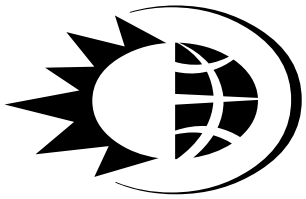

NORTHWEST ENERGY EFFICIENCY ALLIANCE

Market Progress Evaluation

Building Operator Certification, No. 3 (5/00)

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REGIONAL BUILDING OPERATOR CERTIFICATION

MARKET PROGRESS EVALUATION REPORT

Submitted To:

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In addition, our thanks go to the building operators and their supervisors who responded to our questions about the BOC courses and to our baseline survey. These men and women are seldom recognized for the significant contribution they make to the daily comfort and safe working environment of workers throughout the region. We found them consistently generous with their time and thoughtful about the issues of building operations and maintenance.

Finally, we would like to thank Dune Ives-Petersen and Andy Ekman of the Alliance. They have provided a working environment that assured the evaluation was both timely and thorough.

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EXECUTIVE SUMMARY

A BRIEF HISTORY OF THE BUILDING OPERATOR CERTIFICATION (BOC) VENTURE

In 1987, the Washington State Energy Office developed the region's first course in energy maintenance practices for building operators and facility managers, called the Building Operators Training (BOT) program. Independent of the BOT, agencies in Idaho developed the region's first certification program for building operators. In 1990, the Idaho Department of Water Resources (IDWR) and the Idaho Building Operators Association (IBOA) brought a group together to begin development of a training program. IBOA began offering a course series and a one-year building operator's certification in 1993. Its successor agency—Northwest Building Operators Association (NWBOA)—continues to offer a BOC course series in 1999.

As a result of the success of the Idaho BOC, the BOT staff and steering committee recognized that certification would be a more effective long-term strategy than training alone for improving building operations. They redesigned the BOT from a single course to a multi-course BOC program leading to a three-year certification. After the closure of the Washington State Energy Office in 1996, the Washington BOC found a home with the Northwest Energy Efficiency Council (NEEC).[1]

The NEEC BOC was the first operator certification program to be funded by the Northwest Energy Efficiency Alliance (the Alliance), in 1996. The funding to NEEC was focused on getting the NEEC BOC operational and established first in Washington and later into Oregon. IBOA received funding from the Alliance in 1997 to assist their BOC efforts through marketing and evaluation research support. In addition, the Alliance funding designated IBOA as the lead agency for facilitating a region-wide approach to building operator training and certification.

[1] The Washington State Energy Office operated from the 1970s to its closure in 1996.

EVALUATION OVERVIEW

The Alliance contracted with Research Into Action, Inc. in March 1998 to conduct an evaluation of the region-wide BOC market transformation efforts during 1998-1999. The evaluation built on results of the evaluation of the 1997 Washington BOC effort and included five key activities focused on the region-wide program.

- Interviews with participating students and their supervisors for the NEEC BOC in 1998 and 1999 and for NWBOA Idaho and Montana BOC in 1999 and 2000;
- Interviews with venture staffs, instructors, and Steering Committee members;
- A review of the NEEC BOC program database and documents;
- A survey to assess operations and maintenance actions taken by NEEC BOC students as a result of course attendance and to provide estimates of energy impacts resulting from these actions; and
- A baseline market assessment of the four-state region.

This fifth Market Progress Evaluation Report (MPER) follows four previous MPERs, two addressing the results of the 1997 Washington BOC venture, and two addressing the regional efforts of NEEC and NWBOA in 1998 and 1999.[2]

PURPOSE OF THIS REPORT

This report is the fifth MPER addressing NEEC's BOC efforts in Oregon and Washington and the efforts of NEEC and NWBOA to accomplish a region-wide approach to building operator certification. The report includes an analysis of all student, employer/supervisor and instructor survey responses obtained to date, reviews the progress of the regional coordination process, and provides an assessment of how well the NEEC BOC has progressed in reducing market barriers and achieving long-term sustainability.

[2] See Alliance reports E97-001, E98-007, E98-007A, E98-015, E99-027 and E99-031 *http://www.nwlliance.org/*.

PROGRAM STATUS

Overall, students and employers find the NEEC BOC and the NWBOA BOC training programs useful and relevant to their jobs. The NEEC BOC training, which has been supported by the Alliance, has been able to meet enrollment, registration and certification goals in both Oregon and Washington. NEEC has offered the BOC training in a variety of locations both east and west of the Cascades in Washington, and in both northern and southern Oregon locations, with eastern Oregon locations planned for 2000. Distance learning tools are still being investigated, and promise to further the reach of the program when they are refined.

Program Goals

The 1999 targets for the Washington and Oregon BOC were to:

- Enroll an additional 175 Washington and 80 Oregon building operators, for a program-to-date total of 415 enrollees in Washington and 140 in Oregon;
- Certify a cumulative total of 80 Washington and 35 Oregon building operators;
- Transfer curriculum to two additional training providers; and,
- Earn annual revenues of $60,000 in Washington and $11,000 in Oregon from training and certification fees.

The number of students enrolling in the NEEC BOC continues to increase and to surpass NEEC's goals. As of September 20, 1999, there were 696 people enrolled and 389 students who had attended at least one class in Washington or Oregon. Of these, 338 students had completed the course series, with 84 of these from Oregon. (The first course in Oregon began in spring 1998.)

As of September 30, 1999, eight BOC series had been completed in Washington and three in Oregon, since the first pilot at Boeing in 1996. In addition, three course series were in session in Washington and one was in session in Oregon.

As of September 30, 1999, NEEC had far exceeded the 1999 revenue goals for Washington and Oregon with revenues of $149,607 and $70,435, respectively.

Number of People Certified

As of September 30, 1999, NEEC had certified 125 operators (48%) of the 338 students who attended a full course series in Washington or Oregon where certification was offered. This is a substantial increase over the 22% rate of certification found at the end of 1998. This global rate of certification has been achieved for all but one course series. The high rate is due to the persistence of the NEEC BOC staff in working with students to complete their projects up to two years after the course series was completed.

Regionalization

The discussions among NEEC and NWBOA staffs in 1998 and 1999 to develop a region-wide approach to BOC successfully resolved curriculum differences and facilitated the development of a common curriculum. The administrative issues took more time to resolve. These issues included: how the curriculum would be updated future, how training and certification would be managed and by whom, and how training would be conducted in Montana. These issues were resolved in January 2000.

Transfer of Curriculum to Other Education Providers

In 1998, NEEC broadened its criteria for determining whether the course has been successfully "transferred" to other education providers to include organizations that:

- *Accredit* the BOC for their membership, rather than adopting the curriculum and teaching it internally. Accreditation means the organization offers credit hours or continuing education units for BOC courses

- *Recognize* the course. Recognition means that the organization has publicly endorsed the program as a professional development opportunity for members or employees.

By September 30, 1999, six organizations had accredited the curriculum and five organizations had recognized the BOC as a professional development program for their members involved in facility O&M. These organizations are listed in Chapter 2. NEEC continues to work toward more of these arrangements.

Implications for Long-Term Viability

Long-term viability of the NEEC BOC program appears solid. Over the course of the evaluation we have seen increased private sector participation, large numbers of students who report plans to be re-certified or to attend the Level II series, and many employers who are enthusiastic about sending multiple employees. In addition, NEEC is working with organizations in several other states to offer BOC training and certification outside of the Pacific Northwest. These efforts, along with continued efforts to attract private sector participation and to keep the curriculum fresh, up-to-date and interactive, will likely ensure NEEC's success.

A resolution of issues surrounding regional certification is required if the region is the see the market transformation benefits of the NEEC BOC Venture. The goal in funding the NEEC BOC was to gain market transformation for building operations. The current impasse between NEEC and NWBOA on regional issues stand in the way of the larger goal that all building operators in the Pacific Northwest have access to state-of-the-art training.

KEY EVALUATION FINDINGS

Survey Findings

For this fifth MPER, we conducted interviews with students and their employers from the Portland and Medford, Oregon, and Tri-Cities, Washington courses. Overall, students and their employers express very positive assessments of both course series and a willingness to pay for the course.

The results for the NEEC BOC courses were highly consistent with those obtained during 1998 and 1997. The cumulative results from all phases of the multi-year evaluation indicate that HVAC is the most useful course, followed by building systems overview and electrical systems. The cumulative results show that employers expect to send additional employees to the BOC and expect to look for the BOC on the resumes of prospective employees and that students have confidence that the BOC is good for job development.

We also conducted long-term follow-up interviews with students and employers who completed the NEEC BOC Kitsap, Spokane, Everett, Kent, and Olympia course series. These series were completed over one year ago and provided an opportunity to assess the long-term benefits of taking the NEEC BOC course. Students and employers reported long-term satisfaction with the NEEC BOC training. Fifty percent of the students credited the BOC with a subsequent increase in job responsibility or compensation and 82% reported having implemented activities

that improved the comfort of building occupants or saved money as a result of BOC training. On a long-term basis employers rated the building system overview as the most useful course, while students continued to rate HVAC as the most useful course.

Impact Assessment

We developed two strategies for estimating NEEC BOC program impacts. The first was to review the savings assumptions used in funding the NEEC BOC effort and make adjustments based on actual program participant data. The second was to look at the incremental improvements Level I students reported making in how they do their job and the projects they felt they improved as a result of their training. We then compared these estimates to the initial program assumptions.

After reviewing the savings assumptions we concluded that the only assumption that could be tested was the assumed square foot of building space affected by the BOC training. Students reported square footage of the facilities they operate averaged 104,000 square feet. This figure is almost ten times that in the original program assumptions.

Twelve of the 34 students contacted for the long-term follow-up indicated involvement in projects following their NEEC BOC training. Of these three were involved in projects with estimates of savings that equal the initial program estimates regarding the level of potential savings for the entire program. Given this, it appears that 10% of students may be involved in retrofit projects providing more extensive savings than the initial program estimates.

RECOMMENDATIONS

Recommendation 1: Work to ensure the building operators' certification training has recognition throughout the four-state region.

A region-wide approach to BOC has been at the core of the market transformation goal. NEEC and NWBOA should continue to pursue good faith efforts to implement the January 2000 agreement.

Recommendation 2: Continue to expand the NEEC BOC program.

NEEC should continue to expand its program reach into rural areas and into the private sector. Students surveyed for this MPER asked for more courses "east of the

mountains." NEEC should continue to explore local sponsorship, technology options, and other means to increase delivery of the BOC course in remote areas. In addition, private-sector firms appear to be represented among past BOC students at a little over one-half the rate they appeared in the baseline survey (42%), although the proportion has increased over time. NEEC should continue its efforts to engage this sector in the trainings.

Recommendation 3: Continue to refine the NEEC BOC course series.

NEEC should continue to refine the BOC course series. In particular, NEEC should seek to increase the opportunity that students have during the training to apply the concepts presented. With such course refinement, the frequency with which students report that they are "extremely satisfied" with the series might increase. This recommendation, however, should not diminish NEEC's significant achievement: 80% of students have been satisfied or extremely satisfied with the training and only 2% of students have been dissatisfied.

Recommendation 4: Adapt NEEC BOC content and delivery to unique course sites.

When the BOC is offered at the request of specific employers, or in settings where only one employer sends students as occurred in the Tri-Cities in 1998-99, program staff should identify the experience, education level, and expertise of these students and meet with the employer. Using this information the training approach could be adapted to better meet the needs of students and their employer.

Recommendation 5: Continue to evaluate the 1999 and 2000 BOC trainings in all four states.

The Alliance should continue to evaluate the NEEC BOC training course series in Washington and Oregon and, using the same format, the NWBOA training course series in Idaho and Montana. Such an evaluation approach will provide data for a comparative analysis of the strengths of the two approaches and of the challenges they each face, and will generate information that can be used to improve both course offerings.

Recommendation 6: Redesign or substantially revise the NEEC BOC database.

NEEC should take steps to eliminate the irregularities and omissions found in the BOC program database. Specifically, NEEC should define all data fields, constrain data entries for fields so that entries will be not be out of bounds and the size of the database will remain manageable, and complete data entry for all fields. Only with a complete and accurate database can the achievements of the program be ascertained and used for case studies, for evaluation or for demonstration of value to funding sources and clients.

1. INTRODUCTION

PROGRAM OVERVIEW

Building operations and maintenance activities have long been identified as critical components for the efficient operation of commercial and industrial buildings. Yet, building operations and maintenance staff are often among the least educated about energy issues and among the least valued of staff in a company. These conditions led professionals interested in increasing the region's energy efficiency to wonder how operations and maintenance staff could receive training and education that would increase their capabilities, their estimation of the importance of their work, and their valuation by the market.

In 1987, the Washington State Energy Office developed the region's first course in energy maintenance practices for building operators and facility managers, called the Building Operators Training (BOT) program. The course aimed to improve the energy management skills of building operators, but did not offer certification.

Independent of the BOT, agencies in Idaho developed the region's first certification program for building operators. In 1990, the Idaho Department of Water Resources (IDWR) and the Idaho Building Operators Association (IBOA) brought a group together to begin development of a training program. The energy efficiency section of the Bonneville Power Administration and Idaho Power helped to fund the program called the Building Operator Certification (BOC) program. IBOA began offering a course series and one-year building operator's certification in 1993. Its successor agency—Northwest Building Operators Association (NWBOA)—continues to offer the course series in 1999.[3]

As a result of the success of the Idaho BOC, the BOT staff and steering committee recognized that certification would be a more effective long-term strategy for improving building operations. They redesigned the BOT from a single course to a multi-course program leading to a three-year certification. The Washington BOT

[3] In January 1999, IBOA changed its name to NWBOA. Both names are used in this report, with IBOA typically used to describe the agency and its activities prior to January, 1999, and NWBOA used to describe it from January 1999 on.

program evolved into the currently offered BOC program. Its curriculum and structure is a direct outgrowth of research and course development conducted in 1995 and 1996 to generate a certificate-based program. After the closure of the Washington State Energy Office in 1996, the Washington BOC found a home with the Northwest Energy Efficiency Council (NEEC).[4]

In 1996, the NEEC BOC became the first building operator certification program to be funded by the Northwest Energy Efficiency Alliance (the Alliance). IBOA received funding in 1997 to assist with their BOC efforts.

With respect to the Alliance's funding structure, the NEEC BOC is a market transformation venture, expected to become financially self-sustaining after an initial period of Alliance help. The funding for IBOA is not venture-based, but instead provides funds for market research activities. The funding also established IBOA as the lead organization for coordinating regional BOC efforts across Washington, Oregon, Idaho and Montana. The sponsoring organizations—NEEC and IBOA—refer to their activities as programs. Consequently, the terms venture and program will be used interchangeably in this report, with the understanding that the Alliance maintains the goal that the BOC efforts of both organizations become self-sustaining.

Although the NEEC BOC and the IBOA BOC programs were developed independently and continue to have a number of differences in structure and content, both programs target building operations and maintenance practices. Both have the goal of improving energy and resource efficiency by enhancing the skills, knowledge and capabilities of building operations staff.

NEEC BOC

In December 1996, NEEC requested $275,000 annually from the Alliance to fund a Building Operator Certification market transformation venture in Washington State. The funding was approved at the December 17, 1996, meeting of the Alliance Board of Directors. NEEC proceeded to implement the venture in 1997 and extended its reach to include Oregon the following year.

Initially offered as a three-year certification period, the Level I course series currently provides certification for two years. NEEC now also offers a course series

[4] The Washington State Energy Office operated from the 1970s to its closure in 1996.

for Level II certification and anticipates offering a Level 3 certification series in the near future.

The Level I series comprises seven courses.[5] Courses are held monthly, with five courses lasting one day each and two courses lasting two days each. NEEC provides certification, based on the completion of independent projects and tests of competency. Candidates who meet the requirements must submit an application to be certified. Re-certification is met through continuing education and is required every three years.

The Level II series comprises four required and two elective courses. Level II offers advanced education for Level I certified operators as well as advanced continuing education for qualifying students who did not take the Level I series.

A NEEC program director heads the BOC and is assisted by a curriculum director and an administrative assistant. A professional experienced with building operations training programs is on contract with NEEC to review all student projects. NEEC hires site coordinators as needed for courses in Washington, and has a full-time site coordination manager and a part-time assistant who acts as the on-site coordinator in Oregon. NEEC also has marketing and graphic support contractors who assist in preparing curriculum materials, student handbooks, and instructor manuals for publication. NEEC's Board of Directors is not directly involved in the implementation of the BOC program.

Thirteen instructors located in eastern and western Washington and western Oregon teach the courses. Most of the instructors have extensive experience in training building operators—some through technical colleges and some independently.

Both the Oregon and Washington efforts have Steering Committees comprised of governmental, utility, educational, and industry experts in building operations in their respective states. These committees guide the development of the BOC program in each state.

The Washington Steering Committee has its roots in the steering committee initiated by the Washington State Energy Office at the outset of the BOT in 1987 and some members of the original committee still serve. This committee includes 14 representatives from government, utilities, technical colleges, and industry, plus

[5] A copy of the course descriptions and enrollment information for the NEEC BOC is included in Appendix D.

three NEEC staff and a representative from the Alliance. In the program's first years (1997-1998), the Steering Committee met quarterly to review plans, make recommendations, and ensure the program was meeting the needs of building operators and their employers. The committee no longer meets regularly, but may be called on once or twice a year to confer on program changes.

In 1997, NEEC organized the Oregon Steering Committee to support the extension of the program into Oregon the next year. The committee includes ten representatives from government, utilities, technical colleges, and industry, plus four NEEC staff and one Alliance staff member. As with the Washington Steering Committee, the Oregon committee meets quarterly to review plans, make recommendations, and to ensure that the program is meeting participants' needs.

