
<tr>
<th>STATE</th>
<th>QUALIFYING POPULATION</th>
<th>SAMPLE SIZE</th>
<th>NUMBER AWARE</th>
<th>PERCENT*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut</td>
<td>3,341</td>
<td>70</td>
<td>7</td>
<td>10.0%</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>5,645</td>
<td>70</td>
<td>10</td>
<td>14.3%</td>
</tr>
<tr>
<td>Long Island, NY</td>
<td>2,177</td>
<td>70</td>
<td>8</td>
<td>11.4%</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>2,211</td>
<td>35</td>
<td>5</td>
<td>14.3%</td>
</tr>
<tr>
<td>Total</td>
<td>13,374</td>
<td>245</td>
<td>NA</td>
<td>12.8%</td>
</tr>
<tr>
<td>Total without Long Island</td>
<td>11,197</td>
<td>175</td>
<td>NA</td>
<td>13.0%</td>
</tr>
</tbody>
</table>

* Percentages for the states are derived from the samples. Percentages for Total and Total without Long Island are weighted by the qualifying populations.

The BOC program started in 2000 in Connecticut, Massachusetts, and Rhode Island. It extended in late 2001 to Long Island, NY. Given that the program reached Long Island only a short time before the survey, Table 2.3 shows the regional awareness

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9 Throughout this chapter, the term “regional supervisors” is used to indicate respondent group on which we base the regional market assessment. This group is the study’s comparison group, also termed a nonparticipant group.
2. Regional Market Assessment

both with and without Long Island. Awareness for New Hampshire is not reported in the table because the sample of regional supervisors in that state was derived from a list of facilities that had already received BOC program marketing materials and invitations to participate in the program. Consequently, 25.7% of New Hampshire respondents were aware of the BOC.

Awareness of the BOC program did not differ among respondents by sector; similar proportions of supervisors in both public and private sector facilities had either heard of the BOC course or had had an employee take the course. Were awareness of the BOC program to grow at the rate evidenced in its first two years (i.e., 6.5% per year), about 50% of the qualifying market will be aware of the program in another six years, as shown in Figure 2.1.

![Figure 2.1](image)

TREND ANALYSIS OF BOC AWARENESS

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10 Awareness of the BOC training was assessed from the following question: Are you aware of the Building Operators Certification offered by [name of respondent’s utility] and the Northeast Energy Efficiency Partnership (NEEP)? In addition, a small number of respondents had previously indicated that they or someone on their staff had received certification from a building operator certification program and they named their utility and NEEP as the sponsors. See the last survey instrument in Appendix F, questions 4 through 9 and 65.

11 Awareness of the BOC program in New Hampshire averages 25.7% and not 100% because staff who received BOC marketing materials are not necessarily the supervisors participating in the regional survey. The sample was comprised of BOC nonparticipants.

12 In each sector, one percent of the regional respondents reported that someone on their staff had already taken the BOC training.
As a point of comparison, awareness of the BOC program in the Pacific Northwest grew at an annual rate of about 5.5%.\textsuperscript{13}

Utility marketing and advertisement are the information sources most often mentioned by regional supervisors who had heard of BOC training (see Table 2.4). Over half of the regional supervisors (54%) learned of the BOC training through some form of communication from their utility. Almost one-third (31%) said they received information directly from a utility representative and nearly a quarter said they learned of BOC from a “utility seminar, mailing, or advertisement”. Few said they learned about it from a co-worker or conference, perhaps because the BOC program is relatively new to building operators in the Northeast.

\begin{table}[h]
\centering
\caption{Table 2.4 \small{HOW HEARD OF BOC}}
\begin{tabular}{|l|c|}
\hline
\textbf{SOURCE OF INFORMATION} & \textbf{REGIONAL SUPERVISORS (N=39)*} \\
\hline
Utility Representative & 31\% \\
Utility Seminar & 10\% \\
Utility Mailing/Advertisement & 13\% \\
Other Mailing/Advertisement/Flyer & 15\% \\
Professional Association or Publication & 13\% \\
Conference or Trade Show & 3\% \\
Boss or Co-Worker & 3\% \\
Other & 5\% \\
Not Sure/Refused & 8\% \\
\hline
\end{tabular}
\end{table}

* Percents do not add to 100\% due to rounding.

\textsuperscript{13} In the Pacific Northwest, when funded by the Northwest Energy Efficiency Alliance, BOC program awareness grew at a rate of about 5.5\% a year. Prior to the period in which the program received funding from the Alliance, awareness grew at a rate of about 4\% a year. See Jane Peters, et al., \textit{Regional Building Operator Certification Venture: Final Market Progress Evaluation Report}, September 20, 2001, prepared for the Northwest Energy Efficiency Alliance.
2. Regional Market Assessment

Supervisors in the public sector tended to be somewhat more likely to have received information about the BOC program from a utility source: 60% of public-sector supervisors had learned about the BOC from a utility representative, seminar, mailing or advertisement. In the private sector, 50% of the supervisors had heard of the training program from these sources.

Of the 39 regional supervisors14 who were aware of the BOC training, over half (56%) had considered going to or sending their staff to the training, and another 8% had either taken the course themselves (two respondents) or supervised staff who had taken the course (one respondent). (See Table 2.5.) Of all the regional supervisors interviewed — most of whom learned about the BOC through the description provided in the survey — two-thirds would consider going themselves or sending their staff to the program.

Table 2.5

<table>
<thead>
<tr>
<th>CONSIDERED GOING OR SENDING STAFF TO BOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONSIDERED BOC TRAINING</td>
</tr>
<tr>
<td>Have Considered</td>
</tr>
<tr>
<td>Would Consider</td>
</tr>
</tbody>
</table>

Supervisors who would consider sending staff to the BOC training work at larger facilities, on average, than those who would not consider sending staff, as illustrated by the information in Table 2.6.

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14 The 39 respondents are the 30 shown in Table 2.3 plus 9 in New Hampshire.
2. Regional Market Assessment

Table 2.6

**COMPARISON OF FIRMS THAT WOULD AND WOULD NOT CONSIDER SENDING STAFF TO BOC**

<table>
<thead>
<tr>
<th>CHARACTERISTIC (AVERAGE)</th>
<th>WOULD CONSIDER</th>
<th>WOULD NOT CONSIDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility Size (SF)¹⁵</td>
<td>338,953</td>
<td>117,057</td>
</tr>
<tr>
<td>Electricity Demand (kW)</td>
<td>361</td>
<td>289</td>
</tr>
<tr>
<td>Electricity Use (kWh)</td>
<td>1,413,273</td>
<td>1,145,485</td>
</tr>
<tr>
<td>Number of Building Operators</td>
<td>18</td>
<td>13</td>
</tr>
</tbody>
</table>

At least half of the respondents in each business sector would consider sending staff. The program had greatest appeal to those in medical, schools, and grocery facilities, for which 75% to 80% of respondents would consider sending staff. Between 67% and 70% of respondents with government, office, retail, or wholesale/warehouse facilities would consider sending staff. Finally, between 50% and 56% of respondents with lodging, manufacturing, or public utility (e.g., waste treatment) facilities would consider sending staff.¹⁶

Respondents in Long Island and New Hampshire are most likely to say they would consider sending staff to the BOC training (79% and 78%, respectively). Rhode Island respondents were next (at 75%), and Massachusetts and Connecticut respondents were only slightly lower (69% and 68%, respectively) in considering sending staff.¹⁷

There was little difference between respondents in the public and private sectors on this question. Supervisors from both public and private-sector companies were

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¹⁵ To further describe the size differences, compare the groups by quartiles. Twenty-five percent of respondents who would send staff have facilities smaller than 25,000 square feet, whereas nearly half of the respondents who would not send staff are in that size category. At the other end of the size spectrum, 25% of those who would send staff have facilities in excess of 200,000 square feet, compared with 10% of those who would not send staff.

¹⁶ These statistics reflect those to whom the BOC training concept is interesting and who would consider sending staff. They do not reflect budget constraints that might preclude staff being sent.

¹⁷ The differences among these responses are not statistically significant. The findings are presented by state due to their potential interest to the sponsoring utilities.
2. Regional Market Assessment

equally likely to say they would consider going themselves or sending an employee to the BOC training program.

Of the supervisors who are aware of the BOC program and say they have considered going to the training or sending staff, the majority (15 out of 22) heard about the training from a utility source. Nearly a fifth of the respondents mentioned professional contacts as a source of information, as Table 2.7 shows.

Table 2.7
SOURCES OF INFORMATION ABOUT THE BOC AMONG SUPERVISORS WHO HAVE HEARD OF THE BOC AND CONSIDERED TRAINING

<table>
<thead>
<tr>
<th>SOURCE OF INFORMATION</th>
<th>REGIONAL SUPERVISORS (N=22)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TOTAL</td>
</tr>
<tr>
<td>Utility Representative, Seminar, Mailing, or Advertisement</td>
<td>15</td>
</tr>
<tr>
<td>Professional Association, Trade Show, or Publication</td>
<td>4</td>
</tr>
<tr>
<td>Other Source</td>
<td>2</td>
</tr>
<tr>
<td>Not Sure</td>
<td>1</td>
</tr>
</tbody>
</table>

INTEREST IN OPERATOR TRAINING ON BOC-RELATED TOPICS

Over half of the regional supervisors (55%) think certification for building operations staff is “very important” or “important” (rating it a “5” or a “4” on a 5-point scale with 1 being “not at all important” and 5 being “very important”). Table 2.8 shows that nearly a quarter (24%) consider certification “not very important,” or “not at all important” (a “1” or “2” rating).
Supervisors in the public sector were more likely than those in the private sector to consider certification in building operations and maintenance as “important” or “very important.” Roughly two-thirds (64%) of the respondents in the public sector rate this as important or very important, in contrast to half (51%) of the private-sector supervisors.

Regional supervisors (i.e., the nonparticipants) are primarily interested in certification that is transferable to other companies, issued by a trade association, or based on competency, with nearly half of the respondents saying that they are “interested” or “very interested” in these types of certification (rating of “4” or “5” on a 5-point scale). (See Table 2.9)

Supervisors from private- and public-sector companies are equally interested in all types of certification except for certification issued by equipment vendors, for which public-sector supervisors tended to be more interested. Roughly half (45%) of the public-sector respondents say they are “interested” or “very interested” in certification issued by equipment vendors, compared to one-third (34%) of supervisors from private-sector companies.
2. Regional Market Assessment

### Table 2.9
INTEREST IN TYPES OF CERTIFICATION

<table>
<thead>
<tr>
<th>TYPE OF CERTIFICATION</th>
<th>REGIONAL SUPERVISORS (N=214)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transferable</td>
<td>48%</td>
</tr>
<tr>
<td>Issued by Trade Associations</td>
<td>48%</td>
</tr>
<tr>
<td>Competency-Based</td>
<td>47%</td>
</tr>
<tr>
<td>Issued by Equipment Vendors</td>
<td>39%</td>
</tr>
<tr>
<td>From Private Training Organizations</td>
<td>34%</td>
</tr>
<tr>
<td>Nationally Valid</td>
<td>32%</td>
</tr>
</tbody>
</table>

* Asked of supervisors who said certification had some importance, a rating of “3,” “4,” or “5” on a 5-point scale [see Table 2.8].

Preventative maintenance and energy conservation techniques are at the top of the list of course topics that interest regional supervisors (see Table 2.10). Using a scale of 1 to 5, with 1 being “not at all interested” and 5 being “very interested,” the majority of regional supervisors said they were “interested” or “very interested” (4 or 5) in preventative maintenance (74%) and energy conservation techniques (68%). Public-sector supervisors were more likely than private sector supervisors to be “interested” or “very interested” in every course except for heating equipment maintenance and troubleshooting. On average across the courses, five percent more public-sector supervisors than private-sector supervisors expressed high interest in the courses.

The respondents’ other suggestions for training topics include safety management and fire safety; water systems, hydraulics, and waste management; hazardous waste or material handling, including asbestos inspection and removal; automated building controls; and computer skills (not defined).
2. Regional Market Assessment

Table 2.10
INTEREST IN TYPES OF COURSES

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>REGIONAL SUPERVISORS (N=280)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preventative Maintenance</td>
<td>74%</td>
</tr>
<tr>
<td>Energy Conservation Techniques</td>
<td>68%</td>
</tr>
<tr>
<td>Indoor Air Quality</td>
<td>61%</td>
</tr>
<tr>
<td>Facility Electrical Systems</td>
<td>58%</td>
</tr>
<tr>
<td>Electrical Systems Maintenance and Troubleshooting</td>
<td>58%</td>
</tr>
<tr>
<td>Heating Equipment Maintenance and Troubleshooting</td>
<td>57%</td>
</tr>
<tr>
<td>HVAC Systems and Controls</td>
<td>56%</td>
</tr>
<tr>
<td>Maintenance and Related Codes</td>
<td>56%</td>
</tr>
<tr>
<td>Efficient Lighting Fundamentals</td>
<td>50%</td>
</tr>
<tr>
<td>HVAC Controls, Maintenance and Troubleshooting</td>
<td>50%</td>
</tr>
<tr>
<td>Energy Auditing</td>
<td>43%</td>
</tr>
<tr>
<td>Refrigeration Equipment Maintenance and Troubleshooting</td>
<td>39%</td>
</tr>
</tbody>
</table>

PREVIOUS AND PLANNED TRAINING

Two-thirds (67%) of supervisors said they or their staff have attended one or more training and education programs in the last year (see Table 2.11). Of these, half (49%) of the supervisors have attended training that issued certification. Nearly half (43%) had staff who had been certified through training.

Eight supervisors say they have been certified in building operations and five say they have a staff member who has been certified. Of those, two supervisors say their building operations certificate was from “the course sponsored by their utility and
2. Regional Market Assessment

NEEP® and one supervisor says the staff member received certification from the utility/NEEP course.\(^\text{18}\)

<table>
<thead>
<tr>
<th>CERTIFICATION FROM TRAINING OBTAINED</th>
<th>PERCENT RECEIVING CERTIFICATION (N=188)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisor Training</td>
<td>49%</td>
</tr>
<tr>
<td>Staff Training</td>
<td>43%</td>
</tr>
</tbody>
</table>

* Respondents indicating training.

Roughly half of the regional supervisors (54\%) plan to attend or send one or more of their building and operations staff to training in the twelve months following the survey. Table 2.12 shows the types of training that supervisors plan to use.

The majority of regional supervisors plan to use in-house training in general (79\%) or training videos or other materials (77\%). It is reasonable to assume that supervisors who are interested in in-house training or videos are also interested in keeping costs associated with training low (travel expenses and additional labor costs to cover trainee down-time). Even so, a comparable proportion of the regional supervisors (76\%) also say that they plan to acquire training through trade show or professional conference attendance.

---

\(^{18}\) These three supervisors comprise 1\% of the random, regional nonparticipant sample and were not excluded from the analysis.
### Table 2.12
**TYPES OF TRAINING PLANNING TO USE**

<table>
<thead>
<tr>
<th>TRAINING TYPE</th>
<th>REGIONAL SUPERVISORS (N=150)</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-House Training</td>
<td>79%</td>
</tr>
<tr>
<td>Training Videos or Other Materials</td>
<td>77%</td>
</tr>
<tr>
<td>Trade Show/Professional Conference</td>
<td>76%</td>
</tr>
<tr>
<td>Vendor Workshop for Specific Piece of Equipment</td>
<td>59%</td>
</tr>
<tr>
<td>Government Regulation Training (e.g. OSHA)</td>
<td>59%</td>
</tr>
<tr>
<td>Training Offered by Private Training Organizations</td>
<td>45%</td>
</tr>
<tr>
<td>Community or Technical College Course</td>
<td>31%</td>
</tr>
<tr>
<td>BOMA Certification Course</td>
<td>19%</td>
</tr>
<tr>
<td>Operation Engineers Training Course</td>
<td>17%</td>
</tr>
</tbody>
</table>

“Money” is the most important factor regional supervisors say they consider when deciding whether to send an employee or attend training themselves (see Table 2.13). The respondents with whom we spoke say that relevancy of the subject matter and gain to the company are the most important factors they consider after training costs when making decisions about whether to invest in training.
Table 2.13
FACTORs determining whether supervisor sends staff to training

<table>
<thead>
<tr>
<th>Factor</th>
<th>Regional Supervisors (N=280)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Money</td>
<td>21%</td>
</tr>
<tr>
<td>Relevancy of Subject Matter</td>
<td>17%</td>
</tr>
<tr>
<td>Gain to Company</td>
<td>14%</td>
</tr>
<tr>
<td>Time/Staff Availability</td>
<td>11%</td>
</tr>
<tr>
<td>Needs Training/Job Growth</td>
<td>5%</td>
</tr>
<tr>
<td>Course Quality</td>
<td>5%</td>
</tr>
<tr>
<td>Location</td>
<td>4%</td>
</tr>
<tr>
<td>Nothing/No Need for Training</td>
<td>4%</td>
</tr>
<tr>
<td>Requirements by Law</td>
<td>3%</td>
</tr>
<tr>
<td>Up-to-Date Information</td>
<td>3%</td>
</tr>
<tr>
<td>Subject Area</td>
<td>2%</td>
</tr>
<tr>
<td>Length of Training</td>
<td>1%</td>
</tr>
<tr>
<td>Personal Interest</td>
<td>1%</td>
</tr>
<tr>
<td>Follow-Up Training or Schooling</td>
<td>1%</td>
</tr>
<tr>
<td>Other</td>
<td>1%</td>
</tr>
<tr>
<td>Unsure/Refused</td>
<td>6%</td>
</tr>
</tbody>
</table>

* Multiple responses allowed.

Organizational Memberships

The three most often-cited professional organizations mentioned by the building operator supervisors were the International Facility Management Association (IFMA), the Building Operations Management Association (BOMA), and the National Fire Protection Association (NFPA) (see Table 2.14).
2. Regional Market Assessment

### Table 2.14
MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

<table>
<thead>
<tr>
<th>ORGANIZATION</th>
<th>REGIONAL SUPERVISORS (N=280)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFMA</td>
<td>4%</td>
</tr>
<tr>
<td>BOMA</td>
<td>4%</td>
</tr>
<tr>
<td>NFPA</td>
<td>4%</td>
</tr>
<tr>
<td>AFE</td>
<td>3%</td>
</tr>
<tr>
<td>ASHRAE</td>
<td>3%</td>
</tr>
<tr>
<td>AEE</td>
<td>1%</td>
</tr>
<tr>
<td>APPA</td>
<td>1%</td>
</tr>
<tr>
<td>IEEE</td>
<td>1%</td>
</tr>
<tr>
<td>IFMA</td>
<td>1%</td>
</tr>
<tr>
<td>IREM</td>
<td>1%</td>
</tr>
<tr>
<td>Other</td>
<td>21%</td>
</tr>
</tbody>
</table>

* Percents do not add to 100% because some respondents mentioned multiple professional memberships or affiliations.

Respondents who belong to a professional organization are no more likely than their colleagues who do not belong to a professional organization to rate building operations certification as “important” or “very important.”

Membership in a professional organization is similar for supervisors from both public and private sectors. Roughly one-third of each group (35% for private and 38% for public) say they belong to some professional organization.
2. Regional Market Assessment
3. PROJECTED MARKET FOR BOC TRAINING

WILLINGNESS TO PAY

The supervisors of BOC students express a higher willingness to pay and a higher level of certainty about what they would like to pay for BOC training than regional supervisors whose employees had not taken the BOC courses. Table 3.1 shows one-third of the supervisors of BOC students report being willing to pay over $1,400 for BOC training. Among both the supervisors of BOC students and the regional supervisors (nonparticipants), half of those who indicated a dollar amount they would be willing to pay said $1,200 or more. Supervisors of BOC students are less likely than regional supervisors to be unsure of their willingness to pay or to refuse to answer a question about willingness to pay.

Table 3.1
WILLINGNESS TO PAY FOR BOC TRAINING

<table>
<thead>
<tr>
<th>AMOUNT WILLING TO PAY</th>
<th>STUDENTS’ SUPERVISORS (N=15)*</th>
<th>REGIONAL SUPERVISORS (N=184)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over $1,400</td>
<td>33%</td>
<td>2%</td>
</tr>
<tr>
<td>Between $1,200 and $1,400</td>
<td>7%</td>
<td>11%</td>
</tr>
<tr>
<td>Less than $1,200</td>
<td>33%</td>
<td>13%</td>
</tr>
<tr>
<td>Not Willing to Pay</td>
<td>7%</td>
<td>16%</td>
</tr>
<tr>
<td>Unsure/Refused</td>
<td>20%</td>
<td>58%</td>
</tr>
</tbody>
</table>

* Percents do not add to 100% due to rounding.

When considering the possible costs and his ability to pay, the business manager for one school system said:

“If the course is over $750, there have to be creative ways to finance it. Each employee at this level has only this amount in his or her training budget for the
whole year. Maybe this course could be spread over a two-year span [to spread the costs over two fiscal years].”

This same supervisor expressed a high level of satisfaction with the BOC training overall, and agreed that his employee’s job performance had improved since taking the course. The implication of his remarks is that he is willing to come up with innovative solutions to the challenge of funding BOC training within the limitations of a public school system budget. This constraint is underscored by the remarks of another supervisor in a public school system who said, “We are allocated $4000 a year for training. This needs to cover 55 people in a district.”

In contrast, two supervisors from private companies – both manufacturing facilities – valued the cost of the training at considerably greater than its cost:

- “When I think about training, I think about what the person needs and can use. My employee has used what he’s learned. I’d say it’s worth at least $2000.”
- “I’d ballpark what we can pay at about $2,400-$3,600.”

Both of these private-sector supervisors expressed a high level of satisfaction with the BOC as a whole, and their remarks indicate that they may have more latitude in the amount they can invest in employee training than some of their peers in the public sector.

Table 3.2 shows the distribution of willingness to pay by whether the respondent works in the public or private sector. While willingness to pay was similar for regional supervisors in both the public and private sectors, and reflected their lack of knowledge about the course, willingness to pay appears to differ between public and private facilities for supervisors with employees who had taken the BOC training. Forty percent of the students’ supervisors in the private sector were willing to pay $1,200 and over for the BOC training. In contrast, none of the five students’ supervisors in the public sector were willing to pay that amount. (Note that this analysis is limited by very small sample sizes. Five respondents are too few to accurately represent the group as a whole.) As the remarks from the two public school system administrators indicate, willingness to pay may indicate more about a supervisor’s concerns with ability to pay than his or her estimation of the worth of the training to the organization. The small sample size of BOC student supervisors precludes any firm conclusions; further research may be able to confirm this assertion.
3. Projected Market for BOC Training

Table 3.2

WILLINGNESS TO PAY FOR BOC BY BUSINESS SECTOR

<table>
<thead>
<tr>
<th>AMOUNT WILLING TO PAY</th>
<th>STUDENTS’ SUPERVISORS, PRIVATE* (N=10)</th>
<th>STUDENTS’ SUPERVISORS, PUBLIC* (N=5)</th>
<th>REGIONAL SUPERVISORS, PRIVATE (N=106)** +</th>
<th>REGIONAL SUPERVISORS, PUBLIC (N=77)** +</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over $1,400</td>
<td>3 (30%)</td>
<td>0 (0%)</td>
<td>2 (2%)</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Between $1,200 and $1,400</td>
<td>1 (10%)</td>
<td>0 (0%)</td>
<td>1 (1%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Less than $1,200</td>
<td>3 (30%)</td>
<td>4 (80%)</td>
<td>22 (21%)</td>
<td>22 (29%)</td>
</tr>
<tr>
<td>Not Willing to Pay</td>
<td>0 (0%)</td>
<td>1 (20%)</td>
<td>17 (16%)</td>
<td>12 (16%)</td>
</tr>
<tr>
<td>Unsure/Refused</td>
<td>3 (30%)</td>
<td>0 (0%)</td>
<td>64 (60%)</td>
<td>42 (55%)</td>
</tr>
</tbody>
</table>

* From private sector, inferred, data. See Appendix A, Table A.3 for discussion.
** Asked of respondents who said they would consider going themselves or sending a staff person to the BOC training.

We can compare the average willingness to pay for the training expressed by nonparticipating supervisors in the Northeast with those of the Pacific Northwest interviewed for a program baseline study. The comparison is facilitated by excluding from both studies the responses of people who said they would not be willing to pay anything (i.e., would pay $0), since these people are not candidates for the training. Excluding these responses, the mean willingness to pay currently in the Northeast is $747, compared with $752 in the Pacific Northwest.19

However, the current (Northeast) study finds a higher proportion of supervisors who do not know how much they would be willing to pay (58% in the current study compared with 35% in the Pacific Northwest) and a higher proportion who say they would not be willing to spend anything (38% in the current study compared with 4% in the Northwest).

19 When responses of $0 are not excluded from the analysis, the mean willingness to pay in the current study is $466, compared with $707 in the Pacific Northwest. Although the willingness to pay in the Pacific Northwest did not differ significantly by state, there were numerical differences. The average values by state ranged from $468 in Idaho to $857 in Montana.
3. Projected Market for BOC Training

These differences in responses may result from several factors. One, the baseline study for the Pacific Northwest was conducted during a time of economic expansion, in contrast to our current period of economic recession. Two, the survey for the Pacific Northwest asked the willingness to pay questions after a series of questions on training options. The entire survey was relatively short. In the current study, the willingness to pay questions came toward the end of lengthy survey, following detailed questions on operator actions to be used in the calculation of program impacts. Thus, in the current study, responses could be affected by respondent fatigue. In addition, respondents may have mistakenly formed the impression that the training would cover only the actions that were addressed in the detailed questions they had just answered.

Factors Related to Regional Supervisors’ Willingness to Pay

Regional supervisors who belong to professional organizations show a higher willingness to pay, and a lower level of uncertainty about their willingness to pay, than those who do not belong to professional organizations. Regional supervisors belonging to professional organizations are much more likely (25%) to be willing to pay $400 or more than are their colleagues who do not belong to any professional organizations (14%); see Table 3.3. Furthermore, those who belong to a professional organization are less likely to be unsure about their willingness to pay than those who do not belong to any professional organization.

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20 As explained in the preceding section, most of the regional supervisors said that they did not know what they would be willing to pay, and of those that gave an amount, several answered $0. As a consequence, the number of supervisors willing to pay $1,200 or greater is too small to support a comparison with the number of supervisors willing to pay less than $1,200. Thus, for the analyses of the factors influencing willingness to pay, we assumed that values greater than $400 signified considerable interest in the course. Recall that most respondents were just learning about the program during the interview and heard only a few sentences describing the training before they were asked what they would be willing to pay.
Regional supervisors who think that building operator certification is important also show a higher willingness to pay for the BOC training (see Table 3.4).

### Table 3.4
**Importance of Certification and Willingness to Pay Among Regional Supervisors**

<table>
<thead>
<tr>
<th>AMOUNT WILLING TO PAY</th>
<th>CERTIFICATION IMPORTANT (N=116)</th>
<th>CERTIFICATION NOT VERY IMPORTANT (N=32)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over $400</td>
<td>21%</td>
<td>13%</td>
</tr>
<tr>
<td>Between $1 and $400</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>Not Willing to Pay</td>
<td>16%</td>
<td>25%</td>
</tr>
<tr>
<td>Unsure/Refused</td>
<td>55%</td>
<td>53%</td>
</tr>
</tbody>
</table>

* Respondents are those who said they would consider going themselves or sending a staff person to the BOC training, excluding those who rated operator certification as neither important nor unimportant.
3. Projected Market for BOC Training

We considered the regional supervisors’ previous experience with training and certification and examined how that might affect their willingness to pay for the BOC program. Table 3.5 looks at supervisors who had received certification in any area of building operations and maintenance in the previous three years and compares them with those who had received training but no certification and those who had not taken any training. Supervisors who had received certification from training are more likely than the other two groups to be willing to pay higher values, and they are less likely to respond “don’t know”.

Table 3.5
WILLINGNESS TO PAY AND SUPERVISOR RECEIVED CERTIFICATION

<table>
<thead>
<tr>
<th>AMOUNT WILLING TO PAY</th>
<th>IN THE PAST 3 YEARS SUPERVISOR RECEIVED TRAINING IN BUILDING OPERATIONS*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TRAINING AND CERTIFICATION (N=73)</td>
</tr>
<tr>
<td>Over $400</td>
<td>30%</td>
</tr>
<tr>
<td>Between $1 and $400</td>
<td>8%</td>
</tr>
<tr>
<td>Not Willing to Pay</td>
<td>14%</td>
</tr>
<tr>
<td>Unsure/Refused</td>
<td>48%</td>
</tr>
</tbody>
</table>

* Asked of respondents who had considered sending self or staff to BOC training.

Potential BOC Enrollment

Approximately two-thirds of students think that additional staff might take the BOC training and an equal proportion of regional supervisors report that they might send staff to the BOC. Roughly half of the BOC students’ supervisors (47%) estimate that additional staff will go to the BOC training. Table 3.6 shows that about two-thirds of each of the three groups interviewed estimate that one or two staff members will attend.
Table 3.6
POTENTIAL ENROLLMENTS FOR BOC 100 SERIES

<table>
<thead>
<tr>
<th>MIGHT SEND STAFF TO BOC*</th>
<th>STUDENTS (N=49)</th>
<th>STUDENTS’ SUPERVISORS (N=15)</th>
<th>REGIONAL SUPERVISORS (N=280)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent that might send staff</td>
<td>67%</td>
<td>47%</td>
<td>66%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NUMBER OF STAFF THAT MIGHT ATTEND**</th>
<th>STUDENTS (N=33)</th>
<th>STUDENTS’ SUPERVISORS (N=8)</th>
<th>REGIONAL SUPERVISORS (N=184)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>6%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>One to Two</td>
<td>67%</td>
<td>63%</td>
<td>66%</td>
</tr>
<tr>
<td>Three to Five</td>
<td>9%</td>
<td>13%</td>
<td>21%</td>
</tr>
<tr>
<td>Six to Ten</td>
<td>3%</td>
<td>0%</td>
<td>6%</td>
</tr>
<tr>
<td>More Than Ten</td>
<td>3%</td>
<td>0%</td>
<td>2%</td>
</tr>
<tr>
<td>Unsure</td>
<td>18%</td>
<td>24%</td>
<td>5%</td>
</tr>
<tr>
<td>Average</td>
<td>3.0 (N=25)</td>
<td>2.0 (N=6)</td>
<td>2.75 (N=174)</td>
</tr>
</tbody>
</table>

* Regional supervisors were asked, following a brief description of the program: “Have you considered going yourself or sending any of your staff to earn a building operators certification?” Students and their supervisors were asked: “Do you expect any other staff at your facility will enroll in the Building Operator Certification Program?”

** Asked of respondents that might send staff to the BOC.

Nearly one out of three regional supervisors said that they might send three or more staff to the BOC training. On average, regional supervisors thought they might send 2.75 staff, a figure that lies between the estimates given by BOC students and students’ supervisors. This average is comparable to estimates from regional
3. Projected Market for BOC Training


About two-thirds of students and of regional supervisors (the nonparticipants) estimate that more than 25\% of their facilities’ building operations staff might enroll in the BOC training. Note that approximately half of the student respondents (25 out of 49) are, themselves, supervisors. Of the eight students who estimated that all of their facility’s operator staff might enroll in the BOC 100 Series classes, five were supervisors.

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|}
\hline
\textbf{PROPORTION OF STAFF THAT MIGHT ENROLL IN BOC TRAINING} & \textbf{STUDENTS (N=25)*} & \textbf{STUDENTS’ SUPERVISORS (N=6)*} & \textbf{REGIONAL SUPERVISORS (N=174)*} \\
\hline
1\% to under 10\% & 4 (16\%) & 2 (33\%) & 33 (19\%) \\
\hline
10\% to under 25\% & 5 (20\%) & 2 (33\%) & 31 (18\%) \\
\hline
25\% to under 50\% & 3 (12\%) & 1 (17\%) & 44 (25\%) \\
\hline
50\% to under 100\% & 2 (8\%) & 1 (17\%) & 35 (20\%) \\
\hline
100\% & 8 (32\%) & 0 (0\%) & 31 (18\%) \\
\hline
\end{tabular}
\caption{ESTIMATES OF POTENTIAL ENROLLMENTS FOR BOC 100 SERIES BY PERCENT OF TOTAL STAFF}
\end{table}

* Respondents who know how many staff they might send are represented.

Fully 50\% of students have already taken or plan to take the BOC 200 Series training (see Table 3.8). Two-thirds of students’ supervisors plan to recommend that their student employees take the training.
3. Projected Market for BOC Training

Table 3.8
POTENTIAL BOC 200 SERIES ENROLLMENTS

<table>
<thead>
<tr>
<th>PLANS TO ATTEND OR RECOMMENDED BOC 200 SERIES</th>
<th>STUDENTS* (N=46)</th>
<th>STUDENTS’ SUPERVISORS (N=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>33%</td>
<td>67%</td>
</tr>
<tr>
<td>Have Taken BOC 200 Already</td>
<td>17%</td>
<td>0%</td>
</tr>
<tr>
<td>No</td>
<td>26%</td>
<td>7%</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>24%</td>
<td>27%</td>
</tr>
</tbody>
</table>

* Students were asked: “Are you planning to attend the BOC200 Series course?” Students’ supervisors were asked: “Do you think you will encourage your employee to take the BOC200 Series course?”