IBOA/NWBOA BOC

First offered in 1993, the series for Level I certification comprises four one-day courses and two two-day courses, with courses held once a month. In 1995, IBOA developed a series for Level II certification, including a course in HVAC and Energy Management. In 1997, the Level I series was made available by video for the first time. A Level 3 course in Management is currently under development. IBOA provides Level I certification based on the satisfactory completion of a test. Unlike the NEEC BOC, no independent projects are required and certification lasts for one year. Re-certification is based on completion of continuing education requirements, occurs every year, and is tied to membership renewal.

In January 1999, IBOA officially became NWBOA and offered its curriculum in Boise, Idaho and Missoula, Montana. Membership in NWBOA is open to building operators in the four-state region.

The NWBOA program has a different staffing structure than the NEEC program. NWBOA contracts for association management with a management firm owned by the NWBOA Executive Director. The management firm provides all administrative services to the certification program, including organizing the training sessions and maintaining the database. The executive director also manages four other associations representing various industries. She allocates about 20% of her time to the certification program.

NWBOA has a ten-member Board of Directors that includes representatives from government, utilities, public and private sectors, and industry specialists in building operations. The executive director also serves on the Board. The Board meets quarterly to oversee implementation of the BOC program, to ensure program quality, and to plan future efforts.

In late 1997, IBOA received funding from the Alliance for a multi-task project. Through this project, the NWBOA management company agreed to, implement an evaluation survey of trainees, conduct a marketing survey of private sector interest in the BOC, develop a marketing strategy for the private sector based on the survey results, and facilitate a Regional Coordinating Committee. The Regional Coordinating Committee was structured to include NEEC BOC representatives from Washington and Oregon, IBOA BOC representatives, and representatives from Montana interested in offering BOC. As further discussed below, the goal of the coordination effort was to ensure the certification process would be reciprocal across the four states.

Regional Coordinating Committee

The Alliance contract with NWBOA led to the development of a Regional Coordinating Committee to work toward making the BOC a regionally recognized certification program.

Key issues discussed by the committee include establishing a single, regional:

- Curriculum,
- Test,
- Certifying body, and
- Certification period.

Facilitated by NWBOA's Executive Director, the committee did not have a planned schedule for meetings, but met several times during 1998 and 1999. The committee comprises:

- Two NEEC staff from Washington;
- One steering committee member and one staff from Oregon;
- Two NWBOA Board of Directors members in Idaho;
- The NWBOA Executive Director, and
- Two representatives from Montana interested in establishing the program in their state.

Representatives from the Alliance often attend these meetings but are not formal members. The committee formed two subcommittees, one for curriculum review and development and one for administration. The curriculum subcommittee succeeded in developing a common curriculum for the region. The administration subcommittee sought to develop a common certification process or, as an alternative, a reciprocal certification process. Issues to be agreed upon included the designation of a certifying body (or bodies), certification requirements, and length of certification. As of September 30, 1999, these issues remained unresolved.

The Regional Coordinating Committee last met on April 20, 1999. As of June 1999 the efforts toward regionalization were at a stalemate and efforts. In January 2000, the Alliance, NEEC, and NWBOA were able to resolve the outstanding issues. The process leading to this stalemate and its resolution is discussed in Chapter 7.

EVALUATION APPROACH

Objectives

The Alliance contracted with Research Into Action, Inc. in March 1998, to conduct an evaluation of the region-wide BOC market transformation efforts during 1998-1999. The evaluation built on results of the evaluation of the 1997 Washington BOC effort and included five key activities focused on the region-wide program:

- Interviews with participating students and their supervisors for the NEEC BOC in 1998 and 1999 and NWBOA Idaho and Montana BOC in 2000;
- Interviews with venture staffs, instructors, and Steering Committee members;
- A review of the NEEC BOC program database and documents;
- A survey to assess operations and maintenance actions taken by students as a result of course attendance and to provide estimates of energy impacts resulting from these actions; and
- A baseline market assessment.

In addition, the evaluation includes an investigation of responses to interview questions that were common across all evaluation phases, providing a collective assessment of the 1997-1999 NEEC course series.

Previous Reports

The region-wide evaluation has four scheduled Market Progress Evaluation Reports (MPERs). Two MPERs were completed prior to this fifth report:

- E98-015 *Market Progress Evaluation Report Regional Building Operator Certification Venture: Mid-Year 1998*
- E99-027 and 031 *Market Progress Evaluation Report Regional Building Operator Certification Venture: Number 2. Volume 1* 5/99 (E99-027), *Volume 2* 6/99 (E99-031).

This fifth MPER includes findings from surveys with staff, instructors, students, and employers for both NEEC and NWBOA BOC efforts. Additional data collection will occur during 2000 and will include an assessment of NWBOA's Idaho and Montana BOC efforts in 1999 and 2000, and NEEC's efforts to implement the Level II curriculum and training in Washington in 1999 or 2000.

Interview Guide Development

For this fifth MPER, we used the staff/steering committee interview guide and the student and employers/supervisors interview guides, which were revised in 1998 and again for this MPER. We developed an additional guide to conduct long-term follow-up interviews with student and employers/supervisors who completed the BOC course approximately a year or more before the follow-up.

We revised the instructor survey and modified the approach for obtaining instructor feedback. During this data collection period, the instructor survey was included with the instructors' course packets and instructors were asked to complete the form and return it by mail to Research Into Action at the end of the course. This approach increased the percentage of completed instructor surveys over that obtained in previous evaluation phases.

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

Sample Framework

Three NEEC-sponsored courses were offered over a seven-month period beginning in 1998. The Portland course series ended in December 1998 and the Medford and Tri-Cities courses were completed in April 1999. The detailed results of the

interviews with students and employers for these course series are provided in Appendices A and B.

Table 1 displays the distribution of students by courses reviewed in this fifth report and the total number of unique facilities from which the supervisor sample was drawn.

Table 1

BOC COURSES INCLUDED IN FIFTH MPER

COURSE LOCATION	SPONSORING ORGANIZATION	NUMBER OF STUDENTS	NUMBER OF UNIQUE FACILITIES
Portland, Oregon	NEEC	32	28
Medford, Oregon	NEEC	20	15
Tri Cities, Washington	NEEC	23	13

Table 2 displays the evaluation data collection goals and number of interviews completed for this report.

We derived the research goals for number of student and employer surveys based on our experience from previous phases of the evaluation. We have consistently attempted to reach students from half of the unique facilities represented among the attendees and with the supervisors of half of the interviewed students. For course series in which a large proportion of students came from one or a few facilities, we then surveyed several students from the same facility.

Table 2

DATA COLLECTION ACTIVITIES FOR FINAL 1999 MARKET PROGRESS EVALUATION REPORT

	COMPLETE/GOAL				
ACTIVITY	WASHINGTON	OREGON	IDAHO**	MONTANA**	TOTAL
Staff*	2/2	1/1	2/2	2/2	7

Student Surveys: 1999	7/10	6/10	--	--	13
Employer Surveys: 1999	6/5	4/5	--	--	10
Student Surveys: Long-Term Follow-Up	34/32	Not Planned	Not Planned	Not Planned	34

* *Staff interviews addressed NEEC BOC Level II implementation. In addition to the BOC staff interviewed, we interviewed one Alliance board member and one Alliance staff member.*

*** Student and employer survey results for Idaho and Montana will be reported in the 6th MPER in 2000.*

Data Collection Approach

During the fall of 1999, we attempted contact with every student in each course series (Table 1 reports number of students) in order to achieve the interview goals given in Table 2. We asked each interviewed student to provide the name of his or her supervisor. We attempted contact with each identified supervisor in order to achieve the interview goals.

We also conducted a long-term follow-up of students and their employers from the course series in Spokane, Snohomish/Everett, Olympia, and Kent. We attempted contact with a student from each unique facility, until we reached a sample size of 50% of the previous sample obtained for that course series. We then asked each interviewed student to provide the name of his or her supervisor and attempted to contact one-half of the supervisors thus identified. In contacting students from unique facilities, we explicitly included students who had not been interviewed previously.

Data Analysis

Data pertaining to each NEEC BOC course has been linked by common interview questions. These data were analyzed on a course by course basis throughout the evaluation period. However, for this fifth MPER responses were entered into a database permitting an analysis of the evaluation data for students and employers/supervisors for the BOC courses as a whole and by course series, state, and year. Please note that some questions did not appear on all interview guide versions and, consequently, are not included in the cumulative analysis. The quantitative analysis relies on simple descriptive statistics such as counts and frequencies.

KEY FINDINGS AND RECOMMENDATIONS FROM PREVIOUS MARKET PROGRESS EVALUATION REPORTS

Research Into Action, Inc. conducted an evaluation of the 1997 NEEC BOC efforts in Washington, as well as an evaluation of the NEEC and NWBOA region-wide BOC efforts in 1998 and 1999. The following summarizes the key findings and recommendations from two MPERs completed for the 1997 NEEC BOC effort and two MPERs completed for the NEEC and NWBOA region-wide effort.

Key Findings and Recommendations from MPER #1

In the first MPER[6] addressed several important issues for the NEEC BOC. The report focused on assessing early marketing efforts, enrollment, and student response to the curriculum. We conducted surveys with students and employers from the course series conducted in Kitsap and spoke with staff about program implementation.

Key findings included:

- Students and employers, although dissatisfied with a few of the courses early in the series, expressed overall satisfaction with program and felt that program content and delivery improved as the series progressed.
- Students reported that the out-of-class projects required too much time; consequently, they were dissatisfied that the projects needed to be completed to obtain certification.
- Most students believed that the BOC was good value for the cost, but both students and employers felt that any substantial increase in the cost would limit participation. Employers were willing to pay more than the then-current price: $650 to $700 was acceptable to them, on average.
- NEEC was seen as an appropriate sponsor for the BOC.
- Students and employers expressed confusion about the length of the certification and the requirements for re-certification.

6 E97-001 *Market Progress Evaluation Report: Building Operators Certification-Washington State* (12/97).

- Some students felt that there was too much material for the time allotted, while others felt the course was too basic.

The findings led to optimism about the long-term viability of the NEEC BOC. However, challenges to effective implementation remained. The MPER recommended that NEEC continue its efforts to build credibility as a training organization through working with other professional organizations such as WAMOA, BOMA, and the Operating Engineers Union, as these organizations could assist in marketing the program to their members.

Based on a review of NEEC's program database, the MPER recommended that they collect additional data on students to enable better tracking of student progress. The MPER also recommended that both written program materials and course announcements clarify the length of the certification and the re-certification requirements.

Key Findings and Recommendations from MPER #2

The second MPER[7] presented initial views of the NEEC BOC implementation. Research Into Action conducted interviews with Washington staff and steering committee member and conducted surveys with students and employers from the course series held in Kitsap and Spokane.

Findings from the second MPER included the following:

- NEEC was meeting its goal for course registrations, but certification rates were low, due to the two-year lag permitted to complete certification.[8]

- In response to student reports that they did not have time to complete seven projects, staff reduced the projects to four and provided additional support for students to complete the projects during the course series rather than following course completion. Following this change, certification rates improved for the Spokane course series.

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7 E98-007 *Market Progress Evaluation Report: Building Operators Certification-Washington State* (5/98). E98-007A *Market Progress Evaluation Report (Appendix): Building Operators Certification-Washington State* (5/98)

8 Students in 1997 were offered 3-year certification and had two years following course series completion to finish all work and apply for certification.

- Students and their employers responded positively to the program and felt that NEEC had the credibility to deliver the BOC. Most students and employers believed the course was good value for the price. Employers were willing to pay more than the then-current price: on average, $100 per class seemed appropriate to many employers.

- Students and employers expressed confusion about the re-certification requirement.

- As with the earlier evaluation, most students felt that the course material was too much for the time available, while a few students said that the course was too basic for their level of experience. Some students wanted more hands-on experiences during the course series.

Overall, the NEEC BOC continued to improve in 1997. Staff had made several changes based on the first evaluation findings: they had reduced the number of student projects required; adjusted the curriculum; and hired a marketing director to improve visibility of the program.

The MPER recommended to the Alliance that a market assessment be conducted to determine the number and location of potential students and their desire for training. Also, since employers pay for almost all of the students' registrations, the MPER recommended expanding the awareness of the BOC among Washington employers. It further suggested that promotion should focus on the overall benefits of the BOC, the re-certification requirements, and support available for students in completing in-facility projects.

Key Findings and Recommendations from MPER #3

The third MPER[9] was the first MPER focused on the region-wide program. As a result of expanded funding from the Alliance, NEEC had offered eight BOC course series and expanded the program into Oregon, which included adding new instructors and a part-time marketing director. By mid-1998, NEEC had achieved its enrollment and certification targets, and, compared with previous series, certification rates were increasing.

[9] E98-015 Market Progress Evaluation Report Regional Building Operator Certification Venture: Mid-Year 1998 (10/98).

IBOA had also received funding as part of the region-wide effort. As part of the mid-year evaluation, we examined two IBOA series (one of which used training videos), as well as NEEC's Spokane series through student and employer interviews. Key findings included:

- Most students and employers found the NEEC and IBOA BOC programs useful and relevant to their jobs. NEEC BOC students gave the highest ratings of usefulness to the HVAC and the systems overview courses.

- Many students, in both the NEEC and IBOA courses, thought that the course series contained too much material for the time allotted. As in previous evaluations, students continued to ask for more hands-on activity during the classes.

- The private sector market continued to be underrepresented by Oregon and Washington students, and was poorly represented in the IBOA series as well.[10]

- Idaho students taking the course by video expressed disappointment with this format. Given the magnitude of the course fee, the students would have preferred to have an instructor available to answer their questions.

NEEC staff again had responded to feedback from previous evaluations. Their program had growing recognition and support. We concluded that the long-term viability of the NEEC BOC program seemed very promising. At the same time, it was apparent that the IBOA BOC program had saturated the public sector market and needed to investigate opportunities in the private sector.

The MPER made several recommendations for continuous improvement of the BOC venture. It recommended that NEEC:

- Clarify its marketing strategy in Oregon to ensure adequate levels of enrollment;

- Increase promotion of the program among private sector employers; and

[10] It should be noted that, at this time, IBOA had not yet begun marketing to the private sector.

- Address the ongoing student concerns about the amount of course material in the available time and the desire for more hands-on activity during classes.

In addition, the MPER offered recommendations relevant to both NEEC and IBOA. These recommendations included:

- Continue to involve and train new instructors to ensure a competent, experienced staff for the regional effort; and

- Reconsider the value of video instruction and continue to explore other distance learning techniques that permit student-teacher interaction.

During the period covered by MPER #3, the Regional Coordinating Committee made initial steps to convene and work on a regional-wide approach to BOC for Idaho, Montana, Oregon and Washington.

Key Findings and Recommendations from MPER #4

The fourth MPER[11] focused on NEEC BOC efforts in Washington and Oregon and IBOA's efforts with the regional coordinating committee. Key issues included: the expansion into Oregon, progress made toward the regional certification process and the market potential for a BOC program in all four states, serving both public and private sectors.

The fourth MPER concluded the following:

- The first course series in Oregon was fully subscribed with 40 participants and was well received. NEEC followed their Washington model of developing relationships with public agencies and professional organizations, having a strong steering committee, and using highly trained instructors. This approach was also working well in Oregon.

- During 1998, project completion rates increased from that of previous NEEC series.

[11] E99-027 and E99-031 *Market Progress Evaluation Report Regional Building Operator Certification Venture: Number 2. Volume 1* (5/99), *Volume 2* (6/99).

- The later 1998 NEEC course series showed increased involvement of the private sector.

- Students and employers expressed high levels of satisfaction with the NEEC BOC and noted that it provided credibility to the students or enhanced their position within their organization. Almost all students believed that the course had improved their job performance and that certification would help them in finding a new job.

- More than half of the employers of NEEC BOC students said they plan to send additional staff to the BOC and that they would look for the BOC on the resumes of future employees.

- NEEC continued progress toward transfer of the curriculum to other education providers. Clarification of "ownership" of the NEEC BOC curriculum needed to be resolved for this process to move forward. To date no education providers had purchased the NEEC BOC. However, several organizations had accredited or recognized the BOC as a continuing education or professional development option for their employees or students.

- The baseline survey of the four-state region found that 70% of building operators were unaware of the BOC. The survey concluded that supervisors were willing to pay, on average, $707 for a comprehensive building O&M series. More than one-fifth of supervisors were willing to pay as much as $950. Idaho supervisors had the lowest willingness to pay and Montana supervisors had the highest. Washington supervisors had the second lowest willingness to pay, followed by Oregon. Supervisors were most interested in competency-based training courses. Public and private sector employers ranked a course in preventive maintenance as the most valuable, followed by one in electrical systems.

- NEEC and IBOA continued to work together to craft a regional certification process. While all agreed that regional certification would enhance the long-term viability and market penetration of a certification program, challenges remained. A common curriculum, testing procedures, certifying body and price needed to be determined, and the process for sharing instructors needed to be established.

- During 1998, NEEC, NWBOA, and representatives for Montana jointly explored opportunities to establish a distance learning capability for BOC training in rural areas of the region. Following an extensive review of

available sites and costs, they concluded that distance learning delivery of the regional BOC curriculum in 1999 would cost as much, or more, than on-site delivery in the same locations. Hopefully, these costs will diminish in the future, but for 1999 the option of distance learning was eliminated.

The fourth MPER was optimistic about the long-term viability of the BOC. To ensure continuation of this positive momentum, the MPER made several recommendations. It encouraged NEEC to continue promoting the BOC to the private sector, to continue efforts to secure accreditation or recognition of the BOC, and to resolve the ownership issues necessary for transferring the curriculum to other education providers. Lastly, it recommended that NEEC continue to explore alternatives to distance learning for including rural students.

ORGANIZATION OF THE REPORT

This report is the fifth MPER addressing NEEC's efforts in Oregon and Washington and the efforts of NEEC and NWBOA to accomplish a region-wide approach to building operator certification. The report includes an analysis of all student and employer/supervisor surveys conducted to date, reviews the progress of the regional coordination process and provides an assessment of how well the NEEC BOC has progressed in reducing market barriers and achieving long-term sustainability.