PROJECTED MARKET SIZE OF BOC

It is difficult to provide a good estimate for a product, such as the BOC training, that respondents are just learning about during a telephone interview. We estimate in the near term (2002-2004), the potential market for the BOC program is 25% of the qualifying market. We derived this estimate using the following logic.

➤ Two-thirds (66%) of regional supervisors said they would consider sending staff to the BOC training. This proportion is supported by the following findings, given in chapter 2:

- Two-thirds (67%) of regional supervisors said they or their staff had received training in the last three years;
- Fifty-five percent of regional supervisors rated the notion of certification of building operators as “important” or “very important”; and
- Between 50% and 68% of regional supervisors expressed high interest in the course topics presented in the BOC 100 Series.

➤ Of those who would consider sending staff to the BOC and who offered an estimate of the price they would be willing to pay, 39% said over $400.
3. Projected Market for BOC Training

Given they were just learning about the BOC, we use this price cut-off as a proxy that these supervisors would be willing to pay for training at the going market rate. Research conducted in the Northeast for the BOC prior to its launch determined the BOC is priced within the market norm for training.

- The proportion of qualifying facilities comprising a market for the BOC is 25%. This proportion is calculated by multiplying the 67% who might send staff by the 39% who expressed a willingness to pay for it, as expressed in the equation $0.67 \times 0.39 = 0.25$.

- The regional supervisors who might send staff estimated that they would send an average of 2.75 staff. This figure is comparable to the number found by research in the Pacific Northwest.

Using the above findings and assumptions, the estimated near-term market size for the BOC 100 Series is about 10,000 students, as shown in Table 3.9.\(^{22}\)

<table>
<thead>
<tr>
<th>STATE</th>
<th>ESTIMATED NUMBER OF QUALIFYING FACILITIES (FROM TABLE 2.1)</th>
<th>ESTIMATED NUMBER OF FACILITIES THAT MIGHT ATTEND BOC (25% OF TOTAL)</th>
<th>ESTIMATED NUMBER OF STAFF THAT MIGHT ATTEND (2.75 PER FACILITY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut</td>
<td>3,341</td>
<td>835</td>
<td>2,297</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>5,645</td>
<td>1,411</td>
<td>3,881</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>1,152</td>
<td>288</td>
<td>792</td>
</tr>
<tr>
<td>Long Island, NY</td>
<td>2,177</td>
<td>544</td>
<td>1,497</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>2,211</td>
<td>553</td>
<td>1,520</td>
</tr>
<tr>
<td>Total</td>
<td>14,526</td>
<td>3,631</td>
<td>9,987</td>
</tr>
</tbody>
</table>

We call this figure a “near-term” estimate because it is based on the responses of supervisors who are just learning about the training. As market awareness increases, the estimated market size will change. We expect it would increase as supervisors become aware of the training’s value.
3. Projected Market for BOC Training
4. INFLUENCE AND IMPACT OF THE BOC PROGRAM

This chapter addresses natural resources (energy and water) benefits generated by the program and nonresource benefits, such as improvements in building occupant comfort and the career development of the students. We address the nonresource benefits first. As we are not able to develop quantitative estimates of these benefits, we discuss them under the category of program influences. We discuss the natural resource benefits under the category of program impacts.

INFLUENCE OF THE BOC PROGRAM

Nine out of ten students surveyed said they use or apply methods and concepts from the BOC training (see Table 4.1). Over half of the students report they perform new activities they did not do prior to taking the BOC classes; an equal number of students say they do some activities more frequently now than they did before taking the BOC classes. Two-fifths of the group (39%) report they both perform new activities and do some activities more frequently.

Table 4.1
APPLICATION OF CONCEPTS TAUGHT IN BOC CLASSES

<table>
<thead>
<tr>
<th>APPLICATION OF BOC TRAINING</th>
<th>STUDENTS (N=49)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uses or Applies Methods and Concepts from BOC Classes</td>
<td>90%</td>
</tr>
<tr>
<td>Performs New Activities Not Performed Prior to Taking BOC Classes</td>
<td>57%</td>
</tr>
<tr>
<td>Does Some Activities More Regularly or Frequently Now Than Prior to Taking BOC Classes</td>
<td>57%</td>
</tr>
<tr>
<td>Does Both New Activities and Some Activities More Frequently</td>
<td>39%</td>
</tr>
</tbody>
</table>
4. Influence and Impact of the BOC Program

Nine out of ten BOC students and their supervisors report the students have improved comfort, saved energy, or saved money.\(^{23}\), \(^{24}\) Table 4.2 shows that 80% to 100% of those supervisors who are aware of their employees’ performance in an area agree that their employee has shown improvement.

<table>
<thead>
<tr>
<th>IMPROVEMENT</th>
<th>STUDENTS (N=49)</th>
<th>STUDENTS’ SUPERVISORS*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved Comfort or Saved Energy or Saved Money</td>
<td>94%</td>
<td>92% (n=12)</td>
</tr>
<tr>
<td>Improve Occupant Comfort</td>
<td>76%</td>
<td>83% (n=12)</td>
</tr>
<tr>
<td>Save Energy</td>
<td>78%</td>
<td>90% (n=10)</td>
</tr>
<tr>
<td>Save Money</td>
<td>69%</td>
<td>100% (n=8)</td>
</tr>
</tbody>
</table>

* Sample size and percentage excludes supervisors reporting “Don’t know” about their employee’s actions.

All of the BOC students’ supervisors report their employees have more confidence on the job, and most (89%) say their employees are better able to interact with contractors since taking the BOC training (see Table 4.3). Most of the students (85%) and all of the supervisors say students have advised in decisions about equipment operation or replacement since taking the BOC training. Roughly one-fourth to one-

\(^{23}\) Similarly, over 90% of students and students’ supervisors from the Pacific Northwest said that they had improved comfort, saved energy, or saved money as a result of the training. See Jane Peters, et al., *Regional Building Operator Certification Venture: Final Market Progress Evaluation Report*, September 20, 2001, prepared for the Northwest Energy Efficiency Alliance.

\(^{24}\) One utility sponsor told of another benefit derived from the program: it had saved someone’s life. Information taught on how to re-energize a breaker box saved an operator’s life when the breaker box blew.
half of students and supervisors report they have received comments from occupants, supervisors, co-workers, or a contractor about improved occupant comfort or savings, or report they have saved money in trouble-shooting or the use of contractors.

Table 4.3

<table>
<thead>
<tr>
<th>FEEDBACK</th>
<th>STUDENTS*</th>
<th>STUDENTS’ SUPERVISORS**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have More Confidence on the Job</td>
<td>—</td>
<td>100% (n=13)</td>
</tr>
<tr>
<td>Better Able to Interact with Contractors</td>
<td>—</td>
<td>89% (n=9)</td>
</tr>
<tr>
<td>Advised in Decisions about Equipment Operation or Replacement</td>
<td>85% (n=39)</td>
<td>100% (n=11)</td>
</tr>
<tr>
<td>Comments from Occupants, Supervisor, Co-Workers, or Contractors</td>
<td>58% (n=43)</td>
<td>36% (n=11)</td>
</tr>
<tr>
<td>Saved Money in Trouble-Shooting or Use of Contractors</td>
<td>28% (n=44)</td>
<td>30% (n=10)</td>
</tr>
</tbody>
</table>

* Considers a “don’t know” response to be equivalent to “no.”
** Excludes “don’t know” responses from base.

Regarding advising in decisions about equipment replacement, one student told us that, after taking the BOC training, he was able to: “Spot inefficient filters on new equipment. I installed better ones to extend the life of HVAC units. Now I recommend economizers on equipment and that we use the economizer feature.”

Of those respondents reporting any type of job change—change in title, increased responsibilities, increased compensation—over half (57%) said having the Building Operator’s Certification helped them attain it (see Table 4.4). Thus, 30% of students (=53% * 57%) report the BOC training has helped them advance in their careers.
4. Influence and Impact of the BOC Program

Table 4.4
JOB CHANGES DUE TO BOC TRAINING

<table>
<thead>
<tr>
<th>CAREER ENHANCEMENTS DUE TO BOC TRAINING</th>
<th>STUDENTS (N=49)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Had Change in Job Title, or Responsibility, or Compensation</td>
<td>53%</td>
</tr>
<tr>
<td>Change in Job Title</td>
<td>14%</td>
</tr>
<tr>
<td>Increased Responsibilities</td>
<td>45%</td>
</tr>
<tr>
<td>Increased Compensation</td>
<td>35%</td>
</tr>
<tr>
<td>Thinks BOC Helped Attain Changes</td>
<td>57%</td>
</tr>
</tbody>
</table>

It is interesting to note students’ satisfaction with the BOC training does not appear to be predicated on job changes. Students were equally likely to say they were “satisfied” or “extremely satisfied” with the training they received whether or not they had experienced a change in their title, responsibilities, or compensation.

The majority of the BOC students think the BOC training is good for advancing in their current job or getting a new job. Table 4.5 shows students are nearly unanimous in saying they have put or will put their Building Operator’s Certification on their resume. Similarly, all of the BOC students’ supervisors say the mention of BOC training on a resume enhances the attractiveness of a job candidate. In addition, nearly half of the students’ supervisors say they might make BOC certification a requirement for hiring sometime in the future when more people have received BOC training.

Regional supervisors have views similar to those of the students’ supervisors. Eight out of ten regional supervisors agree BOC training identified on a resume would enhance the attractiveness of a job candidate.
4. Influence and Impact of the BOC Program

Table 4.5
ATTITUDES ABOUT BOC INFLUENCE ON CAREER ADVANCEMENT

<table>
<thead>
<tr>
<th>ATTITUDE ABOUT INFLUENCE OF BOC ON CAREER ADVANCEMENT</th>
<th>STUDENTS (N=49)</th>
<th>STUDENTS’ SUPERVISORS (N=15)</th>
<th>REGIONAL SUPERVISORS (N=280)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has Put, or Will Put, BOC on Resume</td>
<td>96%</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Thinks BOC Is Good for Current Job Advancement or Getting a New Job</td>
<td>84%</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>BOC on Resume Enhances Attractiveness of Job Candidate</td>
<td>—</td>
<td>100%</td>
<td>80%</td>
</tr>
<tr>
<td>BOC on Resume Leaves Assessment of Job Candidate Unchanged</td>
<td>—</td>
<td>0%</td>
<td>20%</td>
</tr>
<tr>
<td>Might Require BOC for New Hires in the Future</td>
<td>—</td>
<td>47%</td>
<td>—</td>
</tr>
</tbody>
</table>

IMPACT OF THE BOC PROGRAM

Estimating the impact of educational programs such as the BOC can prove to be a harder nut to crack than for resource acquisition programs where specific installed measures can be counted or where anticipated impacts are large enough to be detected from billing analysis. The BOC training delivers information over seven days (that is, for about 50 hours) and covers many (perhaps numbering in the hundreds) efficiency concepts and techniques.

To further complicate things, the BOC students have varied backgrounds and learn different things from the same educational material. The students themselves may have a hard time distinguishing whether specific behaviors of theirs had changed due to the their educational experience, due to other factors, or as an outgrowth of many experiences.25

---

4. Influence and Impact of the BOC Program

We base our estimation of program impacts on a comparison of the actions taken by students and nonstudents during a six-month period after the all the interviewed students had completed their training. This method avoids having the students to identify exactly what actions they have taken because of the training. In a separate line of questioning, we asked students whether they had applied concepts and techniques learned in the BOC training and whether they thought they had saved energy, saved money, or improved occupant comfort by their application of BOC information.

This estimation method derives a resource impact based on 11 specific measures taught in the BOC training. While the method is arguably the best means of actually “measuring”—as in counting measures—the BOC impact, two inaccuracies, or biases limit this method.

1. The method has a downward bias; that is, the derived impact significantly understates the actual impact of the BOC program. There are several reasons for this, but the most glaring reason is that the method is based on 11 measures. The 50 hours of BOC training covers far more than 11 measures. This reason and the other reasons that explain the downward bias of the estimator are discussed in more detail below.

To address this downward bias, we employ a method termed “triangulation”, which approaches an assessment problem from multiple perspectives. As shown below, we approach the estimation problem from the perspective of the impacts we estimated from the 11 measures, plus from the perspectives of two engineering estimates relevant to building operations.

2. The method also has an upward bias; that is, it assumes that each student is responsible for the operation of every building system. While some students in smaller facilities may be responsible for every system the building has, their buildings may not have all of the systems that we measure (e.g., compressed air). And, in larger facilities, it is common for more than one student from the facility to attend the BOC training.

To address this upward bias, we scale down the final estimate produced by triangulation by a “unique facilities factor”—a percentage multiplier derived by the average number of students attending from each facility.

We discuss these steps in more detail in the following subsections.
### Table 4.6
DERIVATION OF MINIMUM SAVINGS IMPACTS BASED ON SURVEY RESULTS FOR 11 MEASURES TAUGHT IN BOC

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiler Maintenance</td>
<td>0.003</td>
<td>MMBtu/sf</td>
<td>671,804 sf</td>
<td>1,680</td>
<td>40% (F)</td>
<td>672</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Handler Door Gasket Replacements²</td>
<td>0.01</td>
<td>KWh/sf</td>
<td>671,804 sf</td>
<td>6,718</td>
<td>7% (F)</td>
<td>470</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Damper Seal Maintenance²</td>
<td>0.06</td>
<td>KWh/sf</td>
<td>671,804 sf</td>
<td>40,308</td>
<td>4% (F)</td>
<td>1,612</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HVAC Controls (EMS, thermostats) (kWh)³</td>
<td>0.53</td>
<td>KWh/sf</td>
<td>671,804 sf</td>
<td>356,056</td>
<td>19% (X)</td>
<td>67,651</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HVAC Controls (EMS, thermostats) (MMBTU)³</td>
<td>0.005</td>
<td>MMBtu/sf</td>
<td>671,804 sf</td>
<td>3,359</td>
<td>19% (X)</td>
<td>638</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chiller System / Cooling Tower Maintenance⁴</td>
<td>80</td>
<td>KWh/ton</td>
<td>1,305 ton</td>
<td>104,400</td>
<td>7% (F)</td>
<td>7,308</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economizer Maintenance²</td>
<td>0.62</td>
<td>KWh/sf</td>
<td>671,804 sf</td>
<td>416,518</td>
<td>3% (F)</td>
<td>12,496</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor Maintenance (belt alignment)⁵</td>
<td>24.52</td>
<td>KWh/hp</td>
<td>369 hp</td>
<td>9,048</td>
<td>3% (F)</td>
<td>271</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replacement Motors⁴</td>
<td>52.90</td>
<td>KWh/hp</td>
<td>369 hp</td>
<td>19,520</td>
<td>4% (X)</td>
<td>781</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable Frequency Drives (VFD)⁷</td>
<td>937.2</td>
<td>KWh/hp</td>
<td>132 hp</td>
<td>123,710</td>
<td>21% (F)</td>
<td>25,979</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Compressor Maintenance (leaks, filters, belts)⁸</td>
<td>68,000</td>
<td>KWh/ facility</td>
<td>68,000</td>
<td>68,000</td>
<td>5% (F)</td>
<td>3,400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Saving Measures⁹</td>
<td>1,551,207</td>
<td>gallons/ facility</td>
<td>1,551,207 gallons</td>
<td>1,551,207</td>
<td>7% (F)</td>
<td>108,585</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Savings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>119,968</td>
<td>1,310</td>
<td></td>
<td>108,585</td>
</tr>
</tbody>
</table>
4. Influence and Impact of the BOC Program

Table Notes:
Column C: Square footage is the average facility size. Horsepower (hp) and tons are the average sizes of equipment for which the student is responsible.

Column E: The percentage is labeled as Frequency (F) or Extent (X). F indicates that the proportion of students taking an action exceeds the proportion of nonstudents by the stated percentage. X indicates the average extent or scope of the action taken by students exceeds that of the action taken by nonstudents by the stated percentage.

Column E: The values compared for students and for nonstudents for each action—from which the percentage difference in each action reported in Column E was calculated—were estimated with a 90/10 precision/confidence.

Columns F, G, H: Derivation of minimum resources savings attributable to the 11 measures. These resource savings are used as building blocks in the impact analysis and do not constitute the final estimated savings. See the accompanying text for a full description of the methodology.

Column G: Btu savings apply to both gas- and oil-fired equipment.

Table Footnotes:
1 GDS estimate based on conservative end of 5-10% range. (Assume 50,000 Btu/sf/yr).
3 GDS estimate based on 300 square foot per ton of cooling, 0.8 kW/ton and 2,000 equivalent full load hours (MA). Heating assumed to be 50,000 Btu/sf/yr, resulting in 5,000 Btu/sf/yr for controls savings at 10%. Cooling savings due to EMS are estimated to be 0.53 kW.
4 GDS estimate based on 5% savings, 0.8 kW/ton and 2,000 equivalent full load hours (MA).
6 Suozzo and Nadel, op. cit., page 137.
9 Based on BOC survey responses in current evaluation.
The 11-Measure Estimator

To estimate a savings impact for the BOC program in the Northeast, we compared the efficiency actions reported by the BOC students with actions by the operator on staff that the regional supervisor would be most likely to send to training as reported by the regional supervisors.\(^{26}\) We asked both groups to say whether the efficiency action had been taken in the last six months. If it had, we asked them to describe the extent to which the action was taken. For example, we asked the size of the chiller system on which maintenance was performed, the proportion of new motors that were energy efficient, and the horsepower of variable frequency drives installed. Thus, for most efficiency actions, we have a measure of the average frequency with which both students and nonstudents took the action and the average extent or scope of the action.

Table 4.6 (above) provides our derivation of impacts from 11 electric and gas measures taught by the BOC, as estimated from survey data.\(^ {27}\) The table also includes a water savings estimate. For each measure, the column labeled [A] gives the average savings that results per size of the space or equipment affected (e.g., per facility square footage or per chiller tonnage). Column [B] gives the unit of analysis (e.g., square footage or tonnage). Column [C] provides a characterization of the average BOC student’s equipment (e.g., average horsepower or cooling ton for which the student is responsible). Multiplying the values in columns [A] and [C] gives the average savings from the action when taken by the BOC student (column [D]).

As we know, nonstudents also take efficiency actions. Thus, column [E] gives the incremental impact of the BOC program; it is an estimate of the frequency or extent to which the actions of the BOC students exceed the actions of the nonstudents. (Next to the percentage estimate in column [E] is a parenthetical F or X. “F” indicates that the frequency with which BOC students take the action exceeds that of nonstudents by the stated percentage. “X” indicates that the extent to which BOC students take the action exceeds that of the nonstudents by the stated percentage.)

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\(^{26}\) We also asked students’ supervisors the same set of questions about efficiency actions. However, when “don’t know” responses were excluded, the number of supervisors in the sample was too small to provide meaningful comparisons with the other two groups.

\(^{27}\) Appendix B provides additional information on the savings estimation methodology. The savings estimates for each measure are averages based on accepted engineering practices and some specific studies. They are not based on analysis of individual facilities.
4. Influence and Impact of the BOC Program

The incremental BOC impact percentage \([E]\) times the average savings from the action taken by the students \([D]\) gives the estimated per-participant average savings induced by the BOC program for these measures \([F, G, \text{ and } H]\), based on survey results.

Summing the values estimated for each measure, we estimate that the BOC program creates, at a minimum, the following annual per participant savings for participants that work all of a facility’s equipment:

- 107,473 kWh of electricity (= 0.18 kWh per square foot operator is responsible for);
- 1,310 MMBtu of gas (= 1.95 MBtu per square foot); and
- 108,585 gallons of water (= 0.16 gallons per square foot).

Downward Bias of the 11-Measure Estimator

We believe the resource savings estimated from the 11 measures that we explored in the surveys represent a lower bound to the actual BOC program impact for a number of reasons. We offer the following arguments for this assertion.

- These estimates are derived from just eleven activities from the many actions taught during the seven-day course. Savings likely are also accruing from actions we did not measure.

- Many of the early BOC students, the subject of this evaluation, work in a supervisory capacity. The question was phrased “have you” taken a certain action. The supervisors, under the influence of the BOC, may have directed staff to take this action, but may not have done it themselves. A simple calculation suggests that this factor may indeed be influencing the results.

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28 Note that these are intermediate values. In a subsequent step of the analysis, these facility totals will be modified to reflect the fact that, on average, more than one operator attends per facility. Consequently, these numbers differ from those reported in the Executive Summary and Chapter 8, conclusions.

29 The estimate of 0.18 kWh per square foot is comparable to an impact of 0.14 kWh per square foot estimated for BOC participants in the Pacific Northwest. See Jane Peters, et al., Regional Building Operator Certification Venture: Final Market Progress Evaluation Report, September 20, 2001, prepared for the Northwest Energy Efficiency Alliance.
4. Influence and Impact of the BOC Program

- BOC students with the word “manager” or “director” in their title (n=19): 47% responded “no” to five or more efficiency actions
- BOC students without the word “manager” or “director” in their title (n=3): 30% responded “no” to five or more efficiency actions

Given the comprehensiveness of the BOC training, it can be argued that the impact values given in Column [A] of Table 4.6 are conservative values for the per-measure impacts. BOC graduates are likely to exceed average savings values for many of these measures. However, there is no simple formula for quantifying how much more savings a BOC graduate may be able to generate.

The regional supervisors likely overstate the positive actions of the staff they supervise. This phenomenon in survey data is called social desirability bias. BOC students have first-hand knowledge of their actions, understand the terminology, and have had opportunity elsewhere in the survey to present themselves favorably. Thus, they are less likely to overreport their own actions than are the regional supervisors, who are talking about the actions of another person and may not be as familiar with the terms used.

The current study found that BOC students conducted maintenance measures at a higher rate than nonstudents; however, no difference was found for retrofit measures (installed lighting controls or efficient lighting equipment). It is possible that BOC students conduct retrofit measures more frequently or more extensively than nonstudents, yet the current study was unable to measure this effect. Our arguments in support of this hypothesis are:

- The research question asked students and nonstudents what actions they had taken “in the last six months.” A number of students reported that they had done the retrofit after attending the training, but prior to the last six months. These actions are not counted in the current study.

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4. Influence and Impact of the BOC Program

- Given that two-thirds of the regional supervisors said that developments in the energy market during the previous year increased their concern about energy efficiency, it’s possible that nonparticipants engaged in more retrofit activity in the past six months than they had on previous six-month periods.

- This is an evaluation of early program results. The students represent “early adopters” in product diffusion terminology. It is likely that early adopters of O&M training may be early adopters of best operating practices in general and therefore are already implementing energy efficiency practices at a higher rate than the general population. Thus, early students may have already undertaken retrofits prior to attending the BOC whereas subsequent students may conduct retrofits in response to the training.

However, the region has seen a high penetration of retrofit measures over the last 14 years. The retrofit market may be saturated. If this were the case, BOC students (both early adopters and subsequent generations) would be no more likely than BOC nonparticipants to engage in retrofits.

Thus, we see a number of factors that may apply and would serve to reduce the impact that we are able to measure for the BOC training.

Triangulation Method

We conclude that the BOC training has a minimum impact of 0.18 kWh, 1.95 MBtu, and 0.16 gallons of water per square foot of facility space the building operator is responsible for. These estimates rest on two simplifying assumptions, which we will modify in turn. The first assumption is that these eleven measures constitute the bulk of the efficiency measures taught in the BOC course. The second assumption is that students are responsible for all of the equipment spanned by these eleven measures. In this subsection, we correct for the simplification of the first assumption using the tool of triangulation.

The impacts from these 11 measures provide us with one perspective on the program impacts—a perspective that is known to underestimate the true yet unmeasurable value.
A second perspective is provided from the efficiency procedure known as retrocommissioning. A building uses the least energy to serve its occupants when all of the building systems are working optimally. Commissioning a building is the process of fine tuning all of the electromechanical systems in a newly constructed building so that their performance, including their influence on each of the other systems, is optimal. Retrocommissioning applies the process to existing buildings. As defined by ACEEE, it is the practice of re-tuning and recalibrating major systems in existing commercial buildings.

Table 4.7 compares the scope and impact of retrocommissioning activities with the scope and impact of the efficiency activities the BOC survey addressed. Retrocommissioning fine-tunes the electricity-using equipment in a building, accounting for the interaction between systems, and is estimated to generate about 1.2 kWh in savings per square foot. In contrast, we are able to estimate the influence of the BOC program on just eight electric efficiency actions, and estimate an influence that is 15% of the savings retrocommissioning generates. The situation for oil and gas savings is considerably different. The two gas and oil measures that we explore for the BOC program address the major gas and oil using equipment in a building and generate a savings estimate that is 75% of that estimated for retrocommissioning.

<table>
<thead>
<tr>
<th>EQUIPMENT FUEL-TYPE</th>
<th>SCOPE OF RETROCOMMISSIONING MEASURES</th>
<th>ESTIMATED IMPACT OF RETROCOMMISSIONING</th>
<th>SCOPE OF MEASURED BOC ACTIVITIES</th>
<th>BOC ACTIVITIES AS PROPORTION OF RETROCOMMISSIONING ESTIMATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity-Powered</td>
<td>Highly diverse, numerous</td>
<td>1.2 kWh/sf</td>
<td>8 measures</td>
<td>15%</td>
</tr>
<tr>
<td>Gas- and Oil-Powered</td>
<td>Primarily boilers and furnaces</td>
<td>2.6 MBtu/sf</td>
<td>Boilers and furnaces</td>
<td>75%</td>
</tr>
</tbody>
</table>

In our method of triangulation, we find that the MMBtu savings estimates from the 11-measure approach provide a reasonable estimate of the gas and oil impacts from
the BOC training. The situation is quite different for electricity savings. The estimate from the 11-measure approach is too low, while the estimate from retrocommissioning is too high, as retrocommissioning is more thorough than we would expect the actions of the average student to be. We do not have additional data sources on water actions to use the triangulation method for water. The estimated water savings obtained from the 11-measure approach will need to suffice until such time as further research is judged to be worth its cost to conduct.

For the electricity savings, we need a third perspective to bring to the triangulation process. Fortunately, we have one from the work done by the Northwest Energy Efficiency Alliance (the Alliance) in its analysis of the BOC program’s cost-effectiveness. When the Alliance considered funding the program, it conducted engineering simulations to estimate the program’s likely impact. Based on the engineering simulations, the Alliance determined a program impact of 0.5 kWh per square foot.

A program evaluation was conducted for the Alliance using a methodology similar to the current one. That study estimated from survey data a program impact of 0.14 kWh per square foot. As that estimator involved a downward bias, as does the current one, the Alliance adopted an impact of 0.5 kWh per square foot as the post hoc program impact.

An impact of 0.5 kWh per square foot represents about 40% of what is achievable through retrocommissioning, and is more than twice as large, but less than three times as large, as we estimated using the 11-measure method. Thus, through the method of triangulation, we believe that 0.5 kWh per square foot is an appropriate value to use for electricity savings in program cost-effectiveness analyses. However, that value needs a further adjustment to correct for the simplifying assumption that each student is responsible for all of the equipment in the building.

Deflating with a Unique Facilities Factor

The last step in the impact analysis requires that the estimated resources savings (electricity, gas, oil, and water) be deflated to account for the fact that a single student is typically not responsible for all of the building’s equipment. The survey responses indicate that the proportion of students responsible for a given action varies among the actions. To simplify the necessary correction, we make the adjustment as follows.
We counted the number of unique facilities associated with the BOC students certified in 2000 and 2001. We also counted the number of certified students in 2000 and 2001. We then divided the number of unique facilities by the number of students, yielding a value of 0.71. We term this value the “unique facilities factor” and use it to deflate the savings estimates to reflect the fact that more than one student attended per facility.

**Determining Annual Program Savings**

The following equations can be used by sponsoring utilities and by NEEP to determine the annual resource savings generated by the BOC.

Annual resource savings = resource savings per square foot * average square footage * unique facilities factor * number of certified students during the period

Annual electricity savings from 2000-2001 = 0.50 kWh/sf * 671,804 sf * 0.71 * number of certified students 2000-2001

Annual gas/oil savings from 2000-2001 = 1.95 MBtu/sf * 671,804 sf * 0.71 * number of certified students 2000-2001

Annual water savings from 2000-2001 = 0.16 gallons/sf * 671,804 sf * 0.71 * number of certified students 2000-2001

For the region-wide BOC program from 268 students certified 2000-2001, resource savings total:

- Electricity: 63,915 MWh annually
- Gas/Oil: 249,270 MMBtu annually
- Water: 20,453,000 gallons annually

For the region-wide BOC program, potential from 518 students enrolled 2000-2001, when all students complete certification, resource savings total:

- Electricity: 123,538 MWh annually
- Gas/Oil: 481,798 MMBtu annually
- Water: 39,532,000 gallons annually
4. Influence and Impact of the BOC Program

These savings accrue annually for the life of the program influence, which we assume to be five years. Nearly 80% of BOC students and fully 80% of the regional supervisors (nonparticipants at the supervisory level) have been in building operations for more than five years (see Appendix A). In addition, the Northwest Energy Efficiency Alliance in its cost-effectiveness analysis of the BOC program assumes a five-year life. A review of the literature from the adult education discipline may provide findings useful to a determination of the program’s span of influence, but such review is beyond the scope of this project.

Average Annual Operating Cost Savings of BOC Students

Using the following fuel prices from Massachusetts in 2001, we calculated the annual operating cost savings for the average size space operated by BOC students to be $20,000, as shown in Table 4.8:

- Electricity: $0.05288 kWh (demand savings are not estimated)
- Gas and oil: $7.50 MMBtu
- Water: $5.51 per 1,000 gallons

---

31 Composite prices for Massachusetts used in development of Massachusetts Annual Report to Massachusetts Department of Energy and Resources.

32 Estimated from average commercial sales data from NSTAR Gas, 2001. Obtained from personal communication with NSTAR sponsor.
4. Influence and Impact of the BOC Program

Table 4.8
ANNUAL COST SAVINGS FOR AVERAGE SPACE STUDENT OPERATES (671,804 SF)

<table>
<thead>
<tr>
<th>FUEL</th>
<th>RESOURCE SAVINGS PER SQUARE FOOT (SF)</th>
<th>RESOURCE SAVINGS AT 671,804 SF</th>
<th>AVG FUEL PRICE ($/FUEL UNIT)*</th>
<th>ANNUAL OPERATING COST SAVINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>KWh</td>
<td>0.5</td>
<td>238490.42</td>
<td>$0.05288</td>
<td>$12,600</td>
</tr>
<tr>
<td>MMBtu</td>
<td>0.00195</td>
<td>930.1</td>
<td>$7.50</td>
<td>$7,000</td>
</tr>
<tr>
<td>1000 Gallons</td>
<td>0.000162</td>
<td>77.09535</td>
<td>$5.51</td>
<td>$400</td>
</tr>
<tr>
<td>Total</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>$20,000</td>
</tr>
</tbody>
</table>

* Based on fuel prices in Massachusetts in 2001.

Table 4.9 gives the approximate annual resource cost savings for different sizes of space maintained by a BOC student.

Table 4.9
ANNUAL RESOURCE COST SAVINGS FOR DIFFERENT SIZES OF SPACE

<table>
<thead>
<tr>
<th>SIZE OF SPACE MAINTAINED BY OPERATOR</th>
<th>APPROXIMATE ANNUAL RESOURCE COST SAVINGS*</th>
</tr>
</thead>
<tbody>
<tr>
<td>47,000 SF</td>
<td>$1,400</td>
</tr>
<tr>
<td>100,000 SF</td>
<td>$3,000</td>
</tr>
<tr>
<td>250,000 SF</td>
<td>$7,500</td>
</tr>
<tr>
<td>500,000 SF</td>
<td>$15,000</td>
</tr>
<tr>
<td>1,000,000 SF</td>
<td>$30,000</td>
</tr>
</tbody>
</table>

* Based on fuel prices in Massachusetts in 2001.
4. Influence and Impact of the BOC Program
5. STUDENT AND EMPLOYER ASSESSMENT OF THE BOC

Table 5.1 compares the usefulness of the BOC courses. The courses most frequently endorsed by students as useful were building systems overview, energy conservation techniques, and indoor air quality (IAQ). Students’ supervisors also found the building systems overview the most useful course, followed by energy conservation techniques, HVAC systems and controls, and facility electrical systems. Preventative maintenance, energy conservation techniques, and indoor air quality were the top three choices of course topics among the regional supervisors we interviewed (see Table 2.12).

<table>
<thead>
<tr>
<th>COURSE</th>
<th>PERCENT RATING COURSE AS “USEFUL”*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>STUDENTS (n=48)</td>
</tr>
<tr>
<td>Building Systems Overview</td>
<td>79%</td>
</tr>
<tr>
<td>Energy Conservation Techniques</td>
<td>77%</td>
</tr>
<tr>
<td>Indoor Air Quality (IAQ)</td>
<td>77%</td>
</tr>
<tr>
<td>HVAC Systems and Controls</td>
<td>69%</td>
</tr>
<tr>
<td>Facility Electrical Systems</td>
<td>69%</td>
</tr>
<tr>
<td>Energy-Efficient Lighting</td>
<td>67%</td>
</tr>
<tr>
<td>Building Maintenance Codes</td>
<td>67%</td>
</tr>
</tbody>
</table>

* Response categories included: useful, somewhat useful, and not useful.

Student ratings on the usefulness of the individual courses also provide a way to assess students’ experience with the seven-course series. One-third of the students (35%) rated all seven courses as “useful.” Nearly three-quarters of the students (71%) rated more than half of the courses (four or more courses) as “useful,” while only 16%
5. Student and Employer Assessment of the BOC

rated more than half of the courses as “somewhat useful.” Most students (86%) rated all of the courses as either “useful” or “somewhat useful.” Five of the 49 students indicated one of the courses was not useful and two of the students indicated that two of the courses were not useful.

All 49 of the BOC students interviewed had positive comments about the usefulness of the training as a whole. Two students’ remarks reflect the general tone of comments made by many:

➢ “The BOC courses gave me a better outlook on what we actually have. We look at the buildings more comprehensively now. It really helped.”

➢ “Now I think in terms of the facility – it’s like a super-organism. I’m able to think more developmentally about how various components interact. The training helped me to think in those terms.”

Several other students said that taking the BOC training has helped them communicate more effectively with other building operators, with management, and with sub-contractors:

➢ “I can document problems better and look out more for indicators of problems. The BOC helped me make better charts and matrices to record what happens in the building.”

➢ “I’ve used the information from the BOC as a point of reference to be able to reinforce to management that we know what we’re doing.”

➢ “I’m more aware of problems and know where to look for them. I can include information in specifications for other contractors.”

A majority of the students praise the presentation, style, and knowledge of the BOC instructors (see Table 5.2). With regard to the benefits students feel they had received, the most frequently cited response was that they have the knowledge and confidence to do such things as ask better questions, document procedures and systems, work with contractors, troubleshoot problems, or implement a large-scale project since taking the BOC training.
## Table 5.2
COMMENTS ON THE COURSES

<table>
<thead>
<tr>
<th>COMMENTS</th>
<th>STUDENTS (N=49)</th>
<th>STUDENTS’ SUPERVISORS (N=13)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>POSITIVE COMMENTS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructors Excellent, Knowledgeable</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Gained Knowledge, Confidence to:</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>• Ask Better Questions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Document Procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Work with Contractors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Troubleshoot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Implement a Big Project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading Material Is A Good Reference</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Broad Scope of Course Was Good</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Really Good Review or Overview</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Good for Tradespeople to Get More Experience</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Gave Needed New Information to Recently-Promoted Operator</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Better Able to Think in Terms of Facility</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Flexibility in Class Scheduling, Locations Helpful</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Information Was Clearly Presented</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>NEGATIVE COMMENTS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presenter Not Well-Versed, Not a Good Teacher</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Time Away From Job Difficult</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>HVAC Reading Material Not Relevant to New England</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Classroom Space Too Hot</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
5. Student and Employer Assessment of the BOC

Although not all of the comments were universally positive, negative comments were the exception rather than the rule. Two students volunteered that they felt an instructor was not well versed in the subject matter or did not have an effective teaching style. Of the two who made this remark, one had given all of the courses a “2” (useful) rating and had rated his overall satisfaction with the BOC as a “4” on a 1 to 5 scale with 5 being “very satisfied.” The other student rated five of the seven classes as “not useful” and rated his overall satisfaction with the BOC training as a “2” out of 5. Given the divergent levels of satisfaction between the two students with negative comments about the instructors, it is not possible to determine the extent to which dissatisfaction with the instructor affects overall satisfaction with the BOC program.

Of the supervisors who are aware of their employees’ actions, several say their employees’ application of the concepts learned in the BOC training has been noticeable. One supervisor light-heartedly noted that:

“We made a dangerous man out of my employee by putting him through this training. Now all he wants to do is save money. The BOC courses gave him a lot of theory — now he knows what he is talking about with contractors. Seriously, it has been great. Since taking the course he has put together some nice packages, especially with HVAC.”

Other supervisors had similar comments about how taking the BOC training has affected their employees’ performance:

- “My employee has implemented the ideas he learned and used his knowledge to save energy.”
- “Taking the BOC training made my employee more well rounded.”
- “My employee has used the knowledge to inspect and improve systems such as the electrical circuitry.”
- “I’ve seen the benefit when these guys come back and apply the lessons.”

We asked students and student supervisors to rate their satisfaction with the BOC training as a whole (see Table 5.3). Three-quarters of the students (78%) said that
they were either “satisfied” or “extremely satisfied” with the training. One-fifth (10 of 49 students) said that they were not particularly satisfied or dissatisfied. Yet of these ten students, four had described the majority of the courses as useful, six said that their job performance has improved since taking the course, and eight have applied methods and concepts taught in the course.

### Table 5.3

**Satisfaction with Training as a Whole**

<table>
<thead>
<tr>
<th>RATING</th>
<th>STUDENTS (N=49)</th>
<th>STUDENTS' SUPERVISORS (N=13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely Satisfied</td>
<td>25%</td>
<td>23%</td>
</tr>
<tr>
<td>Satisfied</td>
<td>53%</td>
<td>61%</td>
</tr>
<tr>
<td>Not Particularly Satisfied or Dissatisfied</td>
<td>20%</td>
<td>15%</td>
</tr>
<tr>
<td>Not Satisfied</td>
<td>2%</td>
<td>0%</td>
</tr>
<tr>
<td>Extremely Dissatisfied</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

At the time of the interview, more than three-quarters of students (78%) had already recommended the BOC training to their colleagues (see Table 5.4). All but two of the eleven students who had not yet recommended the training said that they would do so were someone to ask them about it. The student discussed above as being dissatisfied with the series as a whole would not recommend it. Nor would an engineer who had taken the course recommend it to his colleagues. However, this engineer said, “The course is good for operators. They need that type of familiarity and the background it gives.”

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33 This compares with 84% of BOC students in the Pacific Northwest. Given that the Northwest sample was twice as large as that of the Northeast, this difference is not significant. See Jane Peters, et al., *Regional Building Operator Certification Venture: Final Market Progress Evaluation Report*, September 20, 2001, prepared for the Northwest Energy Efficiency Alliance.
5. Student and Employer Assessment of the BOC

Table 5.4

<table>
<thead>
<tr>
<th>RECOMMEND BOC</th>
<th>STUDENTS (N=49)</th>
<th>STUDENTS’ SUPERVISORS (N=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have recommended</td>
<td>78%</td>
<td>13%</td>
</tr>
<tr>
<td>Would recommend *</td>
<td>82% (n=11)</td>
<td>85% (n=13)</td>
</tr>
<tr>
<td>Would not recommend *</td>
<td>18% (n=11)</td>
<td>0%</td>
</tr>
</tbody>
</table>

* Respondents who had not yet recommended the BOC were asked if they would recommend it were someone to ask about it.

The majority of students who say they would like to see something added or dropped requested that instructors cover all of the existing topics in greater detail (see Table 5.5). This corresponds with student requests that the BOC 200 Series classes cover the same topics in more depth (see Table 5.9). Table 5.5 shows that two students and one supervisor expressed the desire for more hands-on activities or activities drawn from the participants’ own facilities.

Table 5.5

<table>
<thead>
<tr>
<th>SUGGESTED CHANGES TO COURSE SERIES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COMMENTS</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>More Detail in Courses</td>
</tr>
<tr>
<td>More Hands-On Activities or Activities Drawn from Participants’ Own Facilities</td>
</tr>
<tr>
<td>More Detail in Handouts</td>
</tr>
<tr>
<td>Information on Security, Winter Preparation</td>
</tr>
<tr>
<td>More Information on Codes</td>
</tr>
</tbody>
</table>
Utility promotion of the BOC training was the most frequently mentioned source of information for students (see Table 5.6). Over three-fourths of the students report that they had learned about the BOC training from their utility representative or seminar. A third of the students’ supervisors say they had learned about the BOC training from their utility representative or seminar, and roughly one-quarter (27%) learned about the BOC from a supervisor or co-worker.

### Table 5.6

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>STUDENTS (N=49)</th>
<th>STUDENTS’ SUPERVISORS (N=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utility Representative or Seminar</td>
<td>78%</td>
<td>33%</td>
</tr>
<tr>
<td>Supervisor or Co-Worker</td>
<td>10%</td>
<td>27%</td>
</tr>
<tr>
<td>Colleague or Friend</td>
<td>6%</td>
<td>27%</td>
</tr>
<tr>
<td>Professional or Trade Association</td>
<td>2%</td>
<td>13%</td>
</tr>
<tr>
<td>Publication, Conference or Trade Show</td>
<td>2%</td>
<td>13%</td>
</tr>
<tr>
<td>Mailing, Advertisement, Flyer</td>
<td>2%</td>
<td>7%</td>
</tr>
<tr>
<td>State Energy Office</td>
<td>4%</td>
<td>0%</td>
</tr>
</tbody>
</table>

The BOC program brochure or a letter from the utility are the written materials most often mentioned by students and supervisors (see Table 5.7). Nearly half of the students’ supervisors (47%) and two-fifths (42%) of the students say they had seen a program brochure. One student respondent who had seen a brochure reported that it had been attached to a rebate coupon the utility had sent to his company. Almost a third of the students (31%) had received a letter from the utility company. One-fifth of the students said that they had seen no written material describing the BOC prior to taking the course.
5. Student and Employer Assessment of the BOC

Table 5.7
WRITTEN MATERIALS SEEN DESCRIBING BOC

<table>
<thead>
<tr>
<th>WRITTEN MATERIALS</th>
<th>STUDENTS (N=48)</th>
<th>STUDENTS' SUPERVISORS (N=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Brochure</td>
<td>42%</td>
<td>47%</td>
</tr>
<tr>
<td>Letter from Utility</td>
<td>31%</td>
<td>7%</td>
</tr>
<tr>
<td>Newsletter</td>
<td>8%</td>
<td>—</td>
</tr>
<tr>
<td>None</td>
<td>19%</td>
<td>47%</td>
</tr>
</tbody>
</table>

Most students (92%) said that the materials they had read provided them with a good understanding of the course and its potential value. Three students who saw written materials did not think that the materials provided a good description. These three students each reported seeing different materials (a brochure, a utility letter, and a newsletter). Two of these three student respondents had expressed low satisfaction with the training, saying they were neither satisfied nor dissatisfied. One of these wanted more detail on what would be covered and a clearer understanding of the hours for each class (the schedule). This student had rated only two of the seven courses as “useful”. The other student recognized the difficulty of providing potential students with a good description of what would be covered without making use of terms and concepts taught in the classes.

Of the eight supervisors who had seen written material prior to their students’ taking the BOC classes, most (13 out of 15) had seen a letter or email from their utility representative. All of the supervisors said that they felt the written material gave them a good understanding of the course and its potential value to them. One of the supervisors who said he had not seen any written material mentioned that he had seen a “very good” presentation by NEEP on the BOC training and added “they should put it on their web site.”

About two-thirds of both students and supervisors (60%) are aware that the Building Operator’s Certification is recognized in more than nine states (see Table 5.8). About three-quarters of the students (76%) say that this cross-state recognition is important to them.
5. **Student and Employer Assessment of the BOC**

### Table 5.8

<table>
<thead>
<tr>
<th>CROSS-STATE RECOGNITION FOR BOC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RECOGNITION FACTOR</strong></td>
</tr>
<tr>
<td>Know that BOC is Recognized in More Than 9 States</td>
</tr>
<tr>
<td>Cross-State Recognition is Important</td>
</tr>
</tbody>
</table>

Two-thirds of students thought that their utility and NEEP were appropriate sponsors for the BOC certification. One-third of students and 13% of employers thought that the certification would carry more clout if another organization provided certification.

When asked to name an organization that would be a more appropriate sponsor, there was little agreement among the respondents. The following list provides their suggestions. Unless otherwise indicated, each organization was named by only one respondent.

- Building Operators Management Association (BOMA)—mentioned by three students, although one expressed the caveat that BOMA tends to confine its training locations to big cities
- A university or college—mentioned by two students, one of whom expressed a desire for college credits for the training, and one supervisor
- International Facilities Management Association (IFMA)
- Association of Physical Plant Administrators (APPA)
- KEYE Productivity Center, a division of the American Management Association
- The Association of Facility Engineers (AFE)

In his response to the question of whether another organization might carry more “clout,” one student suggested that either a large equipment manufacturer like
5. Student and Employer Assessment of the BOC

Simplex or Johnson Controls or a consortium of companies could “help keep the cost factor down by coming in with $900 of the $1,200 for the course.”

When asked what they’d like to see in the BOC 200 course series, several students and supervisors expressed the desire to learn about the BOC 100 Series topics in “more detail” or “more depth.” Table 5.9 shows that more information on HVAC systems and controls was the specific topic most often mentioned for BOC 200 courses by both students and supervisors. Students were particularly interested in “knowing what’s happening and how things are changing in the field of controls,” learning about “the capabilities of advanced controls,” and “digital control systems.”

### Table 5.9

<table>
<thead>
<tr>
<th>COURSE TOPICS</th>
<th>NUMBER OF RESPONDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>STUDENTS (N=23)</td>
</tr>
<tr>
<td>Same Topics, Covered in More Depth</td>
<td>5</td>
</tr>
<tr>
<td>HVAC Systems and Controls</td>
<td>5</td>
</tr>
<tr>
<td>Indoor Air Quality</td>
<td>3</td>
</tr>
<tr>
<td>Cost Analysis/Management</td>
<td>2</td>
</tr>
<tr>
<td>Procurement/Vendors/Outsourcing</td>
<td>2</td>
</tr>
<tr>
<td>Energy Conservation</td>
<td>1</td>
</tr>
<tr>
<td>Electrical Systems</td>
<td>1</td>
</tr>
<tr>
<td>Plumbing</td>
<td>1</td>
</tr>
<tr>
<td>Water Cooling Towers</td>
<td>1</td>
</tr>
</tbody>
</table>

* Recommendations were asked of students who were planning to take BOC 200 Series or had already taken it, and of supervisors who said they would encourage their employee to take BOC 200.
Two students who had already taken the BOC 200 Series classes — and were themselves supervisors — expressed a wish for a BOC 300 class to cover administrative and managerial issues and concerns:

- “I’d like to see a BOC Level III as a more managerial class, how to manage a building in an administrative role.”
- “There should be a Level III with more about managerial processes, what kinds of programs to implement in facilities. I’d also like to learn more about analyses and paybacks.”
5. Student and Employer Assessment of the BOC
6. PROGRAM IMPLEMENTATION

This chapter discusses program implementation from the perspectives of program staff, utility sponsors, and instructors. Our interviews with these program stakeholders explored their opinions and experiences of the program goals, instruction, administration, and marketing, as well as their thoughts about the future direction of the BOC program.

STAFF AND SPONSOR INTERVIEWS

We interviewed four NEEP staff members and six utility sponsors to discuss the program goals and direction, administration, marketing, course content, and instructors.34

Program Goals

The stakeholders with whom we spoke all had a clear understanding of the established BOC program goals to train and certify operators to optimize the operations of their facilities, demonstrate the value of training and certification, and building market demand for resource-efficient O&M services. They thought the BOC was meeting these goals. One of the “founding fathers” of the effort to address building operations assessed the program as “very effective” at “improving building reliability by improving the operator.”

One utility sponsor told the following anecdote. “I gave a presentation to a room full of facility managers. I didn’t realize this, but one person in the room had taken the training. He spontaneously told everyone what a great course it was and how well it taught him about energy efficiency. He said it was not that the course taught him things he didn’t know, but that it called his attention to things. It gave him an understanding of the ‘why’ behind what he does. And this fits into our [the utility’s] commercial programs. We offer things to take our customers to the next step.”

34 The utility sponsors were National Grid and Northeast Utilities, including PSNH, N Star, and Unitil.
6. Program Implementation

Instruction

The sponsors and staff expressed confidence in the instructors and in the 100 Series materials. Several respondents expressed the opinion that the original BOC 200 Series was inadequate for the needs of the students it was attracting, who typically were technically skilled. In their view, the original materials basically repeated concepts taught in the 100 Series. The 200 Series material has been substantially revised and is now judged as adequate. One respondent said, “We have already added so much, it dwarfs NEEC. We still have more to do.” Another added, “The 200-level series still needs refining and tweaking, but it’s not an embarrassment.”

Use of the Working Group

During the initial launch phase, NEEP program manager and the utilities worked together closely, meeting often and creating the rollout strategy. As the program evolved, fewer meetings were necessary between NEEP and the program sponsors.

Currently, meetings are held quarterly. “We review and comment on the number and location of courses, program accomplishments and challenges, program budgets and utility subsidies, recruiting students, leveraging successes, arranging for rooms.”

One sponsor noted that he would like to be informed of program developments more frequently than the current three-month intervals. Emails or phone calls would suffice for interim communication. “At the quarterly meetings I hear things and think, ‘a lot has happened.’ Not that I would act on all of it, but I would like to know.”

Sponsors and staff noted that the Working Group had grappled with a number of issues as the program was conceptualized and launched, yet they characterized these issues as expected for a new program. The people we spoke with thought that the Working Group worked well together and that the challenges they had encountered had been addressed and solved through meetings and communication.

➢ “We were a good team. We are a good team. All of us [program and utility staff].”

➢ “I’ve never been involved with such a group of divergent characters who worked so well together. We all pulled on the oars. Diverse corporations worked together.”

One sponsor briefly discussed a limitation on the work at Working Group meetings. “Sometimes the communication is awkward. [The program manager] is not at a high
6. Program Implementation

enough level within NEEP to negotiate with the utilities about some issues. I feel bad for him when he’s in the position of presenting his management’s viewpoint and I think ‘hey, let’s not shoot the messenger.’”

Administration

Utility sponsors did not identify any administrative problems with the program. “NEEP has done a great job on getting the program up and running.”

As the program manager’s responsibilities grew and the number of students increased, NEEP was able to assign a part-time administrative assistant and another part-time support staff person. Communication among NEEP personnel has been essential, although somewhat informal. One staff person characterizes the information flow as a “conversation.”

However, there are areas in which the “conversation” falters. The program manager was described as carrying a lot of information in his head. And his numerous responsibilities preclude him from having the time to transfer needed information in an orderly way.

Commenting on the difficulties in getting and processing information, a staff member said, “It is difficult to get the information if I’m not on-site gathering it myself.” Tracking current and past training locations, certification, changes, cancellations, and sponsors and their contributions have been the biggest challenge for NEEP administrative staff to date. The BOC database is programmed in Microsoft Access. It is poorly configured for tracking the inputs and delivering the outputs that are regularly needed. Some of the data (particularly that maintained by the program manager) are kept in Excel spreadsheets. The part-time personnel have experienced a learning curve that is typically steep for new users of Access when the data have not been programmed for the novice to use.

Suggestions offered for improving program administration by support staff include:

- More information in the form of lists (such as lists of participating utilities, their contacts and account representatives; student names with complete contact information, including email addresses);

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35 See Appendix D for a detailed review of the database and recommendations for its improvement.
6. Program Implementation

- A better scheduling system for classes; and
- A calendar (or chronological list) with the dates and locations of all upcoming classes.

Elaborating on the last point, the administrative support person said, “When someone calls in and asks where the class is, it takes me 15 minutes to answer the question.”

In spite of the difficulties with data management, the administrative support person thought that the time allotted to the program (one-half full-time equivalent staff) was adequate for its current size and scope.

The program manager characterizes the administrative and management support that he is getting from the NEEP organization as “good, although [we are] still working out the division of labor. There’s a network at NEEP – we help each other sell our projects. I want someone connected to the national organizations to help me. Everyone at NEEP has a full-time job, so everyone I want to help me is overloaded.”

In addition, managing the site logistics for each training creates its own challenges. In the words of one respondent, “We need to bring everything into each classroom except the chairs. So, a million things can fall through the cracks.”

Marketing

The sponsoring utilities have conducted most of the program marketing during its first two years. The marketing methods differed among the utilities, and differed “greatly,” in the words of one sponsor. The following approaches were used by one or more utilities.

- Utility program liaisons (e.g., the utility staff on the Working Group) talk with the field staff, Account Executives, and their bosses to promote the program to them.
- Account Executives talk about the program with customers individually and in groups, offering program brochures and newsletters.
- Utility program liaisons speak directly with large customers and customers expressing an interest in the program.
Utility program liaisons speak at industry organization meetings, such as BOMA chapters or meetings of facility managers.

Information on the BOC has been included in other C&I program promotions and with efficiency rebate checks.

The BOC program is promoted during other C&I training courses conducted by the utilities.

Mass mailings and targeted mailings have been conducted.

Higher-level facility staff have been encouraged to take the course to judge its usefulness for the staff they supervise.

Students provide word-of-mouth recommendations.

Participants receive rebates that subsidize the course fee by one-third, one-half, or even 100%.

Some Account Executives have received monetary rewards for meeting participation goals.

Some Account Executives attended the program with their customers or helped customers with their class homework, thus simultaneously meeting other customer service goals the utility had set for them.

Most of the program sponsors have attended the BOC 100 Series and so are able to promote the training based on an accurate understanding of its content. One utility has used the BOC to train its own staff in the efficient operation of commercial facilities. In fact, one respondent suggested making the BOC course a requirement for utility staff entering the conservation and load management field. He added, “You can only explain the course [to potential customers] by taking it.”

Massachusetts utilities must meet efficiency program metrics defined by the regulators, for which they receive monetary support. The metric for the O&M

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36 This comment echoes the remarks of a student attempting to describe why the written materials for the BOC program did not adequately describe the program. See Chapter 5, Student and Employer Assessment of the BOC, discussion after Table 5.7.
6. Program Implementation

initiative specifies a number of BOC participants. Initially, the number was set for the state as a whole; in 2002, a number was set for each utility. Massachusetts, Connecticut, and New Hampshire all have a public benefits charge. “We need to give this money back to customer in services and rebates.”

The current staff person hired to help with NEEP marketing says he has been “authorized for quarter-time since January [2002] and I’ve been averaging 10% a month. We need staff for doing both strategic and grunt work at this point. For example, we need to call the Forbes list of big companies in the region to find out who their director of training is.” One respondent enumerated some of the campaigns he thought NEEP could and should do:

- Start a direct mailing;
- Target trade associations such as IFMA;
- Create alliances with national and state organizations involved in building operations; and
- Investigate awarding continuing education units (CEUs) for the BOC classes.

He added, “We talked about [creating] a database of mass mailing contacts, but it did not happen.” Another respondent observed that one key to successfully marketing the BOC program is to expand the media through which the BOC is marketed and to focus on a larger audience than the utilities have used in the past. “Customers need to hear about the program from many sources besides their Account Executives – articles about the BOC in other publications like their company newsletter or web site would help.” In addition, this respondent suggested that marketing efforts target multiple levels and departments within a company’s management structure. “[There may be] large customers out there with many operators but only two have attended. Will more attend? We need to keep the program in the forefront of customers’ minds.”

The program manager believes that more staff are needed to help with the marketing campaign. “NEEP is not used to running things as a business. I’ve made it clear that I need lots more marketing help ...I think they’ve heard me.” He estimates that the

According to a sponsor, the metrics for O&M have been motivated by regulators’ desire to educate the people who make financial and purchasing decisions, to move them away from first-cost criteria to lifecycle costs.
BOC initiative may need to double its marketing staff in order to meet the challenges of becoming self-sustaining.

**INSTRUCTOR INTERVIEWS**

We interviewed 4 of the 11 instructors for the BOC program. The interviews addressed their experiences teaching BOC courses, their opinions on the curriculum, their assessment of student experience, and their opinions about the program’s future direction.

All of the instructors interviewed feel that the program administration is good. They noted that the program is “relatively well organized and hassle-free.” Most instructors expressed the opinion that the program manager had good communication skills. They felt that they were well informed and that the program manager listened and responded to their feedback.

When pressed to identify any glitches in the course implementation, three of the instructors mentioned a few times in the early months of the program when they had had to adjust their instruction methods because a projector was not available or books did not arrive. All said that this was not a recurring problem.

Every instructor said that he has enough time to prepare for class and cover his responsibilities. They said that they did not receive any formal training prior to teaching the courses, nor did they need any; each one feels that his educational and professional background has fully prepared him to teach the courses assigned to him.

All instructors we interviewed feel that the student requirements and student populations are appropriate. One instructor observed that his students from public school facilities often have the least experience. A second instructor observed that schools appeared to be the least represented facility type among his student base. Both respondents surmised that marketing to schools was “probably not pushed.”

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38 The program had 11 instructors at the end of 2001. Three of these instructors also had other roles in the program (two are program staff, one is a utility sponsor). We interviewed these three people with respect to their other roles. Thus, we interviewed a total of seven people on the instructor list, but discussed teaching with only four of those seven.

39 This instructor said that his students appeared to come mainly from medical and industrial facilities.
6. Program Implementation

All of the instructors mentioned that they had revised or augmented the original BOC 100 Series materials, adding photographs “from the field” and “real-world examples or anecdotes.” One staff person who has also taught a course or two said “I don’t like the NEEC overheads and don’t think any of the instructors do. Some are too crowded [with text], some are too academic. Half are good, half are lousy. Some instructors don’t use them at all.”

Two instructors suggested that the BOC course could benefit from including a “problem to solve, hands-on activities.” One of these instructors suggested that it might be possible to “explore the actual building that the classroom is in.” However, he noted that this activity could make finding a site host more difficult.

Consistent with the views of the staff and sponsors, most instructors said the original BOC 200 Series materials were not sufficiently advanced. The revised and augmented materials better fit the needs of students.

The strengths of the BOC curriculum lie in their “basis in building science,” the illustrations of problems and solutions, and the broad scope of the topics. “It gives the students tools they can use to solve problems themselves more frequently than they had been doing.”

Each instructor had suggestions for additions to the course topics. Instructors mentioned providing more in-depth discussion of efficient energy use, more information on building security in the wake of 9/11, retrocommissioning, addressing building moisture, and discussing new technologies such as geothermal heating and photovoltaics.

All instructors felt that the BOC is a valuable and much-needed program. One respondent says that his students send him emails and call him “all the time” to tell him how they are applying the concepts he has taught them. The other instructors also mentioned the importance and impact of the BOC training. Typical comments include:

- “The students have been very interested. These operators move on, they get better jobs as a result of taking the BOC training. I see a continual need for this type of program.”

- “I think students appreciate the whole program a lot. These are the people that run the building and can make a big difference in building operations.”
6. Program Implementation

➢ “The students have an opportunity to talk about the problems they are facing in their buildings and to have other students and the instructor help them to think through solutions.”

➢ “Building operators are an underserved population.”

➢ “Buildings last for decades. It’s good to pay attention to their operation. Most of our (the instructors’) professional lives have been devoted to solving problems in buildings.”

Concerning program weaknesses, the building codes course is a problem due to the lack of homogeneity of codes among the states in the region. One respondent reports, “We almost need eight different curricula for the eight states. And codes change all of the time, most often in two states.” Two of the instructors thought that there should be greater emphasis on energy efficiency. Both of these instructors teach HVAC courses. Said one instructor, “My impression is that saving energy is not explicit. Currently, we give an overview of building systems and it’s up to the student to draw conclusions about energy.”

The instructor continued, “And there is not a strong tie-in between the course and NEEP. Students are not given an understanding nor have any awareness of what NEEP is, its mission, and how the course ties with that. Often the utility is introduced but not NEEP. Yet all the instructors come through the energy efficiency field. We could be more explicit and say, ‘We’re here to save energy and your time and money in operating your buildings. Better operating practices save energy.’”

Two instructors expressed concern about the program’s future. One instructor focused his remarks on the price. He was not sure whether demand for the course would persist at higher prices. The other instructor was concerned about the utilities’ changing role, a topic that relates to the price charged to students. “The utilities seem to have done their bit. They aren’t pushing it any more. They are on to the ‘next big thing’. If the utilities decide not to market it any more, well, NEEP must market it. Perhaps NEEP can team up with community colleges. But there has been a wide range of facility types that have taken the program. It’s the utilities that have all of these facility types as their customers. NEEP will have to reach all these different segments, and I don’t know if it will be able to do that.”
6. Program Implementation
7. PROGRAM STRATEGY

The Northeast BOC program was conceived as a program that could be self-sustaining after an initial start-up period. The expectation is that, at some point, program revenue through course fees will cover program costs. It is housed within NEEP, but could, in fact, be spun off as its own non-profit organization because it would be self-supporting.

This chapter explores the program strategy and the assumptions that underlie it.

THE UNDERLYING ASSUMPTIONS

Desirability of BOC Self-sustainability

The expectation that the program would become self-sustaining formed the basis of the program’s business plan. Every sponsor and staff person interviewed took this expectation as a given in our discussion of the BOC. Many respondents made the statement: “If it is marketed effectively, it can be self-sustainable.” In the words of one sponsor, “The idea is that customers would sign up without rebates because it’s a good program.” Another said, “We need to let NEEP try it on its own, then evaluate.” Still another said, “At some point, the program needs to be capable of standing on its own. If not, one must conclude that it doesn’t provide participants with sufficient value.”

Even so, the sponsors expressed opinions that suggest self-sustainability may not be a desirable goal. Four of the six sponsors explicitly stated that the utilities should continue to be involved with the program because it serves their customers, and another sponsor said that his utility is likely to continue to support it. “Utilities

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40 Appendix E contains the memorandum written by the project team assessing the business plan and other program documents.

41 This chapter incorporates the views of sponsors and staff. To avoid identifying the views of the one woman interviewed, we use the pronoun “he” at all times, regardless of the gender of the speaker.

42 One of these sponsors, however, also said that his utility will not continue its involvement if the Account Executives do not think that the program provides a valued service. This assessment has yet to be made.
7. Program Strategy

should still market the program. All customers have a utility. We should use the utility as a mediator for the program. We should build on the relationships the utilities have with their customers. It’s important that everyone in the region—both electric and gas companies—stay involved, participate.” Two of the sponsors added a second reason for continuing to support the program: in doing so, they support NEEP.

One sponsor went so far as to say that utilities should pay 40% of the participant course fee “forever. Never back out.” Another sponsor also thinks that the utility receives value from offering scholarships. “Scholarships add credibility to the program. They show that the utility values it.”

The sponsor who made the preceding comment also made it clear that the main benefit of the program to his utility is as a tool for customer service and customer contact. “If NEEP takes over all the marketing, we’ll definitely reconsider our involvement. We don’t want them to take our mailing lists and just ask us to write a check [for scholarships]. If we are cut out of the loop, the program won’t have as much value to us as when it is our rooms and we are there with them. In past, we did our own marketing, which is a good thing. We wouldn’t want NEEP to blast our customers with ads.”

Another sponsor spoke to the issue of customer lists. “I don’t think utilities will want to share their lists.”

Possibility of BOC Self-sustainability

None of the respondents questioned whether self-sustainability was possible, that is, a goal that is achievable under the right conditions. Yet one respondent commented that additional revenue streams, such as those that NEEC receives from recertification and the sale of program licenses, would be necessary to cover program costs. This respondent also suggested that the program might be best offered through, or linked to, an academic institution.

Another respondent thought that additional revenue streams were not necessary. He looked to the expanding geographic region served by the program to bring in more students and make up for any declining revenue from the initial three-state sponsoring region. In contrast, one respondent said, “I would like to think that expanding the geographic reach of the program would help, but it will probably have the opposite effect.”
Path to BOC Self-sustainability

All respondents agreed that the program would not be self-sustainable by the end of 2002, for the 2003 fiscal year. Self-sustainability requires two conditions: (1) a minimum number of students per year, and (2) a minimum revenue per student. The initial business plan described a two-pronged approach for achieving self-sustainability by 2003. First, the sponsoring utilities would encourage participation by subsidizing the participant cost by 50% in 2000, 33% in 2001, and 25% in 2002. By 2003, the program was expected to have proven its value to prospective participants who would then pay the full fee, ensuring the minimum revenue per student was attained. Second, the utilities would conduct marketing to attract all participants served by the program in 2000, two-thirds of the participants served in 2001, and one-third served in 2002. NEEP would conduct marketing to generate the remaining portion of students, including 100% of the students in 2003 and thereafter.

Respondents suggested three reasons to explain why the BOC has not attained self-sustainability on the projected schedule. First, the utilities have not effectively or aggressively marketed the program. Comments included: “I don’t think we’ve marketed this as well as we have to. The marketing approaches have differed greatly among the utilities” and “I am disappointed that the other utilities have not been more aggressive in their marketing. If they had, we would have a better sense of the demand for the program.” The second reason offered is that NEEP has not effectively or aggressively marketed the program. Comments included that the NEEP efforts need to be more focused geographically and that the organization “is not ready” to effectively market on its own. Third, respondents are concerned that customers may be unwilling to pay the full tuition costs.

There is an alternative reason why the BOC has not attained self-sustainability, although none of the respondents suggested this. It is possible that the marketing strategy, even if perfectly executed by all parties, is not capable of producing self-sustainability, whether in three years or at some subsequent time. Some of the comments made by sponsors and staff, as well as findings from the survey research and a comparison with the history of the BOC in the Pacific Northwest, suggest that this is a possibility worth considering.