Following this introductory chapter, Chapter 2 describes the current status of the NEEC and NWBOA BOC programs. Chapter 3 presents a market assessment for the NEEC BOC venture. The assessment identifies barriers to the penetration of a building operator certification program and presents evaluation findings that indicate the success of the NEEC BOC in overcoming these barriers. Chapter 4 provides a long-term assessment of the NEEC BOC based on findings from a long-term follow-up survey and an analysis of survey data from all phases of this multi-year evaluation. Chapter 5 provides the NEEC instructors' assessment of the program obtained from research activities of the last two years. Chapter 6 presents energy impacts for the NEEC BOC. Chapter 7 discusses the current status of progress and barriers toward a region-wide approach for BOC, and Chapter 8 concludes and presents recommendations.

Following the report, Appendix A includes 1999 survey results of students and employers from the Portland, Oregon training. Appendix B includes the results for the Tri Cities, Washington and Medford, Oregon training. Appendix C provides the course descriptions and enrollment information for the 1999 NEEC and NWBOA BOC course series. Appendix D contains the interview guides and survey instruments used in data collection for this fifth MPER. Appendix E contains a brief

review of the NEEC BOC database with recommendations for database enhancement.

2. 1999 PROGRAM STATUS

Past MPERs have more fully described the implementation of the NEEC and IBOA BOC programs. This chapter provides an update to cover 1999 achievements of and activities of the NEEC BOC and the NWBOA effort to regionalize the BOC.

NEEC BOC

Objectives

NEEC aims to enhance building operators' expertise throughout the region and improve the general operating efficiency of facilities. This is being accomplished through the establishment of a competency-based program that clearly defines knowledge and skills required to efficiently operate today's more complex buildings. This focus has remained unchanged since the BOC's inception.

Goals for the Level I series, as conveyed to building management by the program brochure, include "increased [building operator] capability and productivity, improved efficiency through employee cross-training, facility assessments and recommendations through student study projects, reduction of utility bills and unscheduled maintenance, [and] increased facility safety, comfort, and air quality."

The Level II course series has comparable goals offering advanced education for Level I certified operators as well as advanced continuing education for qualifying students who did not take the Level I series.

The Level I course series includes 80 hours of training and project work in building systems maintenance. The Level course series includes 50 hours of training and elective coursework in equipment troubleshooting and maintenance. The seven Level I courses are all required and the six Level II courses include four required and two elective courses. Staff noted elective courses give a building operator the chance to specialize in areas of particular interest. Each course series has its own certification.

Implementation

NEEC defines four categories of participation in the venture: enrollment, registration, certification, and re-certification.

- *Enrollment:* Operators enroll in the BOC program to express intent to become certified and to be notified of future training opportunities in their geographic area. Enrollment is free of charge. The *Program Enrollment* form is used.

- *Registration:* Operators register to participate in a scheduled series of BOC training courses. Registrants pay a fee and may register for a single course. The *Course Schedule and Registration* form and a *Student Questionnaire* are used.

- *Certification:* Operators who complete coursework and pass test and project requirements can become certified upon approval of an application to NEEC. The *Official Certification Application* is used. The applicant must submit one letter of reference and a verification of employment with the application.

- *Re-certification:* To remain certified, Level I operators must complete five professional credits every year following the date of certification and submit a *Re-certification Application*. Level II operators will have to complete 10 professional credits.

The 1999 program targets were to enroll 175 additional students in Washington and 80 in Oregon, for a program-to-date total of 415 Washington and 140 Oregon enrollees. As of September 1999, NEEC BOC enrollment was just under 700 with the goals for enrollment exceeded in both states.

Certification is encouraged for all course participants and requires completion of all course work, tests, projects, and the submission and approval of an application for certification.[12] In the interviews for this and previous evaluations, most students stated that they plan to obtain certification, though many take time after course completion to do so.[13] As of October 1, 1999, 104 Washington students had been certified, exceeding the goal of 80 by over 25%. Certified Oregon students numbered 21, a little over half of the goal of 37.

12 Appendix D provides the certification/re-certification requirements.

13 As of 1999, certification is offered on an annual basis. Students have a full year following course series completion to apply for certification.

Table 3

REGISTRANTS IN EACH BOC COURSE SERIES THROUGH OCTOBER 1999

LOCATION	ATTENDED CLASSES	COMPLETED SERIES	CERTIFIED	PERCENT CERTIFIED
WASHINGTON				
Boeing (1997)[1]	37	37	0[2]	NA[2]
Kitsap (1997)	40	31	11	35.5%
Spokane (1997/98)	39	31	13	41.9%
Snohomish (1998)[1]	46	37	22	59.5%
Kent (1998)[1]	40	35	14	40.0%
Olympia (1998)[1]	34	31	14	45.2%
Renton (1997-1999)	13	8	0[3]	NA[3]
Tri-Cities (1998)	25	23	15	65.2%
Wenatchee (1999)	21	16	5	NA[4]
WASHINGTON SUBTOTAL	**295**	**249**	**94**	**47.3%**
OREGON				
Portland (1998)	40	32	17	53.1%
Medford (1998)	21	20	13	65.0%
Eugene (1999)	33	32	1	NA[4]
OREGON SUBTOTAL	**94**	**84**	**31**	**57.7%**
TOTAL	**389**	**333**	**125**	**48.4%[4]**

1. *The number attending and number certified are lower than reported in previous MPERs. Issues with the BOC database make tracking and interpretation of student data very difficult. See our discussion in Chapter 6.*
2. *The Boeing series was a pilot and did not include the full series for certification. Certification requires completion of make-up courses in another series.*
3. *Renton participants registered through Renton Technical College. Certification will be achieved at the end of a two-year Commercial High-Rise Operations Program.*
4. *Percentage not calculated due to the assumption that students in this recently offered course have just begun to seek certification.*

Table 3 gives, for each state and course location, the number of participants

attending one or more classes, the number completing the course series, and the number certified. The percentage of students achieving certification has shown a general increase over time. For course series conducted prior to 1999, and excluding Renton, 47% of Washington students and 58% of Oregon students have been certified.

Staff noted that the bulk of certification occurs within three to four months following the end of the series. Certification rates for the 1999 course series in Medford and Eugene are likely to increase in the coming months.

In 1998 and 1999, the price for the course series, including certification, was $650. This price represents an increase of $100 over the 1997 fee. The price of the Level I and Level II program will increase to $850 for series starting next year (2000). The fee for re-certification after completing the required number of continuing education credits is $30.

Teaching Process

Course instruction in 1999 reflected the standardization begun the previous year. A core group of experienced instructors trained by NEEC use the regionally-developed curriculum materials and add their own expertise and materials as appropriate. A teaching manual with sequencing instructions accompanies course materials. NEEC requires instructors to teach all test-related technical information in detail sufficient to ensure students are prepared for the test.

The regional BOC curriculum offers opportunities for instructors to supplement the curricula with "current issues." NEEC distributes materials associated with the special topics but does not automatically integrate these topics into the existing curricula.

Many of the current instructors have taught the classes several times. With the finalization of the curriculum (as a result of the regionalization effort facilitated by NWBOA), most of the instructors report that the preparation time is adequate and the materials are well developed. They stated that they encounter few challenges in delivering the material in the time available.

Transfer of the Curriculum

NEEC continued in 1999 to work with organizations that wish to "accredit" the BOC for its members, students, or employees or "recognize" the BOC as a professional development program. Accredit means to offer credit hours or

continuing education units for BOC courses. In 1999, Lower Columbia Community College joined the list of accrediting organizations. The following organizations accredit the BOC:

- Washington Department of Labor & Industries
- Oregon Department of Consumer and Business Affairs
- Renton Technical College, Renton, WA
- Highline Community College, WA
- Rogue Community College, Medford, OR
- Lower Columbia Community College, Longview, WA
- Lane Community College, Eugene, OR

Recognition means that the organization has publicly attributed value to the program as a professional development opportunity for its members or employees. The following organizations recognize the BOC in this way:

- Washington State Department of General Administration
- Washington Association of Maintenance and Operations Administrators
- Operating Engineers Union
- U.S. Navy, Naval Station Everett
- Tri-Met Transit, Portland, OR

NEEC plans to continue developing relationships of this type with organizations and businesses in the future. Though the initial goal for the NEEC BOC was a full "transfer" of the curriculum, this strategy of accreditation and recognition has proved more market based. Using this strategy NEEC has been able to expand dissemination of the curriculum and validate the BOC program in the market. These arrangements have also led to additional course registrants and enabled NEEC to conduct course series and generate income in close affiliation with these organizations.

NWBOA REGIONALIZATION EFFORTS

Objectives

The NWBOA contract with the Alliance specifies four objectives for NWBOA. These are:

- Undertake an evaluation of its existing building operator certification program in commercial-sector buildings in Idaho;
- Complete a market survey of the need for continuing or expanding BOC training in Idaho;
- Promote the concept of the BOC and of BOC-certified personnel; and
- Lead an effort to coordinate the BOC among the Pacific Northwest states of Idaho, Montana, Oregon, and Washington.

NWBOA completed their research efforts in 1998 with advice and support from the Alliance. Results from the market survey of private sector building operator supervisors were incorporated into the market assessment reported in the fourth MPER (E99-031). Research Into Action conducted interviews with past participants in the NWBOA BOC program and reported these results in the third MPER (E98-015).

The current evaluation report focuses on the last two bullets—development of a marketing strategy for the BOC and regionalization of the BOC efforts. The following briefly discusses progress in 1999 on these two goals. More detail on the regional coordination effort is provided in Chapter 7.

Regional Coordination

During 1998 and 1999 NWBOA coordinated three meetings with NEEC and representatives from Montana to discuss curriculum and administrative issues. In January 1999, IBOA changed its name to NWBOA to reflect their role as a regional organization for building operators.

Curriculum Efforts

NWBOA worked closely with NEEC during 1998 to revise and finalize a regional Level I BOC curriculum. The NEEC BOC curriculum formed the base for these

discussions, to which NWBOA contributed. The regional Level I curriculum was finalized in late 1998.

NEEC currently, as part of their contract with the Alliance, holds the copyright on the Level I training and has agreed to license NWBOA to use the curriculum at no charge. Despite NWBOA's intent to use the regional curriculum, due to timing and other factors NWBOA used the original IBOA BOC materials for the Missoula, Montana and Boise, Idaho NWBOA BOC series offered in early 1999.

Administrative Efforts

Beginning in 1998, NWBOA and NEEC began to work on the resolution of administrative issues surrounding the implementation of a region-wide BOC effort. A variety of issues surfaced during the discussions including: how the curriculum will be updated in the future, how training and certification will be managed and by whom, and how training will be conducted in Montana. As of September 30, 1999, these issues have yet to be resolved.

Development of Marketing Strategy

In 1999 NWBOA developed a marketing plan for marketing the NWBOA BOC to private sector employers in Idaho. Based on results from the market research, NWBOA determined that a market for BOC training and certification existed among private sector employers in Idaho. In April 1999 they submitted a plan to the Alliance outlining their approach to this market.[14]

The market research identified the size of the target market as building operators of 6,653 mid-size Idaho companies and managers of facility operations in 508 large Idaho companies.

The marketing plan to reach these markets has two goals:

- Enroll 75 private sector building operators in certification training in 1999 and 2000.
- Promote certification value to employers.

[14] *NWBOA's Private Sector Training Marketing Opportunities in Idaho*. April 1999.

NWBOA began the implementation of their marketing plan in 1999. Along with efforts in Idaho, the Alliance also awarded NWBOA the contract for implementing BOC course series in Montana. With the marketing plan just implemented in summer 1999, the NWBOA BOC course series in Idaho and Montana will be included in the evaluation update to be completed in 2000.

In early 1999 NWBOA offered a course series in Boise, Idaho as well as a course in Missoula, Montana as part of their efforts. Each course series is conducted a single month with six meetings. Eleven building operators attended the Boise training and ten operators attended the Missoula training. Additional course series planned or underway include:

- Level I & II: Idaho Falls, Idaho — September 1999
- Level I & II: Coeur d' Alene, Idaho — October 1999
- Level I & II: Boise, Idaho — November 1999
- Level I: Twin Falls, Idaho — November/December 1999
- Level I: Helena & Missoula, Montana — March 2000
- Level I & II: Boise, Idaho — April 2000

3. MARKET ASSESSMENT FOR BUILDING OPERATORS CERTIFICATION TRAINING

In the 4th MPER (E99-031, pp. 33-36), Research Into Action, Inc. presented a market assessment formulated from data collected using the baseline survey. The baseline survey addressed receptiveness to a comprehensive training for building O&M staff, the NEEC BOC venture specifically, and region-wide BOC training generally. The market assessment identified the services exchanged, market participants, distribution chain, geographic boundaries, and communication and information channels. It estimated the numbers of buyers and sellers and the market share.

In conducting the market assessment, we sought to determine the extent to which the market barriers to comprehensive building O&M training were addressed by the NEEC BOC venture and by the region-wide coordination supported through Alliance funding to NWBOA.[15] We also sought to identify outstanding and additional market barriers and opportunities.

To examine the level of success achieved by the NEEC BOC venture, this chapter summarizes our prior market assessment and analyses as well as applicable new evaluation findings.

ASSESSMENT OF MARKET TRANSFORMATION

The NEEC BOC venture hopes to transform building O&M practices by providing building operators with comprehensive, competency-based training and certification. It is expected that trained operators can better adjust, maintain, and operate their buildings' equipment, leading to decreased building energy consumption with improved or maintained occupant comfort and satisfaction.

While well-trained operators can indeed transform typical building operating procedures, a range of market barriers reduce the number of operators that receive training. Prior to the establishment of the NEEC BOC venture and support for

[15] Due to the nature of the contract between the Alliance and NWBOA, a similar assessment was not conducted for Idaho and Montana in 1999, but will be conducted during 2000.

region-wide coordination, the principal barrier was the lack of comprehensive, competency-based training and certification outside of Idaho. With the establishment of the NEEC BOC venture, the principal barriers are those that limit the number of operators who register for, attend, and complete the coursework and certification.

To provide a framework for our assessment of the venture's success and remaining challenges in regional market transformation, we have used the well-regarded *Scoping Study*.[16] The study proposed an operational definition of market transformation by which one can assess the degree to which utility programs had observable market effects and had overcome underlying market barriers to energy efficiency in a lasting fashion.

Recently the California Demand Side Measurement Advisory Committee used the *Scoping Study* framework to examine the market effects of 15 programs. The *Summary Study*[17] prepared from this research found that establishing a causal link between targeted market barriers, the intervention, and the expected effect—although difficult to do—was critical to demonstrating market effects. Furthermore, the study concluded that measurement of effects on participants did not constitute a measurement of effects on the market.

We applied the *Scoping Study* framework to identify market barriers faced by the BOC efforts. We then examined and compared the WSEO baseline study[18] findings to the baseline survey (E99-027) and evaluation findings to determine the progress made by the venture in reducing these market barriers for participants and their employers.

We are unable to measure progress on all barriers, since the WSEO baseline study completed prior to program implementation did not use the *Scoping Study* framework and so did not address each of the issues presented here. Because of baseline data limitations, some of the findings that we cite apply only to program participants and do not constitute an assessment of market effects. And while the

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16 Eto, Joe, Ralph Prahl and Jeff Schlegel. (1996) *A Scoping Study on Energy Efficiency Market Transformation by California Utility DSM Programs - LBNL-39059 UC-1322.* Ernest Orlando Lawrence Berkeley National Laboratory. Berkeley, CA. July 1996.

17 Peters, Jane, Bruce Mast, Lori Megdal, & Patrice Ignelzi. (1998) *The Market Effects Summary Study.* California Demand Side Management Advisory Committee. December 1998.

18 Schueler, Vince. (1996) *Building Operator Certification and Training: Results from Survey of Building Operators and Engineers.* Washington State Energy Office. Olympia, Washington. January 1996.

distinction between participant and market effects must be borne in mind, participant effects constitute progress indicators that suggest whether the BOC efforts are capable of transforming the region's O&M market.

Table 4 describes market barriers that make it difficult for building operators to obtain comprehensive O&M training in general. To be successful, any training program will need to reduce or overcome these barriers. Table 5 describes barriers specific to the BOC ventures.

Table 4

MARKET BARRIERS TO OBTAINING COMPREHENSIVE BUILDING OPERATIONS AND MAINTENANCE TRAINING FOR ENERGY EFFICIENCY

BARRIERS	MARKET PARTICIPANTS AFFECTED	BARRIER DESCRIPTION
Performance Uncertainty	Employers	Employers do not easily see financial benefits from training staff in energy efficiency practices in building operations.
	Students	Students do not know if employers realize the benefits of trained staff.
Availability of Service	Employers/Students	Course offerings are limited. Other than BOC, courses are not comprehensive but focus on single issue or piece of equipment.
Search or Information Costs	Employers	Finding out about training programs may be difficult.
	Students	Courses may not be offered in accessible sites.
Transaction Costs	Employers	Employers incur costs for training and absence from job.
	Students	Students need time away from work for classes and time to complete projects.
		Continued
Access to Financing	Employers	Employers may not have training funds available.
	Students	Students lack access to financing. Students depend on employers' willingness to pay and may not be able to "sell" training to employers.

BARRIERS	MARKET PARTICIPANTS AFFECTED	BARRIER DESCRIPTION
Organization Practices	Employers/Students	Lack of organizational commitment to energy efficiency may not allow students to fully implement learned skills.
Split Incentives	Students	Students are asked to make decisions that reduce energy use, but they do not see the energy bill.