43 “BOC Business Plan Revised February 2001”, NEEP, p. 3.

7. Program Strategy

- Importantly, at the end of 2002, although the program will have been operating for three years, no customers will have been recruited at the full course fee. There will be no marketplace experience by which to judge whether customers will be willing to pay the full fee.

- Any word-of-mouth marketing generated by the program to date necessarily assesses the value of the course in comparison to the cost paid by the speaker.\(^{45}\)

- NEEP is supposed to “take over” the marketing of the program from the utilities, and yet is not supposed to continue the utilities’ activities. While the utilities marketed the program as a service to individual customers, NEEP is to market the program to organizations as a service to their memberships. The utilities marketed to firms identified on existing customer lists and built on existing customer relationships. NEEP needs to generate its own marketing lists, create new relationships, and promote the program within those relationships. The business plan thus implicitly describes two markets; the utilities will pursue with decreasing frequency one method in one market, and NEEP will pursue with increasing frequency another method in another market.

- NEEP lacks the staff resources to conduct the marketing necessary to fill the courses, in the opinion of six respondents. Yet additional staff would increase the program budget, increasing the number of students required and the marketing necessary to recruit those students. Neither the first nor second business plan, nor the comments of any respondents, suggest that any formal analysis has identified the balance point between number of staff necessary to support the program and number of students necessary to support the staff.

- The BOC program was initially positioned in the market as a utility service. A utility offered the program, taught by NEEP, to its customers, in its facilities, sometimes accompanied by its staff. Although this positioning

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\(^{45}\) This issue emerged during the survey of students’ supervisors. When asked their willingness to pay for the course, some supervisors noted that they had gotten the course for free or heavily discounted and that influenced their willingness to pay for it. One respondent said, “It’s basically free training and I’ve seen the benefit when these guys come back and apply the lessons.” Student respondents offered such comments as, “If the utility picked up 50%, staff here would definitely go again.”
falls short of “branding”, any program awareness that is generated likely links the program with the utility.\textsuperscript{46} Market awareness is not primed to accept NEEP as the sole program purveyor.

- In the Pacific Northwest, the BOC program began with full funding in Idaho for six years and in Washington for nine years. This was followed by a three-year period of substantial funding by the Northwest Energy Efficiency Alliance. Alliance funding continues at a modest level today, 12 to 15 years after its beginnings in those states. NEEC’s current business plan assumes that licensing fees will bring in needed revenue.

- Educational programs are seldom self-sustainable. That is why most educational institutions are either publicly funded or are privately funded with very high fees. Commonly, training fees generate enough revenue to cover the cost of delivering the training, but not enough revenue to support program development (including program enhancement and expansion and database development) or marketing.\textsuperscript{47}

## THE CURRENT PROGRAM PREDICAMENT

Clearly, the program will not attain the goal of self-sustainability by 2003 set forth in the first business plan. Yet the founding sponsors are, in the words of one sponsor, “moving away from BOC.” He added, “Not due to anything about BOC, but due to external factors. Marketing for BOC has taken a back seat.” In the words of another sponsor, “My utility is focused on resource acquisition—\textit{kWh}. They go for the biggest bang for the buck.” Another said, “In Massachusetts, budgets are very tight. We don’t have the flexibility we had in the past. Market transformation is important, but not as important as energy efficiency.”

The initial program strategy assumed that effective marketing for a few years would get the program on its feet; that the program would prove itself in that time. From the survey of regional supervisors, one can conclude that the marketing has been very effective. In twenty-four months, program awareness went from zero to 13%. Even so, a market awareness of 13% is not sufficient to sustain the program.

\textsuperscript{46} A sponsor commenting on the survey instrument said that students may not know it as the NEEP BOC program but rather as the utility’s BOC program. An instructor expressed this same point of view.

\textsuperscript{47} See Appendix D.
7. Program Strategy

THE SECOND BUSINESS PLAN: 2002-2003

The second business plan describes marketing goals of 20 courses a year serving 435 students. These courses would take place in seven states in 2002 and eight states in 2003. The program product is the BOC 100 Series course and 200 Series course. NEEP will concentrate its marketing efforts in Connecticut, Massachusetts, and Rhode Island, where it will have primary responsibility for marketing. The marketing efforts of the utilities in these states will diminish starting in 2003. In these three states, NEEP assumes that most students will enroll at the full price of $1,200 in 2002 and $1,400 in 2003. Sponsoring utilities are expected to subsidize students only on a case-by-case basis. As for the other five states, utilities in those states will have primary responsibility for marketing. In these states, the full price of the course is $1,400; NEEP expects that sponsors will likely provide subsidies to most students, at least through 2003.

The main marketing channels identified in the business plan are:

- Direct marketing to former and existing students, encouraging them to refer their colleagues.
- Direct marketing to large employer supervisors and managers.
- Promotion to utility account managers.
- Marketing to facility management associations.
- Marketing to O&M service providers.
- Expanding product offerings and course locations to attract additional participants.
- Developing and distributing marketing materials.

The plan states that program revenue will come from two sources, students and sponsors, although it does not say how much will come from each source. Calculations using the projected number of students in each state and the course fees associated with those students suggest that all but $2,200 of the projected $570,600 revenue in

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2002 will come from course fees. In 2003, revenue is projected to be $644,000 and course fees appear to comprise all but $35,000.

Expenditures are itemized in the plan and are roughly equivalent to revenue.

**ANALYSIS OF THE SECOND BUSINESS PLAN**

This analysis of the business plan will use the simple convention of the Five P’s: the product, price, promotion, positioning, and place. This provides an easily understood analytical framework. We conclude with a sixth topic: measurement (of achievements).

**Product**

The business plan addresses the possibility that additional BOC products will be developed. These include: customized 100 Series and 200 Series courses for specific business types; additional course topics such as building security, retro-commissioning, and advanced indoor air quality; and one-day workshops on specific subjects.

These additional products are discussed under the topic of marketing-related activities. The reasoning appears to be “if we offer more things appealing to more people, we will attract more participants.”

The geographic expansion of the program beyond the founding three states into an additional five by 2003 can be viewed as a type of product proliferation. It is, quite obviously, not possible to put the BOC training on a truck and send it to a new market. Consequently, the product is in some senses created anew in each region that it enters. New instructors need to be found that reside in or close to the region. New facilities need to be procured. Thus, there are development costs to the geographic expansion of the program, not simply marketing costs.

The geographic expansion also requires finding new sponsors. The business plan did not define the sponsoring relationship. Even if it simply means a financial contributor, negotiations must determine what form or forms the contribution takes:

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49 The Five P’s were not used as a theoretical framework for data collection or analysis. Rather, they provide a convenient organization of the findings.
in-kind donations, course fee subsidies, a grant. But it may also mean that the sponsor conducts some portion of the marketing.

What are the mutual obligations of sponsors and NEEP? For example, what happens if NEEP incurs product development costs in finding and hiring instructors in a new region and the sponsor does not deliver enough students to hold the class? What happens if the sponsor only delivers sufficient students after several anticipated course dates—who incurs the cost of scheduling and rescheduling students, making facility arrangements, and keeping instructors on-line or hiring a replacement to fill in for someone who is no longer available?

And what are the expectations on NEEP? Suppose the new sponsor wants the course customized for its constituency. Who pays for this development? And who determines what the cost of this customization really is?

**Price**

The marketing plan states that the price in 2002 will be $1,200 for the three founding states and $1,400 for all others. In 2003, the price will be the same across all states. However, in some states (the newer ones) it is expected that all students will receive a scholarship; in other states (the three founding ones), selected students will be chosen for scholarships. Scholarships range from 25% to 100%.

In short, the marketing plan describes a single product that is offered to the customer at a variety of prices. Furthermore, as of the end of 2002, no customer will have paid the full market price of $1,200, much less $1,400.

The interviews with sponsors revealed two in Massachusetts who think that it would be good to continue providing student subsidies of one-third to 40% of the course fee. It was not clear from their comments whether that position is the policy of their utility or their own view. Nonetheless, the view does not appear to be consistent with the marketing plan.

According to a few of the sponsors, NEEP unilaterally decided to raise the course fee to $1,400. These members of the Working Group experienced this as an affront, since the fee of $1,200 had resulted from the Working Group’s collaborative deliberation. One sponsor said that he had not realized the fee had changed until he received a bill from NEEP for a course series he had sponsored.

The reasoning behind the fee increase did not come out in the conversations with program staff, nor is it explained in the business plan. It is reasonable to assume that
NEEP realized it needed additional revenue to cover program costs and decided that this would be a viable way to get it.

Comments made by the surveyed students and their supervisors suggest that participants want to purchase the training at the lowest possible cost. Thus, potential participants who are aware of the different prices at which the course is offered may try to negotiate for the lowest price.\(^{50}\)

With or without such negotiations, multiple prices set the stage for dissatisfaction: Consider the reactions of a supervisor who has sent a student at the full price and has plans to send another when he learns that a colleague sent staff at a considerably lower price.

Finally, marketing researchers have found that consumers often have no way of judging product quality prior to consuming the product. They use price as a proxy for value; a higher price is assumed to signify a higher value.

**Promotion**

**Promotional Strategy**

Sponsors and NEEP alike speak of NEEP “taking over” the marketing of the program. As mentioned in the discussion of the assumptions underlying the program strategy, the reality is that the utilities do one type of marketing to one type of market (relationship marketing their customers) while NEEP will do another type of marketing to another type of market (initially cold-calling on associations, asking to provide a service to their customers). Although the plan calls for NEEP to market to large utility customers and Account Executives, the discussion below presents some drawbacks to this plan. Even without drawbacks, these firms are not NEEP’s customers and NEEP does not have an existing relationship with them.

When it is acknowledged that the plan calls for two types of marketing, it becomes obvious that, in fact, both types of marketing are necessary. Both types have strengths and limitations. The strength of utility marketing is its ability to use

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\(^{50}\) In the Pacific Northwest, the fee charged for the BOC differs between the states. Willingness to pay appears to track with exposure to different fee structures for the training. See Peters, et al., *Regional Building Operator Certification Venture: Market Progress Evaluation Report – Year-End 1998*, June 30, 1999, prepared for the Northwest Energy Efficiency Alliance.
relationships. The limitation is that the relationships are with the large customers, and with facility managers (typically, senior managers) of these customers. By going through professional organizations, NEEP can reach a wider variety of customers than those with Account Executives and can reach the line staff of these customers.

Both marketing approaches are necessary. In fact, NEEC’s success in the Pacific Northwest has been reduced by limited support from the region’s utilities.\(^{51}\) It stands to reason then that the continued marketing efforts of both utilities and NEEP would result in the Northeast BOC program attaining a higher market penetration.

**Promotional Channels**

The business plan describes a number of promotional channels. It elaborates on marketing to facility management associations and gives a timetable for targeting 12 associations. The timetable for establishing a relationship with these associations appears reasonable. However, the business plan does not address the lag between establishing the relationship and obtaining students and revenue.

The program manager’s experience to date suggests that this lag might be more than a year. The process may involve a contact with one individual, information sent to that person, referral to a board meeting, additional information requested by the board, referral to a committee, and so on. This process continues until a decision is made to enter negotiations, which may well take months to complete.

Assume the negotiations reach a successful conclusion. At this point, the association has finally become a comparable source of students as a utility is when it first joins the program, because it is at this point that marketing to the potential student begins. In this comparison with the utility, the association may have an advantage if its members need CEUs and the course provides it, or there is some other strong inducement to take the course. But, generally speaking, it is after negotiations are concluded that the association contacts potential students, promotes the advantages of the training, and encourages people to sign up.

Thus, it may take a year or more after the initial contact with the association before marketing to the end-user—the potential student—even starts.

\(^{51}\) The recommendation to take steps to increase utility support was made repeatedly in the program MPERs.
The business plan identifies two marketing channels whose success depends on the utilities: direct marketing to large employer supervisors and managers and direct promotion to utility account managers. Regarding the former, sponsors interviewed doubted that the utilities would be willing to give NEEP their customer lists. Thus, NEEP will have to purchase a business list and conduct cold calls into the organization to find the appropriate person to talk to. Regarding the latter, the interviewed sponsors said that the BOC is taking a back seat to other concerns. Even though the survey of students and their supervisors gives the program high marks in customer satisfaction, utility account managers may be focused on meeting resource acquisition goals or meeting internal criteria and metrics for providing customer service.

The business plan also identifies marketing to O&M service providers. Less market research has been conducted on this sector than on customers with in-house O&M practices, yet the findings are not encouraging.

The RLW study conducted a market segmentation analysis and identified five clusters of customers, each of which they named descriptively.52 They found that the “passive underachievers” were the most likely to outsource O&M. This group was characterized as only “somewhat” interested in O&M, just above the last ranking of “uninterested” characterizing the “Run It ‘Til It Breaks” group. Without further study, it remains a question what level of expertise clients of O&M service providers demand; the RLW study would suggest that it is low. Certainly, O&M service providers will try to meet that level of expertise at the lowest possible cost. Staff training may be viewed as an unnecessary expense.

The final Market Progress Evaluation Report (MPER) for the BOC program in the Pacific Northwest provides data that strongly suggests that the BOC program would attain much lower penetration among contract O&M staff than is its potential among in-house staff.53 The primary finding concerning contract staff is that they have little involvement in building operations; they mainly provide maintenance and janitorial services. Table 7.1 draws together information from several tables in that report to further contrast the two markets. Because the information is drawn from answers to


### 7. Program Strategy

different types of survey questions, the second column in the table defines what the data in the third and fourth column measure.

<table>
<thead>
<tr>
<th>CONCEPT</th>
<th>MEASUREMENT</th>
<th>IN-HOUSE SUPERVISORS</th>
<th>CONTRACTING SUPERVISORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certification Recognized by Multiple States</td>
<td>Percent with high interest in</td>
<td>55%</td>
<td>29%</td>
</tr>
<tr>
<td>In-house Training</td>
<td>Percent planning to send self or staff to training</td>
<td>80%</td>
<td>48%</td>
</tr>
<tr>
<td>Video Training</td>
<td>Percent planning to send self or staff to training</td>
<td>71%</td>
<td>88%</td>
</tr>
<tr>
<td>Seminar at Trade Show or Conference</td>
<td>Percent planning to send self or staff to training</td>
<td>72%</td>
<td>25%</td>
</tr>
<tr>
<td>Vendor Workshop</td>
<td>Percent planning to send self or staff to training</td>
<td>69%</td>
<td>48%</td>
</tr>
<tr>
<td>Community or Technical College Course</td>
<td>Percent planning to send self or staff to training</td>
<td>43%</td>
<td>32%</td>
</tr>
<tr>
<td>BOMA Course</td>
<td>Percent planning to send self or staff to training</td>
<td>26%</td>
<td>8%</td>
</tr>
<tr>
<td>Operating Engineering Course</td>
<td>Percent planning to send self or staff to training</td>
<td>28%</td>
<td>4%</td>
</tr>
<tr>
<td>Some Type of O&amp;M Certification Received by Supervisors in Past 3 Years</td>
<td>Average number of certifications received by those receiving certification</td>
<td>1.32</td>
<td>.85</td>
</tr>
<tr>
<td>Some Type of O&amp;M Certification Received by Staff in Past 3 Years</td>
<td>Average number of certifications received by those receiving certification</td>
<td>1.93</td>
<td>.77</td>
</tr>
<tr>
<td>Some Type of Building Operator Certification Received by Staff</td>
<td>Percent receiving certification</td>
<td>13%</td>
<td>4%</td>
</tr>
<tr>
<td>NEEC BOC Certification</td>
<td>Average amount willing to pay</td>
<td>$820</td>
<td>$493</td>
</tr>
</tbody>
</table>
Staffing of Promotional Efforts

The business plan calls for the program manager to spend 15% of his time (and he is full-time) on marketing in 2002 and 37% of his time in 2003. The administrative support person will spend 0.05 full-time equivalency (FTE) in 2002 and 0.07 FTE in 2003 on marketing. The other NEEP staff assigned to the program will spend 0.03 FTE in 2002 and 0.10 FTE in 2003 on marketing.

The table of staffing hours required for the program by necessity identifies only a few subtasks for each marketing approach. Nonetheless a few key subtasks do not appear to be subsumed in the data given, a supposition that is based on the subtask descriptions and the hours assigned. It is possible that the subtasks to be noted presently fall under the category “other activities (development, etc)”, which are budgeted at 41% of the program manager’s time in 2002 and 27% in 2003. These subtasks include preparing new marketing materials (such as a publication of case studies) and designing the workshops to be offered. They also include negotiating with the facility management associations to craft a deal, arrange a time and location for a course, and keep tabs on progress filling the course.

Regardless of whether the subtasks are adequately covered in the table to enable an adequate mapping of resources, the FTE devoted to marketing (totaling 23% across all staff in 2002 and 54% in 2003) do not appear sufficient for the marketing challenge at hand.

Positioning

The business plan states that the BOC will be positioned as high quality training at a low price. This does not seem appropriate for at least two reasons. First, the survey results suggest that customers will not consider the full course fee to be a low price. Second, marketing research suggests that a low price often conveys low quality.

Related to positioning is the strategy described by the marketing plan and implemented thus far by the sponsoring utilities, namely, recruiting managers to

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54 The program manager and administrative support person described that significant effort goes into scheduling a course. This entails matching interested students from throughout the region to the location nearest to them in the near-term. Meanwhile, course dates are in flux until the time when the quota of students has enrolled. Finally, all students need to receive confirmation of the final place and date. Presumably this work comprises a considerable portion of “other activities”.

BOC TRAINING AND CERTIFICATION PROGRAM IN THE NORTHEAST
take the class to demonstrate its value for line staff. NEEC followed a strategy of introducing managers to the course by conducting by-invitation-only meetings, often held over breakfast or lunch. During these meetings, the BOC would be explained and questions answered. Sometimes, managers whose staff had taken the course would give testimonials.

When the managers themselves are recruited to take the course, it is unclear how this translates into staff attendance. Do the managers use the course information to conduct on-the-job training and establish better performance expectations for the staff, rather than sending their staff? Have they used the department training budget on themselves, instead of their staff? Because the curriculum is formulated for “the nuts and bolts” staff, who often have only a high school degree or some technical college, do managers’ experience that the course is simplistic for them color their views of the value the course has for their staff?55

In addition to the questions raised about how attendance by managers translates into attendance by staff, there is the issue of the experience of students in a class where the attendees have much different levels of expertise. It is impossible to teach to all levels at once. Either the instructor picks one level and goes with that, or ping-pongs between both levels with questionable effectiveness. The result may be that either one type of student or both types feel some dissatisfaction with the portion of the class that is not taught to their level.

The disadvantage of inviting managers to take the course may be most apparent in the experience with the BOC 200 Series. NEEC designed the course to be continuing education for the same “nuts and bolts” staff that took the 100 Series. Given that the 100 Series teaches new concepts to line staff, the 200 Series intentionally provides some review of what was new material for these students. It then extends the subject matter.

The business plan states that 68% of students enrolled for the 200 Series took the 100 Series. Presumably, one-third of students were entering BOC training for the first time because they were considered too experienced for the 100 Series. Given NEEC’s intent for continuing education, these people are also too experienced for the 200 Series. NEEC had considered developing a Level 3 series for managers and technically proficient staff; it dropped these plans when it realized that BOMA and the Association of Energy Engineers already serves this group.

55 In the survey of students, the single dissatisfied rating was given by a manager.
Place

During its first two years, the program has had its place at the sponsoring utilities, which have provided the facilities. More generally, it has had its home with the sponsors, on a footing with other customer service and market transformation activities. Potential customers have learned about the program through their utilities.

When facility management associations offer the program to its members, they, too, will comprise the program place and home.

It is not clear what the vision is for the program’s place once the program is self-sustaining. Will it still find a place with the utility sponsors?

The question of place provides us with a framework for considering the sponsors’ comments discussed at the beginning of this chapter under the heading “Desirability of BOC self-sustainability”. The comments can be viewed as a desire that the BOC maintain its place with the utilities.

Measurement

The business plan states that NEEP will target getting 15% of the enrollment (66 students) in 2002 and 41% (181 students) in 2003. It also states that NEEP will have most of the responsibility for marketing in the three founding states and that the sponsors will have most of the responsibility for marketing elsewhere.

A table that gives the projected student enrollment by state indicates that 54% of the students will come from the three founding states in 2002 and 63% will come in 2003. Assuming that NEEP recruits no students outside of the three founding states, a simple calculation suggests that the sponsors in the three-state region will be responsible for recruiting 72% of the students from that region in 2002 and 34% of these students in 2003. The results of this calculation do not appear to be consistent with the phrase “most of the marketing responsibility.”

Finally, there is the issue of the methodology that will be used to measure NEEP’s success at its goals of 15% and 41% of student enrollment. Will a NEEP-enrolled student be counted as one who calls or contacts NEEP directly to request or submit an enrollment form? Will a NEEP-enrolled student be those students with whom NEEP spoke prior to enrollment? What if NEEP speaks with a student and then they contact their utility for an enrollment form? Or vice versa? Or will NEEP only count the students that come from a facility management association? And what about
multiple marketing sources? Several respondents stated, and marketing texts agree, that the potential market must be repeatedly reached through multiple sources in order to make the sale. What if someone comes from a facility management association and also happens to have heard about the program from the utility, or vice versa? These questions are raised to illustrate the point that it is not possible to identify the party that generates specific enrollment when multiple parties are involved in marketing. It is not that the measurement process needs to be better defined; rather, it should be abandoned because it is not applicable to the marketing process. NEEP has set a goal that cannot be tracked with a performance indicator.
8. SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY OF FINDINGS

Regional Market Assessment and Projected Market for BOC Training

- About 14,500 facilities have building operators in the five-state region of Connecticut, Massachusetts, New Hampshire, Long Island (NY), Rhode Island, and approximately 243,000 building operators work in these facilities.

- Customers with building operators on staff have average electricity demands that are nearly double, at 390 kW, the average electricity demands of customers without building operators, and electricity usage is nearly triple, at 1.8 million kWh.

- Awareness of the BOC program among supervisors of building operators without BOC experience has grown to 13% at the end of the second year of program operations. 56

- Three-fourths of regional supervisors would consider sending staff to the BOC training.

- Respondents who say they would consider sending staff to the training have facilities that are more than twice as large, averaging 338,935 square feet, as those who would not consider sending staff.

- By business type, the proportion of respondents who would consider sending staff ranged between 50% and 80%.
  - The business types with the highest likelihood of sending students are medical, schools, and grocery (75% to 80%).

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56 This figure is comparable to the growth rate for the BOC program in the Pacific Northwest with funding from the Northwest Energy Efficiency Alliance.
8. Summary of Findings, Conclusions, and Recommendations

- Government, office, retail, and wholesale warehouse would consider sending staff at rates of 65% and 70%.

- The business types with the lowest likelihood of sending students are lodging, manufacturing, and public utilities (50% to 55%).

Regional supervisors (nonparticipants) who said they might send staff might send 2.75 staff on average.\(^57\)

In the near term (e.g., 2002-2004), the potential market for the BOC program is likely to be 25% of the firms with operators, or about 10,000 students.\(^58\)

Just over half of the regional nonparticipating supervisors think that certification for building operations staff is “very important” or “important.”

In the past three years, one-third of the regional supervisors had attended a training or education program. Of those, one-half had received certification from training in building operations and maintenance, and nearly half said their staff had received similar certification.

Half of the nonparticipating supervisor respondents who said they were willing to pay a dollar amount for the BOC training indicated a willingness to pay of $1,200 or more. (We are not able to estimate the proportion that would be willing to pay $1,400.)\(^59\)

Nearly two-thirds of the nonparticipating supervisors were hearing about the BOC for the first time through the survey and said that they did not know what they would be willing to pay for such training.

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\(^57\) This figure is comparable to that found for nonparticipating regional supervisors in the Pacific Northwest and that lies between the estimates of additional staff that might attend given by BOC students and students’ supervisors.

\(^58\) We call this figure a “near-term” estimate because it is based on the responses of supervisors who are just learning about the training. As market awareness increases and supervisors become aware of the training’s value, we expect that the estimated market size would increase. The RLW estimates of the BOC market size, reported in the business plan, can be considered “long-term” estimates.

\(^59\) The sample size—those who might send a staff person (50%) multiplied by those who stated a value (33%)—is too small to identify the proportion willing to pay over $1,400.
8. Summary of Findings, Conclusions, and Recommendations

- Of the BOC students’ supervisors who stated a dollar amount they were willing to pay, one-half said they would be willing to pay $1,200 or more and one-third said they would be willing to pay $1,400 or more. The comments made by several of these supervisors suggest that the course fee subsidies have had some effect on their estimate of the maximum they would be willing to pay.

- Higher willingness to pay appears related to past experience with certification in some area of building operations, as well as with membership in a professional organization, and to exposure to the BOC training itself.
  
  - Regional supervisors who have received certification are three times as likely as both those with training but no certification and those with no training to say they would pay higher amounts for the BOC training.
  
  - Regional supervisors who belong to professional organizations are twice as likely to say they would pay higher amounts for training as their colleagues who do not belong to professional organizations.
  
  - BOC students’ supervisors—the supervisors best informed about the program—were much more willing to pay at the highest level (over $1,400) than regional supervisors. One-third of the BOC students’ supervisors said they would be willing to pay over $1,400.

BOC Impact and Participant Assessment of the Program

- Most (90%) BOC students say they use or apply methods and concepts from the BOC classes. Over half of the students say they perform new activities they did not do before taking the BOC classes or do some activities more regularly or frequently now than they did before taking the BOC classes.

- Most (90%) BOC students and their supervisors report the students have improved comfort, saved energy, or saved money. About one-third of students and supervisors report their assessment has been supported by comments from occupants, a supervisor, co-workers, or a contractor, or report that they have saved money in trouble-shooting or the use of contractors.
8. Summary of Findings, Conclusions, and Recommendations

- Participants’ assessment that they have saved energy is supported by the impact measurements obtained from survey responses. Students engaged in 11 energy efficiency actions more frequently than nonstudents, or undertook the actions to a greater extent (e.g., on a larger proportion of the equipment).

- The annual resource savings from the average BOC student certified in 2000 or 2001 are:
  - 238,490 kWh (demand savings were not estimated)
  - 930 MMBtu of oil or gas
  - 77,095 gallons of water
  - $20,000 in resource cost savings at resource prices current in Massachusetts from 2001.

- Most (80%) BOC students and their supervisors report being satisfied or extremely satisfied with the BOC training as a whole, comparable to the satisfaction reported in the Pacific Northwest.

- One-third of the students rated all seven of the 100 Series courses as “useful” (on a 3-point scale) and nearly three-quarters rated four or more courses as useful.

- The building systems overview, energy conservation techniques, and indoor air quality (IAQ) are the courses most often rated as useful by students. Their supervisors most frequently rated the building systems overview as most useful, followed by energy conservation techniques, and a tie between HVAC systems and controls, and facility electrical systems.

- One-third of the students report the BOC training has helped them advance their career: a change in title, an increase in responsibilities, or an increase in compensation.

- All of the students’ supervisors and 80% of regional supervisors report that seeing the BOC training on a job candidate’s resume would enhance the

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60 These annual savings are expected to flow for five years from the time of training.
attractiveness of the candidate to them. Half of the students’ supervisors say that they might require the BOC certification sometime in the future when more people have received the training.

- Eighty percent of students had already recommended the BOC to their colleagues, and nearly all of those who had not yet recommended it would do so if someone were to ask them. Nine in ten student supervisors said they had or would recommend the program.

- Fifty percent of students plan to take or have taken the BOC 200 Series.

**Program Implementation**

- Sponsors, staff, and instructors believe the BOC 100 Series materials and program delivery meet the needs of students.

- The original 200 Series materials did not address the needs of the more technically skilled students the course was attracting, but recent revisions had improved the quality of the courses.

- Communication within the Working Group was characterized as very good. One respondent expressed the view that sometimes issues that are raised at the quarterly meetings require the involvement of a NEEP staff member with more authority than that of the program manager.

- The primary administrative tool, the Access database, is not adequate to the program needs, especially for the administrative support person. The state of the database significantly increases the time required for the administrative assistant to complete most tasks.

- The program manager carries a lot of information in his head and his numerous responsibilities impede the orderly transfer of information from the manager to the support person. The manager relies on Excel to maintain data. The clumsiness of the Access database is exacerbated by the need to move between software tools when conducting information-related tasks.

- A review of the database has identified recommended changes and estimates the cost to revise it to be about $5,000.
8. Summary of Findings, Conclusions, and Recommendations

- The administrative assistant reported that, by attending the courses, she obtains tracking information first-hand.

- Each utility sponsor has employed a different set of marketing methods and has conducted their marketing a different level of effort. It is not possible, therefore, to determine the methods that were most effective in achieving market penetration, nor is it possible to determine what kind of market penetration would be possible if all utilities had used all the methods with the same intensity.

Program Strategy and Business Plan Analysis

- Sponsors and staff recognize that the program will not be self-sustaining by 2003.

- Sponsors and staff identify three primary explanations for why the program will not be self-sustaining:
  - The utilities have not marketed the program sufficiently.
  - NEEP has not marketed the program sufficiently.
  - Customers may not be willing to pay full price for the course.

- Even though the goal of self-sustainability has not been reached, utilities are ready to “pull back” from the program due to market and regulatory conditions.

- The business plan findings correspond to the “Five P’s” of marketing:  
  - **Product**: While the two core products are the BOC 100 Series and 200 Series, geographic expansion of the program requires some development work. In addition, several other products are contemplated for development, including one-day workshops, and customized course series.

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8. Summary of Findings, Conclusions, and Recommendations

- **Price:** Participants have paid prices ranging from $0 (full subsidization) to $800. No participants paid $1,200 during the program’s first two years.

- **Promotion:** The utility sponsors have pursued relationship marketing with their customers. NEEP will continue to market to utility customers (working through the utilities) and will market to facility management associations and contract O&M firms. Marketing to utility customers will require a degree of cooperation that comments from sponsors suggest may not be forthcoming. The program manager has learned that marketing to associations requires a long lead-time until it yields participants. Contract O&M firms primarily engage in maintenance and janitorial work and express much less interest in operator training than firms with in-house O&M staff.

  - **Promotional Level Of Effort:** The business plan allocates for marketing a total of 0.23 FTE across all program staff in 2002 and 0.54 FTE across all staff in 2003.\(^62\)

- **Positioning:** The program is being positioned as quality training at low cost. Facility managers are encouraged to take the training as a means of deciding whether to send staff.

- **Place:** In the first two years, the program place (both its physical location in terms of classrooms, and its “home”) has been the sponsoring utilities. If facility management associations become sponsors, they too will provide the program place.

  ➢ The business plan sets a goal that NEEP will generate 15% of the students in 2002 and 41% in 2003.

  - The percentage for 2003 is ambitious given that one-quarter of these students are expected to come from states in which NEEP does not have principal marketing responsibility.

\(^62\) FTE = full time equivalent
8. Summary of Findings, Conclusions, and Recommendations

- Achievement of the goal is not measurable. When sources of marketing messages exist (as accords with good marketing principles), it is not possible to determine which source resulted in the sale. The final source may merely reap the cumulative effect of multiple persuasive messages.

  ➢ The business plan does not address the lag between establishing relationships with organizations and obtaining students and revenue.

CONCLUSIONS

The evaluation Request for Proposal and the sponsors and staff interviewed for the evaluation raised a number of questions about the quality, direction, and progress of the BOC program.

1. Are there resource impacts?

Graduates of the BOC training have saved electricity, gas, oil, and water in their facilities. Students certified in 2000-2001 are collectively saving 63,915 MWh annually, 249,270 MMBtu annually, and 20,453,000 gallons annually. To date, about one-half of the students enrolled in 2000-2001 have become certified. Noncertified students are also saving resources; should most of them complete the training and become certified, estimated annual savings from the 2000-2001 training activity will roughly double.

2. Are participants satisfied with the product?

Students and their supervisors have indicated high levels of satisfaction with the BOC training. The majority of students and supervisors have recommended or would recommend the program to a colleague, many students credit the BOC training with positive job changes they experienced since taking the training, and students’ supervisors indicated willingness to pay at higher levels than nonparticipating supervisors.

3. Is there a market?

In the near term, the potential market is about 10,000 students, coming from about one-third of all C & I facilities in the region that have building
operators on staff. As the number of certified operators increase, we expect the BOC will gain a place in supervisors’ consideration and hiring decisions.

4. Who is the market?

Potential customers for the BOC are large facilities from all business sectors. Among the supervisors who said they would consider sending staff, the average facility size is about 340,000 square feet, and average consumption is approximately 1.8 million kWh. While all business sectors indicated strong interest in the training, respondents in medical, school, and grocery facilities expressed the highest likelihood (75% to 80%) of sending students.

5. How effective have we been in reaching the market?

Awareness of the BOC has grown to 13% at the end of the second year of the program.