Table 5

BARRIERS TO SELLING BOC TRAINING AND CERTIFICATION

BARRIERS	MARKET PARTICIPANTS AFFECTED	BARRIER DESCRIPTION
Hidden Costs	Employers	Employers may fear that something will happen while employee is away resulting in lost production.
Inseparability of Product Features	Employers	Employers may think employees need only selected topic courses. Employers may not think certification is important for job performance or for company.
	Students	Students may have advanced training in some topics and not find the additional information in other skill areas sufficient incentive to complete certification. Students may doubt certification will provide value in the job market or to the company.

PROGRAM SUCCESS IN REDUCING MARKET BARRIERS

Table 6 comprehensively looks at the results from surveys with students and employers and the baseline survey with supervisors throughout the region. The table summarizes the market barriers and responses to pertinent questions to address the strength of the barrier in the market now that the NEEC BOC has been available for three years.

In general, the findings suggest that the perceived barriers have been reduced and in some cases eliminated. For instance, there is no apparent barrier to training for O&M personnel, as over 62% of O&M supervisors responding to the baseline survey reported that they plan to send at least some O&M staff to job related training in 1999. In other cases, the presence of the BOC has led to the barrier reduction, for with the NEEC BOC there is now widely available comprehensive training for O&M throughout the region.

The key barriers to training for O&M staff have been lack of access to financing, performance uncertainty and availability of service. These have all been substantially reduced as a result of NEEC and NWBOA efforts funded by the Alliance. Information and search costs, however, remain with only 30% of the O&M supervisors responding to the baseline survey reporting awareness of the BOC. Clearly awareness needs to increase in order to assure that the BOC programs flourish.

The finding which is most important relative to barriers is that the states with the highest awareness and most experience with BOC training, Idaho and Washington, expressed the lowest willingness to pay for training in the baseline survey. To counter this, both of the BOC programs need to charge fees that reflect the true cost of operating the training program so as not to erode the high willingness to pay we observed in the baseline survey for Oregon and Montana. As this is done, willingness to pay in Idaho and Washington may increase. The high levels of satisfaction and willingness to pay observed among NEEC BOC participants suggest that support exists for the program at the higher fee level and that the support can be maintained.

Table 6

ASSESSMENT OF REDUCTIONS IN MARKET BARRIERS

BARRIERS	EVALUATION QUESTIONS ADDRESSING BARRIER	SYNOPSIS OF FINDINGS FROM LONG-TERM FOLLOW-UP	SYNOPSIS OF FINDINGS FROM CUMULATIVE ASSESSMENT AND BASELINE SURVEY*
		PERFORMANCE UNCERTAINTY	
Employers	Value of training to organization.	87% stated BOC useful to employee; 79% satisfied or extremely satisfied with BOC training.	80% satisfied or extremely satisfied with BOC training.
	Plans to send employees to BOC.	64% plan to send or have sent additional staff to BOC.	63% plan to send staff to BOC. Baseline survey found 63% of O&M supervisors would consider sending staff to BOC.
	Looks for BOC on applicant resume.	Yes: 88%.	Yes: 92%.
Students	Value to advance on present job or look for another job.	50% credited BOC with subsequent increase in responsibility or compensation. 82% think BOC will aid their future job prospects.	67% think BOC would help them advance on the job; 85% thought would help find new job.
	Willingness to put on resume.	Yes: 77%.	Yes: 96%.

Continued

BARRIERS	EVALUATION QUESTIONS ADDRESSING BARRIER	SYNOPSIS OF FINDINGS FROM LONG-TERM FOLLOW-UP	SYNOPSIS OF FINDINGS FROM CUMULATIVE ASSESSMENT AND BASELINE SURVEY*
		AVAILABILITY OF SERVICE	
Employers	Courses offered by BOC ventures and others.	NA	Baseline survey found NEEC BOC venture and NWBOA offer region's only comprehensive, competency-based, certification training.
	Interest in certification, continuing education, and Level II certification.	93% encourage continuing education; 93% encourage Level II series.	92% encourage continuing education.
Students	Interest in certification, continuing education, and Level II certification.	18% have taken continuing education; 59% plan to take Level II series.	83% plan or have taken continuing education.
		SEARCH OR INFORMATION COSTS	
Employers and Students	Awareness of BOC program.	NA	Baseline survey found 30% of regional O&M supervisors aware of BOC.
		TRANSACTION COSTS	
Employers	Comments regarding costs related to projects and time away from job.	NA	Like the 1-day and 2-day classes in series.
Students	Comments regarding costs related to projects and time away from job.	NA	Like the 1-day and 2-day classes in series. Prefer the current project expectations to those of early course series.

Continued

BARRIERS	EVALUATION QUESTIONS ADDRESSING BARRIER	SYNOPSIS OF FINDINGS FROM LONG-TERM FOLLOW-UP	SYNOPSIS OF FINDINGS FROM CUMULATIVE ASSESSMENT AND BASELINE SURVEY*
		ACCESS TO FINANCING	
Employers	Willingness to pay.	50% willing to pay (WTP) $800 or more for comprehensive training.	60% WTP $800 or more for comprehensive training. Baseline survey found O&M supervisors average WTP $707 with 64% WTP $650, 40% WTP $950. By state supervisors in Idaho avg. WTP $468, Oregon avg. WTP $733, Montana avg. WTP $856 and Washington avg. WTP $687.
	Perceived value for the cost.	100% thought BOC a good value at $650; 69% thought so for $750; 25% thought so for $950.	92% thought BOC a good value at $650; 84% thought so for $750; 55% thought so for $950.
	State of organization and impact on sending other employees to training in the future.	NA	80% of the companies sending employees to BOC are either financially stable or government, 75% expect no change in future.
Students	Willingness to pay for self.	NA	11% willing to pay $800 or more.
	Student's ability to "sell" training to their employers.	NA	Most students attend because an employer encourages attendance.

Continued

BARRIERS	EVALUATION QUESTIONS ADDRESSING BARRIER	SYNOPSIS OF FINDINGS FROM LONG-TERM FOLLOW-UP	SYNOPSIS OF FINDINGS FROM CUMULATIVE ASSESSMENT AND BASELINE SURVEY*
		ORGANIZATION PRACTICES	
Employers	Supervisor's support for training of building O&M staff.	NA	Yes: 93%. Baseline survey found 62% of O&M supervisors planned to send some staff to job related training in 1999.
	Support for implementing BOC training on the job.	86% observed BOC training as being useful on the job; 46% observed differences in their employees job performance.	100% support implementation of what student learned on the job; 73% report observed differences in their employees' job performance.
	Organization's overall commitment to energy efficiency in building operations.	NA	Baseline survey found energy conservation ranked 4th in importance for private sector O&M supervisors and 9th for public sector out of 12 topics.
Students	Supervisor's support for implementing lessons learned.	82% reported their supervisor supports their implementation of lessons learned.	91% reported their supervisor supports their implementation of lessons learned.
		SPLIT INCENTIVES	
Students	Project completion rate.	NA	Prefer the current project expectations to those of early course series.
	Effect of training on ability to increase occupant comfort or obtain cost savings.	82% stated they saved money or improved occupant comfort.	NA

Continued

BARRIERS	EVALUATION QUESTIONS ADDRESSING BARRIER	SYNOPSIS OF FINDINGS FROM LONG-TERM FOLLOW-UP	SYNOPSIS OF FINDINGS FROM CUMULATIVE ASSESSMENT AND BASELINE SURVEY*
HIDDEN COSTS			
Employers	Comments regarding costs related to projects and time away from job.		Baseline survey found supervisors prefer single-day courses within 1-hour driving distance.
INSEPARABILITY OF PRODUCT FEATURES			
Employers	Importance of skill areas taught to employee.	Rate HVAC as highest value on the job, followed by building system overview, energy conservation techniques, IAQ and electrical systems.	Rate HVAC as most useful followed closely by Building System Overview.
	Comments on certification.	75% consider multi-state reciprocity important.	NA
Students	Importance and usefulness of skill areas on the job.	Rate HVAC and energy conservation techniques as highest value on the job followed closely by building system overview and IAQ.	Rate HVAC as highest value on the job.
	Comments on certification.	82% consider multi-state reciprocity important.	NA

* *Results in column are from cumulative database unless noted as from baseline survey.*

4. NEEC BOC: CUMULATIVE AND LONG-TERM ASSESSMENTS

Previous MPERs evaluated the three or so NEEC BOC courses offered in the period prior to the report. In this fifth MPER, we present a cumulative assessment of the eight NEEC BOC courses and surveys completed by September 30, 1999.[19] We interviewed 38% of students and 20% of employers from the eight courses, for a total of 104 students and 56 employers.[20] This relatively large cumulative sample enabled us to explore differences in responses to the course series that might exist between public or private enterprise, course year, location, and so on.

We conducted the BOC evaluation in four phases over two years. During this time, NEEC made a number of changes to the program. To maintain consistency with the program, we revised the survey instruments a number of times. As a consequence, sample sizes vary considerably across variables in the cumulative assessment.

Also for this fifth MPER, we conducted a long-term follow-up survey of students (and their employers) who had completed the course series prior to about a year earlier, at the Spokane, Snohomish/Everett, Olympia, and Kent locations. We completed interviews with 34 students and 16 employers. The survey included some questions from the previous surveys as well as questions added to assess the long-term value to participants.

CUMULATIVE ASSESSMENT

We focused the cumulative assessment of the NEEC BOC on the variables related to market viability among those variables with large enough sample sizes to make meaningful qualitative comparisons between groups of respondents. None of the groups were large enough to support statistically-based comparative analyses. The groups considered include business type (public, private, and utility/other), year of

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19 See Table 3 for course locations. Surveys for Renton, Wenatchee, and Eugene were not complete as of September 30 as courses had only recently been completed. Courses and surveys were completed for 277 students attending the other eight series. Detailed results of surveys for Portland, Tri-Cities, and Medford are provided in Appendix A and B.

20 We created three datasets—for students, employers, and instructors—containing all of the closed-end survey responses.

training (1997, 1998), and state (Washington or Oregon).[21] Because the public and private sectors comprise the major submarkets for the program and differences between their response to the program may have implications for the program's viability, most of the data that we report here distinguish between the sectors in which the respondents work.

The NEEC BOC focused early marketing efforts on the public sector. Program attendance throughout the three years has reflected this marketing strategy. As shown in Table 7, two-thirds of the surveyed students worked in public-sector organizations.

Table 7

STUDENTS/EMPLOYERS BY BUSINESS TYPE

BUSINESS TYPE	STUDENTS		EMPLOYERS	
	FREQUENCY	PERCENT	FREQUENCY	PERCENT
Public	67	64.4%	39	69.6%
Private	25	24.0%	12	21.4%
Utility/Other	12	11.5%	5	8.9%
TOTAL	**104**	**100.0%**	**56**	**100.0%**

About 12% of the students' workplaces are categorized as "utility/other." Typically, these BOC students are not building operators, but are people who nonetheless benefit from the information taught by the series. For example, many of these students are utility customer account representatives who need to understand the building operation challenges their clients face.

When we consider only those students who are building operators (i.e., students whose affiliation is categorized as public or private), public-sector organizations have furnished 73% of the students, while only 27% of the students have come from

[21] As with other data collection and analysis activities, Idaho and Montana were not included because of the nature of NWBOA's contract with the Alliance.

the private sector. The percentage of public-sector students is considerably higher, and that of private-sector students considerably lower, than the percentages of 57% and 42% reported for the region in the baseline survey (MPER #E99-031).[22] For long-term sustainability, NEEC will need to continue to expand its reach into private sector businesses.

Table 7 also shows the business distribution of employers, which is of interest when considering findings presented later in this report. However, the student sample, being larger, is more representative of the total population of 277 students that have taken the eight BOC series.

Responses to three survey variables offer insight into the sustainability of the BOC in NEEC's markets: satisfaction with the BOC, willingness to pay for the course series, and value of the BOC.

Satisfaction with BOC

Table 8 shows student satisfaction by sector with the BOC.

Table 8

STUDENT SATISFACTION BY BUSINESS TYPE
(N=103)

LEVEL OF SATISFACTION	FREQUENCY (PERCENT)							
	PUBLIC		PRIVATE		UTILITY/OTHER		TOTAL	
Extremely Satisfied	20	(30.3%)	5	(20.0%)	4	(33.3%)	29	(28.2%)
Satisfied	34	(51.5%)	14	(56.0%)	6	(50.0%)	54	(52.4%)
Neither Satisfied nor Dissatisfied	10	(15.2%)	5	(20.0%)	2	(16.7%)	17	(16.5%)
Not Satisfied	1	(1.5%)	1	(4.0%)	0	(0.0%)	2	(1.9%)
Not At All Satisfied	1	(1.5%)	0	(0.0%)	0	(0.0%)	1	(1.0%)
TOTAL	**66**	**(100%)**	**25**	**(100%)**	**12**	**(100%)**	**103**	**(100%)**

[22] One percent of baseline survey respondents did not define their affiliation.

Eighty percent of surveyed students said that they were either "extremely satisfied" (28%) or "satisfied" (52%). However, private-sector students were somewhat less likely than public-sector students to provide a rating of "extremely satisfied" (20% versus 30%, respectively).

The employers gave satisfaction ratings nearly identical to the employees (see Table 9).

Table 9

EMPLOYER SATISFACTION BY BUSINESS TYPE
(N=55)

LEVEL OF SATISFACTION	FREQUENCY (PERCENT)							
	PUBLIC		PRIVATE		UTILITY/OTHER		TOTAL	
Extremely Satisfied	10	(26.3%)	2	(16.7%)	2	(40.0%)	14	(25.5%)
Satisfied	21	(55.3%)	7	(58.3%)	2	(40.0%)	30	(54.5%)
Neither Satisfied Nor Dissatisfied	6	(15.8%)	3	(25.0%)	1	(20.0%)	10	(18.2%)
Not Satisfied	1	(2.6%)	0	(0.0%)	0	(0.0%)	1	(1.8%)
Not At All Satisfied	0	(0.0%)	0	(0.0%)	0	(0.0%)	0	(0.0%)
TOTAL	**38**	**(100%)**	**12**	**(100%)**	**5**	**(100%)**	**55**	**(100%)**

Student satisfaction with the BOC increased from 1997 to 1998 (see Table 10). This increase may be the result of changes made by NEEC in response to its own experience and the initial evaluation findings. Another explanation for the finding could be that different types of students participated in 1997 and 1998 course series, although we have no data on student characteristics beyond sector affiliation that would allow us to test this hypothesis.

In 1997, 70% of students reported being "extremely satisfied" or "satisfied", compared with 85% in 1998. The difference between the two years lies in a reduction in the proportion of students reporting "neither satisfied nor dissatisfied" and an increase in the proportion reporting "satisfied."

Table 10

STUDENT SATISFACTION WITH BOC BY YEAR
(N=103)

LEVEL OF SATISFACTION	FREQUENCY (PERCENT)					
	1997		1998		TOTAL	
Extremely Satisfied	9	(30.0%)	20	(27.4%)	29	(28.2%)
Satisfied	12	(40.0%)	42	(57.5%)	54	(52.4%)
Neither Satisfied Nor Dissatisfied	8	(26.7%)	9	(12.3%)	17	(16.5%)
Not Satisfied	1	(3.3%)	1	(1.4%)	2	(1.9%)
Not At All Satisfied	0	(0.0%)	1	(1.4%)	1	(1.0%)
TOTAL	**30**	**(100%)**	**73**	**(100%)**	**103**	**(100%)**

Throughout the multi-year evaluation we noticed differences between student and teacher rankings of the importance of BOC courses on the job. Figure 1 displays the rankings students gave to the seven courses (1 = highest, 7 = lowest) and Figure 2 displays the rankings employers gave to the seven courses when they were interviewed about three months after the course series ended. As can be seen, employers ranked HVAC highest followed closely by building systems overview, electrical system and energy conservation techniques. While students also ranked HVAC highest, their rankings of other courses was different with electrical system next, followed by indoor air quality (IAQ) and energy conservation techniques.