6. Will the market bear the cost?

It is likely that the market will bear the cost, although the current study is inconclusive. The data suggest that the practice of subsidizing the course fee may “poison the well” and create expectations of entitlement to a subsidy or undermine the value that participants have ascribed to the course. Two years into the program, the market has not been exposed to the true cost. Forty percent of the small sample of student supervisors interviewed said that they would be willing to pay $1,200, and one-third are willing to pay $1,400. Most nonparticipating regional supervisors did not hazard a guess as to what they would be willing to pay. Of those that identified a price, half said $1,200 or more.

7. Should the classes be offered independently of certification?

The program approach of offering certification in combination with training is a sound one. Regional supervisors’ experience with and attitude toward training combined with certification is a clear indicator that certification is valued in this market.
8. How does the current BOC program compare to previous BOC experience?

The level of participant satisfaction, number of kilowatt-hours saved, and growth in awareness in the market for the NEEP 2000-2001 BOC program is similar to that for the NEEC 1999-2001 BOC program.

9. Is the program administration effectively supporting the training?

The program administration has met the challenge of supporting program activities in its first two years. The inadequacies of the database have reduced the efficiency of administrative support efforts. The considerable responsibilities of the program manager and the plans for an expansion of NEEP’s role indicate that the administrative infrastructure will need to grow.

10. Are the marketing activities of the sponsoring utilities or NEEP responsible for the failure of the program to reach its goal of self-sustainability by the end of its third year?

The marketing activities have been highly successful, resulting in 13% market awareness and 518 enrolled students in two years. Lack of self-sustainability owes to problems in the program vision as originally created by the Working Group and NEEP. The sponsors wanted to limit the duration of their involvement with the program, a desire consistent with the regulatory conditions they face, and so embraced the notion of self-sustainability.

11. Is self-sustainability feasible?

The current analysis suggests that self-sustainability is not possible in the near term and may not ever be possible. In addition, the goal may not be in the utilities’ best interests, because the program offers high value to their participating customers and can better serve these customers with utility involvement. Self-sustainability was assumed to be possible for the program, and yet the program expenses appear to be driven by the identified funding sources, rather than identifying funding sources to cover necessary program expenses. Self-sustainability was assumed to be achievable by having the sponsors effectively market the program while NEEP geared up delivery, followed by NEEP “taking over” marketing. The possibility or desirability of NEEP using the utilities marketing methods to reach utility customers—that is, “taking over”—was not considered. Self-sustainability was assumed to be desirable for the program, and yet
8. Summary of Findings, Conclusions, and Recommendations

sponsor comments suggest the desirability of maintaining their role as the program’s “place” or home.

12. By 2003, is financial autonomy feasible?

No. The program expenses have been estimated to fit within the identified funding sources and do not match the level of effort implied by the business plan.

13. By 2003, is marketing that is helped by the founding utilities, but not largely dependent on them, feasible?

No. Marketing to professional associations is unlikely to yield many students by 2003. If the level of effort devoted to the task is not immediately increased, it is unlikely they will be a source of many students in 2004. The lag time between initial contact and sponsorship is likely to be on the order of 18 to 24 months or more. The contract O&M market for the BOC appears to be extremely limited. Finally, there are unresolved issues about how NEEP will market to large utility customers and utility Account Executives.

14. Does the experience to date warrant moving ahead or terminating the program?

The high levels of participant satisfaction, market interest, and resource savings indicate that the program should move ahead.

RECOMMENDATIONS

1. Rethink the desirability of the goal of “self-sustainability.” To date, the program’s “place” or home has been with the utility sponsors. Marketing to date associates the utility with the course.

2. Both utilities and NEEP should market the program. NEEP and the sponsors can best promote the program to different markets and by using different means. Utilities are reluctant to share their customer lists and, even were they to do so, NEEP cannot conduct the relationship marketing with these customers that the utilities can do. Both efforts are needed to reach a high level of market awareness in the next five years.
3. Recognize that marketing to facility management associations is not likely to generate many students until the end of 2003, at the earliest.

4. Increase funding for the program by moving quickly to charging students the full fee. Utility funding for the program should be in addition to course fees paid by participants, not a substitute. Utilities that want to demonstrate that they “stand behind” the program can offer a $100 rebate coupon.

5. Have a uniform price throughout the region. Subsidized course fees should be offered customers on an as-needed basis as warranted by criteria established by the Working Group.

6. Sponsoring utilities should move to justify continued financial support on the basis of the resources saved in their jurisdiction from the successful operation of the program there. Regional promotion is important. Utilities throughout the region should be encouraged to participate.

7. NEEP should conduct an analysis of the FTE required to successfully offer the program to 435 students a year. These activities include (1) delivering the program in disparate locations, (2) conducting the development activities associated with new geographical markets, enhanced course materials, marketing materials, and so forth, and (3) marketing the program. A reasonable estimate of the program’s financial requirements should then be compared with the revenue stream expected from a uniform tuition of $1,400. NEEP should then approach the working group to determine how the sponsors can fund the shortfall. If program cost-effectiveness under a resource acquisition model precludes the sponsors from fully funding the shortfall, NEEP should determine the size of program (number of students) at which projected revenues and expenses balance.

8. Staff the program at levels commensurate with the activities to be accomplished. We estimate that a reasonable staffing level for the program in 2002 is:

- 1-plus FTE for strategy and decision-making, marketing—including developing marketing materials and negotiating with potential
8. Summary of Findings, Conclusions, and Recommendations

sponsors—and enhancing the product. (The program manager full-time, plus some support.)

- 1 FTE to deliver the program in Massachusetts, Connecticut, and Rhode Island—conducting scheduling of classes, arranging for all materials to be brought to the facility, providing attending the classes, maintaining the database, and related activities.

- 1 FTE to deliver the program in each geographic area comparable in size and students to that of the initial three sponsors. The markets in Long Island and New Jersey might need 1 FTE now or by 2003, and each might need 1 FTE thereafter. The markets in New Hampshire, Vermont and Maine might need 1 FTE.

9. Revise the program database to increase the efficiency of program administrative efforts. Recommendations for revising the database are given in Appendix D.

10. Market both the BOC 100 Series and the 200 Series as courses for line staff, as designed. Position them as high-quality training for a reasonable price.

11. Do not target contract O&M firms for marketing efforts.

12. Postpone new product development (e.g., a customized course series) until after the core products (the two-course series) have attained a secure place in the market.

13. Ensure that goals regarding each party’s responsibilities are observable or measurable. It is not possible to identify which students came from what marketing effort and thereby allocate the accomplishment to a utility or to NEEP.

14. Due to the consistency in findings between the Northeast and Northwest BOC 100 Series programs in impacts and participants satisfaction, these facets of the program can be accepted as sufficiently “proven.” That is, further research on these subjects would cost more than likely would be warranted by any changes in findings or improvement in accuracy. However, an evaluation of these facets would be useful if the program implementation or content significantly changes.
8. Summary of Findings, Conclusions, and Recommendations

15. Assess student and supervisor response to the BOC 200 Series. Determine accuracy of staff and sponsor’s current views that the 200 Series is too simple. If their views are accurate, determine the appropriate balance between the corrective actions of revising the course materials and marketing the course to less experienced operations staff (e.g., line staff instead of supervisors).

16. Progress toward the resolution of the strategic issues raised herein (and discussed under the marketing concepts of product, price, promotion, positioning, place and measurement) should be assessed through subsequent evaluations.

17. The following performance indicators reflect the program’s history of accomplishments to date and should be tracked in future evaluations and assessments of program activity and market transformation results. The three resource savings indicators (for electricity, gas or oil, and water use) do not need to be re-estimated unless the content of the BOC training undergoes considerable change. Two other indicators—average square footage of the facility and average number of staff sent per organization—are also used in calculating program-wide savings. If tracking indicates that these numbers have changed by more than 10%, the formula for calculating program-wide savings should be adjusted to reflect the change in these values.

Table 8.2
BOC PROGRAM PERFORMANCE INDICATORS

<table>
<thead>
<tr>
<th>PERFORMANCE INDICATOR</th>
<th>BASELINE RESULTS</th>
<th>EOY 2001 RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Awareness</td>
<td>0%</td>
<td>13%</td>
</tr>
<tr>
<td>Number of 100 Series Taught</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td>Number of 200 Series Taught</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Students Enrolled in 100 Series</td>
<td>0</td>
<td>518</td>
</tr>
<tr>
<td>Students Certified for 100 Series</td>
<td>0</td>
<td>268</td>
</tr>
<tr>
<td>Students Enrolled in 200 Series</td>
<td>0</td>
<td>67</td>
</tr>
</tbody>
</table>

Continued
8. Summary of Findings, Conclusions, and Recommendations

<table>
<thead>
<tr>
<th>PERFORMANCE INDICATOR</th>
<th>BASELINE RESULTS</th>
<th>EOY 2001 RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students Certified for 200 Series</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>Drop-Out Rate</td>
<td>NA</td>
<td>4% (7) in 2000 0 in 2001</td>
</tr>
<tr>
<td>States Participating</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Utility Sponsors</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>Professional Association Sponsors</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Institutions Giving Academic or CEU Credit for the BOC</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Newsletters Published</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Case Studies Published</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Average Number of Students per Class in 100 Series</td>
<td>0</td>
<td>21.3</td>
</tr>
<tr>
<td>Average Number of Students per Class in 200 Series</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>Planned Courses Cancelled Due to Lack of Registrants</td>
<td>NA</td>
<td>0</td>
</tr>
<tr>
<td>Average Number of Times Planned Start Date is Postponed</td>
<td>NA</td>
<td>Not tracked</td>
</tr>
<tr>
<td>Organizations Sending Staff to the BOC</td>
<td>0</td>
<td>143</td>
</tr>
<tr>
<td>Average Number of Staff Sent*</td>
<td>0</td>
<td>1.4</td>
</tr>
<tr>
<td>Electric and Gas Utilities Sending Staff to the BOC</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Average Size of Facility Space**</td>
<td>NA</td>
<td>671,804 SF</td>
</tr>
<tr>
<td>Annual kWh Savings per Student per Square Foot of Space Student Operates</td>
<td>NA</td>
<td>0.5</td>
</tr>
<tr>
<td>Annual MBtu (Gas, Oil) Savings per Student per Square Foot of Space Student Operates</td>
<td>NA</td>
<td>1.95</td>
</tr>
<tr>
<td>Annual Gallons Water Savings per Student per Square Foot of Space Student Operates</td>
<td>NA</td>
<td>0.162</td>
</tr>
</tbody>
</table>

* The inverse of this number (i.e., 1/1.43) gives the unique facilities factor (=0.71) used in calculating program-wide impact
8. Summary of Findings, Conclusions, and Recommendations
APPENDICES
APPENDIX A

Participant and Market Sample Characteristics
APPENDIX A  
PARTICIPANT AND MARKET SAMPLE CHARACTERISTICS

SAMPLE DISPOSITIONS

The student sample is representative of the population of students that received BOC certification prior to November 2001. We called students in the population in a random order until we completed our quota. Table A.1 gives the disposition of the student sample.

<table>
<thead>
<tr>
<th>CONTACT STATUS</th>
<th>NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Students Completing BOC 100 Series by 11/1/01</strong></td>
<td>232</td>
</tr>
<tr>
<td>Utility Staff — Not Contacted</td>
<td>46</td>
</tr>
<tr>
<td>Bad Numbers (e.g., Fax, Residence)</td>
<td>5</td>
</tr>
<tr>
<td>No Longer at This Job or Company</td>
<td>11</td>
</tr>
<tr>
<td><strong>Subtotal: Study Survey Base</strong></td>
<td>170</td>
</tr>
<tr>
<td>Called, No Answer</td>
<td>1</td>
</tr>
<tr>
<td>Called, Did Not Reach Student</td>
<td>88</td>
</tr>
<tr>
<td>Called, Student Refused</td>
<td>2</td>
</tr>
<tr>
<td>Called, Had Scheduled Call-Back Time (Not Interviewed; Quota Met)</td>
<td>9</td>
</tr>
<tr>
<td>Not Called (Quota Met)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Complete</strong></td>
<td>49</td>
</tr>
<tr>
<td><strong>Complete as Percent of Student Survey Base</strong></td>
<td>29%</td>
</tr>
</tbody>
</table>
Appendix A

We asked the students that we interviewed to tell us the name of a person, such as their supervisor, who would be the best person at their company to ask for opinions about whether the BOC training is a good investment for the company. About half of the students said that they were the best person to make that assessment. These students said that they reported to someone in name only—a person who was not knowledgeable about building operations. Table A.2 gives the disposition of students’ supervisors.

Table A.2
DISPOSITION OF BOC STUDENTS’ SUPERVISORS

<table>
<thead>
<tr>
<th>CONTACT STATUS</th>
<th>NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Students Interviewed</td>
<td>49</td>
</tr>
<tr>
<td>Students Naming Themselves as Supervisors</td>
<td>25</td>
</tr>
<tr>
<td>Students Naming Another as Supervisor</td>
<td>24</td>
</tr>
<tr>
<td>Student Not Interviewed, Supplied Supervisor Name</td>
<td>1</td>
</tr>
<tr>
<td><strong>Subtotal: Supervisor Survey Base</strong></td>
<td>25</td>
</tr>
<tr>
<td>Supervisors With More Than One Student</td>
<td>2</td>
</tr>
<tr>
<td>Called, Did Not Reach Supervisor</td>
<td>4</td>
</tr>
<tr>
<td>Called, Supervisor Refused</td>
<td>2</td>
</tr>
<tr>
<td>Called, Supervisor Not Knowledgeable</td>
<td>1</td>
</tr>
<tr>
<td><strong>Complete</strong></td>
<td>16</td>
</tr>
<tr>
<td><strong>Complete as Percent of Supervisor Survey Base</strong></td>
<td>64%</td>
</tr>
</tbody>
</table>

For the regional supervisor survey, we interviewed a random sample drawn from lists of commercial and industrial customers provided by the utilities sponsoring the research. Northeast Utilities, with customers in Connecticut and Massachusetts, provided a list of all customers with demands of 50 kW or greater. National Grid, with customers in Massachusetts and Rhode Island, provided a list of all of the institutional, retail, and medical customers and remaining C&I customers with demands of 100 kW or greater. N Star, with customers in Massachusetts, provided a
list of all customers with demands of 50 MWh (approximately 10 kW) or greater. Unitil, with customers in Massachusetts, provided a list of all large C&I customers. Public Service of New Hampshire provided a list of customers that have Account Executives; these customers had been approached about participating in the BOC program but had declined to participate. LIPA, with customers in Long Island (NY), provided a list of a random sample of all C&I customers with demands of 100 kW or greater. KEYSPAN, with gas customers throughout the region, provided a list of a random sample of all C&I customers. We matched, based on phone number and company name, the KEYSPAN records with the records provided by the electric utilities to create a single data set. We were unable to match most of the records.

The regional sample is representative of the customer lists provided by the utilities. The regional survey disposition is given in Table A.3.

### Table A.3

**DISPOSITION OF REGIONAL SUPERVISORS**

<table>
<thead>
<tr>
<th>CONTACT STATUS</th>
<th>NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL NUMBER OF CUSTOMER NUMBERS SUPPLIED BY PARTICIPATING UTILITIES</strong></td>
<td>42,558</td>
</tr>
<tr>
<td><strong>RANDOM SAMPLE DRAWN FROM UTILITY LISTS</strong></td>
<td>1,272</td>
</tr>
<tr>
<td>Private Residence</td>
<td>102</td>
</tr>
<tr>
<td>Bad Number Other Reason (e.g. Fax, Disconnected)</td>
<td>271</td>
</tr>
<tr>
<td>No Maintenance Personnel on Staff</td>
<td>380</td>
</tr>
<tr>
<td><strong>SUBTOTAL: REGIONAL SURVEY BASE</strong></td>
<td>519</td>
</tr>
<tr>
<td>Called, Second Refusal</td>
<td>239</td>
</tr>
<tr>
<td><strong>COMPLETE</strong></td>
<td>280</td>
</tr>
<tr>
<td><strong>COMPLETE AS PERCENT OF SUPERVISOR SURVEY BASE</strong></td>
<td>54%</td>
</tr>
</tbody>
</table>
FIRMOGRAPHIC AND OTHER CHARACTERISTICS

The following tables provide firmographic and other information about the samples that is not presented elsewhere in the report. Information on all three samples—students, students’ supervisors, and regional supervisors—is presented. This information is given to aid in the understanding of each of the samples. A direct comparison across the samples should not be made, as the students are not assumed to be representative of the utility customer lists, nor are the students’ supervisors a good representation of the students.

Table A.4
PERCENT OF FIRMS BY FACILITY TYPE

<table>
<thead>
<tr>
<th>TYPE OF FACILITY</th>
<th>STUDENTS (N=49)</th>
<th>STUDENTS’ SUPERVISORS (N=15)</th>
<th>REGIONAL SUPERVISORS (N=280)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>35%</td>
<td>33%</td>
<td>27%</td>
</tr>
<tr>
<td>Office</td>
<td>20%</td>
<td>7%</td>
<td>5%</td>
</tr>
<tr>
<td>Government</td>
<td>12%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>School/College</td>
<td>12%</td>
<td>13%</td>
<td>20%</td>
</tr>
<tr>
<td>Public Utility</td>
<td>6%</td>
<td>13%</td>
<td>4%</td>
</tr>
<tr>
<td>Medical</td>
<td>4%</td>
<td>7%</td>
<td>10%</td>
</tr>
<tr>
<td>Retail</td>
<td>4%</td>
<td>0%</td>
<td>8%</td>
</tr>
<tr>
<td>Wholesale or Warehousing</td>
<td>4%</td>
<td>0%</td>
<td>2%</td>
</tr>
<tr>
<td>Lodging</td>
<td>2%</td>
<td>13%</td>
<td>9%</td>
</tr>
<tr>
<td>Mixed-Use Office, Manufacturing, Research Labs</td>
<td>0%</td>
<td>7%</td>
<td>0%</td>
</tr>
<tr>
<td>Other</td>
<td>0%</td>
<td>0%</td>
<td>9%</td>
</tr>
<tr>
<td>Unsure/Refused</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
</tbody>
</table>

Percents do not add to 100% due to rounding.
Table A.5
PERCENT OF FIRMS BY FACILITY SIZE

<table>
<thead>
<tr>
<th>SIZE OF CONDITIONED SPACE IN SQUARE FEET</th>
<th>STUDENTS (N=49)</th>
<th>STUDENTS’ SUPERVISORS (N=15)</th>
<th>REGIONAL SUPERVISORS (N=280)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 2,500</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
</tr>
<tr>
<td>2,500 to 49,999</td>
<td>12%</td>
<td>7%</td>
<td>32%</td>
</tr>
<tr>
<td>50,000 to 99,999</td>
<td>14%</td>
<td>20%</td>
<td>11%</td>
</tr>
<tr>
<td>100,000 to 299,999</td>
<td>24%</td>
<td>20%</td>
<td>16%</td>
</tr>
<tr>
<td>300,000 to 999,999</td>
<td>18%</td>
<td>27%</td>
<td>9%</td>
</tr>
<tr>
<td>1 Million or More</td>
<td>25%</td>
<td>13%</td>
<td>6%</td>
</tr>
<tr>
<td>Don’t Know Size</td>
<td>6%</td>
<td>13%</td>
<td>23%</td>
</tr>
</tbody>
</table>

Percents do not add to 100% due to rounding.

Table A.6
PERCENT OF FIRMS BY SECTOR

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>REPORTED</th>
<th>INFERNED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>STUDENTS (N=49)</td>
<td>STUDENTS’ SUPERVISORS (N=15)</td>
</tr>
<tr>
<td></td>
<td>51%</td>
<td>33%</td>
</tr>
<tr>
<td></td>
<td>Private</td>
<td>49%</td>
</tr>
<tr>
<td></td>
<td>Unsure/Refused</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Public</td>
<td>57%</td>
</tr>
<tr>
<td></td>
<td>Private</td>
<td>43%</td>
</tr>
<tr>
<td></td>
<td>Unsure/Refused</td>
<td>0%</td>
</tr>
</tbody>
</table>

Percents do not add to 100% due to rounding.

* Apparent misreporting of public and private. Inference not computed for regional supervisors. See text accompanying table.
Appendix A

Note: Table A.6 shows the percent of firms by public and private sectors. The top portion of the table shows the percent of public and private firms as reported by BOC students and BOC students’ supervisors. However, many respondents expressed confusion when asked whether their organization was public or private. Several respondents asked the interviewer “What do you mean?” Two respondents working for manufacturing suppliers said their company was “public, we just had an initial public offering of our stock.” Consequently, we examined the facility type the respondents reported and inferred whether the firm was public or private. This inference is reported in the lower portion of Table A.6. Four students who reported their company as “public,” gave their company’s business as electronics manufacturing, semiconductor manufacturing, or another, similar business type. One supervisor at an office supply manufacturing company characterized his business as “public.” Another supervisor who reported the facility type as a municipal government building said that his employer was in the private sector. For the purposes of analyses in this report, we use the designation of public/private that we inferred for each respondent.

Table A.7

<table>
<thead>
<tr>
<th>OPERATORS</th>
<th>STUDENTS’ SUPERVISORS (N=15)</th>
<th>REGIONAL SUPERVISORS (N=280)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0%</td>
<td>6%</td>
</tr>
<tr>
<td>1 to 5</td>
<td>53%</td>
<td>47%</td>
</tr>
<tr>
<td>6 to 10</td>
<td>33%</td>
<td>15%</td>
</tr>
<tr>
<td>11 to 25</td>
<td>7%</td>
<td>15%</td>
</tr>
<tr>
<td>26 to 100</td>
<td>7%</td>
<td>13%</td>
</tr>
<tr>
<td>More Than 100</td>
<td>0%</td>
<td>4%</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>
### Table A.8
**NUMBER OF OPERATOR SUPERVISORS AT LOCATION**

<table>
<thead>
<tr>
<th>NUMBER OF SUPERVISORS</th>
<th>STUDENTS’ SUPERVISORS (N=13)*</th>
<th>REGIONAL SUPERVISORS (N=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondent Only</td>
<td>61%</td>
<td>49%</td>
</tr>
<tr>
<td>Two</td>
<td>15%</td>
<td>16%</td>
</tr>
<tr>
<td>Three to Five</td>
<td>8%</td>
<td>16%</td>
</tr>
<tr>
<td>Six to Ten</td>
<td>0%</td>
<td>11%</td>
</tr>
<tr>
<td>Eleven or More</td>
<td>15%</td>
<td>9%</td>
</tr>
</tbody>
</table>

Percents do not add to 100% due to rounding.

* Two of the BOC students’ supervisors had building operators report to them, but they were not, themselves, in building operations.

### Table A.9
**TENURE ON THE JOB**

<table>
<thead>
<tr>
<th>YEARS IN BUILDING OPERATIONS</th>
<th>STUDENTS (N=49)</th>
<th>STUDENTS’ SUPERVISORS (N=15)</th>
<th>REGIONAL SUPERVISORS (N=280)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Years or Less</td>
<td>22%</td>
<td>13%</td>
<td>20%</td>
</tr>
<tr>
<td>6-10 Years</td>
<td>28%</td>
<td>13%</td>
<td>21%</td>
</tr>
<tr>
<td>11-20 Years</td>
<td>28%</td>
<td>27%</td>
<td>30%</td>
</tr>
<tr>
<td>21 Years or More</td>
<td>16%</td>
<td>27%</td>
<td>30%</td>
</tr>
<tr>
<td>Not in Building Operations*</td>
<td>4%</td>
<td>13%</td>
<td>0%</td>
</tr>
<tr>
<td>Unsure/Refused</td>
<td>0%</td>
<td>7%</td>
<td>1%</td>
</tr>
</tbody>
</table>

Percents do not add up to 100% due to rounding.

* Some students and some student supervisors reported that they were not in building operations.
### Table A.10

**TRAINING TAKEN**

<table>
<thead>
<tr>
<th>Training Taken</th>
<th>Students (n=47)</th>
<th>Students’ Supervisors (n=8)</th>
<th>Regional Supervisors (n=92)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSHA, Safety, Security, Emergency Response</td>
<td>11</td>
<td>1</td>
<td>29</td>
</tr>
<tr>
<td>Specific Equipment Training (Motors, Drives, Boilers, Refrigeration, Plumbing)</td>
<td>7</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Building Operator or Facilities Management Course</td>
<td>6</td>
<td>0</td>
<td>26</td>
</tr>
<tr>
<td>Computer/Software Training</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Hazardous Materials Inspection and Handling</td>
<td>4</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>Wastewater Treatment</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>ADA, Codes</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Air Quality</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>HVAC</td>
<td>3</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>Controls, Building Automation</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Electrical/Lighting</td>
<td>3</td>
<td>1</td>
<td>24</td>
</tr>
<tr>
<td>Energy Conservation/Efficiency, Energy Engineering/Maintenance, Energy Audit,</td>
<td>3</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Environmental</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervisory/Office Management Skills</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Building Assessment, Construction, Blueprint Reading</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Process Control/Systems Analysis</td>
<td>2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Purchasing/Procurement of Energy, Energy Management</td>
<td>2</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Utility Seminars/Classes</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>0</td>
<td>13</td>
</tr>
</tbody>
</table>
Appendix A

Table A.11
EMPLOYEE RESPONSIBILITY FOR WHOLE OR PART OF CONDITIONED SPACE

<table>
<thead>
<tr>
<th>SPACE RESPONSIBLE FOR</th>
<th>STUDENTS (N=49)</th>
<th>STUDENTS’ SUPERVISORS (N=15)</th>
<th>REGIONAL SUPERVISORS * (N=280)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole</td>
<td>96%</td>
<td>73%</td>
<td>72%</td>
</tr>
<tr>
<td>Part</td>
<td>4%</td>
<td>27%</td>
<td>24%</td>
</tr>
<tr>
<td>Unsure/Refused</td>
<td>0%</td>
<td>0%</td>
<td>4%</td>
</tr>
</tbody>
</table>

* Regional supervisors were asked to describe the space of the employee he or she would be most likely to send to the BOC training.

Table A.12
SIZE OF CONDITIONED SPACE FOR WHICH EMPLOYEE IS RESPONSIBLE

<table>
<thead>
<tr>
<th>SIZE OF CONDITIONED SPACE UNDER EMPLOYEE RESPONSIBILITY</th>
<th>STUDENTS (N=49)</th>
<th>STUDENTS’ SUPERVISORS (N=15)</th>
<th>REGIONAL SUPERVISORS (N=280)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 2,500 Square Feet</td>
<td>0%</td>
<td>0%</td>
<td>3%</td>
</tr>
<tr>
<td>2,500 to 49,999 Square Feet</td>
<td>12%</td>
<td>13%</td>
<td>32%</td>
</tr>
<tr>
<td>50,000 to 99,999 Square Feet</td>
<td>14%</td>
<td>20%</td>
<td>9%</td>
</tr>
<tr>
<td>100,000 to 299,999 Square Feet</td>
<td>25%</td>
<td>33%</td>
<td>16%</td>
</tr>
<tr>
<td>300,000 to 999,999 Square Feet</td>
<td>18%</td>
<td>20%</td>
<td>9%</td>
</tr>
<tr>
<td>1 Million or More Square Feet</td>
<td>25%</td>
<td>0%</td>
<td>4%</td>
</tr>
<tr>
<td>Don’t Know Square Footage</td>
<td>6%</td>
<td>13%</td>
<td>26%</td>
</tr>
</tbody>
</table>

Percents do not add to 100% due to rounding.

* Regional supervisors were asked to describe the space of the employee he or she would be most likely to send to the BOC training.
### Table A.13
AFFECT OF ENERGY CRISIS ON OPERATIONS

<table>
<thead>
<tr>
<th>Priority for Considering Energy Efficiency in O&amp;M at Facility Has:</th>
<th>Students’ Supervisors (N=15)</th>
<th>Regional Supervisors (N=280)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stayed the Same</td>
<td>33%</td>
<td>31%</td>
</tr>
<tr>
<td>Become More Important</td>
<td>67%</td>
<td>68%</td>
</tr>
<tr>
<td>Unsure/Refused</td>
<td>0%</td>
<td>1%</td>
</tr>
</tbody>
</table>

### Table A.14
COURSE LOCATION AND DATE CERTIFIED FOR BOC STUDENTS

<table>
<thead>
<tr>
<th>Location</th>
<th>Date Certified</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhode Island</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Providence</td>
<td>January, 2001</td>
<td>2</td>
</tr>
<tr>
<td>Connecticut</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hartford</td>
<td>February, 2001</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>November, 2000</td>
<td>5</td>
</tr>
<tr>
<td>Berlin</td>
<td>November, 2000</td>
<td>1</td>
</tr>
<tr>
<td>Windsor</td>
<td>November, 2000</td>
<td>1</td>
</tr>
<tr>
<td>New Hampshire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concord</td>
<td>April, 2001</td>
<td>9</td>
</tr>
<tr>
<td>Manchester</td>
<td>May, 2001</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>June, 2001</td>
<td>5</td>
</tr>
</tbody>
</table>

Continued
## Appendix A

### BOC Training and Certification Program in the Northeast

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>DATE CERTIFIED</th>
<th>NUMBER OF STUDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Massachusetts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northborough</td>
<td>June, 2001</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>November, 2000</td>
<td>6</td>
</tr>
<tr>
<td>Pittsfield</td>
<td>February, 2001</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>December, 2000</td>
<td>1</td>
</tr>
<tr>
<td>Wareham</td>
<td>October, 2001</td>
<td>4</td>
</tr>
<tr>
<td>Raynham</td>
<td>October, 2001</td>
<td>1</td>
</tr>
<tr>
<td>Worcester</td>
<td>November, 2000</td>
<td>1</td>
</tr>
<tr>
<td>Norwood</td>
<td>April, 2001</td>
<td>1</td>
</tr>
<tr>
<td>Shrewsbury</td>
<td>November, 2000</td>
<td>1</td>
</tr>
<tr>
<td>Attleboro</td>
<td>June, 2001</td>
<td>1</td>
</tr>
<tr>
<td>Boston</td>
<td>November, 2000</td>
<td>4</td>
</tr>
<tr>
<td>Can’t remember location</td>
<td>August, 2001</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>49</strong></td>
</tr>
</tbody>
</table>
Appendix A
APPENDIX B

Impact Estimation Methodology
APPENDIX B
IMPACT ESTIMATION METHODOLOGY

This Appendix augments the information given in chapter 4 on the methodology used to estimate and attribute impacts to the BOC program.

Table B.1 describes the frequency or extent to which BOC students and nonstudents took energy-saving actions in the six months prior to the survey. The differences between the students’ and nonstudents’ provide the basis for the impact calculations presented in Table 4.6.

The efficiency actions in Table B.1 showed a positive influence of the BOC. The null hypothesis for this research is that the BOC has no effect on the behavior of students. We exclude as unreasonable the hypothesis that BOC training would lead operators to do less than they were doing prior to training; in other words, that the program would have a negative effect on operator behavior. As discussed in chapter 4, we believe the estimated impacts to be lower bounds for the true, unobservable impact. Chapter 4 offers a number of arguments in support of this assertion.

In addition to the measures in Table B.1, the survey explored three other energy-efficiency actions for which the BOC showed no positive effect. These actions are (1) installed lighting controls, (2) conducted lighting retrofit, and (3) conducted unitary equipment maintenance.

In chapter 4, we discussed our anecdotal finding that several students, when asked if they had installed lighting controls or conducted a lighting retrofit responded: “Not in the last six months. I did this right after I took the course.” We were not able to measure the actions taken by students since completing the training, because that time varied among the students and did not provide a single cut-off date that we could use when querying the regional supervisors. It is possible that BOC students have installed more lighting controls and retrofits than nonstudents yet our survey cannot measure this.
## Table B.1

### ENERGY-SAVING ACTIONS OF STUDENTS AND NONSTUDENTS

<table>
<thead>
<tr>
<th>ENERGY-SAVING ACTIONS TAKEN IN PAST SIX MONTHS</th>
<th>PERCENT OF:</th>
<th>REPORTED BY STUDENTS</th>
<th>REPORTED BY REGIONAL SUPERVISORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installed Thermostats or EMS for HVAC Control</td>
<td>Floorspace</td>
<td>22% (n=42)</td>
<td>3% (n=143)</td>
</tr>
<tr>
<td>Installed Air Handler Door Gaskets</td>
<td>Operators</td>
<td>21% (n=43)</td>
<td>14% (n=149)</td>
</tr>
<tr>
<td>Installed Damper Seals: Percent of Operators</td>
<td>Operators</td>
<td>16% (n=43)</td>
<td>12% (n=149)</td>
</tr>
<tr>
<td>Conducted Chiller System Maintenance:</td>
<td>Operators</td>
<td>93% (n=28)</td>
<td>86% (n=64)</td>
</tr>
<tr>
<td>Conducted Economizer Maintenance</td>
<td>Operators</td>
<td>84% (n=25)</td>
<td>81% (n=79)</td>
</tr>
<tr>
<td>Energy-Efficient Motors</td>
<td>Newly-Purchased Motors†</td>
<td>87% (n=23)</td>
<td>83% (n=138)</td>
</tr>
<tr>
<td>Installed Variable Frequency Drives</td>
<td>Operators</td>
<td>42% (n=38)</td>
<td>21% (n=202)</td>
</tr>
<tr>
<td>Conducted Motor Maintenance</td>
<td>Operators</td>
<td>71% (n=41)</td>
<td>68% (n=154)</td>
</tr>
<tr>
<td>Conducted Air Compressor Maintenance</td>
<td>Operators</td>
<td>86% (n=35)</td>
<td>80% (n=122)</td>
</tr>
<tr>
<td>Conducted Boiler Maintenance</td>
<td>Operators</td>
<td>82% (n=27)</td>
<td>42% (n=89)</td>
</tr>
<tr>
<td>Installed Any Devices or Taken Actions to Save Water</td>
<td>Operators</td>
<td>59% (n=34)</td>
<td>52% (n=189)</td>
</tr>
</tbody>
</table>

Note: “don’t know” responses from base. Percentages estimated with a 90/10 precision/confidence.