Figure 1

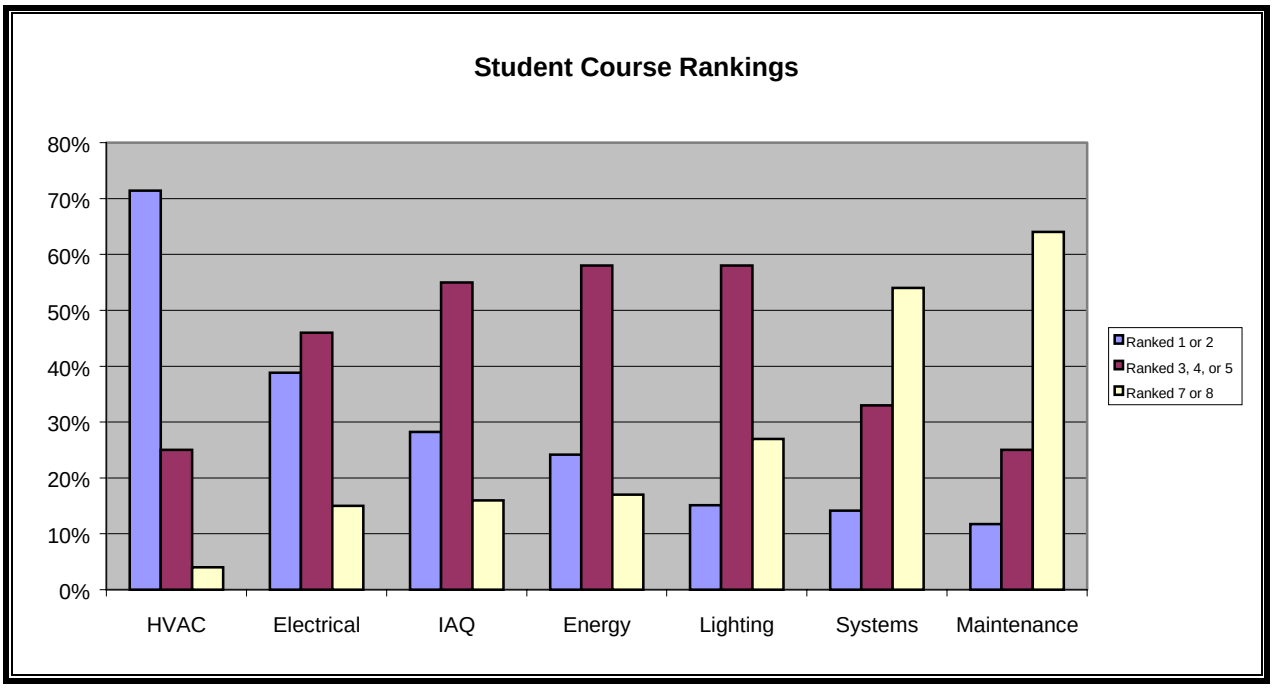
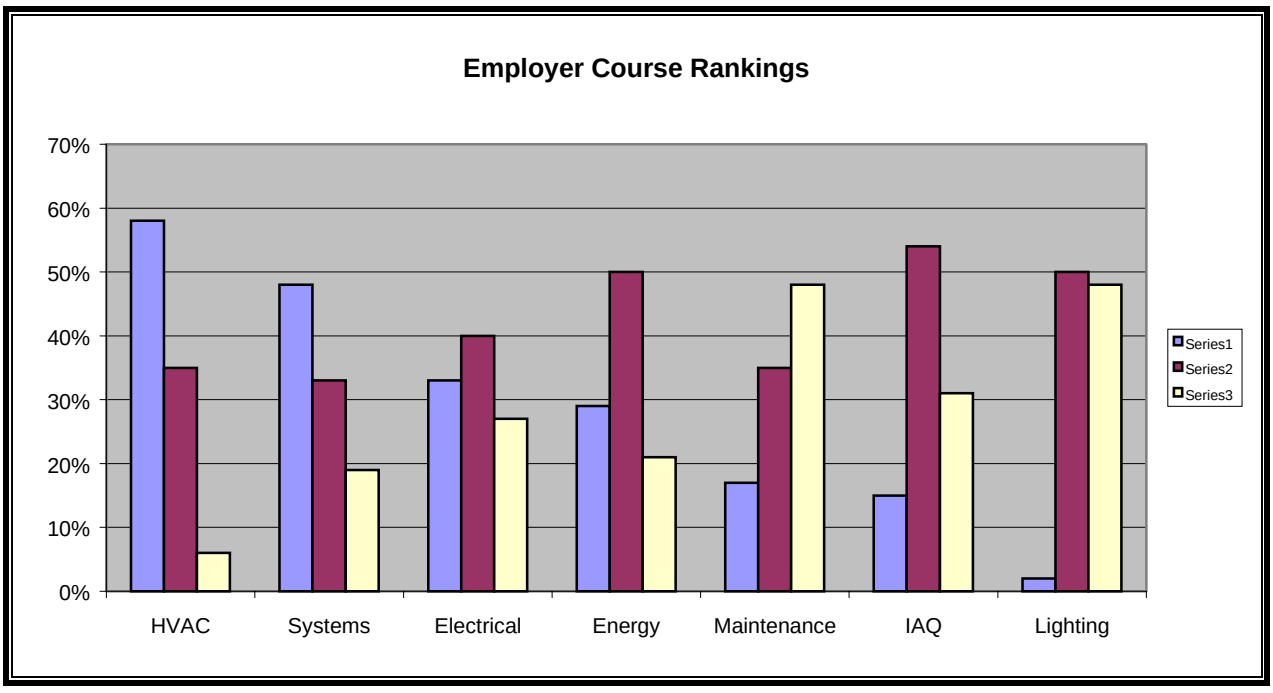


Figure 2



Willingness to Pay

Through use of a structured sequence of questions, we assessed student and employer willingness to pay more for the course series than the price at which the students registered ($550 or $650).

We asked students about their willingness to pay for the series themselves. More than one-third of students (37%) said they would be willing to pay for the course themselves at a price of $600 or more (see Table 11). There was no difference between the proportions of public- and private-sector students willing to pay $600 or more.

Table 11

STUDENT WILLINGNESS TO PAY BY BUSINESS TYPE (N=104)

AMOUNT WILLING TO PAY FOR SELF	FREQUENCY (PERCENT)							
	PUBLIC		PRIVATE		UTILITY/OTHER		TOTAL	
$0	14	(25.9%)	2	(10.0%)	2	(22.2%)	18	(21.7%)
$25-$500	15	(27.8%)	10	(50.0%)	2	(22,2%)	27	(32.5%)
$501-$600	5	(9.3%)	1	(5.0%)	1	(11.1%)	7	(8.4%)
$601-$800	13	(24.1%)	3	(15.0%)	3	(33.3%)	19	(22.9%)
More than $800	7	(13.0%)	4	(20.0%)	1	(11.1%)	12	(14.5%)
TOTAL WITHOUT "DON'T KNOW"	**54**	**(100%)**	**20**	**(100%)**	**9**	**(100%)**	**83**	**(100%)**
Don't know	13		5		3		21	

In addition, one out of seven students said they would be willing to pay $800 or more for the two-year certification course series. Here, a larger proportion of private-sector students than public-sector students gave this response. However the small number of private-sector students that gave this response (4) suggests caution

in drawing conclusions about the relative willingness of the two groups to pay over $800.[23]

Most of the registration fees had been paid by the students' employers, not by the students. It is not surprising, therefore, that employers stated a higher willingness to pay for the course series than did students. As shown in Table 12, 90% of employers stated they would be willing to pay more than $600 for the two-year certification course series. Sixty-percent of employers stated they would be willing to pay more than $800, with little difference in the responses of public-sector and private-sector employers. These findings are consistent with findings from the baseline survey where the employers stated willingness to pay, on average, $707.33. More than 20% of employers had reported they would pay over $950.[24]

Table 12

EMPLOYER WILLINGNESS TO PAY BY BUSINESS TYPE
(N=56)

AMOUNT WILLING TO PAY FOR EMPLOYEE	FREQUENCY (PERCENT)							
	PUBLIC		PRIVATE		UTILITY / OTHER		TOTAL	
More than $800	17	(58.6%)	5	(62.5%)	2	(66.7)	24	(60.0%)
$601-$800	10	(34.5%)	1	(12.5%)	1	(33.3%)	12	(30.0%)
$25-$600	2	(6.9%)	2	(25.0%)	0	(0.0%)	4	(10.0%)
TOTAL WITHOUT "DON'T KNOW"	**29**	**(100%)**	**8**	**(100%)**	**3**	**(100%)**	**40**	**(100%)**
Don't know	10		4		2		16	

[23] If just one private-sector student who had stated a willingness to pay of more than $800 range had instead stated a willingness to pay of $601-$800, the proportions between public-sector and private-sector students in these two response categories would be nearly identical.

[24] E99-031 Market Progress Evaluation Report Regional Building Operator Certification Venture: Number 2 Volume 2 (6/99) pp. 29.

BOC Value

We investigated whether students and employers thought the NEEC BOC training and certification was valuable. First, we asked respondents whether they would recommend the training to their peers, on the assumption that they would only recommend the series if they had found it valuable. Secondly, we asked students if they planned to put the BOC training and certification on their resumes and we asked employers whether they would look for the BOC on job applicant resumes. Such intentions by the respondents would suggest that they believe the BOC training enhanced students' job skills.

As seen in Tables 13 and 14, an overwhelming majority of students would recommend the training to others in their same position (93%) and plan to put the BOC on their resume (96%).

Table 13

STUDENT WILLINGNESS TO RECOMMEND BOC BY BUSINESS TYPE (N=100)

RECOMMEND BOC TO OTHERS	FREQUENCY (PERCENT)							
	PUBLIC		PRIVATE		UTILITY/OTHER		TOTAL	
Yes	60	(93.8%)	22	(88.0%)	11	(100.0%)	93	(93.0%)
No	4	(6.2%)	3	(12.0%)	0	(0.0%)	7	(7.0%)
TOTAL	**64**	**(100%)**	**25**	**(100%)**	**11**	**(100%)**	**100**	**(100%)**

Table 14

STUDENT PLANS TO PUT BOC ON RESUME BY BUSINESS TYPE (N=77)

PLACE BOC ON RESUME	FREQUENCY (PERCENT)							
	PUBLIC		PRIVATE		UTILITY/OTHER		TOTAL	
Yes	48	(94.1%)	17	(100.0%)	9	(100.0%)	74	(96.1%)
No	3	(5.9%)	0	(0.0%)	0	(0.0%)	3	(3.9%)
TOTAL	**51**	**(100%)**	**17**	**(100%)**	**9**	**(100%)**	**77**	**(100%)**

Looking at other factors affecting the value students place on the BOC training, 67% said it would help them advance on their job, 85% said it would be helpful in getting a new job, and 62% reported that others from their firm were likely to enroll in future BOC courses. Oregon students (n = 7) predicted an average of four persons per work site and Washington students (n = 33) predicted an average of 2.5 persons per work site would attend future BOC training course series.

Employers were nearly unanimous in their stated willingness to recommend to their peers the BOC as an employee training option, as found in Table 15.

Table 15

EMPLOYER WILLINGNESS TO RECOMMEND BOC BY BUSINESS TYPE (N=54)

RECOMMEND BOC TO OTHERS	FREQUENCY (PERCENT)			
	PUBLIC	PRIVATE	UTILITY/OTHER	TOTAL
Yes	38 (97.4%)	10 (100.0%)	5 (100.0%)	53 (98.1%)
No	1 (2.6%)	0 (0.0%)	0 (0.0%)	1 (1.9%)
TOTAL	**51 (100%)**	**17 (100%)**	**9 (100%)**	**54 (100%)**

Ninety-two percent of the employers, as presented in Table 16, stated they would look for the BOC on the resumes of job applicants, with public-sector employers potentially more likely than private-sector employers to do so, but the small private-sector sample size supports only conjectures and not conclusions. Finally, 63% of all the employers stated they plan to send other employees to BOC training in the future.

Table 16

EMPLOYER PLANS TO LOOK FOR BOC ON RESUME BY BUSINESS TYPE (N=38)

LOOK FOR BOC ON RESUME	FREQUENCY (PERCENT)			
	PUBLIC	PRIVATE	UTILITY/OTHER	TOTAL
Yes	26 (96.3%)	6 (75.0%)	3 (100.0%)	35 (92.1%)
No	1 (3.7%)	2 (25.0%)	0 (0.0%)	3 (7.9%)
TOTAL	**27 (100%)**	**8 (100%)**	**3 (100%)**	**38 (100%)**

LONG-TERM FOLLOW-UP

Objectives

As a follow-up to earlier assessments presented in previous MPERs, we assessed students' ability, after the passage of sufficient time, to apply aspects of their training to their job, as well as students' and supervisors' opinions regarding the usefulness of the BOC training.

Data Collection

We conducted long-term follow-up surveys using samples of students and their employers from the following NEEC BOC course series: Spokane, Snohomish/ Everett, Olympia, and Kent. As described in Chapter 1, we contacted a student from each unique facility until we had obtained interviews with about half of the number interviewed for the previous MPER. We explicitly sought to interview some students that had not been previously interviewed. We asked interviewed students to identify their supervisor and contacted each supervisor until we had obtained interviews with about half of those identified.

We completed interviews with eight students from both the Spokane and Everett series and nine students from both the Olympia and Kent series, for a total of 34 student interviews. We also completed interviews with five employers from the Spokane series, four employers from both the Everett and Kent series, and three employers from the Olympia series, for a total of 16 employer interviews. Table 17 gives the sample breakdown by business type.

Table 17

STUDENT AND EMPLOYERS BY BUSINESS TYPE LONG-TERM FOLLOW-UP

BUSINESS TYPE	STUDENTS (N=34)		EMPLOYERS (N=16)	
	FREQUENCY	PERCENT	FREQUENCY	PERCENT
Public	22	64.7%	12	75.0%
Private	10	29.4%	3	18.8%
Utility/Other	2	5.9%	1	6.3%
TOTAL	**34**	**100.0%**	**16**	**100.0%**

Program Benefits

We asked students to describe what they now believed to be the major benefits they received from the BOC training. The question solicited, in an open-ended format, as many comments as the students wanted to make. Nearly half of the responses, as shown in Table 18, addressed the benefit of having a greater general understanding of building systems and building operations. One-third of the responses cited the benefits of knowing more about particular building systems (HVAC and electrical systems) and issues (indoor air quality [IAQ] and energy efficiency).

Table 18

MAJOR BENEFITS LONG-TERM FOLLOW-UP
(N=34)*

BENEFITS	NUMBER
Increased Overall Knowledge/General Awareness/Wider Perspective/Better Understanding of Building Operators' Job	9
Understanding of Whole Building Systems/of Our Facilities	7
Knowledge of HVAC/Calibration	4
Knowledge of Energy Conservation/Energy Efficiency/Resource Management	3
Knowledge of IAQ	3
Raised Morale/Increased Confidence	3
Books and Materials	2
Better Understanding of How to Work with Trades People	1
Knowledge of Electrical Systems	1
No Response	3

* *Multiple responses allowed.*

For each course, we asked students to state whether the information learned in the course series had been of use to them in the last year for their job. Approximately nine out of ten students, as shown in Table 19, rated the courses of energy conservation techniques, HVAC systems and controls, building systems overview, and indoor air quality as useful. Energy-efficient lighting and building maintenance codes each had both the highest number of students assessing them as "not useful" and the highest number of students who did not comment on their usefulness. These findings suggest that the students may not have had the opportunity, ability, or time to apply these course areas to their job.

Table 19

STUDENT ASSESSMENT OF COURSE USEFULNESS LONG-TERM FOLLOW-UP (N=34)

COURSE AREA	USEFUL		CAN'T SAY IF USEFUL OR NOT USEFUL		NOT USEFUL		Total
	FREQUENCY	PERCENT	FREQUENCY	PERCENT	FREQUENCY	PERCENT	PERCENT
HVAC System and Controls	31	91.2%	2	5.9%	1	2.9%	100.0%
Energy Conservation Techniques	31	91.2%	0	0.0%	3	8.8%	100.0%
Building System Overview	30	88.2%	1	2.9%	3	8.8%	100.0%
Indoor Air Quality	29	85.3%	3	8.8%	2	5.9%	100.0%
Facility Electrical Systems	27	79.4%	3	8.8%	4	11.8%	100.0%
Energy Efficient Lighting	21	61.8%	8	23.5%	5	14.7%	100.0%
Building Maintenance Codes	17	50.0%	9	26.5%	8	23.5%	100.0%

While the rating given to HVAC had not changed from responses provided by students approximately three months after their series ended, student's assessment of the usefulness of the building system overview had changed markedly. Nearly 90% of students in the long-term follow-up indicated the course was useful whereas only 26% of responses made a few months after the course series ended indicated it was useful. It appears, therefore, that over time students may gain a greater appreciation for the overview, which initially may have appeared to have limited applications to or implications for their job.

We asked students, using an open-ended format, to explain why they assessed a course as useful. Most frequently, students reported that they used the subjects in their daily activities or that the course provided specific information in an area of current interest. Comments included:

- *"The day to day application is good."*
- *"All the courses are useful. The main thing is knowing the good way to do things. IAQ maintenance is really important."*

- *"I got more insight on HVAC and IAQ, how to make good readings and buy new equipment."*
- *"Lighting was helpful since we are in the process of purchasing lights."*

As with students, we asked employers to assess the usefulness of each course to the day-to-day job responsibilities of their employees.[25] For most courses, employers gave course assessments comparable to that given by students, as found in Table 20.

Table 20

EMPLOYER ASSESSMENT OF COURSE USEFULNESS LONG-TERM FOLLOW-UP (N=16)

COURSE AREA	USEFUL		CAN'T SAY IF USEFUL OR NOT USEFUL		NOT USEFUL		Total
	FREQUENCY	PERCENT	FREQUENCY	PERCENT	FREQUENCY	PERCENT	PERCENT
HVAC System and Controls	16	100.0%	0	90.0%	0	0.0%	100.0%
Building System Overview	15	93.8%	0	0.0%	1	6.3%	100.0%
Energy Conservation Techniques	14	87.5%	1	6.3%	1	6.3%	100.0%
Indoor Air Quality	14	87.5%	1	6.3%	1	6.3%	100.0%
Facility Electrical Systems	13	81.3%	1	6.3%	2	12.5%	100.0%
Building Maintenance Codes	11	68.8%	1	6.3%	4	25.0%	100.0%
Energy Efficient Lighting	9	56.3%	1	6.3%	6	37.5%	100.0%

[25] Due to differences in question phrasing between surveys, we are unable to compare employer course assessments from the long-term follow-up study with course assessments made a few months after the series ended.

Despite the overall similarity in responses, employers and their employees differed regarding their rating of the usefulness of building maintenance codes. A greater proportion of employers than students rated the course as useful. This difference could reflect the difference in priority that employers and students give to the topic of building maintenance or could arise from employers' lack of knowledge of the specific course content.

For both students and employers, as seen in Tables 19 and 20, the greatest percentage of "useful" ratings went to HVAC system and controls, energy conservation techniques, building system overview, and indoor air quality Additionally, the fewest number of "useful" ratings were given to lighting and building maintenance.

When asked why they thought the courses had been useful, employers responded with comments such as the following.

- *"All of it is used in daily work."*
- *"Working with the HVAC tech, he understands more of the overall system."*
- *"When they work as part of a team, they function better due to awareness of all of the systems."*

In the few cases where employers described a course as "not useful," most often they said that factors such as facility constraints pose a barrier to implementing changes in those areas.