Chapter 4 provides additional reasons suggesting that our estimate of “no effect” for these two measures, as well as unitary equipment maintenance, may be an underestimate. The study of the BOC in the Pacific Northwest, whose impact
estimates are also subject to underestimation, showed a small effect for lighting retrofits and for coil cleaning. Lighting controls were not explored in that study.

The study of the BOC in the Pacific Northwest and the market baseline study conducted by RLW Analytics for NEEP addressed some of measures explored in the current study and, for the most part, found comparable rates of activity. The comparisons given below are for illustrative purposes only. All three studies explored the actions of different populations and used a different line of questioning to conduct the exploration.

Table B.2: Comparison of Studies

<table>
<thead>
<tr>
<th>STUDY</th>
<th>TOTAL</th>
<th>STUDENTS</th>
<th>NONSTUDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ECONOMIZER MAINTENANCE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Study</td>
<td>84%</td>
<td>81%</td>
<td></td>
</tr>
<tr>
<td>PNW Study</td>
<td>85%</td>
<td>69%</td>
<td></td>
</tr>
<tr>
<td><strong>LIGHTING RETROFIT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Study</td>
<td>58%</td>
<td>66%</td>
<td></td>
</tr>
<tr>
<td>PNW Study</td>
<td>76%</td>
<td>74%</td>
<td></td>
</tr>
<tr>
<td><strong>Unitary Equipment Maintenance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Study</td>
<td>80%</td>
<td>85%</td>
<td></td>
</tr>
<tr>
<td>PNW Study (coils)</td>
<td>83%</td>
<td>80%</td>
<td></td>
</tr>
<tr>
<td>RLW Study (unitary equipment maintenance)</td>
<td>63%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RLW Study (coils)</td>
<td>59%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


64 Tom Ledyard, et al., Commercial and Industrial O&M Market Segment Baseline Study, July, 1999, prepared for NE/NJ Consortium. This study confined its exploration to the commercial and industrial sectors of office, health care, and manufacturing.
### Appendix B

<table>
<thead>
<tr>
<th></th>
<th>STUDY</th>
<th>TOTAL</th>
<th>STUDENTS</th>
<th>NONSTUDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chiller System Maintenance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Study</td>
<td>93%</td>
<td></td>
<td>86%</td>
<td></td>
</tr>
<tr>
<td>RLW Study</td>
<td>80%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Air Compressor Maintenance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Study</td>
<td>86%</td>
<td></td>
<td>80%</td>
<td></td>
</tr>
<tr>
<td>RLW Study</td>
<td>78%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Boiler Maintenance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Study</td>
<td>82%</td>
<td></td>
<td>42%</td>
<td></td>
</tr>
<tr>
<td>RLW Study</td>
<td>84%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX C

Case Studies
BAYER CORPORATION – BERLIN, CT

BACKGROUND

Facility: Bayer Corporation
Location: Berlin, CT
Facility Square Footage: 20,000

BOC Attendee Name: Chris Mozian
BOC Attendee Job Title: Process Control Systems Engineer
BOC Graduate: Series 1 and partial completion of Series 2
BOC Sponsor: Northeast Utilities (Connecticut Light & Power)
Years in Position: 13
Number of Staff: NA
End Use Fuels Affected: Electric, natural gas, water

OVERALL IMPACT OF BOC TRAINING

Concerning the impact of the BOC course on his work at Bayer Corporation, Chris Mozian stated that, “We cannot know everything about every trade in the maintenance field. You know your trade then pick up bits and pieces from others who are experts in their fields. The BOC course allows for experts to give an overview of systems and offers an open forum to ask questions, which is great.” Chris went on to say:

“Since taking the BOC course, I have been able to save money, save energy, and improve occupant comfort at my facility. For example, I have spotted inefficient filters on new equipment and installed better ones to increase the life of the HVAC
units. I have recommended economizers on equipment and that we actually use the economizer feature.”

One specific example where the BOC course offered direct savings to the Bayer Corporation through Chris’ attendance was to reduce the operating air pressure of the compressed air system in the facility. As Chris described, there were places in the facility that required 150 psi but most equipment could work properly at 90 psi. Chris, along with his supervisor Mark Marshall and their air compressor company, worked with Connecticut Light & Power to install new compressors that reduce the overall facility air pressure to 90 psi. The equipment that requires 150 psi was then addressed with a separate compressor. This greatly minimized the energy-related impact associated with leaks in the compressed air system, as well as requiring less power due to lowering the operating pressure. Mark Marshall estimates that the new air compressor system saves Bayer $11,000 per year.

Chris also noted that the BOC course was valuable in exposing the students to the latest diagnostic equipment available, including assessing how useful it might be in a specific facility. For example, Chris was able to inform others on a system to view airflow patterns within a facility, which could be applicable for determining the source of dust in clean rooms at Bayer. In addition, Chris felt that the section on infrared scanning equipment was excellent. Although he already uses infrared scanning technology at Bayer, he felt that it is important to know about and would be very useful to students who had not used it before.

Another improvement that Chris attributed to the BOC course was the installation of programmable thermostats in the main office area of the facility. Four separate zones serve this area.

**IMPACT RELATED TO COMFORT / SAFETY IMPROVEMENTS**

Chris emphasized how important the section on environmental regulations was to facility managers. Because many people are unclear as to the regulations concerning the proper disposal of fluorescent lamps, batteries, and various oils, it can be very damaging to a company if the disposal is not taken care of appropriately. The BOC course not only explained the regulations but also made people aware of the importance of knowing and following these regulations.

Chris also noted the increasing concern with adequate airflow in buildings and the amount of dust in the indoor air. While he has not incorporated the new technologies...
at his facility, he noted that he is better prepared to address indoor air quality concerns since taking the BOC course.

PROFESSIONAL ADVANCEMENT

Chris has received a raise and a promotion since attending the BOC course but could not say whether the course had anything to do with the advancement.

COMMENTS OR RECOMMENDATIONS ON BOC COURSE

Chris’ supervisor, Mark Marshall, noted that, “Chris was very enthusiastic about taking the BOC course. He discussed pertinent information about the course and came away with useful tools. We will probably have other people get involved. Chris got a lot out of it and it’s pertinent to what we do.”

Mark also commented that, “Our company actually had a directive to be able to save so many dollars per year at this site from energy use reduction. The entire corporation is tracking energy consumption and the energy numbers become public within the company. With people looking at the energy numbers, they had better go down.”
NORTHAMPTON VA MEDICAL CENTER – LEEDS, MA

BACKGROUND

Facility: Northampton VA Medical Center
Location: Leeds, MA
Facility Square Footage: 500,000

BOC Attendee Name: Pete Miller
BOC Attendee Job Title: Project Engineer
BOC Graduate: Series 1 and 2
BOC Sponsor: National Grid
Years in Position: 12
Number of Staff: 40 (backup coverage for Chief of Engineering)
End Use Fuels Affected: Electric, natural gas, water

OVERALL IMPACT OF BOC TRAINING

Concerning the impact of the BOC course on his work at Northampton VA Medical Center, Pete Miller stated that he had already implemented many of the practices included in the course but that it was valuable in reinforcing their importance. In addition, Pete noted that there were several methods and concepts taught in the course of which he was not previously aware. Pete noted:

“I oversee twenty buildings of which three-quarters were built prior to the 1950s. So there are always areas to save energy that require innovative solutions. I was already on the energy efficiency train track; the BOC course was another way of getting more information. I thought the course was very good.”
One specific example where the BOC course offered new information that directly affected Pete’s work at his facility involved ventilation upgrades at a 40,000 square foot patient ward building. The ward is currently cooled by window air conditioners. Due to the age of the building, the conversion to a central air conditioning system appears to be cost prohibitive at this time. As an alternative, the system currently being evaluated involves a heat recovery ventilator (HRV) that is controlled by carbon dioxide (CO$_2$) sensors. The CO$_2$ sensors monitor the air in the patient ward and control the HRV operation as necessary. Due to the strict indoor air quality requirements of the ward, this system has potential to save a significant amount of energy. This design is now possible because the new ASHRAE standards for ventilation in commercial buildings allow for the use of CO$_2$ rather than a set value of air changes per hour based on the building type. Pete noted that the BOC course was excellent for informing the students of the latest changes to standards and regulations, such as the new ASHRAE ventilation standard.

Another energy saving practice that Pete attributed to the BOC course was the regulation of condensate that feeds into the de-aerating (DA) tank of the steam boiler system in order to purge air from the system. If the condensate is allowed to freely flow to the DA tank, the system cannot heat the water quickly enough and the safety valve is tripped, which then forces the system to dump steam. This can result in significant amounts of wasted steam over a heating season. By installing a variable speed drive controller on the pump motor, the amount of condensate that reaches the DA tank is slowed to a pace that enables the system to function without releasing steam.

Pete has been working with National Grid for the past two years on developing an energy savings performance contract for his facility. Throughout this process, he has been involved in reviewing many energy savings concepts and measures and noted that the BOC course helped to reinforce many things to which he had already been exposed.

**IMPACT RELATED TO COMFORT / SAFETY IMPROVEMENTS**

Pete reiterated how valuable the BOC course was in highlighting the most relevant updates to standards and regulations that affect commercial buildings. The HRV system currently under evaluation is an example of a technology that could result in improved comfort and safety, while also saving energy.
PROFESSIONAL ADVANCEMENT

Pete feels that his job performance has improved since taking the BOC course by allowing him to more effectively improve occupant comfort, save energy, and save money.

COMMENTS OR RECOMMENDATIONS ON BOC COURSE

“The course on controls is very important and could be expanded in the future. Additional control areas could include what is available and the anticipated compatibility of different control systems. Overall, the course made me better prepared.”

“I think the course would be good for other members of the staff. That has not been possible yet because the budget has been tight, even though the cost is well worth it.”
PEASE INTERNATIONAL AIRPORT / PEASE DEVELOPMENT AUTHORITY
- PORTSMOUTH, NH

BACKGROUND

Facility: Pease International Airport / Pease Development Authority (PDA)
Location: Portsmouth, NH
Facility Square Footage: 58,000

BOC Attendee Name: Joe McPherson
BOC Attendee Job Title: Maintenance Manager
BOC Graduate: Series 1
BOC Sponsor: Public Service of New Hampshire
Years in Position: 10
Number of Staff: 16 Full-time, 14 Part-time
End Use Fuels Affected: Electric, natural gas, water, diesel and gasoline for vehicles

In addition to the indoor facility space of over 58,000 square feet, the PDA Maintenance Staff maintains more than 5 million square feet of grounds including aprons, runways, and roadways. The main objective of the PDA Maintenance staff is to keep the airport open and safe in all weather conditions.
OVERALL IMPACT OF BOC TRAINING

When asked to pinpoint some specific areas where the BOC training impacted his maintenance practices, Joe McPherson found it difficult to highlight one area. Rather, he noted that, “The BOC course really provided a lot of food for thought and reemphasized the idea of planned maintenance rather than reactionary maintenance.” Joe went on to say:

“I benefited not just from the facilities aspect but in all areas of maintenance work we perform. The BOC Course opened my eyes to preventative maintenance items that were being overlooked reinforced maintenance practices that were already in place. Facilities is just a small part of what we do. I have been able to take some thoughts and ideas from BOC and put them to use in other areas such as pavements, runway lighting, and other structures. It gave me a renewed interest in the work that I’m doing, and I’ve tried to pass this on to my crew. It’s at the forefront of the individuals’ minds when they come back from the course, encouraging them to dig further into the specifics of their facilities. You develop a new relationship with your facilities.”

Throughout the PDA grounds, there are more than 500 exterior lights, including over 400 runway lights. Joe noted that the BOC course helped to break down the task of maintaining these lights by scheduling planned replacements. This has reduced maintenance labor costs as well as improving the safety of the runways. Moreover, the concept of scheduled lighting replacements is now also implemented in the PDA facilities. This will allow Joe to more effectively employ his additional winter staff by assigning scheduled replacements, and fixture cleaning, during mild winter days when the seasonal staff is not involved in snow removal operations. Since
implementing this planned replacement schedule, Joe notes that calls related to burned-out lamps have significantly decreased.

Similar to the scheduled replacement of lighting, Joe also attributes a more comprehensive inspection schedule of the PDA’s transformers and emergency generators to the BOC course. PDA has a total of ten emergency generators ranging from 8 kW to 370 kW and totaling 1.1 MW.

Another concept that the BOC course offered was the breakdown of the facility into small components to better understand how the facility functions. One example that Joe noted was the relationship between a dirty air filter and the power consumption of the ventilation fan motor. If the filter is dirty, allowing minimal air through, the motor will use more electricity and the facility’s air will be dirtier. This relationship allows the facility staff to determine the quality of the air filter by monitoring the amperage draw on the fan motor. This is significantly less complicated than measuring airflow to determine the status of the air filters. Joe notes that this gave him and his staff an increased level of sophistication in monitoring facility system’s without purchasing additional equipment and, more importantly, without having to train personnel on how to appropriately use the new equipment.

IMPACT RELATED TO COMFORT / SAFETY IMPROVEMENTS

Reduced lamp failures throughout the PDA grounds have resulted in a safer airport. In addition, the reduced lamp failures in the facilities have reduced the need for PDA personnel to contact maintenance concerning burned-out lamps. This increases the productivity of both the maintenance staff and the other personnel.

PROFESSIONAL ADVANCEMENT

Joe attributes the BOC course to providing an added level of efficiency in his position, which was reflected in the performance based merit increase he received.

COMMENTS OR RECOMMENDATIONS ON BOC COURSE

“The BOC course was the best training that I have attended in my career. The PDA definitely got their $1,200 worth. I will be sending two of my staff to the next Series 1 BOC course and I will be attending the Series 2.”
Appendix C

“I’d like to see a yearly re-certification or bi-yearly re-certification and refresher course.”
APPENDIX D

Review of Program Database
MEMORANDUM

To: Jane Peters, Research Into Action

From: Tom Rooney, GDS Associates, Inc.

cc: Scott Albert and Bruce Bennett, GDS Associates, Inc.

Date: March 8, 2002

Subject: Review of BOC Database

This memo represents the Database Review portion of Task 2 of the NEEP BOC Evaluation. The review of the database focused on the overall condition of database, the data being collected, the quality of the data being entered, and the long-term usability of the database by a broader audience, including program evaluators. With your comments and edits, this may be forwarded to the BOC Working Group in order to expedite any modifications that are deemed necessary.

Background
The NEEP BOC database was developed from the one used for the administration of the BOC program funded by the Northwest Energy Efficiency Alliance (NEEA). The database has been constructed within a Microsoft Access 2000 environment, and consists of 10 data tables, 27 data queries, 7 forms (data input screens) and 23 reports. (For a complete listing of each component please see Appendix A.) The database has been used to track course registration and student grading, conduct transcript maintenance, produce mailing labels, and to perform other program administrative efforts as necessary.

Summary of Key Findings and Recommendations
In general, the database should be cleaned up by eliminating unnecessary components and refining the database’s functionality so that users would not need to be knowledgeable in MS Access database design. Deleting unused or unnecessary tables, queries, forms and reports would eliminate confusion.

Confusion surrounding the correct table, query, form or report to use to retrieve specific information could be clarified by creating a database switchboard which directs users to desired information without the need to select from a list of tables and/or queries. Tables and queries often contain field headings that do not make the data description obvious because they may be designed to house information, while the forms and reports are intended to present the data. Switchboards allow the user to by-pass database components with which users do not need to be concerned.

The database should also track course completion, certification, and re-certification status. The elements necessary for this tracking appear to be in place. However, further refinement through data grouping would allow reports such as Class History for Students to be presented with improved clarity.

As suggested within the NEEA BOC Evaluation, NEEP should consider substantially revising the BOC database. Specifically, NEEP should define all data fields, constrain data entries for fields so that entries will not be out of bounds and the size of the database will remain manageable, and complete data entry for all fields.

Facility-specific information should also be included within the students’ information. At a minimum, facility square footage should be noted. (It is understood that NEEP is currently collecting facility square footage data and expects to have 90% of the data included by March 8, 2002.) Square footage data that is specific to each student’s realm of responsibility would be extremely useful in estimating savings from the BOC program.

ID codes could be "cleaned". There are some that deviate from the one-to-four digit numbering scheme and are expanded to 10 digits or more. And in some cases the ID codes are represented as negative numbers. The MS Access Autonumber was probably changed from Incremental to Random at some point during development. This cannot be changed back to incremental without re-establishing the ID.

GDS estimates that it would cost approximately $5,000 to revise the current database per the recommendations and findings identified in this memo. However, an interim solution would be to fix the non-functioning components and delete those that are not being used, which could be done for a fraction of the cost of a full revision.

Problems / Inconsistencies with Data

The database appears to have been designed for users that are familiar with MS Access. For example, to initiate a query of a particular data table, such as a list of those students...
completing courses at a particular location, the user would need to go to the database’s
design view and manually enter those parameters. This can be difficult if the user does not
know the syntax of MS Access commands.

- Two variables should not be included within one data field. For example, the variable
“Location” is used within several tables and in the case of Northboro, is entered as both
“Northboro 2001” and again as “Northboro 2002”. Program year should be a distinct field.

- Issues regarding inconsistency appear within the functionality of the database where look-up
functions refer to variables incorrectly. For example, within Table: Students there is a look-up
function within the variable “Class Date” which attempts to capture this information from
the variable “Class Date” within the Table: Classes. However, the look-up refers to a
“Class Start Date” and, because there is no such variable, the system creates an error
message.

- Many of the tables, queries, forms and reports appear as though they have been either used
in the development of the database, or are work-in-progress elements to the database.
There are others that do not appear to be functional. For example, the Table: Projects does
not contain any information.

- Data entries for fields should be constrained in some cases so that entries will be consistent.
A specific example of this is a look-up function in the Table: Classes which refers to the
Table: Location. Users are not bound to those locations listed within the Location table.
This creates an opportunity for error by allowing the user to enter location names with
different spellings or abbreviations.

- Upon opening some queries such as BOC 100, user is prompted for a parameter value. In
the case of BOC 100 this is for field named “Contacts. Enrolled”. If queries such as these
are not being used for other functions of the database, then moving or eliminating the query
would assist in cleaning up the database.

- In some places, selections from drop down boxes are offered in places where straight
numeric entries are more appropriate. For example, in the form titled “Enter Class
Grades”, the field Grade is structured as a drop-down box. This should be a direct numeric
entry.

- Incompletion of students’ full names creates problems when reporting. For example, the
report “Class History for Students”, information is displayed from a data field that should
represent a merge of the students first and last name. However, this function was not
completed within the record source (query) and therefore the report displays null text values.
➢ There are many blank fields in some tables. For example, the table “Students and Classes” has very few fields with any content in them.

Additional Recommended Data
➢ As suggested within the NEEA BOC Evaluation, NEEP should be encouraged to maintain a database that includes information regarding the students’ role and responsibilities with their respective organizations and information regarding the characteristics of the facilities for which each student is responsible. Information such as building square footage and the specific systems they are responsible for would provide valuable information regarding the savings that may transpire from the students’ attendance. More specifically, it appears that the Table: Contacts is the primary table with information pertaining to the students. Database developers should consider the addition of a separate related table containing project site information including: Site ID Number, Company Name, Site Address, Site Description, Site System (HVAC, Lighting, Processes etc.), Site Size (building square footage for which each person is responsible).

➢ It would also be beneficial for the purposes of evaluation to include a field within the students’ information table that identifies whether the person is actually a facility manager or a third party participant. Such third party participants include those not directly responsible for implementing energy conservation measures, but rather operate in an advisory capacity or are interested parties such as utility personnel or consultants. Making this delineation allows program evaluators to weigh program savings more accurately.
APPENDIX E

Review of Program Marketing Plan
MEMORANDUM

TO: Elizabeth Titus, Kate Evans
FROM: Jane S. Peters
RE: BOC Document Review
DATE: March 13, 2002

This memo discusses our findings following a review of NEEP-BOC Documents. The documents we reviewed include:

- Three year budget 2001-2003 and Budget Spreadsheets 2000
- BOC Business Plan, Revised February 2001
- BOC marketing materials on the website and mailed brochure
- BOC Newsletters, Fall and Winter 2001

The review is informed by our own experience evaluating the NEEC BOC course between 1996 and 2001 and by a review of the first and second Market Progress Evaluation Reports (MPERs, Feldman, 2000 and 1999) assessing the Northwest Energy Education Institute (NWEEI), another project funded by the Northwest Energy Efficiency Alliance (the Alliance).¹

FINDINGS

Marketing Materials

The marketing materials and website are quite clear and easy to understand from our vantagepoint. We will confirm this with students during the course of the evaluation. But our review indicates that the materials provide information needed to access the course and to understand the value in the course series and certification. The value of the series and certification seems especially well conveyed in the newsletters.

The Business Plan

The Business Plan and associated spreadsheets, although updated February 2001, appear to need additional updating. The Business Plan specifically only notes activities being conducted in 2000 and does not address any changes that subsequently occurred, such that there is effectively no current Business Plan. For instance, there is no discussion of the issues that arose in the process of revising the 200 Series, an event that likely had a significant impact on the ability of NEEP to fulfill the Business Plan as outlined in 2000. And while the budget spreadsheets were revised in 2001, it is unclear to us whether the assumptions in the spreadsheets have been met. The Business Plan should be revised annually. Each annual revision should discuss the accuracy of past assumptions and draw conclusions about, whether and how to revise the plan based on the analysis.

We do not find the Business Plan to be realistic in assuming that a self-sustaining program can evolve over such a short period of time, from 2000-2003. The market transformation model in the Business Plan is that the NEEP BOC will be self-sustaining based solely on fees for the BOC 100 and 200 Series courses by 2004. Shel Feldman conducted an assessment of sustainability for the NW Energy Education Institute in 2000.² His review identified that educational ventures alone are rarely profitable; that is why most educational institutions are either publicly funded or are privately funded with very high fees. The NWEEI had expected to be self-sustaining within three years. The MPER recommended that the NWEEI be considered infrastructure rather than a potentially self-supporting profit making venture. In developing a business plan, a critical question to ask is “where is the profit.” If a source of profit cannot be identified, it is unlikely that the venture can be self-sustaining.

The NEEC BOC and the NW Building Operators Association (NWBOA) BOC are both currently sustainable for different reasons; neither of these organizations is reliant

solely on course fees. The NEEC BOC business model relies on course fees, re-certification fees, and license fees to other organizations such as NEEP. NWBOA is a trade association with membership fees, course fees and re-certification fees as the revenue source for its Business Plan. NWBOA has been in existence since 1990 as the Idaho Building Operator Association, and began offering the first certification course in 1993. Nonetheless, during the time of Alliance funding from 1997-2001 they found themselves at a low point with limited market opportunities. They chose to expand their trade association activities to the Northwest region rather than continue to focus solely on Idaho. Yet that has not proved to be sufficient either, so it is uncertain whether how they will fare if Alliance or utility funding is terminated.

At the outset the NEEC BOC business model was reliant on course fees, however, this proved unsatisfactory. The current NEEC BOC business model is based on NEEC’s promotion and offering of BOC courses in Washington State and the sale of licenses to other organizations. This model has been effective to this point; however, NEEC still obtains some funding from the Alliance to develop electives and specialty courses. Whether the licensing process will provide long-term sustainability for NEEC BOC is dependent on many factors that cannot be predicted. For now, the model appears to be working.

The NEEP BOC needs to develop a business plan that clearly articulates where the profit making opportunity lies, and, if there is none, what the scale of support will be needed to ensure that BOC course offerings are available for the long-term. Some opportunities for NEEP to consider in developing a revised business plan include:

- A marketing plan (see below)
- Costs and process for identifying and securing locations to hold the course series
- Options for offering the course in different configurations (a weeklong course, three weekends, etc.)
- Roles for utilities and opportunities for in-kind contributions versus cash contributions
- Opportunities a for trade association model to work
- Opportunities to cross-list training or become affiliates with other operator affiliated associations

**Marketing Plan**

Based on the project initiation meeting we understand that recruitment has been less successful in 2001 and 2002 than it was in 2000. The Business Plan describes a process that is dependent on the utilities to generate students and then NEEP staff
members become increasingly responsible for marketing the program in 2001 and 2002 and beyond. Yet we found that there is no marketing plan in place for the NEEP BOC. While marketing is discussed in the BOC Business Plan, there is clear need for a targeted marketing plan to achieve the objectives of the Business Plan.

We offer the following suggestions for BOC Marketing:

The O&M baseline study provides a very clear assessment of the potential market for all O&M services in the Northeast. The market segmentation analysis offered in the report suggests that there are five market segments in the O&M market place. These are: O&M Experts, O&M Proficient, Interested Amateurs, Passive Underachievers, and Run it till it Breaks.

The baseline study concludes that O&M training is likely to be useful primarily to the Interested Amateurs and Passive Underachievers. However, our experience with the NEEC BOC suggests that students are likely to come from all of the groups except “Run it ‘til it breaks”. Using the segmentation analysis, all C&I customers with consumption in excess of 50 MWh or with facilities in excess of 10,000 square feet are potential participants in the BOC Certification program, if they have building operator staff.  

The need to identify those businesses with building operator staff is critical to the success of the NEEP BOC, but a plan for doing this is not clearly articulated in the Business Plan. There are several ways to do this.

- The most costly way is to obtain lists of all firms over 50 MWh, contact each of them and ask if they have building operator staff.
- A less costly way is to contact all of the local trade organizations that operators and operation supervisors could join and network with those organizations to find those operators and supervisors who self-select themselves for networking with others doing similar work.
- There are also some publications that cater to O&M professionals. Mailing lists can be purchased from these associations and used for mailings.
- Another marketing technique, used extensively by NEEC (in conjunction with other methods in this list) is to hold introductory meetings in targeted geographic areas where courses might be held. Use all connections possible—including utility contacts—to generate direct mail and phone invitations to the introductory meetings. These meetings are short, one hour, usually over lunch or breakfast and provide a means for supervisors to learn about the course series and the certification process and to ask questions. This approach has been very successful in generating interest and students.

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3 See section 5.3.3 to 5.3.4.5 for a detailed discussion of each segment (RLW 2000).
NEEP needs to develop a marketing plan as soon as possible. The plan should spell out the process for marketing the BOC in the Northeast and identify the roles of NEEP and each of the utilities in the process. The plan should be developed at the outset of each year and revised at the mid-year point based on experience. Such a plan can primarily be a schedule of activities, or could outline the objectives for each activity and then assess whether the objectives have been achieved.
APPENDIX F

Survey Instruments
Name: __________________________________________________________

Class Series: _________ Location: ____________________________ Year: ______

Title: __________________________________________________________

Company Name: __________________________ Phone Number: _____________

Address: ___________________________________________________________________________________

Introduction: I am ______. (Utility)____ gave me your name as a person who had completed the Building Operator Certification Program. We are conducting an evaluation of the certification program and are following up with students to obtain their views of the program. Do you have time to talk for about 15 minutes?

Assessment of Training

1a-f. The BOC course included seven topics. I would like you to rate how useful to your work you found the course material relating to the systems and equipment you work with. Please rate the topic a 0 for not useful, a 1 for somewhat useful, and a 2 for useful.

<table>
<thead>
<tr>
<th>Course Topic</th>
<th>Usefulness to Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building system overview</td>
<td></td>
</tr>
<tr>
<td>Energy conservation techniques</td>
<td></td>
</tr>
<tr>
<td>HVAC system and controls</td>
<td></td>
</tr>
<tr>
<td>Energy efficient lighting</td>
<td></td>
</tr>
<tr>
<td>Building maintenance codes</td>
<td></td>
</tr>
<tr>
<td>Indoor air quality</td>
<td></td>
</tr>
<tr>
<td>Facility electrical systems</td>
<td></td>
</tr>
</tbody>
</table>
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1g. Is there anything you would like to say—either positive or negative—about the BOC classes that the course developers need to know to make sure it meets the needs of other building operators who will take this class?

2. Considering the BOC training as a whole, how would you rate your satisfaction with the training you received? This time, let’s spread out the scale a bit to cover more responses. Please use a scale of 1-5, from not at all satisfied to extremely satisfied.  
   *If necessary: 1=not at all satisfied, 2=not satisfied, 3=neither particularly satisfied nor unsatisfied, 4=satisfied, 5=extremely satisfied.*
   
   1 2 3 4 5

3. Is there anything you would like to see added to or dropped from the course series?

4. Do you use or have you used or applied any of the methods and concepts taught in the courses?  
   *If Q4=N or DK/REF, skip to 5*

   4a. Does that include doing new things that you did not do prior to taking the class?  
      
      N, Y, DK/REF

   4b. Would you say that you do some activities more regularly or frequently now than you did prior to taking the class?  
      
      N, Y, DK/REF

5. Do you think your job performance has been improved since taking the course?  

   5a. Would you say that, by applying things you learned from the course, you have been able to:  
      i. Improve occupant comfort  
      ii. Save energy at your facility  
      iii. Save money  
      
      N, Y, DK/REF
Appendix F

BOC TRAINING AND CERTIFICATION PROGRAM IN THE NORTHEAST

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{Skip to Assessment of Marketing if 5a did not generate any “yes” responses}

5b. Now I’d like to ask you about any feedback you might have received that leads you to think that you have improved comfort, saved money, saved energy.

Have you received comments from building occupants, your supervisor, co-workers, or contractors?

N, Y, DK/REF

5c. Have you saved money in trouble-shooting or in the use of contractors?