We asked students if they thought that applying the knowledge learned from the course series had improved their job performance. Twenty-eight (82.4%) said yes. The four students answering no explained that it was not directly related to their job responsibilities. Two students "couldn't say" if it had improved their performance. Of those who said that applying the course knowledge had improved their job performance, specific examples included:

- *"It improved what I do in lighting and conservation."*
- *"I am just more aware and a better problem solver."*
- *"I learned my facility better through the homework assignments."*
- *"I have more confidence."*
- *"I learned better time management with these techniques."*

To further assess the extent to which the students have seen benefits from the BOC training, we asked whether they had been able to save the facility money or improve occupant comfort as a result of what they learned. As seen in Table 21, over 80% of students reported having either saved their facility money (15%) or improved occupant comfort (15%) or both (53%). A similar percentage of students (82%) reported that their supervisor provided the support they needed to apply the skills and knowledge they gained through the training. For the most part, students who reported taking effective actions had the support of their supervisors, but four students who saved money or improved comfort stated that they acted without additional supervisor support.

Table 21

STUDENT ABILITY TO SAVE MONEY, IMPROVE COMFORT LONG-TERM FOLLOW-UP
(N=34)

BENEFIT	NUMBER	PERCENT
Both Saved Money and Improved Comfort	18	52.9%
Saved Money	5	14.7%
Improved Occupant Comfort	5	14.7%
Neither Saved Money nor Improved Comfort	6	17.6%
TOTAL	**34**	**100%**

Nearly 90% of employers, as found in Table 22, said they thought the training was useful to their employees; however, slightly less than half of employers said that they had observed differences in the way the employees had done their job since taking the training.

Table 22

EMPLOYER ASSESSMENT OF SERIES USEFULNESS AND IMPACT
LONG-TERM FOLLOW-UP
(N=16)

BOC HAS BEEN USEFUL	FREQUENCY (PERCENT)		
	YES	NO	TOTAL*
Training Has Been Useful to Employee	13 (86.7%)	2 (13.3%)	15 (100%)
Observed Differences in Way Employee Does Job	**6** (46.2%)	**7** (53.4%)	**13** (100%)

** Totals less than 16 indicate that some employers did not respond.*

When asked what they had observed or the differences seen in the job performance of their employees since taking the training, employers made comments such as the following.

- *"He's better at troubleshooting and has more confidence."*
- *"He monitors and evaluates a key piece of equipment. We want to replace a cooling tower and he is doing the research. This course helped his analysis."*
- *"The morale of the trades people has improved because the training was excellent. They get better recognition. We have tripled the number of suggestions for facility improvement and we have implemented each one. They got great ideas from the training."*

Satisfaction

We asked students in the long-term follow-up to reflect on their overall satisfaction with the BOC training. More than three-quarters (76.5%), as shown in Table 23, of the students said that they were either "satisfied" or "extremely satisfied" with the training. This is slightly less than the 80% that reported being either "satisfied" or "extremely satisfied" with the training in the cumulative assessment reported in Table 8. The cumulative assessment reflects a satisfaction rating a few months after the series, while the long-term follow-up reflects satisfaction a year or more later. The difference we show here is quite small and suggests satisfaction did not change much.

Table 23

STUDENT SATISFACTION LONG TERM FOLLOW-UP
(N=34)

SATISFACTION RATING	NUMBER	PERCENT	CUMULATIVE PERCENT
5=Extremely Satisfied	7	20.6%	20.6%
4	19	55.9%	76.5%
3	7	20.6%	97.1%
2	1	2.9%%	100%
1=Not at All Satisfied	0	0.0%	0.0%
TOTAL	34	100%	100%

Students who rated their satisfaction level as “4” or “5” said the course offered a lot of good material overall, was well presented, offered new "horizons and solutions," and was practical. Those less satisfied with the training thought the course needed more depth or said that they prefer a more technical and hands-on approach than the BOC training offered, the courses needed more time, or the training did not relate to their job.

Similar to students, more than three-quarters (81.3%) of employers said they were "satisfied" or "extremely satisfied" with the BOC training. Only two employers said that they were "not satisfied." One of these employers noted that his dissatisfaction was with the employee’s lack of motivation to use the training, not the training itself, while the other said the course was too basic for his employee.

Beyond overall satisfaction, we asked students a series of questions to explore the role that the BOC training might have played in any changes in their jobs. First, we asked students if they had experienced a change in job title, an increase in responsibilities, an increase in compensation, or a change in job location since attending the course series. If any of these changes occurred, we then asked if the student attributed the change to the training.

At least half of the students reported a change in their jobs since the training. As shown in Table 24, students credited the BOC training with making a positive contribution to their job change in about half of the cases.

Table 24

STUDENT JOB CHANGES AND ROLE OF BOC LONG-TERM FOLLOW-UP (N=34)*

JOB CHANGES	YES	PERCENT OF SAMPLE	CREDIT GIVEN TO BOC	PERCENT OF THOSE CHANGING
Change in Job Title	5	14.7%	1	20.0%
Increased Responsibilities	16	47.1%	9	56.3%
Increased Compensation	17	50.0%	9	52.9%
Change in Job Location	2	5.9%	0	0.0%

* *Multiple responses allowed.*

We asked students who had made job changes but had not thought their training related to the change whether they thought that in the future the BOC certificate would help them to advance in their current job or find a new job. Table 25 shows that more than 80% of these students thought the certificate would be helpful in some way, with half of those stating it would help them both in advancing and in looking for new employment.

Table 25

USEFULNESS OF CERTIFICATE IN JOB PROSPECTS LONG TERM FOLLOW-UP (N=22)

WHETHER CERTIFICATE IS GOOD FOR JOB PROSPECTS	YES	PERCENT
Both in Advancing and in Looking for a New Job	10	45.5%
Advancing in Current Job	1	4.5%
Looking for a New Job	7	31.8%
Neither in Advancing nor in Looking for a New Job	4	18.2%
TOTAL	**22**	**100%**

We asked the employers whether the certification of employees has any significance for their department. If the employee's certification was pending, we asked what benefit might accrue were the employee to become certified. Most of the employers' comments focused on the increased recognition and respect the training has brought to their department, as suggested by the following representative comments.

- *"It gives authority."*
- *"It means more prestige for our department."*
- *"It raises the department's stature and professional standing. Our customers like it."*
- *"The training will save us some 15% or more in energy costs. It also contributes to 'ownership' in the workplace."*
- *"It legitimizes our position, raises professionalism, and gains respect from our tenants. We also take more pride in our work."*

To assess the value of reciprocal certification, we asked the students whether they were aware that the BOC is recognized in the four-state northwest region and whether this type of multi-state recognition is important. Twenty-three (68%) of the 34 students were aware of the multi-state recognition given the BOC and 28 (82%) said that such recognition is important to them. Responses from employers were similar. Ten (62.5%) of the employers were aware of the multi-state recognition given the BOC and 12 (75%) said that such recognition is important to them.

Future Interest In The Program

Employers we spoke with for the long-term follow-up expressed support for the BOC based on the number of staff they plan to send to future Level I course series. More than half of the employers said they have either already sent additional staff to the BOC, plan to in the future, or both. Most of the employers have or will send one or two more employees through the training. However, one employer had already sent five additional employees and another plans to send twelve in the future.

We sought to assess students' and employers' on-going interest in the program through several questions: Are they planning to attend (or to encourage their employees to attend) the Level II course? Have they taken continuing education courses for re-certification? Do they anticipate taking (or encouraging their employees to take) re-certification courses? Findings are presented in Tables 26 and 27.

More than half of the students said they plan to attend the Level II course, which can serve as part of the re-certification requirement. Considering all the options, 91% say they will either take a Level II course, get continuing education credits or have already taken continuing education courses. These findings are slightly higher than the percentage of students saying they planned to take continuing education courses for re-certification, as presented in previous MPERs (83%).

Table 26

STUDENT CONTINUING EDUCATION PLANS LONG-TERM FOLLOW-UP (N=34)

EDUCATION ACTIONS / PLANS	FREQUENCY (PERCENT)					
	YES		NO		TOTAL*	
Attend Level II Course	19	(59.4%)	13	(40.6%)	32	(100%)
Have Taken Courses/ Continuing Education Classes for Re-Certification	6	(17.6%)	28	(82.4%)	34	(100%)
Anticipate Continuing Education for Re-Certification	6	(17.6%)	28	(82.4%)	34	(100%)

** Totals less than 34 indicate that some students responded, "don't know."*

The majority of employers also support continuing education for building operators who have taken the BOC. Over 80% of employers plan to encourage their employees to attend the Level II series, and more than 90% plan to encourage their employees to keep their certification current.

Table 27

EMPLOYER CONTINUING EDUCATION PLANS LONG TERM FOLLOW-UP (N=16)

EDUCATION ACTIONS / PLANS	FREQUENCY (PERCENT)		
	YES	NO	TOTAL*
Will Encourage Level II Series	9 (81.8%)	2 (18.2%)	11 (100%)
Will Encourage Courses/Continuing Education Classes For Re-Certification	13 (92.9%)	1 (7.1%)	14 (100%)

** Totals less than 16 indicate that some employers responded "don't know."*

Students described what they expected to gain from attending a Level II training series and the topics they would like to see covered. Representative comments include:

Expect to Gain from Level II:

- *"Training that is more technical in nature."*
- *"More depth and more hands-on training."*
- *"More on systems and controls; more tips."*
- *"Firmer understanding of energy calculation and how to save money through long term commitment to conservation. Also more on computer programs and software related to cost/payback calculation on projects."*
- *"More preventive maintenance and advanced IAQ."*

Topics for Level II:

- *"HVAC, and refrigeration. Also system troubleshooting."*
- *"Lighting control systems."*
- *"Supervision of trades; cost-benefit analysis - whether to fix or replace; budgeting for long term."*

- *"More on pro-active things to do. Also communication skills."*
- *"Reading blueprints."*
- *"Energy conservation and fire protection."*
- *"More on digital and electrical controls."*
- *"Software for calculations."*
- *"HAZMAT and OSHA standards."*

Comments of employers on what they would like to see their employees learn in continuing education courses and Level II courses include:

Continuing Education:

- *"Just a refresher on things they use daily."*
- *"Updates on things changing in the field; new technologies.*
- *"Would like to see more on boilers and heating controls for classes."*
- *"Expect to see him keeping up with trends and regulatory changes."*
- *"I would expect the employee to gain the ability to network with the trades. Topics should also include supervision - how to lead a crew."*
- *"Would like to see project planning, budget, accountability, bio-systems, and presenting proposals."*
- *"More on exterior aspects, such as utility lifelines outside, utility drops to lot, savings in irrigation."*

Level II:

- *"More depth on focus on recent changes. Controls, for example, change so fast. One needs to keep current."*
- *"Refrigeration"*
- *"Better IAQ, computer use, and advanced boilers and controls."*

- *"Design issues for retro-fits."*
- *"More on cost-effectiveness and calculating long-term benefits of refits."*
- *"Contract management and working with blueprints."*

Willingness to Pay

Students estimated the amount their employer might be willing to pay for employees to be certified for two years. Findings are presented in Table 28. More than half of the students said they did not know what their employer would pay (15 students) or that their employer would not pay anything (4 students). Of the remaining 15 students who cited a maximum amount, just over half said their employer would pay $601 or more a course series leading to two-year certification.

Table 28

STUDENT ESTIMATE OF EMPLOYER WILLINGNESS TO PAY LONG-TERM FOLLOW-UP (N=34)

LEVEL EMPLOYER WILLING TO PAY FOR STUDENT	FREQUENCY	PERCENT
$0	4	21.1%
$10-$600	7	36.8%
$601-$800	3	15.8%
More than $800	5	26.3%
TOTAL	**19**	**100%**
Don't Know	**15**	

In the follow-up survey, we asked employers to evaluate the cost of the program. All of the surveyed employers thought the program was a good value at $650, and 69% thought it would be a good value at $750. At $950 four (25%) thought the program would be good value. When asked the maximum they would be willing to pay for a course series and the two-year certification of their employees, six of the employers were unwilling to state a maximum they would be willing to pay, however ten

provided an estimate (see Table 29). Fifty-percent of those who were willing to state a maximum said they would be willing to pay over $800 for the BOC course with two years of certification.

Table 29

EMPLOYER WILLINGNESS TO PAY LONG TERM FOLLOW-UP (N=10)

LEVEL EMPLOYER WILLING TO PAY FOR STUDENT	FREQUENCY	PERCENT
$0	1	10%
$50-$600	2	20%
$601-$800	2	20%
More than $800	5	50%
TOTAL	10	100%

BOC Value

More than three-quarters (77%) of the students said they would recommend the BOC training to others doing a similar job as theirs. This response provides another indication of student satisfaction and perceived value. The proportion of those willing to recommend the program from the long-term follow-up is somewhat lower than that found in the cumulative responses from students (93%). For those who would recommend the course, the following comments are representative of what they would say to others:

- *"It's a good educational session to break new ground. It's good for entry level employees."*
- *"It's a good background for talking to people who are building operators."*
- *"It's a very good class, with good integration and quick fixes and tips."*
- *"The energy survey and projects are great learning tools."*

Similarly, we asked employers if they had actually recommended the BOC to a colleague. Over one-third (37.5%) of employers had recommended the BOC to their colleagues. Employers had made recommendations such as the following.

- *"If you want quality employees, then this is a training that is current and relevant to their positions. Potential cost savings can be had from preventative maintenance taught in the course."*
- *"Send your energy monitors. I try to get everyone in my outfit to take it."*
- *"It's a good way to improve blue collar job skills. Helps with 'job creep.' Adds to more complete skills package."*
- *"Excellent training. It improves knowledge, confidence, and productivity."*

More than three-quarters (77%) of the students had put the BOC training on their resume. This percentage of actual behavior is somewhat lower than the proportion of students previously reporting that they intended to put it on their resume (96%) and may reflect the fact that not all have needed to update their resume.

Most (88%) of the employers we interviewed said that they would look for the BOC on resumes of job applicants. One employer noted that he would look for the BOC "now that it is becoming an industry standard."

Finally, we asked students if they had any further comments. Few gave additional comments, with the most noteworthy presented below:

- *"It is well put together and curriculum quality is good. If I knew I would get compensated either with more money or recognition for completing the course, I would be more inclined to take more classes."*
- *"It was worthwhile. I'd like to see more continuing education in the eastern part of the state."*
- *"It is a good credibility item for my trades people to recognize that I know something about their needs."*
- *"I would to be able to reference the manuals more easily. It's hard to find things when you are out there troubleshooting."*
- *"Excellent. I would recommend it not just for content but also for the people. They are competent and teaching it right. They believe in the program as a whole."*

5. NEEC BOC: INSTRUCTOR ASSESSMENT

Typically, four to six instructors teach the seven-course NEEC BOC series. To date, 45 instructors have taught in Washington and Oregon, 33 of which Research Into Action has surveyed. Instructors for every course series with the exception of the Portland course completed evaluations.

The instructor's survey has evolved over the course of this multi-year evaluation, as has the data collection methodology. At the outset of the evaluation, we conducted telephone interviews with instructors as part of the staff interviews. These interviews often covered several courses and occurred several months after the courses had ended. Beginning in January 1999, we now enclose evaluation forms in each instructor packet sent out by NEEC after course completion. In the instructions we ask instructors to complete and return the form as soon as possible after teaching the course. Sample sizes for some of the assessment variables presented in this chapter vary due to changes in the instrument over time and respondents' omissions. The current survey instrument is included in Appendix D.

SKILLS TAUGHT

We asked each instructor to identify three to five skills they hoped students would learn from their course. Responses reflect the course topics and include developing understanding as well as obtaining specific skills. The responses show that different instructors for the same course may emphasize different skill areas. For example, skills listed by a facility electrical systems instructor included:

- Overview of electrical systems;
- Importance of system documentation;
- Basic troubleshooting;
- Learning on the job (electrical); and
- Safety.

Another instructor for the same course, while listing the first three items, added "use test equipment" and "understand power quality issues" as the additional skill areas he hoped students would learn.

Thirty-one (94%) of the instructors surveyed believed they were able to transmit the key skills during their course and all thought that they are the "right" person to teach the course.

DELIVERY FORMAT

The NEEC BOC series aims to provide students with interactive learning. Partly, NEEC accomplishes this goal by requiring students to complete projects both in-class and as homework. In addition, NEEC encourages instructors to provide hands-on activities, such as examining building, measurement, and control equipment, and to solicit student discussion of the ideas. The courses vary in the degree to which the subject matter lends itself to activities and discussion. Instructors also differ in their teaching styles and their experience teaching the course, and the student profile at each location may vary.

Instructors assessed the extent to which activities and discussion occur in their classrooms. Instructors for the building systems overview course reported the least amount of hands-on activities and discussion (see Tables 30 and 31).

Table 30

PERCENTAGE OF TIME SPENT IN HANDS-ON ACTIVITIES (N=31)*

COURSES	INSTRUCTOR-REPORTED PERCENTAGES		
	AVERAGE	MINIMUM	MAXIMUM
Building System Overview (n=6)**	3%	0%	10%
Energy Conservation Techniques (n=6)	13%	0%	35%
HVAC System and Controls (n=6)	9%	0%	20%
Energy Efficient Lighting (n=2)	18%	10%	25%
Building Maintenance Codes (n=3)	17%	10%	30%
Indoor Air Quality (n=3)	23%	20%	25%
Facility Electrical Systems (n=5)	12%	10%	20%

* *Two of the 43 respondents did not report their course number.*

** *n = number of respondents.*

Table 31

PERCENTAGE OF TIME SPENT IN DISCUSSION (N=28)*

COURSES	INSTRUCTOR-REPORTED PERCENTAGES		
	AVERAGE	MINIMUM	MAXIMUM
Building System Overview (n=6)**	15%	10%	20%
Energy Conservation Techniques (n=6)	26%	20%	50%
HVAC System and Controls (n=6)	25%	10%	50%
Energy Efficient Lighting (n=2)	28%	25%	30%
Building Maintenance Codes (n=3)	33%	30%	40%
Indoor Air Quality (n=3)	33%	20%	50%
Facility Electrical Systems (n=2)	23%	5%	40%

* *Two of the 43 respondents did not report their course number, and three respondents for electrical systems did not answer this question.*

** *n = number of respondents*

The proportion of time instructors in the other courses reported that they spent in hands-on activities ranged from about 10% to 25%. The proportion of time spent in discussion in the other courses ranged from about 25% to 33%. Thus, it appears that the NEEC BOC is achieving its objective to be interactive, at least according to instructors' self-assessment. A qualitative comparison between these measures of course format and the students' assessment of course usefulness presented in Chapter 4 suggests that class time spent in activities and discussions do not underlie students' ratings of course usefulness.

Instructors discussed student involvement in the courses and demonstrations that the students really understood the course materials. Representative comments include:

- *"Two students corrected the presentation with better examples."*
- *"We had good interaction from boiler operators during the section on boilers."*

- *"Students volunteered energy projects they were involved in."*
- *"Students solved HVAC pump problems."*

COURSE RATING

We asked each instructor to assess their satisfaction with the course and their involvement using a number of criteria. Instructors answered using a five-point scale ranging from "very much so" to "not at all."

Most instructors thought that NEEC provided them with sufficient time to prepare for the course. (See Table 32; questions are arranged in descending order based on proportion responding "very much so" or "for the most part".) Three-quarters of the instructors thought that the course curriculum and materials were highly successful in meeting the course's stated training objectives, with the remainder of instructors responding that the objectives were met "for the most part."

Table 32

INSTRUCTOR RATING OF COURSE SERIES
(N=33)

COURSE ASPECT	FREQUENCY (PERCENT)				
	VERY MUCH SO	FOR THE MOST PART	SUBTOTAL: VERY MUCH + FOR THE MOST PART	SOMEWHAT	ONLY SLIGHTLY
Instructors given sufficient time to prepare for course?[1]	27 (81.8%)	5 (15.2%)	33 (100%)	0 (0.0%)	0 (0.0%)
Curriculum met stated training objectives?	25 (75.8%)	8 (24.2%)	33 (100%)	0 (0.0%)	0 (0.0%)
Content sequence was logical for students?	17 (51.5%)	16 (48.5%)	33 (100%)	0 (0.0%)	0 (0.0%)
Had sufficient opportunity to provide students with practical insights?	23 (69.7%)	8 (24.2%)	31 (93.9%)	2 (6.1%)	0 (0.0%)
Course materials contributed to students' learning?	22 (66.7%)	8 (24.2%)	30 (90.9%)	3 (9.1%	0 (0.0%)

Continued

COURSE ASPECT	FREQUENCY (PERCENT)				
	VERY MUCH SO	FOR THE MOST PART	SUBTOTAL: VERY MUCH + FOR THE MOST PART	SOMEWHAT	ONLY SLIGHTLY
Training materials will be valuable to students on the job?	18 (54.5%)	12 (36.4%)	30 (90.9%)	3 (9.1%)	0 (0.0%)
Course content was up-to-date?	15 (45.5%)	15 (45.5%)	30 (90.9%)	2 (6.1%)	1 (3.0%)
Content was appropriate for students' level of experience?	15 (45.5%)	13 (39.4%)	28 (84.8%)	5 (15.2%)	0 (0.0%)
Training gave students opportunity to network?	17 (51.5%)	10 (30.3%)	27 (81.8%)	3 (9.1%)	3 (9.1%)
Students had sufficient opportunity during training to apply the concepts presented?	3 (9.1%)	8 (24.2%)	11 (33.3%)	8 (24.2%)	13 (39.4%)
	FULLY ENOUGH	ALMOST ENOUGH	SUBTOTAL: FULLY ENOUGH + ALMOST ENOUGH	SOMEWHAT ENOUGH	ONLY SLIGHTLY ENOUGH
Was enough time was allotted to the course? [2]	13 (46.4%)	10 (35.7%)	23 (82.1%)	3 (10.7%)	1 (3.6%)
	VERY HIGH	HIGH	SUBTOTAL: VERY HIGH + HIGH	SOMEWHAT HIGH	ONLY SLIGHTLY HIGH
What was overall quality of training in terms of preparing students to do their jobs better?	21 (63.6%)	11 (33.3%)	32 (96.9%)	1 (3.0%)	

1. One instructor reported "did not know" if there was enough time or not.

2. One instructor reported "1," indicating that there was not enough time at all.

Over 90% of instructors agreed ("very much so" or "for the most part") that the sequence in which the curriculum presented the course ideas was logical for students, that they had sufficient opportunity during the course to provide students with practical insights, that the course materials aided students' learning, that the materials will be valuable to students on the job, and that the course content is current.

Only one-third of the instructors thought that NEEC attained its intention that participants have sufficient opportunity during training to apply the concepts presented. This opinion of instructors is consistent with the opinion of students found in all phases of the evaluation that there is not enough "hands-on" activity in the course. So although the courses are generally interactive—typically engaging in hands-on activities 10-20% of the time and discussion 25-33% of the time (see Tables 30 and 31)—nonetheless instructors and students think that students need more opportunity during the training to apply the concepts. This finding may contribute to explaining why students more frequently report being “satisfied” than they report being "extremely satisfied" with the course series as discussed in Chapter 4.

All but one instructor (97%) rated the course as “very high quality” or “high quality” overall. The lowest rated attribute was whether there was enough time allotted to the course. Seventy percent of instructors said that there was “fully enough time” or “almost enough time” allotted for this training, and this was the only attribute for which an instructor noted "not at all enough time" in their rating.

Based on students' performance on the skill tests, two-thirds of instructors felt that students showed some basic weakness. However, several of the examples instructors provided suggest that some of the problems could be addressed by further refining the standardized tests to reflect the material students are exposed to in the course. Representative comments included:

- *"HVAC questions need to be simplified."*
- *"Skills tests did not ask many questions described in the text."*
- *“All of the students need to learn on-the job.”*
- *"Mathematical skills are weak."*

About half of the instructors (16) said the NEEC BOC curriculum was better than the other courses they had taught, a little less than half (14 or 42.4%) said it was the same as other courses, and 2 said they "didn't know." Sample comments of ways in which the BOC was better included:

- *"The manuals are great."*
- *"The class is well-targeted to the audience."*
- *"The course materials and organization are great."*

NEED FOR TRAINING COORDINATORS

The NEEC staff have noted that program costs could be reduced if they could eliminate the training coordinators. Consequently, the 1999 instructor surveys included questions to determine whether instructors would be comfortable working without this assistance. Eighteen of the instructors who responded to our surveys had received these questions.

In response to an open-ended question, instructors first identified the ways the coordinator was most helpful. Sample comments included:

- *"In testing and evaluations."*
- *"He was especially helpful with testing. Overall he did a good job. The students liked him and the way he coordinated and resolved their concerns."*
- *"Just the overall support is good."*
- *"The coordinator helped with tearing down visual aids and administration."*
- *"Providing continuity; delivering handouts; handling BOC questions on grades, progress, etc."*
- *"Providing directions to site; setting up room; providing materials and refreshments."*
- *"The coordinator assisted with LCD projector and provided refreshments."*
- *"She really helped me by staying the entire class and guiding me through 'deleted' portions of the first edition. I should have received the 2nd edition manual but she helped me out of the problem."*

Instructors reported whether or not they would feel comfortable doing a variety of tasks that the coordinators usually perform. Over 80% of instructors would feel comfortable meeting and greeting students, answering questions about tests, and bringing all materials to class (see Table 33). Half of the instructors would feel comfortable arranging for the audiovisual equipment or making arrangements for the rooms.

Table 33

INSTRUCTOR COMFORT WITH COORDINATOR'S TASKS
(N=18)

COORDINATOR'S TASKS	FREQUENCY (PERCENT)							
	COMFORT YES		COMFORT NO		DON'T KNOW		TOTAL	
Meeting and Greeting Students	17	(94.4%0	1	(5.6%)	0	(0.0%)	18	(100%)
Answering Questions About Tests	16	(88.9%)	2	(11.1%)	0	(0.0%)	18	(100%)
Bringing All Materials to Class	15	(83.3%)	3	(16.7%)	0	(0.0%)	18	(100%)
Posting Test Grades from the Previous Class	14	(77.8%)	4	(22.2%)	0	(0.0%)	18	(100%)
Collecting Projects and Discussing Them with Students	13	(72.2%)	4	(22.2%)	1	(5.6%)	18	(100%)
Representing the BOC Program and Responding to Questions About the Program	13	(72.2%)	4	(22.2%)	1	(5.6%)	18	(100%)
Arranging for AV Equipment	9	(50.0%)	9	(50.0%)	0	(0.0%)	18	(100%)
Making Arrangements for Rooms	8	(44.4%)	10	(55.6%)	0	(0.0%)	18	(100%)

Having asked instructors to consider each of the coordinator functions individually, we then asked if they would be comfortable without a training coordinator in future classes. Most instructors (78%) said they would. However, their assessment that they would feel comfortable taking over those functions did not mean that they wanted to do so. Many of the comments suggest that they prefer to have a coordinator. The following are some key examples:

- *"I could do it, but prefer not to do so."*
- *"I would do most of those things, but only if the arrangements and setup were done by someone else."*

The instructors who said they would not be comfortable in the absence of a training coordinator noted:

- *"I could not afford the extra time away from my job to do these things."*
- *"You could not pay me enough for all of this leg work."*

- *"It is all I can do to prepare for and improve my presentation using current illustrations and props."*
- *"It could be done, but simply teaching is a luxury and makes the experience simpler and easier."*

RECOMMENDATIONS

Instructors identified changes they would like to see in the BOC courses. As reported in previous MPERs, instructors recommended that courses become more hands-on, more interactive, and provide more time for student practice. Some courses elicited these recommendations more than others. In addition, several 1999 respondents suggested revising test questions. Sample responses included:

- *"Have more equipment for hands-on activities."*
- *"Develop more discussion and interactive activities."*
- *"Make time for exercises."*
- *"Add written material to the text."*
- *"Revise test questions; add site visit."*

6. NEEC BOC: PROGRAM IMPACTS

The initial design for evaluating the NEEC BOC program included a plan to conduct case studies of a sample of participants' facilities to document the benefits of the training. It was hoped that the class projects and assignments would provide the basis for case studies. However, we found that these assignments did not generate sufficient data to develop case studies for the measurement of savings.

Consequently, we developed two alternative strategies for estimating the NEEC BOC program impacts to date. First, we revisited the assumptions used by the Alliance staff in their initial projection of program impacts to verify or revise those assumptions for which we had data. Second, we contacted students who had completed the course series a year previously and explored any projects they reported having undertaken that resulted in improved building occupant comfort or money savings.

REVISED PROGRAM PLANNING ASSUMPTIONS

In evaluating the proposal to fund the NEEC BOC program, Alliance staff estimated potential program impacts by making conservative assumptions about the participants, their facilities, and the percentage impact that efficient operations and maintenance activities might have on commercial buildings. The staff estimated potential savings by positing for each BOC participant an assumed average facility size, an assumed average annual electricity consumption, and an expected savings fraction. From these assumptions, they computed the per-participant annual savings expected from BOC participants and a program annual savings based on the expected number of students.

Table 34 reviews the Alliance staff's planning assumptions and provides revised values based on data obtained from BOC participants. We discuss each of the data elements in turn.

Table 34

PROGRAM IMPACTS AS ESTIMATED FROM PLANNING ASSUMPTIONS AND BOC DATA

VARIABLE	PLANNING ASSUMPTION	ESTIMATE REVISED TO REFLECT BOC DATA
Average Facility Size	11,900 sq. ft.	104,000 sq. ft.
Average Annual Electricity Consumption	20 kWh/sq. ft	20 kWh/sq. ft.
Expected Savings Fraction	2.5%	2.5%
Computed Per-Facility Average Annual Impact	5,950 kWh	52,000 kWh
Unique Facilities per Participant	1	0.55
Computed Per-Participant Savings	5,950 kWh	28,600 kWh
Number of Participants Completing BOC Series by September 1999	338	338
Computed Program Annual Impact as of September 1999	2,011,100 kWh	9,666,800 kWh

Alliance staff assumed that the facilities of BOC students would be 11,900 square foot on average. They assumed an average annual electricity consumption of 20 kWh per square foot, a value consistent with other estimates. For example, results for offices and schools from the Bonneville Power Administration's End-Use Load and Conservation Assessment Program (ELCAP) in the 1980s and 1990s indicated a typical annual electricity consumption of 25 kWh per square foot. Alliance staff stated that efficient operations and maintenance procedures typically save about five percent.[26] Thus, the expected savings fraction of 2.5% is conservative.

From these assumptions, the staff computed the average annual impact per affected facility as 5,950 kWh. They then multiplied this number by the expected number of BOC participants to obtain a program total. The staff did not distinguish between the expected average annual impact per facility and per participant. Thus, the

[26] The savings fraction was provided to the Alliance by Northwest Power Planning staff from their models of savings potential for building O&M.

staff's method for calculating potential program impact includes the implicit assumption that each facility will be the responsibility of a single BOC participant. To date, 338 participants have completed the BOC series, as recorded in Table 32.

We revised the saving assumptions using the information available for the BOC participants. NEEC had asked participants to report the size of their facilities. The NEEC database included usable responses for 60 of the 338 participants (see Appendix E for a discussion of the database). The 60 participants worked for 33 unique facilities—i.e., a proportion of 55% unique. On average, these unique facilities were 104,000 square feet in size. We have no BOC-specific data on the average annual electricity consumption and expected savings fraction and so we use the estimates developed by the Alliance staff.

Based on the available BOC data, the average facility size is nearly ten times larger than the Alliance staff initially assumed, yet approximately two participants attend from each facility represented. Consequently, the revisited program savings estimates are approximately five times larger than the Alliance staff initially assumed.

The revised program savings estimates presented in Table 32 need to be accepted as preliminary. Usable facility square footage data was present in the NEEC database for only 60 participants out of 338, or less than 18%. We have no way of knowing whether these 60 observations are representative of the population of BOC participants to date. In addition, about three-quarters of the BOC participants to date work in the public sector (see chapter 4), which tends to have larger facilities than the private sector. Even were the data available for all 338 participants, the average facility size to date might be larger than it will be in future program years if the BOC attracts a greater proportion of private sector students and if these students come from relatively smaller facilities.

Although the estimate of proportion of unique facilities per BOC student was also calculated from the 60 participants with usable square footage data, we have a means of checking this figure. Our cross-check suggests that 55% is a good estimate: From the database of 338 students, we examined the company names and locations. The current configuration of the NEEC BOC database precluded a definitive tally of unique facilities. However, we estimated that unique facilities total between 50% and 64% of the number of students.

In conclusion, the approach characterized in Table 32 indicates that the NEEC BOC program might be yielding impacts approximately five times greater than Alliance staff originally predicted. However, data limitations imposed by the condition of the BOC database cast doubt on the precision of the revised program estimate. Without

the benefit of substantially improved participant data, we can conservatively conclude that the BOC program is achieving the projected impacts. In all likelihood, it is greatly exceeding the projected impacts.

This conclusion is supported by the results of our second strategy for estimating program impacts, which we present below.

PROJECT EXPERIENCES

We contacted 34 BOC students as part of the long-term follow-up investigation conducted about a year following series participation. The long-term follow-up contacted students from unique facilities. We asked students whether "applying the knowledge learned in the course series had improved [their] job performance." Over 90% of students responded positively. Students most frequently said that the training gave them a better understanding of building operations procedures and an improved ability to supervise contractors.

We then asked students whether they had been able to "improve the comfort of the occupants or save money" as a result of what they had learned. Eighteen students responded that they had both saved money and improved comfort and five students reported saving money without improved comfort, for a total of 23 of the 34 participants (68%). We asked these students to describe the projects they had undertaken.

Twelve students identified specific projects. Most of the projects concerned indoor air quality (IAQ) or general energy conservation activities.

Participants involved in IAQ projects appreciated their improved ability to manage IAQ issues. IAQ is a technical area that many participants had poorly understood. As a result of the training, the participants we spoke with felt they were more capable of responding to problems and developing solutions. Such training had not been available from any other source.

The energy impacts of IAQ projects are difficult to quantify, since adding ventilation will increase energy consumption. However, if the previous building suffered from inadequate air it is inappropriate to make a direct pre/post-project comparison. Often the replaced equipment is just not capable of supplying adequate air volume, rendering a comparison meaningless. Instead, energy consumption after changes in ventilation should be compared to what would have been required to provide the proper amount of air using the previous equipment. Based on the comments we heard from students, it seems clear that the BOC training results in a better response to air quality problems. Without the training, the students might

have attempted to remedy inadequate air quality with poorly designed, over-consuming equipment.

The projects of students who mentioned general energy conservation projects tended to have been initiated prior to, or independent of, the BOC training. Based on comments from students, the BOC training contributed to these projects in terms of improved implementation.

Three participants identified specific projects that they said were influenced by their BOC training. Although our questions could not definitively ascertain whether these projects would have occurred in the absence of the BOC program, the students themselves attributed the projects to the training. Table 35 describes the projects and the project savings as estimated by the participants.

Table 35

ENERGY CONSERVATION PROJECTS DESCRIBED BY PARTICIPANTS

PROJECT	ESTIMATED SAVINGS	KWH EQUIVALENT	PERCENT OF INITIAL PROGRAM SAVINGS ESTIMATE
Three Lighting Retrofits	100,000 kWh	100,000 kWh	5%
EMS Installation on a Large Facility	37,000 MMBtu	10,844,080 kWh	539%
ESCO Retrofit for Campus	200,000 MMBtu	58,616,647	2900%

The EMS installation and the ESCO retrofit projects generate gas savings and so cannot be directly compared with the Alliance estimate. However, when the MMBtu savings are converted into kWh, they overwhelm the projected program savings estimate, as shown in Table 35. The EMS installation saves the equivalent of more than five times the energy savings estimated for the program by the Alliance and the ESCO retrofit saves the equivalent of 29 times the program estimate.