N, Y, DK/REF

5d. Have you advised in decisions about equipment operation or replacement

N, Y, DK/REF

Assessment of Marketing

6. How did you learn about the BOC? {open-ended; Probe: anything else}?

Colleague or friend
Conference or trade show
Colleague or friend
Internet
Other Mailing/Advertisement/Flyer
Professional or trade association / publication
School/college
Supervisor or co-worker
Utility mailing or advertisement
Utility representative
Utility seminar
Other (describe)
Don’t know

7. What, if any, written materials describing the program did you look at prior to taking the training? (Probe by reading list)

Letter from utility
Brochures
Newsletters
Web sites
Nothing (skip to Job Advancement)
Anything else? (Describe: ____________________________)

8. Did the materials that you read provide you with a good understanding of the course and its potential value to you?

N, Y, DK/REF
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{If Y, skip to Job Advancement}

8a. How would the materials need to be changed to better convey the purpose and value of the course? {Interviewer: tie comment to marketing material} {OPEN-ENDED}

Job Advancement, Resume, Referral

9. Did you know that the BOC Certificate is recognized in more than nine states? N, Y, DK/REF

9a. Is this type of cross-state recognition important to you? N, Y, DK/REF

10. Since completing the BOC, have any of the following changes occurred in your job?
   i. Change in job title N, Y, DK/REF
   ii. Increased responsibilities N, Y, DK/REF
   iii. Increased compensation (salary or wages) N, Y, DK/REF

{Ask if Y to one or more subquestions in Q10; otherwise, skip to Q11}

10a. Do you think having the Building Operator Certificate helped you attain this/these change(s)? N, Y, DK/REF

11. Do you think having a Building Operator Certificate will be good for advancing on your current job, or getting a new job if needed? N, Y, DK/REF

12. Have you put the BOC on your resume or do you plan to if you look for another job? N, Y, DK/REF

13. Have you recommended the Building Operator Certificate program to people doing the same type of work that you do? N, Y, DK/REF

{Ask if No, DK/REF; otherwise skip to Impacts, Q17}

13a. Would you recommend the BOC program if someone were to ask you about it? N, Y, DK/REF

{If Q13a =N or DK/REF, skip to Q17}

13b. What have/ would you tell them? {OPEN-ENDED}
14-16 These questions intentionally left blank

Impacts

17. In the last six months have you installed lighting controls? N, Y, K/REF

{Ask if Q17=yes (installed controls); otherwise skip to Q19}

18. Approximately what percentage of the floor area is affected by the controls? ____% don’t know/refused

{Ask if Q17=no (not installed controls); otherwise skip to Q20}

19. Are you responsible for lighting equipment? N, Y, DK/REF

{Ask if Q17=yes (installed lighting controls) or Q19=yes (responsible for lighting); otherwise skip to Q22 (HVAC)}

20. In the last six months, have you replaced less efficient lamps or fixtures with more efficient ones (sometimes called a lighting retrofit)? N, Y, DK/REF

{Ask if Q20=yes (retrofit); otherwise skip to Q22}

21. Approximately what percentage of the floor area was affected by the lighting retrofit? ____% DK/Ref

{Ask all respondents}

22. In the last six months, have you installed thermostats or an energy management system (also called an EMS) to control the HVAC system? N, Y, DK/REF

{Ask if Q22=yes (HVAC controls); otherwise, skip to Q24}

23. Approximately what percentage of the floor area was affected by the HVAC controls? ____% DK/Ref

{Ask if Q22=no (no HVAC controls); otherwise, skip to Q25}

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{Ask if Q22= yes (HVAC controls) or Q24=yes (responsible for HVAC); otherwise, skip to 33 (motors)}

25. In the last six months, have you installed air handler door gaskets or damper seals? N, Y, DK/REF

{Ask if Q25=yes (gaskets); otherwise, skip to Q27 (unitary equipment)}

26. Was that door gaskets or damper seals or both?
   Door gaskets
   Damper seals
   Both
   DK/Ref

27. Have you conducted unitary equipment maintenance, such as on air filters, belts, and coils? (If necessary, add: “in the last 6 months”.) N, Y, DK/REF

28. Have you conducted chiller system or cooling tower maintenance? (If necessary, add: “in the last 6 months”.) N, Y, DK/REF

{Ask if Q28=yes (chiller maintenance); otherwise, skip to Q30}

29. What is the size of the chiller (in tons)? ___tons DK/Ref

{Ask if Q28=no (no chiller maintenance); otherwise, skip to Q31}

30. Are you responsible for a chiller system or cooling tower? N, Y, DK/REF

31. Have you conducted economizer maintenance in the last 6 months? N, Y, DK/REF

{Ask if Q31=no (no economizer maintenance); otherwise, skip to Q33 (motors)}

32. Are you responsible for an economizer? N, Y, DK/REF

{Ask of all respondents}

33. In the last six months, have you installed newly purchased motors? N, Y, DK/REF
Appendix F

{Ask if Q33=yes; otherwise, skip to Q35}
34. Approximately what percentage of the installed motors were energy efficient? ___% DK/Ref

{Ask if Q33=no; otherwise, skip to Q36}
35. Are you responsible for motors and drives? N, Y, DK/REF

{Ask if Q33=yes (installed motors) or Q35=yes (responsible for motors); otherwise, skip to Q43 (boilers)}
36. Have you installed any variable frequency drives (also called VFDs) in the last six months? N, Y, DK/REF

{Ask if Q36=yes; otherwise, skip to Q38}
37. Approximately what is the total horsepower of the affected motors? ___hp DK/Ref
38. Have you conducted motor maintenance, including belt alignment, in the last six months? N, Y, DK/REF

{Ask if Q38=yes; otherwise, skip to Q40}
39. What is the approximate total horsepower of the affected motors? ___hp DK/Ref
40. Have you conducted air compressor maintenance, such as working on filters, belts, and leaks? (If necessary, add: “in the last 6 months.”) N, Y, DK/REF

{Ask if Q40=yes; otherwise, skip to Q42}
41. What is the approximate operating pressure of the compressor? ___psig DK/Ref

{Q42 intentionally omitted}

{Ask if Q40=no (no compressor maintenance); otherwise skip to Q44 (boilers)}
43. Are you responsible for any air compressor equipment? N, Y, DK/REF
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{Ask of all respondents}
44. Have you conducted boiler maintenance, including replacing steam traps? N, Y, DK/REF

{Ask if Q44=yes; otherwise, skip to Q47}
45. What approximately is the rated output of the boiler?
   ___ MMBtu/hour OR other rating (specify): ______________ DK/Ref

{Q46 intentionally deleted}

{Ask if Q44=no; otherwise, skip to Q48}
47. Are you responsible for boilers? N, Y, DK/REF

{Ask if Q47=yes; otherwise, skip to Q51 (water)}
48. Have you installed any insulation or added to insulation around pipes in the last six months? N, Y, DK/REF

{Ask if Q48=yes; otherwise, skip to Q51}
49. Approximately what was the increase in R-value due to the pipe insulation?
   ___ R-value DK/Ref

50. Approximately how many linear feet of pipe was treated?
   ___ linear feet DK/Ref

{Ask all respondents}
51. In the last six months have you installed any devices or taken any actions to save water? Y, N, DK/REF

{Ask if Q51=yes; otherwise, skip to Q54}
52. Please identify types of water-saving measures installed. (do not read; open-ended; up to 6 responses; pre-codes follow; probe: anything else?)
   Cooling tower overflow repair
   Condensate return system installed or repaired
   Low flow faucet or shower heads installed
   Low flow toilets installed
   Changed irrigation practices
   Other (describe)
   DK/Ref
53. What was the approximate water savings estimated to result from the measures? 
   ___ gallons per ___ (day, year, etc) DK/Ref

{Ask if Q51=no; otherwise, skip to Q55}

54. Are you responsible for the operation or maintenance of water-using equipment? N, Y, DK/REF

{Ask all respondents}

55. In the last six months, have you taken actions that I have not mentioned to reduce the facility’s use of electricity, gas, oil, or water? 

{Ask if Q55=yes; otherwise, skip to Q62}

56. What things have been done? (open-ended; up to 5 mentions; probe “anything else?”)

57. Do you have any savings estimates associated with these activities that you can tell me? (open-ended; up to 4 mentions—electricity, gas, oil, and water savings)

Further Training

58. Are you planning to attend the BOC 200 Series course? N, Y, DK/REF, Have already taken BOC 200

{Ask if Q58=Y, otherwise, skip to Q59}

58a. What type of courses would you like to see offered for BOC 200 Series elective courses? (Explain that BOC 200 focuses on troubleshooting and problem solving if asked)

59. Do you expect any other staff at your facility will enroll in the Building Operator Certification Program? N, Y, DK/REF

{If Q59=N or DK/REF, skip to Q60}

59a. About how many? ____________

60. As you know, ____(name of utility)____ and the Northeast Energy Efficiency Partnership are sponsoring the training and providing the certification. Do
you think the training and certification would carry more clout if another organization provided certification?  N, Y, DK/REF

{If Q60= N, DK/REF, skip to Q61}

60a. What organizations come to mind?

61. What training relating to your job have you taken other than the Building Operators Certification?

62. Who would be the best person at your company to ask for opinions about whether the BOC training is a good investment for the company, such as your supervisor?

   Name & Title: _____________________________________

   Phone Number ____________________________________

   Is their fax number the same as yours? If not, record new fax number.

   Fax Number ______________________________________

Firmographics

63. For how many years have you been a building operator?

64. How many building operators are on staff at this location, including yourself?

65. Is your organization a private sector or public sector entity?
   Private, Public, Other (specify: _______________)

66. What type of facility do you manage? (probe to code)
Government.................................................................01
Grocery......................................................................02
Lodging.....................................................................03
Manufacturing...........................................................04
Medical....................................................................05
Military....................................................................06
Office........................................................................07
Public Utility.............................................................08
Retail.........................................................................09
Schools/colleges ......................................................10
Shipyard...................................................................11
Transportation...........................................................12
Wholesale or Warehousing........................................13
Other (describe).........................................................98
Don’t know / refused..................................................99

67. Could you give me an estimate of the size of the conditioned space of the facility where you work? ________________

67a. The equipment that you work on, does it serve this whole space, or just a part?
Whole
Part

{Ask if 67a=Part; otherwise, skip to 68}

67b. Can you give me an estimate of the size of the conditioned space served by the equipment that you work on? __________

68. Do you have any additional comments about the BOC program?

That’s all of my questions. Thank you for your time.
INTERVIEW GUIDE
NEEP BOC PROGRAM: TRAINEE EMPLOYERS
2002

Name: ____________________________________________

Title: ________________________ Company/Org.: ________________________

Employee Training Series: ________ Location: ________________ Year: ________

Employee(s): ____________________________________________

Phone Number: ________________ Address: ________________________

Introduction: I am ______. Your employee(s) ________ participated in a Building Operator Certification training program. I am conducting an evaluation with some of the students and their employers to find out what benefits the program has provided since that time. Do you have about 15 minutes to answer a few brief questions?

Assessment of Training

1a-f. The BOC course included seven topics. I would like for you to assess the BOC training that your employee received in each topic. Please rate the topic a 0 for not useful, a 1 for somewhat useful, and a 2 for useful. If you have not observed enough from your employee to be able to make an assessment, just say so. [Interviewer, code 9 (NA) if supervisor unable to say.]

<table>
<thead>
<tr>
<th>Course Topic</th>
<th>Usefulness of BOC Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building system overview</td>
<td></td>
</tr>
<tr>
<td>Energy conservation techniques</td>
<td></td>
</tr>
<tr>
<td>HVAC system and controls</td>
<td></td>
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<tr>
<td>Energy efficient lighting</td>
<td></td>
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<tr>
<td>Building maintenance codes</td>
<td></td>
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<tr>
<td>Indoor air quality</td>
<td></td>
</tr>
<tr>
<td>Facility electrical systems</td>
<td></td>
</tr>
</tbody>
</table>
Appendix F

1g. Is there anything you would like to say—either positive or negative—about the BOC classes that the course developers need to know to make sure it meets the needs of other building operators who will take this class?

2. Considering the BOC training as a whole, how would you rate your satisfaction with the training your employee received? This time, let’s spread out the scale a bit to cover more responses. Please use a scale of 1-5, from not at all satisfied to extremely satisfied. Again, if you have not observed enough from your employee to be able to make an assessment, just say so.

[Interviewer, code 9 (NA) if supervisor unable to say.] If necessary: 1=not at all satisfied, 2=not satisfied, 3=neither particularly satisfied nor unsatisfied, 4=satisfied, 5=extremely satisfied.

1 2 3 4 5

3. Is there anything you would like to see added to or dropped from the course series?

4. From what you have observed, do you think your employee’s job performance has improved since taking the course?

4a. Would you say that, since taking the course, your employee has been able to:
   i. Improve occupant comfort N, Y, DK/REF
   ii. Save energy at your facility N, Y, DK/REF
   iii. Save money N, Y, DK/REF
   iv. Have more confidence on the job N, Y, DK/REF
   v. Better interact with contractors N, Y, DK/REF
   vi. Better contribute to decisions about operations N, Y, DK/REF

5. Now I’d like to ask you about any feedback you might have received that leads you to think that your employee improved comfort or saved money or energy.

5a. Have you received comments from building occupants, co-workers, your supervisor, or contractors? N, Y, DK/REF

5b. Has your employee saved money in trouble-shooting or in the use of contractors? N, Y, DK/REF

5c. Has your employee participated in decisions about equipment operation or replacement? N, Y, DK/REF
Assessment of Marketing

6. How did you learn about the BOC? {check all that apply. Probe: anything else?}
   Utility representative .................................................................01
   Utility seminar ........................................................................02
   Utility mailing or advertisement ........................................03
   Other Mailing/Advertisement/Flyer ........................................04
   Supervisor, co-worker, or employee ........................................05
   Professional or trade association / publication .........................06
   Conference or trade show ....................................................07
   Friend or colleague ................................................................08
   Internet ..................................................................................09
   School/college .........................................................................10
   Other (describe) ....................................................................97
   Don't know ............................................................................99

7. What, if any, written materials describing the program did you look at prior to taking the training? (Probe by reading list)
   Letter from utility
   Brochures
   Newsletters
   Websites
   Nothing (skip to 4)
   Anything else? (describe:)

8. Did the materials that you read provide you with a good understanding of the course and its potential value to your organization? N, Y, DK/REF
   {If Y, skip to next question}

8a. How would the materials need to be changed to better convey the purpose and value of the course? {Interviewer: tie comment to marketing material} {OPEN-ENDED}

Resume, Referral

9. Did you know that the BOC Certificate is recognized in more than nine states? N, Y, DK/REF
   9a. Is this type of cross-state recognition important to you? N, Y, DK/REF
Appendix F

10. Consider a job applicant whose resume indicates that he or she has BOC certification. How would certification contribute to the assessment you form about the suitability of this applicant for the job? Would it:
   Enhance your assessment
   Leave unchanged your assessment
   Decrease your assessment

{Ask if 10=enhance; otherwise, skip}

10a. Do think in the future, when more people have received BOC training, that you might make BOC a requirement for hiring?  
    N, Y, DK/REF

11. Have you recommended the Building Operator Certificate program to other people who manage or supervise operations staff?  
    N, Y, DK/REF

{Ask if No, DK/REF; otherwise skip to next subquestion}

11a. Would you recommend it, were someone to ask you?  
    N, Y, DK/REF

{If Q11a =N or DK/REF, skip to next question}

11b. What have/ would you tell them?  
    {OPEN-ENDED}

{Q12-16 intentionally omitted}

Impacts

For the next set of questions, I am going to read a list of operator activities. Please tell me whether you believe ___(name of student)’s___ has conducted the activity in the last 6 months.

17. In the last six months has this employee installed lighting controls?  
    N, Y, DK/REF

{Ask if Q17=yes (installed controls); otherwise skip to Q19}

18. Approximately what percentage of the floor area is affected by the controls?  
    ____%  don’t know/refused

{Ask if Q17=no (not installed controls); otherwise skip to Q20}

19. Is the employee responsible for lighting equipment?  
    N, Y, DK/REF
{Ask if Q17=yes (installed lighting controls) or Q19=yes (responsible for lighting); otherwise skip to Q22 (HVAC)}

20. In the last six months, has this employee replaced less efficient lamps or fixtures with more efficient ones (sometimes called a lighting retrofit)? N, Y, DK/REF

{Ask if Q20=yes (retrofit); otherwise skip to Q22}

21. Approximately what percentage of the floor area was affected by the lighting retrofit?

___% DK/Ref

{Ask all respondents}

22. In the last six months, has this employee installed thermostats or an energy management system (also called an EMS) to control the HVAC system? N, Y, DK/REF

{Ask if Q22=yes (HVAC controls); otherwise, skip to Q24}

23. Approximately what percentage of the floor area was affected by the HVAC controls?

___% DK/Ref

{Ask if Q22=no (no HVAC controls); otherwise, skip to Q25}

24. Is this employee responsible for HVAC equipment? N, Y, DK/REF

{Ask if Q22=yes (HVAC controls) or Q24=yes (responsible for HVAC); otherwise, skip to 33 (motors)}

25. In the last six months, has this employee installed air handler door gaskets or damper seals? N, Y, DK/REF

{Ask if Q25=yes (gaskets); otherwise, skip to Q27 (unitary equipment)}

26. Was that door gaskets or damper seals or both?
  Door gaskets
  Damper seals
  Both
  DK/Ref
Appendix F

27. Has this employee conducted unitary equipment maintenance, such as on air filters, belts, and coils? (If necessary, add: “in the last 6 months”.)
   N, Y, DK/REF

28. Has this employee conducted chiller system or cooling tower maintenance? (If necessary, add: “in the last 6 months”.)
   N, Y, DK/REF

{Ask if Q28=Yes (chiller maintenance); otherwise, skip to Q30}

29. What is the size of the chiller (in tons)?
   ___ tons DK/Ref

{Ask if Q28=No (no chiller maintenance); otherwise, skip to Q31}

30. Is the employee responsible for a chiller system or cooling tower?
   N, Y, DK/REF

31. Has this employee conducted economizer maintenance in the last 6 months?
   N, Y, DK/REF

{Ask if Q31=No (no economizer maintenance); otherwise, skip to Q33 (motors)}

32. Is the employee responsible for an economizer?
   N, Y, DK/REF

{Ask of all respondents}

33. In the last six months, has this employee installed newly purchased motors?
   N, Y, DK/REF

{Ask if Q33=Yes; otherwise, skip to Q35}

34. Approximately what percentage of the installed motors were energy efficient?
   ___% DK/Ref

{Ask if Q33=No; otherwise, skip to Q36}

35. Is the employee responsible for motors and drives?
   N, Y, DK/REF

{Ask if Q33=Yes (installed motors) or Q35=Yes (responsible for motors); otherwise, skip to Q43 (boilers)}

36. Has this employee installed any variable frequency drives (also called VFDs) in the last six months?
   N, Y, DK/REF
Appendix F

[Ask if Q36=yes; otherwise, skip to Q38]

37. Approximately what is the total horsepower of the affected motors?  
   ___hp      DK/Ref

38. Has this employee conducted motor maintenance, including belt alignment, in the last six months?  
   N, Y, DK/REF

[Ask if Q38=yes; otherwise, skip to Q40]

39. What is the approximate total horsepower of the affected motors?  
   ___hp      DK/Ref

40. Has this employee conducted air compressor maintenance, such as working on filters, belts, and leaks? (If necessary, add: “in the last 6 months.”)  
   N, Y, DK/REF

[Ask if Q40=yes; otherwise, skip to Q42]

41. What is the approximate operating pressure of the compressor?  
   ___psig     DK/Ref

[Q42 intentionally omitted]

[Ask if Q40=no (no compressor maintenance); otherwise skip to Q44 (boilers)]

43. Is the employee responsible for any air compressor equipment?  
   N, Y, DK/REF

{Ask of all respondents}

44. Has this employee conducted boiler maintenance, including replacing steam traps?  
   N, Y, DK/REF

{Ask if Q44=yes; otherwise, skip to Q47}

45. What approximately is the rated output of the boiler?  
   ___MMBtu/hour OR other rating (specify):______     DK/Ref

{Q46 was intentionally deleted}

{Ask if Q44=no; otherwise, skip to Q48}

47. Is the employee responsible for boilers?  
   N, Y, DK/REF
Appendix F

{Ask if Q47=yes; otherwise, skip to Q51 (water)}

48. Has this employee installed any insulation or added to insulation around pipes in the last six months?  N, Y, DK/REF

{Ask if Q48=yes; otherwise, skip to Q51}

49. Approximately what was the increase in R-value due to the pipe insulation?  ___ R-value  DK/Ref

50. Approximately how many linear feet of pipe was treated?  ___ linear feet  DK/Ref

{Ask all respondents}

51. In the last six months has this employee installed any devices or taken any actions to save water?  N, Y, DK/REF

{Ask if Q51=yes; otherwise, skip to Q54}

52. Please identify types of water-saving measures installed. (do not read; open-ended; up to 6 responses; pre-codes follow; probe: anything else?)
   Cooling tower overflow repair
   Condensate return system installed or repaired
   Low flow faucet or shower heads installed
   Low flow toilets installed
   Changed irrigation practices
   Other (describe)
   DK/Ref

53. What was the approximate water savings estimated to result from the measures?
   ___ gallons per ___ (day, year, etc)  DK/Ref

{Ask if Q51=no; otherwise, skip to Q55}

54. Is the employee responsible for the operation or maintenance of water-using equipment?  N, Y, DK/REF

{Ask all respondents}

55. In the last six months, has the employee taken actions that I have not mentioned to reduce the facility’s use of electricity, gas, oil, or water?
56. What things have been done? (open-ended; up to 5 mentions; probe “anything else?”)

57. Do you have any savings estimates associated with these activities that you can tell me? (open-ended; up to 4 mentions—electricity, gas, oil, and water savings)

**Willingness to Pay**

58. How much would you be willing to pay for a staff person to attend the 8-day building operators certification’s seven course training series?

- Nothing/ not willing to pay ................................................................. 0
- $1 TO less than $1,200 ........................................................................ 1
- $1,200 TO less than $1,400 ................................................................. 2
- $1,400 OR OVER ................................................................................ 3
- Don’t know / Refused ....................................................................... 9

**Skip Q59 and go to Q60 if Q58=2,3; SKIP IF SAID $1,200 OR OVER**

**Skip Q59 and go to Q61 if Q70=0; Skip if said “not willing to pay”**

59. Would you be willing to pay $1,200.

- N= ..............................................................................................................
- Yes .......................................................................................................... 1
- No ......................................................................................................... 2
- Don’t know / Refused ....................................................................... 9

**Skip Q60 and go to Q61 if Q58=3 or Q59=2 or 9**

60. Would you be willing to pay $1,400?

- Yes .......................................................................................................... 1
- No ......................................................................................................... 2
- Don’t know / Refused ....................................................................... 9

**Further Training, Certification**

61. Do you think you will encourage your employee to take the BOC 200 Series course? N, Y, DK/REF

**Ask if Q61=Y, otherwise, skip to Q62**

61a. What type of courses would you like to see offered for BOC 200 Series elective courses? (Explain that BOC 200 focuses on troubleshooting and problem solving if asked)
Appendix F

62. Do you expect any other staff at your facility will enroll in the Building Operator Certification Program? N, Y, DK/REF

   {If Q62=N or DK/REF, skip to Q63}

62a. About how many might enroll in the next 12 months? ______________

63. As you know, _(name of utility)_ and the Northeast Energy Efficiency Partnership is sponsoring the training and providing the certification. Do you think the training and certification would carry more clout if another organization provided certification? N, Y, DK/REF

   {If Q63= N, DK/REF, skip to Q64}

63a. What organizations come to mind?

64. What training relating to your job have you taken?

Firmographics

65. How long have you been in building operations and maintenance? (ENTER WHOLE YEARS)

66. How many building operators work under your supervision, not including yourself?

67. How many building operator supervisors are on staff at this location, including yourself?

68. Is your organization a private sector or public sector entity?
   Private 1
   Public 2
   Other (specify:______________)

69. What type of facility your operators manage? (probe to code)
   Government..........................................................................................................01
   Grocery..................................................................................................................02
   Lodging.................................................................................................................03
   Manufacturing .................................................................................................04
   Medical.................................................................................................................05
   Military...............................................................................................................06
   Office..................................................................................................................07
   Public Utility.....................................................................................................08
   Retail..................................................................................................................09
70. Could you give me an estimate of the size of the conditioned space of the facility where you work? ________________

70a. Consider now the equipment that your employee __name__) works on: does it serve this whole space, or just a part?
Whole
Part

{Ask if 70a=Part; otherwise, skip}

70b. Can you give me an estimate of the size of the conditioned space served by the equipment that your employee works on? __________

71. Comparing this year to a year or two earlier, has the priority for considering energy efficiency in operation and maintenance at your facility stayed the same, or become more important.
1. Stayed the same
2. Become more important
3. Some other response

72. Do you have any additional comments about the BOC program?

That’s all of my questions. Thank you for your time.
INTERVIEW GUIDE
NEEP BOC PROGRAM: INSTRUCTORS
2002

Courses Taught (from database)

➢ What is your background as a teacher of these issues?
➢ How many courses have you taught to date? (update from database)

Curriculum

➢ What are the strong points of the curriculum, materials?
➢ What are the weak points?
➢ Are the student requirements appropriate?

Student Experience

➢ What do you think of the backgrounds that the students’ enter with? About what proportion would you say are appropriately prepared for the course, for what proportion is the course challenging, and for what proportion is the course perhaps too easy?
➢ Have the different backgrounds that students enter with affected the tenor of the class?
➢ Do you have any ideas about how to ensure that students are a good fit with the course series?
➢ What do you think students like best about the course? Least?
➢ What would make the course more useful to students?

Instructor Experience

➢ Do you have enough time to prepare for the class and cover any other class responsibilities?
Appendix F

> Do you have the support you need from BOC administration? Is there anything that you're not getting that would be useful?

> Are there any aspects of your participation with this program that leave you dissatisfied?

Conclusions/Future Directions

> From your perspective, what are the BOC program’s major strengths? Weaknesses?

> If you were to design the curriculum and course series, what would you do differently?

> What do you think is the future of the BOC?

> In your opinion, will there continue to be market interest in the locations where courses have already been held? What needs to happen for continued market interest?

Final Comments
Appendix F

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NEEP BOC PROGRAM: STAFF, SPONSORS 2002

Please briefly describe your role in the program.

➢ (As appropriate ask:) What activities take the most time?

Program Goals/Direction

➢ What are the goals of the program?
➢ Have these changed since the program was initiated?
➢ To what degree do you think the program has met its goals?
➢ How have the goals been established? Who has been involved? Who has the “last word”?
➢ Are there regulatory constraints that are influencing the goals, methods, timelines?
➢ What are the commitments of the various parties?
➢ How does communication occur?
➢ Have there been any difficulties around setting/revising goals,strategies? How have these been resolved? Any issues currently unresolved?

Marketing

➢ How has the program been marketed to date? (strategies, materials)
➢ Has this been effective?
➢ Have courses been fully subscribed? (Level 1, Level 2, all locations)
➢ How has/is the marketing changed/changing to meet current needs?
➢ Have any problems been encountered?
What still needs to happen? Current concerns.

Is there agreement among the parties as to what needs to happen by whom?

Is the staff time allocated to marketing sufficient?

Administration

How are the training locations identified?

How is certification handled?

Any difficulties in tracking participation?

Is the staff time allocated to administration sufficient?

What administrative problems have arisen?

Course Content (ask as appropriate to respondent)

Are any changes planned (under consideration) to the course offerings, content, materials, or requirements?

Do you foresee any difficulties in implementing these changes?

Instructors

Is the number of instructors equal to the demand?

What training have instructors received?

Any challenges in bringing the instructors on board?

What feedback is solicited from instructors? Have instructors reported needing any additional support? What has been the response to feedback?

What are the next steps you are taking?
Students/Their Supervisors/Utility Customers

➢ What feedback have you received from students?
➢ What feedback have you received from supervisors or their companies (the utility customers)?
➢ Do nonparticipating companies seem to be aware of the training? Any feedback from them?
➢ What has been the response to feedback?

Conclusions/Future Directions

➢ What are the program’s major strengths?
➢ What are the major weaknesses?
➢ What changes are being planned for the program?
➢ What else would you like to see happen?
➢ Final comments
INTERVIEW GUIDE
NEEP BOC PROGRAM: NONPARTICIPATING SUPERVISORS
2002

State from sample (2)
N=..............................................................................................................................................
New Hampshire.................................................................NH
Rhode Island................................................................................RI
Massachusetts ........................................................................MA
Connecticut..................................................................................CT
New York (Long Island)... ..................................................NY

INT02

COMPANY <COMP                                                  >
Hello, This is _______________ with RKM Research Group.
May I speak with the manager or supervisor of your building operations and
maintenance staff?
I have the name <RESP                                       >
<TITLE                                      >
If he/she is the supervisor or manager of building operations and maintenance
staff I could talk with him/her.
NEW NAME and TITLE <NEWN                                      >
ONCE ON LINE: Hello, my name is__________ for {add specific utility here} and the
Northeast Energy Efficiency Partnership. We are talking to managers and supervisors about
education and training needs for building operations and maintenance staff. This study is
strictly for research purposes, we are not trying to sell anything.
N=..............................................................................................................................................
Continue ...................................................................................................................................
{convenient times to call back} .................................................................

INT06

First may I please verify that you are a manager or supervisor of building operations and
maintenance staff? (FACILITIES MANAGER OKAY)
N=..............................................................................................................................................
Yes - continue.................................................................................................01
Appendix F

Q1
How many building operators work under your supervision, not including yourself?
N=..............................................................................................................................................
ZERO / NONE................................................................................................................00000
ONE.................................................................................................................................00001
etc ..............................................................................................................................................
DON'T KNOW / REFUSED..........................................................................................99999

Q2
How many building operator supervisors are on staff at this location, including yourself?
N=..............................................................................................................................................
Don't know / Not sure / Refused.................................................................................99999

Q3
I have some questions about your experiences with training programs. Have you or any of
your staff attended any training or education programs in the last three years?
N=..............................................................................................................................................
Yes...........................................................................................................................................1
No ............................................................................................................................................3

{ask if Q3=yes; otherwise, skip to Q10}

Q4
Have YOU received certification from training in any area of building operations and
maintenance? (Do not read:)
N=..............................................................................................................................................
Yes training and certification...............................................................................................1
Training only, but no certification......................................................................................2 skip to Q6
No ............................................................................................................................................3 skip to Q6
Don’t know / Refused ...........................................................................................................9 skip to Q6
Ask if Q4=1, otherwise skip to Q7

Q5

What type or types of certification have you received? (do not read; open-ended; up to 6 responses; pre-codes follow; probe: anything else?)

N= ..............................................................................................................................................
Building Operators Certification .......................................................................................01
Operating Engineering certification .................................................................................02
Certified Energy Manager ...............................................................................................03
Certified Energy Procurement Professional .................................................................04
Certified Indoor Air Quality Professional .......................................................................05
Certified Indoor Air Quality Technician .........................................................................06
Certified Testing, Adjusting, Balancing Professional .....................................................07
Asbestos ............................................................................................................................08
Boilers ...............................................................................................................................09
BOMA ..................................................................................................................................10
Building/Facilities Management .....................................................................................11
Electrical Certification/Electrician ..................................................................................12
Energy Audit ..................................................................................................................13
Energy Conservation ....................................................................................................14
Energy Efficiency ........................................................................................................15
Energy Maintenance/Management ................................................................................16
EPA/Environment ..........................................................................................................17
Emergency response/CPR/First Aid ................................................................................18
Equipment Operation (Crane/Forklift) ............................................................................19
Fire Safety/Alarm/Response ..........................................................................................20
Hazardous Waste/HAZMAT ..........................................................................................21
HVAC ...............................................................................................................................22
OSHA ..................................................................................................................................23
Refrigeration ..................................................................................................................24
Other (specify) ................................................................................................................25
Don’t know / Refused .....................................................................................................26

Ask if Q5=1, otherwise skip to Q7

Q6

Is your Building Operators Certification from ____ (name of utility)____, which is working in tandem with the Northeast Energy Efficiency Partnership (NEEP), or is it from some other group?

N= ..............................................................................................................................................
Utility / NEEP ....................................................................................................................1
OTHER / SPECIFY ..........................................................................................................8
Don’t know / Refused ........................................................................................................9

BOC TRAINING AND CERTIFICATION PROGRAM IN THE NORTHEAST
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Appendix F

Q7
Has any of your staff ever received certification from training in any area of building operations and maintenance?

N=....................................................................................................................................................
Yes (one or more staff) ....................................................................................................................1
No (no staff) ....................................................................................................................................3
Don't know / Refused ....................................................................................................................9

Ask if Q7=1, otherwise skip to Q10

Q8
What type of certification have they received? (do not read; open-ended; up to 6 responses; pre-codes follow; probe: anything else?)

N=....................................................................................................................................................
Building Operators Certification ....................................................................................................01
Air Compressors .............................................................................................................................
Asbestos/Asbestos Inspector/Asbestos Removal/Abatement .......................................................09
Boiler Operator/Boiler Certification/Boilers ..................................................................................07
Computer .........................................................................................................................................
Electrician/Electrical/Lighting .......................................................................................................03
Energy Management certification ..................................................................................................03
Equipment Operation (Forklift/ Crane) .......................................................................................03
Gas (Natural/Medical/High Pressure) ............................................................................................03
Hazardous Waste/Material Handling Management .......................................................................03
Herbicide/Insecticide .....................................................................................................................03
HVAC/Refrigeration/Freon Recovery ............................................................................................03
Indoor Air Quality ........................................................................................................................03
Maintenance (facility maintenance/equipment maintenance/preventative maintenance) ............03
Operating Engineering certification ...............................................................................................03
Plumbing ..........................................................................................................................................03
Pool/Spa Operator .........................................................................................................................03
Safety Management/Safety/Fire Safety ........................................................................................03
Supervisory/Management/Facilities Management .......................................................................03
Water System/Water Operator/Waste Water Management/Backflow Abatement .......................03
Welding/Cutting/Pipe fitting .........................................................................................................03
Other (specify) ...............................................................................................................................97
Don't know / Refused ....................................................................................................................99
Ask if Q8=1; otherwise skip to Q10

Q9
Is their Building Operators Certification from ____(name of utility)____, which is working in tandem with the Northeast Energy Efficiency Partnership (NEEP), or is it from some other organization?
N=..............................................................................................................................................
Utility / NEEP ...................................................................................................................................
OTHER / SPECIFY..........................................................................................................................
Don’t know / Refused...........................................................................................................................

Q10
Are you planning to attend or send any of your building and operations staff to any training or continuing education activities in the next 12 months?
N=..............................................................................................................................................
Yes ..............................................................................................................................................
No ...............................................................................................................................................2  skip to Q9
Don’t know / Refused .......................................................................................................................9  skip to Q9

Ask if Q10=1, otherwise skip to Q12

I’m going to describe some types of training. For each please tell me if you or at least one staff person plan to attend any of the following types of training activities in the next 12 months?
What about ...
N=..............................................................................................................................................
CONTINUE...........................................................................................................................................

Q11A
(Do you or at least 1 staff member plan to attend...) A vendor workshop or seminar for a specific piece of equipment?
N=..............................................................................................................................................
Yes ..................................................................................................................................................
No / Will not attend .........................................................................................................................2
Maybe / Depends / Don’t know / Refused .......................................................................................9

Q11B
(Do you or at least 1 staff member plan to attend...) Government regulation training course such as OSHA training?
N=..............................................................................................................................................
Yes ..................................................................................................................................................
No / Will not attend .........................................................................................................................2
Maybe / Depends / Don’t know / Refused .......................................................................................9
Appendix F

Q11C
(Do you or at least 1 staff member plan to attend...) In-house training?
N= ..............................................................................................................................................
Yes ...........................................................................................................................................1
No / Will not attend ..............................................................................................................2
Maybe / Depends / Don’t know / Refused ...........................................................................9

Q11D
(Do you or at least 1 staff member plan to USE...) Training videos or other materials
N= ..............................................................................................................................................
Yes ...........................................................................................................................................1
No / Will not attend ..............................................................................................................2
Maybe / Depends / Don’t know / Refused ...........................................................................9

Q11E
(Do you or at least 1 staff member plan to attend...) Trade shows or professional conferences
N= ..............................................................................................................................................
Yes ...........................................................................................................................................1
No / Will not attend ..............................................................................................................2
Maybe / Depends / Don’t know / Refused ...........................................................................9

Q11F
(Do you or at least 1 staff member plan to attend...) Training offered by private training organizations
N= ..............................................................................................................................................
Yes ...........................................................................................................................................1
No / Will not attend ..............................................................................................................2
Maybe / Depends / Don’t know / Refused ...........................................................................9

Q11G
(Do you or at least 1 staff member plan to attend...) A Community or technical college course
N= ..............................................................................................................................................
Yes ...........................................................................................................................................1
No / Will not attend ..............................................................................................................2
Maybe / Depends / Don’t know / Refused ...........................................................................9

Q11H
(Do you or at least 1 staff member plan to attend...) BOMA certification courses
N= ..............................................................................................................................................
Yes ...........................................................................................................................................1
No / Will not attend ..............................................................................................................2
Maybe / Depends / Don’t know / Refused ...........................................................................9
### Q11I

(Do you or at least 1 staff member plan to attend...) An Operating Engineers Training course?

<table>
<thead>
<tr>
<th>Option</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td>No / Will not attend</td>
<td>2</td>
</tr>
<tr>
<td>Maybe / Depends / Don’t know / Refused</td>
<td>9</td>
</tr>
</tbody>
</table>

### Q12

What are some of the things you consider in deciding whether or not to send yourself or your staff to training? (open-ended; do not read; up to 5 responses; pre-codes follow; probe: anything else?)

<table>
<thead>
<tr>
<th>Option</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Money</td>
<td>01</td>
</tr>
<tr>
<td>Person needs the training/Job growth</td>
<td>02</td>
</tr>
<tr>
<td>Gain/Benefit to the company</td>
<td>03</td>
</tr>
<tr>
<td>Subject area</td>
<td>04</td>
</tr>
<tr>
<td>Time/Staff availability</td>
<td>05</td>
</tr>
<tr>
<td>Location</td>
<td>06</td>
</tr>
<tr>
<td>Length of training</td>
<td>07</td>
</tr>
<tr>
<td>Required by law for company</td>
<td>08</td>
</tr>
<tr>
<td>Instructor/Sponsor</td>
<td>09</td>
</tr>
<tr>
<td>Personal interest</td>
<td>10</td>
</tr>
<tr>
<td>Subject matter is relevant/addresses our needs/useful</td>
<td>11</td>
</tr>
<tr>
<td>Most up to date information</td>
<td>12</td>
</tr>
<tr>
<td>Certification</td>
<td>13</td>
</tr>
<tr>
<td>Quality of course (what the employee will benefit from it)</td>
<td>14</td>
</tr>
<tr>
<td>Difficult to get approval</td>
<td>15</td>
</tr>
<tr>
<td>Follow-up training or schooling</td>
<td>16</td>
</tr>
<tr>
<td>Nothing/no need for training</td>
<td>00</td>
</tr>
<tr>
<td>Don’t know/ not sure / refused</td>
<td>99</td>
</tr>
</tbody>
</table>

### Q13

Do you consider certification in building operations and maintenance important for building operations and maintenance staff? Please rate importance using a scale of minus 2 to plus 2, where minus 2 means 'not at all important your staff', plus 2 means 'very important for your staff', or any number in-between.

<table>
<thead>
<tr>
<th>Option</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINUS 2 - not at all important</td>
<td>1</td>
</tr>
<tr>
<td>MINUS 1</td>
<td>2</td>
</tr>
<tr>
<td>ZERO - Neutral</td>
<td>3</td>
</tr>
<tr>
<td>PLUS 1</td>
<td>4</td>
</tr>
<tr>
<td>PLUS 2 very important</td>
<td>5</td>
</tr>
<tr>
<td>DON’T KNOW / REFUSED</td>
<td>9</td>
</tr>
</tbody>
</table>
**Appendix F**

**Ask if Q13 = 3, 4, 5, or 9; otherwise, skip to 15**

I am going to list some possible types of certification. Please rate how interested you would be in each type of staff certification using a scale of minus 2 to plus 2, where minus 2 means 'not at all interested in this for your staff', plus 2 means 'very interested in this for your staff', or any number in-between.

How interested would you be in ...

<table>
<thead>
<tr>
<th>N=</th>
<th>MINUS 2 - not at all interested</th>
<th>MINUS 1</th>
<th>ZERO - Neutral</th>
<th>PLUS 1</th>
<th>PLUS 2 very interested in this</th>
<th>DON'T KNOW / REFUSED</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>9</td>
<td></td>
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</tbody>
</table>

**Q14A**

(How interested would you be in...)
Competency based certification?
IF NEEDED: Would you rate this certification minus 2 'not at all interested in this for your staff,' plus 2 'very interested in this for your staff' or some number in between?

<table>
<thead>
<tr>
<th>N=</th>
<th>MINUS 2 - not at all interested</th>
<th>MINUS 1</th>
<th>ZERO - Neutral</th>
<th>PLUS 1</th>
<th>PLUS 2 very interested in this</th>
<th>DON'T KNOW / REFUSED</th>
</tr>
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<td>9</td>
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</tbody>
</table>

**Q14B**

(How interested would you be in...)
Certification valid nationally
IF NEEDED: Would you rate this certification minus 2 'not at all interested in this for your staff,' plus 2 'very interested in this for your staff' or some number in between?

<table>
<thead>
<tr>
<th>N=</th>
<th>MINUS 2 - not at all interested</th>
<th>MINUS 1</th>
<th>ZERO - Neutral</th>
<th>PLUS 1</th>
<th>PLUS 2 very interested in this</th>
<th>DON'T KNOW / REFUSED</th>
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<tr>
<td>9</td>
<td></td>
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</tr>
</tbody>
</table>
Q14C
(How interested would you be in...)
Certification that is transferable to other companies
IF NEEDED: Would you rate this certification minus 2 'not at all interested in this for your staff,' plus 2 'very interested in this for your staff' or some number in between?

N= .................................................................
MINUS 2 - not at all interested ................................................................. 1
MINUS 1 ........................................................................................................ 2
ZERO - Neutral .............................................................................................. 3
PLUS 1 ........................................................................................................... 4
PLUS 2 very interested in this ................................................................. 5
DON'T KNOW / REFUSED ........................................................................ 9

Q14D
(How interested would you be in...)
Certification that is issued by trade associations
IF NEEDED: Would you rate this certification minus 2 'not at all interested in this for your staff,' plus 2 'very interested in this for your staff' or some number in between?

N= .................................................................
MINUS 2 - not at all interested ................................................................. 1
MINUS 1 ........................................................................................................ 2
ZERO - Neutral .............................................................................................. 3
PLUS 1 ........................................................................................................... 4
PLUS 2 very interested in this ................................................................. 5
DON'T KNOW / REFUSED ........................................................................ 9

Q14E
(How interested would you be in...)
Certification that is issued by equipment vendors
IF NEEDED: Would you rate this certification minus 2 'not at all interested in this for your staff,' plus 2 'very interested in this for your staff' or some number in between?

N= .................................................................
MINUS 2 - not at all interested ................................................................. 1
MINUS 1 ........................................................................................................ 2
ZERO - Neutral .............................................................................................. 3
PLUS 1 ........................................................................................................... 4
PLUS 2 very interested in this ................................................................. 5
DON'T KNOW / REFUSED ........................................................................ 9
Appendix F

Q14F

(How interested would you be in...)
Certification by private training organizations
IF NEEDED: Would you rate this certification minus 2 'not at all interested in this for your staff,' plus 2 'very interested in this for your staff' or some number in between?

N=..............................................................................................................................................
MINUS 2 - not at all interested..............................................................................................1
MINUS 1 .......................................................................................................................................2
ZERO - Neutral .............................................................................................................................3
PLUS 1 ........................................................................................................................................4
PLUS 2 very interested in this ..............................................................................................5
DON'T KNOW / REFUSED....................................................................................................9

Now I am going to read you a list of course topics that might be offered for building operations and maintenance staff. Please rate how interested you might be in each of the following types of courses on building or maintenance operations for you or your staff.

Use a scale of minus 2 to plus 2, where minus 2 means 'not at all interested,' plus 2 is 'very interested' or any number in between.

screen

N=..............................................................................................................................................
CONTINUE.....................................................................................................................................1

Q15A

(How interested would you be in a course about...)
Energy Conservation Techniques
IF NEEDED: Would you rate your interest in this type of course for you or your operations or maintenance staff a minus 2, not at all interested, plus 2, very interested, or some number in between?

N=..............................................................................................................................................
MINUS 2 - not at all interested..............................................................................................1
MINUS 1 .......................................................................................................................................2
ZERO - Neutral .............................................................................................................................3
PLUS 1 ........................................................................................................................................4
PLUS 2 very interested in this ..............................................................................................5
DON'T KNOW / REFUSED....................................................................................................9


**Q15B**

(How interested would you be in a course about...)  
HVAC Systems and Controls  
IF NEEDED: Would you rate your interest in this type of course for you or your operations or maintenance staff a minus 2, not at all interested, plus 2, very interested, or some number in between?  
N=..............................................................................................................................................  
MINUS 2 - not at all interested..............................................................................................................1  
MINUS 1..................................................................................................................................................2  
ZERO - Neutral.......................................................................................................................................3  
PLUS 1..................................................................................................................................................4  
PLUS 2 very interested in this .............................................................................................................5  
DON'T KNOW / REFUSED..................................................................................................................9

**Q15C**

(How interested would you be in a course about...)  
Maintenance and related codes  
IF NEEDED: Would you rate your interest in this type of course for you or your operations or maintenance staff a minus 2, not at all interested, plus 2, very interested, or some number in between?  
N=..............................................................................................................................................  
MINUS 2 - not at all interested..............................................................................................................1  
MINUS 1..................................................................................................................................................2  
ZERO - Neutral.......................................................................................................................................3  
PLUS 1..................................................................................................................................................4  
PLUS 2 very interested in this .............................................................................................................5  
DON'T KNOW / REFUSED..................................................................................................................9

**Q15D**

(How interested would you be in a course about...)  
Indoor air quality  
IF NEEDED: Would you rate your interest in this type of course for you or your operations or maintenance staff a minus 2, not at all interested, plus 2, very interested, or some number in between?  
N=..............................................................................................................................................  
MINUS 2 - not at all interested..............................................................................................................1  
MINUS 1..................................................................................................................................................2  
ZERO - Neutral.......................................................................................................................................3  
PLUS 1..................................................................................................................................................4  
PLUS 2 very interested in this .............................................................................................................5  
DON'T KNOW / REFUSED..................................................................................................................9
Appendix F

Q15E

(How interested would you be in a course about...) Facility electrical systems
IF NEEDED: Would you rate your interest in this type of course for you or your operations or maintenance staff a minus 2, not at all interested, plus 2, very interested, or some number in between?

N= ..............................................................................................................................................
MINUS 2 - not at all interested........................................................................................................1
MINUS 1........................................................................................................................................2
ZERO - Neutral...........................................................................................................................3
PLUS 1..........................................................................................................................................4
PLUS 2 very interested in this .....................................................................................................5
DON'T KNOW / REFUSED........................................................................................................9

Q15F

(How interested would you be in a course about...) Efficient Lighting Fundamentals
IF NEEDED: Would you rate your interest in this type of course for you or your operations or maintenance staff a minus 2, not at all interested, plus 2, very interested, or some number in between?

N= ..............................................................................................................................................
MINUS 2 - not at all interested........................................................................................................1
MINUS 1........................................................................................................................................2
ZERO - Neutral...........................................................................................................................3
PLUS 1..........................................................................................................................................4
PLUS 2 very interested in this .....................................................................................................5
DON'T KNOW / REFUSED........................................................................................................9

Q15G

(How interested would you be in a course about...) Energy Auditing
IF NEEDED: Would you rate your interest in this type of course for you or your operations or maintenance staff a minus 2, not at all interested, plus 2, very interested, or some number in between?

N= ..............................................................................................................................................
MINUS 2 - not at all interested........................................................................................................1
MINUS 1........................................................................................................................................2
ZERO - Neutral...........................................................................................................................3
PLUS 1..........................................................................................................................................4
PLUS 2 very interested in this .....................................................................................................5
DON'T KNOW / REFUSED........................................................................................................9
**Appendix F**

**BOC TRAINING AND CERTIFICATION PROGRAM IN THE NORTHEAST**

**Q15H**

(How interested would you be in a course about...)

Preventive maintenance

IF NEEDED: Would you rate your interest in this type of course for you or your operations or maintenance staff a minus 2, not at all interested, plus 2, very interested, or some number in between?

N= ..............................................................................................................................................

MINUS 2 - not at all interested.................................................................1
MINUS 1........................................................................................................2
ZERO - Neutral..........................................................................................3
PLUS 1..........................................................................................................4
PLUS 2 very interested in this .................................................................5
DON'T KNOW / REFUSED.............................................................................9

**Q15I**

(How interested would you be in a course about...)

Electrical systems Maintenance and Troubleshooting

IF NEEDED: Would you rate your interest in this type of course for you or your operations or maintenance staff a minus 2, not at all interested, plus 2, very interested, or some number in between?

N= ..............................................................................................................................................

MINUS 2 - not at all interested.................................................................1
MINUS 1........................................................................................................2
ZERO - Neutral..........................................................................................3
PLUS 1..........................................................................................................4
PLUS 2 very interested in this .................................................................5
DON'T KNOW / REFUSED.............................................................................9

**Q15J**

(How interested would you be in a course about...)

Refrigeration Equipment Maintenance and Troubleshooting

IF NEEDED: Would you rate your interest in this type of course for you or your operations or maintenance staff a minus 2, not at all interested, plus 2, very interested, or some number in between?

N= ..............................................................................................................................................

MINUS 2 - not at all interested.................................................................1
MINUS 1........................................................................................................2
ZERO - Neutral..........................................................................................3
PLUS 1..........................................................................................................4
PLUS 2 very interested in this .................................................................5
DON'T KNOW / REFUSED.............................................................................9
Appendix F

Q15K

(How interested would you be in a course about...)
HVAC Controls Maintenance and Troubleshooting
IF NEEDED: Would you rate your interest in this type of course for you or your operations or maintenance staff a minus 2, not at all interested, plus 2, very interested, or some number in between?
N= ..............................................................................................................................................
MINUS 2 - not at all interested............................................................................................1
MINUS 1 ....................................................................................................................................2
ZERO - Neutral.....................................................................................................................3
PLUS 1 ....................................................................................................................................4
PLUS 2 very interested in this ...........................................................................................5
DON'T KNOW / REFUSED..................................................................................................9

Q15L

(How interested would you be in a course about...)
Heating equipment Maintenance and Troubleshooting
IF NEEDED: Would you rate your interest in this type of course for you or your operations or maintenance staff a minus 2, not at all interested, plus 2, very interested, or some number in between?
N= ..............................................................................................................................................
MINUS 2 - not at all interested............................................................................................1
MINUS 1 ....................................................................................................................................2
ZERO - Neutral.....................................................................................................................3
PLUS 1 ....................................................................................................................................4
PLUS 2 very interested in this ...........................................................................................5
DON'T KNOW / REFUSED..................................................................................................9
Q16

Are there any other training topics which you or your staff would be interested in that I have not mentioned?
N=........................................................................................................................................................
No / No other training topics of interest.................................................................................................00
Yes - Such as? SPECIFY (Do not read; open-ended; up to 5 responses; pre-codes follow; probe: anything
Else)..........................................................................................................................................................
ADA issues ........................................................................................................................................
Air Compressors ..............................................................................................................................
Asbestos/asbestos inspector/asbestos removal ..............................................................................
Boilers ..................................................................................................................................................
Building Maintenance (paint/clean/repair/plumbing) ......................................................................
Building’s automated controls (doors/locks/information systems/fire control panels)........
Computer Skill (CAD/LAN/etc.).....................................................................................................
Earthquake/structural safety/inspections ............................................................................................
Electrical/low voltage .......................................................................................................................
First Aid/blood born pathogens/medical equipment ....................................................................... 
Hazardous waste/material handling management ............................................................................
Hydraulics ...........................................................................................................................................
Maintenance(equipment/grounds) .....................................................................................................
People Skills/Communication Skills/Handling Personnel Issues ..............................................
Pumping ............................................................................................................................................... 
Roofing ................................................................................................................................................
Safety management/Safety/fire safety .............................................................................................
Water system/water operation/waste water management .............................................................
Don't know/ Not sure / Refused ......................................................................................................99

We have just discussed twelve training topics for building operations staff, including energy conservation techniques, preventive maintenance, and electrical systems maintenance and troubleshooting. Think of the one staff member you would be most likely to send for training on these topics. (It could be yourself.) I am going to read a list of operator activities. Please tell me whether you believe this employee has conducted the activity in the last 6 months.
N=........................................................................................................................................................
CONTINUE.........................................................................................................................................1

Q17

In the last six months has this employee installed lighting controls?
Yes..................................................................................................................................................
No ................................................................................................................................................
Don’t know/ Refused .....................................................................................................................
Appendix F

Ask if Q17=yes (installed controls); otherwise skip to Q19

Q18
Approximately what percentage of the floor area is affected by the controls?
___%
don’t know/refused..........................................................................................................................

Ask if Q17=no (not installed controls); otherwise skip to Q20

Q19
Is the employee responsible for lighting equipment?
Yes.............................................................................................................................................
No ...............................................................................................................................................DK/Ref...........................................................................................................................................

Ask if Q17=yes (installed lighting controls) or Q19=yes (responsible for lighting); otherwise skip to Q22 (HVAC)

Q20
In the last six months, has this employee replaced less efficient lamps or fixtures with more efficient ones (sometimes called a lighting retrofit)?
Yes.............................................................................................................................................
No ...............................................................................................................................................DK/Ref...........................................................................................................................................

Ask if Q20=yes (retrofit); otherwise skip to Q22

Q21
Approximately what percentage of the floor area was affected by the lighting retrofit?
___
DK/Ref........................................................................................................................................

Ask all respondents

Q22
In the last six months, has this employee installed thermostats or an energy management system (also called an EMS) to control the HVAC system?
Yes.............................................................................................................................................
No ...............................................................................................................................................DK/Ref...........................................................................................................................................
Ask if Q22= yes (HVAC controls); otherwise, skip to Q24

Q23
Approximately what percentage of the floor area was affected by the HVAC controls?

____%  
DK/Ref......................................................................................................................................

Ask if Q22= no (no HVAC controls); otherwise, skip to Q25

Q24
Is this employee responsible for HVAC equipment?

Yes.............................................................................................................................................
No ..............................................................................................................................................
DK/Ref......................................................................................................................................

Ask if Q22= yes (HVAC controls) or Q24= yes (responsible for HVAC); otherwise, skip to 33 (motors)

Q25
In the last six months, has this employee installed air handler door gaskets or damper seals?

Yes.............................................................................................................................................
No ..............................................................................................................................................
DK/Ref......................................................................................................................................

Ask if Q25= yes (gaskets); otherwise, skip to Q27 (unitary equipment)

Q26
Was that door gaskets or damper seals or both?

Door gaskets ..............................................................................................................................
Damper seals ..............................................................................................................................
Both...........................................................................................................................................
DK/Ref......................................................................................................................................

Q27
Has this employee conducted unitary equipment maintenance, such as on air filters, belts, and coils? (If necessary, add: “in the last 6 months”.)

Yes.............................................................................................................................................
No ..............................................................................................................................................
DK/Ref......................................................................................................................................
Appendix F

Q28
Has this employee conducted chiller system or cooling tower maintenance? (If necessary, add: “in the last 6 months”.)
Yes..............................................................................................................................................
No ..............................................................................................................................................
DK/Ref......................................................................................................................................

{Ask if Q28=yes (chiller maintenance); otherwise, skip to Q30}

Q29
What is the size of the chiller (in tons)?
___tons.....................................................................................................................................
DK/Ref......................................................................................................................................

{Ask if Q28=no (no chiller maintenance); otherwise, skip to Q31}

Q30
Is the employee responsible for a chiller system or cooling tower?
Yes.............................................................................................................................................
No ..............................................................................................................................................
DK/Ref......................................................................................................................................

Q31
Has this employee conducted economizer maintenance in the last 6 months?
Yes.............................................................................................................................................
No ..............................................................................................................................................
DK/Ref......................................................................................................................................

Ask if Q31=no (no economizer maintenance); otherwise, skip to Q33 (motors)

Q32
Is the employee responsible for an economizer?
Yes.............................................................................................................................................
No ..............................................................................................................................................
DK/Ref......................................................................................................................................

Ask of all respondents

Q33
In the last six months, has this employee installed newly purchased motors?
Yes.............................................................................................................................................
No ..............................................................................................................................................
DK/Ref......................................................................................................................................
Ask if Q33=yes; otherwise, skip to Q35

Q34
Approximately what percentage of the installed motors were energy efficient?
___%  
DK/Ref.................................................................

Ask if Q33=no; otherwise, skip to Q36

Q35
Is the employee responsible for motors and drives?
Yes.............................................................................................................
No ..........................................................................................................
DK/Ref.................................................................................................

Ask if Q33=yes (installed motors) or Q35=yes (responsible for motors); otherwise, skip to Q43 (boilers)

Q36
Has this employee installed any variable frequency drives (also called VFDs) in the last six months?
Yes.............................................................................................................
No ..........................................................................................................
DK/Ref.................................................................................................

Ask if Q36=yes; otherwise, skip to Q38

Q37
Approximately what is the total horsepower of the affected motors?
___ hp  
DK/Ref.................................................................

Q38
Has this employee conducted motor maintenance, including belt alignment, in the last six months?
Yes.............................................................................................................
No ..........................................................................................................
DK/Ref.................................................................................................
Appendix F

Ask if Q38=yes; otherwise, skip to Q40

Q39
What is the approximate total horsepower of the affected motors?
___hp
DK/Ref.................................................................

Q40
Has this employee conducted air compressor maintenance, such as working on filters, belts, and leaks? (If necessary, add: “in the last 6 months.”)
Yes.................................................................................................................................
No .................................................................................................................................
DK/Ref...........................................................................................................................

Ask if Q40=yes; otherwise, skip to Q42

Q41
What is the approximate operating pressure of the compressor?
___psig
DK/Ref.................................................................

Q42 intentionally omitted

{Ask if Q40=no (no compressor maintenance); otherwise skip to Q44 (boilers)

Q43
Is the employee responsible for any air compressor equipment?
Yes.................................................................................................................................
No .................................................................................................................................
DK/Ref...........................................................................................................................

Ask of all respondents

Q44
Has this employee conducted boiler maintenance, including replacing steam traps?
Yes.................................................................................................................................
No .................................................................................................................................
DK/Ref...........................................................................................................................
Ask if Q44=yes; otherwise, skip to Q47

Q45

What approximately is the rated output of the boiler?
___ MMBtu/hour OR
other rating (specify):_____
DK/Ref......................................................................................................................................

Q46 Question was intentionally deleted

Ask if Q44=no; otherwise, skip to Q48

Q47

Is the employee responsible for boilers?
Yes............................................................................................................................................
No .............................................................................................................................................
DK/Ref......................................................................................................................................

Q48-50

Questions were intentionally deleted

Ask all respondents

Q51

In the last six months has this employee installed any devices or taken any actions to save water?
Yes............................................................................................................................................
No .............................................................................................................................................
DK/Ref......................................................................................................................................

Ask if Q51=yes; otherwise, skip to Q54

Q52

Please identify types of water-saving measures installed. (do not read; open-ended; up to 6 responses; pre-codes follow; probe: anything else?)
Cooling tower overflow repair.................................................................
Condensate return system installed or repaired........................................
Low flow faucet or shower heads installed..............................................
Low flow toilets installed........................................................................
Changed irrigation practices...................................................................
Other (describe)......................................................................................
DK/Ref..................................................................................................................................
Appendix F

Q53
What was the approximate water savings estimated to result from the measures?
___ gallons per ___ (day, year, etc)
DK/Ref........................................................................................................................................

{Ask if Q51=no; otherwise, skip to Q55}

Q54
Is the employee responsible for the operation or maintenance of water-using equipment?
Yes..........................................................................................................................................
No .........................................................................................................................................
DK/Ref....................................................................................................................................

Ask all respondents

Q55
In the last six months, has the employee taken actions that I have not mentioned to reduce the facility’s use of electricity, gas, oil, or water?

Ask if Q55=yes; otherwise, skip to Q62

Q56
What things have been done? (open-ended; up to 5 mentions; probe “anything else?”)

Q57
Do you have any savings estimates associated with these activities that you can tell me? (open-ended; up to 4 mentions—electricity, gas, oil, and water savings)

Q58-Q61
These questions were intentionally deleted

Q62
What is the approximate square footage of the total CONDITIONED space of the facility where you work? {RKM?? Want to allow for a number as high as tens of millions (xx,xxx,xxx). Commas may be useful to survey staff so they can visually check there work. But not sure how many spaces CATI needs to leave to record response. Adjust the DK code as necessary.}
N= ...........................................................................................................................................
Don't Know/Not Sure / Refused ..............................................................................................99999999
Q63
The equipment that this employee works on, does it serve this whole space, or just a part?
Whole........................................................................................................................................
Part............................................................................................................................................
Don’t know / Refused...........................................................................................................9

{Ask if Q63=part; otherwise, skip to Q65}

Q64
What is the approximate square footage of the CONDITIONED space served by the
equipment your employee works on? {RKM. See comment Q67}
N=..............................................................................................................................................
Don't Know/Not Sure / Refused ...........................................................................99999999

Q65
Skip Q65 and go to Q66 if  (Q5=01 and Q6=01) or (Q8=01 and Q9=01); SKIP IF SELF or
STAFF HAS CERTIFICATION from NEEP
Are you aware of the Building Operators Certification offered by __(name of utility)__
and the Northeast Energy Efficiency Partnership (NEEP)?
N=..............................................................................................................................................
Yes...........................................................................................................................................1
No ............................................................................................................................................2 skip to X19
Don't know / Refused ...........................................................................................................3 skip to X19

{Ask if Q65=yes or (Q5=01 and Q6=01) or (Q8=01 and Q9=01); otherwise, skip
to Q67}

Q66
How did you hear about the Building Operators Certification?
(open-ended; do not read; record the first mention)
N=..............................................................................................................................................
Utility representative ..........................................................................................................01
Utility seminar.......................................................................................................................02
Utility mailing or advertisement .......................................................................................03
Other Mailing/Advertisement/Flyer ................................................................................04
Boss or co-worker.................................................................................................................05
Professional or trade association / publication ..............................................................06
Conference or trade show ...............................................................................................07
Friend or colleague..............................................................................................................08
Internet.................................................................................................................................09
School/college ....................................................................................................................10
Other......................................................................................................................................97
Don't know / Refused .........................................................................................................99
**Appendix F**

**Q67**

Have you considered going yourself or sending any of your staff to earn a building operators certification?

N= ..............................................................................................................................................

Yes ........................................................................................................................................1

No ..........................................................................................................................................2

Don't know / Refused ...........................................................................................................9

Let me tell you a little more about (inset name of specific utility here)’s program.

The Building Operator Certification offers two levels of certification. The first level includes seven courses covering a variety of building systems topics such as HVAC, building maintenance codes and energy conservation techniques. Courses meet for EIGHT days scattered during a SEVEN month period. You are certified after the course work is completed.

The second level focuses on trouble shooting systems and requires level 1 certification.

PRESS ENTER TO CONTINUE @X20

**Q68**

Now that you have heard a little more about the course, would you consider going yourself or sending any of your staff to earn building operators certification?

N= ..............................................................................................................................................

Yes ........................................................................................................................................1

No ..........................................................................................................................................2 skip to Q23

Don't know / Refused ...........................................................................................................9 skip to Q22

**Q69**

Including yourself, how many staff members do you think you might send?

N= ..............................................................................................................................................

DON'T KNOW / REFUSED ........................................................................................................99999
Ask if Q68=yes and Q69>0; otherwise, skip to Q73

Q70
How much would you be willing to pay for a staff person to attend the 8-day building operators certification's seven course training series?
N= ..............................................................................................................................................
NOTHING/NOT WILLING TO PAY........................................................................................0000
Don't know / Refused ...........................................................................................................9999

XQ70
SET ANSWER FROM Q70 INTO RANGES
SET RANGE OF ANSWER GIVEN IN Q70
N= ..............................................................................................................................................
Nothing/not willing to pay .................................................................................................0
$1 TO less than $1,200..........................................................................................................1
$1,200 TO less than $1,400...................................................................................................2
$1,400 OR OVER....................................................................................................................3
Don’t know/Refused .............................................................................................................9

Q71
Skip Q71 and go to Q72 if XQ70=2,3; SKIP IF SAID $1,200 OR OVER
Skip Q71 and go to Q73 if XQ70=0; Skip if said “not willing to pay”
Would you be willing to pay $1,200.
N= ..............................................................................................................................................
Yes...........................................................................................................................................1
No ...........................................................................................................................................2
Don't know / Refused ...........................................................................................................9

Q72
Skip Q72 and go to Q73 if XQ70=3 or Q71=2 or Q71=9
Would you be willing to pay $1,400?
N= ..............................................................................................................................................
Yes...........................................................................................................................................1
No ...........................................................................................................................................2
Don't know / Refused ...........................................................................................................9
Appendix F

Q73
Consider a job applicant whose resume indicates that he or she has BOC certification. How would certification contribute to the assessment you form about the suitability of this applicant for the job? Would it: (read list)
Enhance your assessment .............................................................................................................
Leave unchanged your assessment ..............................................................................................
Decrease your assessment ........................................................................................................... 

Q74
Finally, I'd like to ask you a few questions about you and your organization only to group your answers with others. How long have you been in building operations and maintenance?
ENTER WHOLE YEARS
N=................................................................................................................................................
Don't know/ REFUSED ................................................................................................................

Q75
Are you a member of any of the following professional or trade associations?
READ 1-2
N= ................................................................................................................................................
International Assoc. of Facility Managers (IFMA)........................................................................1
Building Owners and Managers Association (BOMA)...............................................................2
None of these................................................................................................................................8
Don't know / Not sure / Refused..................................................................................................9
Q76

Are you a member of any other professional or trade associations that I have not mentioned?

CLARIFY FOR NAME IF INITIALS

Yes - Such as? (This is an open-ended question with pre-coded responses below)
No, not a member to any others ................................................................. 00

Don't know / Not sure / Refused ................................................................. 98

(The responses here are pre-codes. They were the responses the last time the survey was administered. Do not limit
the list to this, if other responses are given.)
Hospital Engineering/American Society of Health Care Engineering ................. 01
AFE - American Facility Engineers ................................................................. 02
APPA - Association of Physical Plant Administrators .................................... 03
ASHRAE - American Society Heating Refrigeration and Air Conditioning Engineers .... 04
IEEE - Institute for Electronic and Electric Engineers ........................................ 05
NWA - National Hospital Association ............................................................ 06
RSES - Refrigeration Service Engineer Society .............................................. 07
IREM - Institute of Real Estate Management ................................................... 08
NFPA - National Fire Protection Agency ......................................................... 09
IEE - Inspectors of Electrical Engineering ....................................................... 10
AEE - Association of Energy Engineers .......................................................... 11
AIA - American Institute of Architects ......................................................... 12
IFMA ................................................................................................... 13
OTHER MISCELLANEOUS ............................................................................. 01

Q77

Is your organization a private sector or public sector entity?
N= ............................................................................................................
Private ................................................................................................. 1
Public ................................................................................................... 2
Don’t Know/ Refused ............................................................................ 9
Appendix F

Q78
Which of the following best describes the type of facility your operators manage? (open-ended. Do not read. Pre-codes given)
N=..............................................................................................................................................
Government..........................................................................................................................01
Grocery..................................................................................................................................02
Lodging.................................................................................................................................03
Manufacturing.....................................................................................................................04
Medical.....................................................................................................................................05
Military..................................................................................................................................06
Office.....................................................................................................................................07
Public Utility.........................................................................................................................08
Retail......................................................................................................................................09
Schools/colleges.................................................................................................................10
Shipyard................................................................................................................................11
Transportation......................................................................................................................12
Wholesale or Warehousing...............................................................................................13
Other (describe)...................................................................................................................98
Don’t know / refused..........................................................................................................99

Q79
Comparing this year to a year or two earlier, has the priority for considering energy efficiency in operation and maintenance at your facility stayed the same or become more important?
N=..............................................................................................................................................
Stayed the same.....................................................................................................................1
Become more important.......................................................................................................2
Don't know/ Refused ............................................................................................................9

GENDR
RECORD GENDER
N=..............................................................................................................................................
Male.........................................................................................................................................1
Female .....................................................................................................................................2

INT01
That's all my questions. If you would like a copy of the results of this survey they will be available in the fall at the NEEP website located on the Internet. Thank you for your time and cooperation.
Completed Interview.............................................................................................................1