These three participants comprise about 9% of the sample of 34 students queried in the long-term follow-up survey. We make the assumptions that these students are

representative of the 338 BOC students to date and that their projects are representative of projects occurring at the facilities they represent. We estimate that about 5% of the 338 students to date (about 17 students) may have undertaken projects such as those described in Table 35.[27] Again, assuming the projects are representative, about 6 students undertook projects comparable to the lighting retrofit, saving about 600,000 kWh in total, and about 11 students undertook projects saving gas, for electric-equivalent savings of about 255,000,000 kWh in total.

We conclude from the activities of participants queried in the long-term follow-up survey that the BOC program produces energy savings in three ways. From:

- A better understanding of building operations procedures, an improved ability to supervise contractors, and a general improvement in their job skills;
- Projects addressing IAQ problems or general energy conservation activities; and
- Large energy conservation projects such as described in Table 35.

More than 90% of the sampled students reported an improvement in their understanding and skills; 68% of students said that they had been able to save their employer money by applying the training concepts. Thus, it is likely that over two-thirds of the 338 BOC participants have generated some energy savings from more efficient O&M activities.

In addition, 26% of the sampled students reported IAQ projects or general energy conservation activities. Adjusting for the unique facilities represented by the 338 participants to date produces a figure of about 13% of total students generating energy savings from these IAQ and general conservation activities.

Finally, 9% of the sampled students, or about 5% of the total population when adjusted for unique facilities, reported projects that yielded significant savings. If the three projects described by sampled students and presented in Table 35 are representative, savings from large projects undertaken by the BOC students to date

[27] Percentage of students undertaking projects at unique facilities (.09)times percentage of unique facilities (.55) equals percentage of total students that likely undertake projects at unique facilities (.0495, or about 5%).

vastly exceed initial program estimates (by 40 fold for gas and electric savings combined, considered in kWh equivalents of Btu).

CONCLUSION

Although definitive data on the NEEC BOC program impacts are not available, we are able to gauge whether the program meets the initial planning estimate for savings. We conclude, using two different analytical methods, that program savings greatly exceed the planning estimates. Using BOC participant data and some Alliance staff planning assumptions, we estimate that program to date impacts exceed the initial planning estimate by a factor of five. Considering participant projects and their savings estimates, we estimate that program impacts for gas and electricity combined could exceed 40 times the initial planning estimate.

7. BOC REGIONALIZATION: STATUS AS OF JUNE 1999 AND CURRENT AGREEMENTS

INTRODUCTION

This chapter summarizes findings from a mid-year review of the process to develop a region wide approach for building operator certification. The primary focus of this chapter is on NEEC and NWBOA staff and Board member views regarding the effort to establish a regional BOC as well as views by Montana contacts. To accomplish the review we conducted telephone interviews in May and June 1999 with two NEEC Washington BOC staff members, one NEEC Oregon BOC staff member, one NWBOA staff member in Idaho, one NEEC Board member, two NWBOA Board members, and two contacts supporting BOC efforts in Montana.

Findings from this effort were subsequently reviewed and discussed between July 1999 and January 2000 by NEEC and NWBOA BOC staff and by Alliance BOC project management staff. In response to these discussions and following an evaluation recommendation that the Alliance take an active role in resolving the key issues, the Alliance hired an organizational development consultant to assist in bringing about resolution between NEEC and NWBOA. On January 21, 2000, the consultant facilitated a discussion between NEEC, NWBOA and Alliance staff that both created a greater level of understanding of the issues facing the BOC and resulted in a series of agreements between all parties.

The primary focus of this chapter is two fold: 1) to document the issues facing regionalization of the BOC and 2) to report the agreements reached by NEEC and NWBOA that will help to ensure the BOC is successful in the Alliance service territory. What follows is a detailed assessment of the views that were held by the key parties in May and June 1999, identification of the factors that may contribute to those views, and a re-cap of the specific agreements reached in January 2000.

JUNE 1999 STATUS OF THE EFFORT TO REGIONALIZE THE BOC

NEEC and NWBOA contacts we spoke with used terms such as "dead in the water," "at a standstill," and "stuck on role issues" to describe current efforts to establish a

regional BOC. One contact noted, "all we've done is agree on reciprocal recognition of certification by two entities." Most of those interviewed agreed that this stalemate developed after a proposal was put forth by NWBOA on February 24, 1999 to become the regional certifying body and NEEC made a counter proposal on April 20, 1999. As one contact put it, the proposals presented by the two organizations indicate that there was never clear agreement on a definition of "regionalization."

In addition to lack of agreement on regionalization, the ability to resolve the agreement has been slowed by the process. NWBOA felt that after the February 24th meeting agreement on certification issues had been reached. NWBOA members on the coordinating committee were empowered to make final decisions for their organization while attending the coordinating committee and they assumed that NEEC members were as well. However, NWBOA realized with the April 20th proposal from NEEC that those representing NEEC were not empowered to make decisions on the issues being discussed in the coordinating committee. From NWBOA's perspective this created an impasse in the decision-making ability of the coordination committee.

The NWBOA Management Agreement as revised during the regional coordination meeting on February 24th proposed that an independent certifying body, administered by NWBOA, become the sole certifying body for the four-state Pacific Northwest region. NWBOA would oversee a seven member certifying board comprised of two representatives from NEEC, two members of NWBOA, and three at-large members with an interest in competency-based building operator certification. NWBOA stated the following benefits from this approach:

- Employers in the region would gain from being able to verify certification of an applicant with one phone call (one central database);
- There would be stronger recognition of the certificate by employees; and
- There would be a guarantee of a consistent standard of training for those certified.

In addition, NWBOA staff and Board members we spoke with indicated their concerns that NEEC, as a not-for-profit entity without a record of continuity without Alliance funding, might be at risk of failure if the market for training declines. NWBOA, as a member organization, has been in existence (as IBOA) since the early 1990s and expects to remain viable in the future through member support. Furthermore, NWBOA sees training as a service they offer their members but on which they are not dependent.

NEEC's counterproposal was to maintain two certifying bodies with reciprocity. NEEC further proposed that NEEC oversee the certifying board for Washington and Oregon, which would include representatives from Oregon and Washington and one representative from NWBOA. NEEC noted the following benefits from their proposal:

- A cooperative effort would evolve to ensure consistent training and testing standards and problems/issues around certification/re-certification could be resolved across the two entities, which is consistent with NWBOA's proposal.

- NEEC's contract with the Alliance is for training *and* certification. Thus, NWBOA's proposal would put them at odds with their contractual agreement.

- NEEC's curriculum and certification is based in a solid business plan, including fees that allow for a self-sustaining program once Alliance funding is complete. NWBOA's approach did not fit with this business plan.

NEEC, in response to NWBOA's proposal, also asked NWBOA to propose how they might administer the certification and re-certification process as a subcontractor to NEEC and not as an independent certifying entity. In response to this proposal, NWBOA indicated that they have never wanted to become a sub-contractor to NEEC.

DIFFERENCES IN THE ORGANIZATIONS/PHILOSOPHY/BOARD/STAFF

Several of those we interviewed cited differences in the organizations that have contributed to the current stalemate. First, the organizations are viewed as having a different mission vis-à-vis training and certification. NWBOA is a membership organization for building operators, with the goal of providing services to members, such as training and certification. The target audience for NWBOA membership is building operators and maintenance staff, which is the same audience targeted for the BOC.

NEEC is a membership organization of energy efficiency products and service companies. NEEC's mission is to build a cadre of professionals to change energy practices in the region's buildings. As one contact noted, NEEC is a business-based membership organization to whom the benefits flow if the BOC is successful. That is, if people are operating buildings better and understand the need for more

efficient operations, then these people are a better market in the future to sell energy efficient products and services.

Second, there are differences between the two organizations in their market strategies and marketing approaches. NEEC staff attributes much of the BOC's success in Washington and Oregon to marketing through and close relationships with facility associations such as the Washington Association of Maintenance and Operations Administrators (WAMOA), IFMA, and health care and school associations. NEEC contacts noted that Idaho and Montana do not have strong facility associations. As NEEC considers moving the BOC into other states, a key approach is to look for these types of associations to aid in marketing the training. This approach, tied closely to NEEC's philosophy and practice of not aligning with any specific member organization, has been a cornerstone of the BOC implementation in Washington and Oregon.

NEEC contacts expressed concern that NWBOA seems to have "shifted their point of view" about what their organization wants to "be" in regards to certification. At the outset of the regionalization process, NEEC interviewees indicated that the IBOA contacts consistently said they only wanted to serve building operators in Idaho. Yet, now regional certification is seen as a way to gain members, fund training efforts, and increase revenue. This appears to have occurred after NWBOA/IBOA contacts recognized that their market in the Idaho public sector is saturated. This linking of membership and training, however, is not new. The BOC evaluation reported in 1998 that IBOA linked annual membership in IBOA with training by offering an annual membership as part of the $35 annual re-certification fee for those who complete the training and certification program.

NWBOA staff has stated that they do not plan to prepare a business plan prior to taking on the BOC for Idaho and Montana. NEEC is concerned about this. They would like NWBOA to clearly identify the size of market they will target, calculate a fee structure based on the market, and develop a realistic business plan for long-term sustainability.

Three contacts we spoke with felt that there should be one central board that oversees certification and re-certification, which is consistent with what NWBOA proposed. The training could be provided by contract with this board. Another two contacts said there should just be one organization managing and delivering every aspect of the BOC, including training and certification. Two of these five contacts were skeptical that agreement on one certifying body would happen and thought that if not, questions would remain about which organization will certify students trained under licenses as NEEC moves beyond this region.

CURRICULUM

Another source of distrust between the two organizations developed around the BOC curriculum. Both IBOA/NWBOA and NEEC worked cooperatively over the past 12 months to develop a joint, revised curriculum with testing that would ensure consistent training and assessment for certification. Both organizations tacitly agreed to use the revised curriculum.[28] NWBOA representatives indicated, however, that they played the key role in starting the BOC, developing the original curriculum, and conducting training, with all of this occurring before NEEC was in existence.

NWBOA representatives feel that they have not been given the recognition they deserve for their part in curriculum development. As NEEC moves to gain copyright over the revised curriculum, some NWBOA contacts used terms such as "NWBOA was ripped off" and "NEEC took our information and now wants to license us to use it" to describe their reactions.

Following the discussion on the curriculum in 1998, there is now concurrence over the content of the curriculum. Where there were differences between the NEEC and NWBOA curriculum, these have been resolved. NEEC believes that the 2nd Edition provides significant improvements to IBOA's old curriculum and to the NEEC 1st Edition. A brief history may provide some clarity on this issue.

Development of NEEC BOC Curriculum: A Short History

The Washington State Energy Office (WSEO) participated in a BOC Regional Committee established by the Bonneville Power Administration (BPA) in 1994-95 to explore the feasibility of a regional BOC program. This regional committee reviewed the Idaho BOC curriculum that had been developed by the Idaho Department of Water Resources (IDWR) and Idaho Building Operators Association (IBOA) under contract to BPA. Following this review, WSEO convened a Washington State BOC Steering Committee and, under its guidance, began development of outlines and learning objectives for a series of courses for building operators that would use hired contractors to teach courses based on these materials.

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28 *BOC Level I, Second Edition*. Northwest Energy efficiency Council. Seattle, WA. 1999.

NEEC's development of the BOC began in 1996 when the BPA awarded NEEC a grant to complete the curriculum for the BOC program which had been under development at the Washington State Energy Office.[29] The grant required NEEC to accomplish the following:

- Reconvene a BOC steering committee to advise NEEC on the development of a BOC program for Washington State;
- Pilot a number of BOC Level I and Level II courses with Boeing and U.S. Navy employees in the Fall of 1996;
- Make modifications and refinements to curriculum based on the results of the pilot.

Before program development began, in August or September of 1996, Stan Price and Bill Younger of NEEC met with Connie Searles of IBOA by phone to introduce her to NEEC and the decision by the NEEC Board to include IBOA in discussions about the development of Washington's BOC. Following this phone call, Stan Price was invited to attend a meeting of IBOA's Board of Directors to discuss the certification program NEEC was developing in Washington. IBOA's Board Members expressed support for the direction NEEC was taking the BOC curriculum and encouraged the two organizations to look for opportunities to co-recognize BOC graduates in each state.

NEEC contacts stated, they "learned from IBOA's model" but were charged by BPA (and subsequently by the Alliance) to develop a unique curriculum. Thus, while the Washington BOC program was patterned after the Idaho model, the learning objectives, tests, and competency measures were developed independently. In addition, two new course topics in Level I were introduced one focused on codes and one on electricity. When Oregon was added to NEEC's program, the steering committee chose to use the Washington BOC curriculum.

NEEC used the following process to develop the BOC curriculum for Level I:[30]

- Learned about the use of testing and certification in the IBOA BOC from BPA;

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29 WSEO was dismantled in 1996.

30 *BOC Level I, First Edition*. Northwest Energy efficiency Council. Seattle, WA. 1997.

- Acquired the set of course outlines and learning objectives which had been established by WSEO for the BOT;
- Acquired course materials for some of these courses that contractors had "fleshed out" for WSEO;
- Identified contractors or consultants to take these outlines and develop courses;
- Presented initial course plans to a curriculum sub-committee of NEEC BOC steering committee for review;
- Worked with a contractor who developed text and visual materials for course presentation;
- Sent course materials to two or three experts for peer review;
- Piloted the courses;
- Refined the courses based on pilot evaluations; and
- Produced final course workbooks.

NEEC is using this same process, starting with consultants developing course outlines and teaching approach, to develop the Level II course series.

Future Issues

NWBOA has stated that they plan to use the jointly revised BOC curriculum in future training efforts but need time to train their instructors to use it. The NWBOA course series offered in Idaho Falls and Missoula in early 1999 did not use the revised curriculum, because they did not receive the curriculum in sufficient time to train their instructors. At this time there is no agreement in place to ensure that the curriculum used by NEEC and NWBOA will be the same now or in the future. One NWBOA member noted that "we might want to change our curriculum in the future to meet local needs."

For the Alliance, this may raise issues about consistency of certification across the region. NEEC's proposal to license NWBOA (free of charge) as a user of the copyrighted curriculum has been proposed as a means to formalize agreement to use the joint curriculum. NWBOA, however, believes that an agreement between the two organizations that the two curriculums are equivalent should be sufficient. NWBOA feels that this was accomplished for the Level I curriculum at the April 8,

1998 meeting, where all parties agreed that the WA and ID Level I curriculum is reciprocal.

Training Approach

Delivery of the program varies slightly between NWBOA and NEEC. NEEC's approach in Oregon and Washington has been to spread the training over a six-month period to minimize the time employees are away from their workplace and to allow students time to complete out-of-class projects. Typically, different instructors are used for each class topic. Traditionally, due to the distances involved in Idaho (and now in Montana), NWBOA has offered its course two days per week over a three-week period to minimize travel for both students and the instructors with one instructor delivering all of the training.

NEEC contacts expressed concern that the one instructor approach may not achieve the same quality training as multiple instructors. NEEC has two reasons for their concern, first one instructor may not have the expertise or experience required to effectively teach all courses. In addition, multiple instructors with different teaching styles can help maintain student interest and involvement in a course as well as meet different student learning needs. On the other hand, NEEC contacts noted a qualified single instructor can provide continuity lost with the use of multiple instructors.

NWBOA contacts stated they cannot afford to hire different instructors for the training. NEEC noted this might be addressed with a good business plan based on a membership fee schedule comparable to other professional organizations.[31]

The baseline survey found that employers in Montana were willing to pay the highest amount for the training. Given this it would appear that a training provider should be able to recover their costs for implementing the BOC curriculum using a cadre of instructors. The main problem identified in the baseline study regarding fee structure was that Washington and Idaho employers were least willing to pay higher fees than have been offered in their states to date. This suggests that rather than a reluctance to pay higher fees there is a reluctance to pay more than others have paid in the past.

[31] Most professional organizations membership dues range from around $100 to $400.

EXPANSION IN MONTANA

All of these issues, as well as others, affect the expansion of the BOC into Montana. In the fall of 1998, the Alliance board approved funding for delivering programs to the Western side of Montana. These funds were withheld pending the results of the baseline market study (report finalized 6/30/99). The Alliance Board agreed to authorize NWBOA to serve Montana, but their contract never reflected this change. Both of these factors led to a delay in funding the Montana BOC effort.

Recently, the Alliance Board agreed to serve Montana Power's customers east and west of the continental divide, in exchange for increased contributions to the Alliance. Alliance staff began meeting with NWBOA the first week of July 1999 to work out contractual agreements, costs for serving the entire state of Montana rather than the initial estimates based on serving the Western portion of the state, and a plan for beginning the effort.

The Montana contacts support regional efforts and believe delivery of the program should be closer to the "Idaho model." That is, they have a small, geographically dispersed population who need to minimize travel distances (and thus expense) to attend training.

Unlike Idaho, however, there is no building operator organization in place in Montana. Marketing for the only Montana training to date was done by two individuals calling contacts and sending letters. None of their efforts were financially supported and both said this could not continue in the future. Marketing the BOC in Montana will require an intensive effort with significant costs. Both Montana contacts expressed disappointment that the expected funding had not been forthcoming. As one stated, "I was very excited in the beginning, put a lot of effort into it, and made calls out of my own pocket. But the future looks bleak. I'm not going to spend any more energy on it myself unless there is more support."

One contact from Montana felt that development of a strong organization, such as a Montana building operators association, is a good model to follow for marketing and administering the BOC. The other contact, however, strongly disagreed, noting that "no one should have to be a member of anything to get the training." Although membership is not required for the training, this contact believes that Montana building operators would feel pressure to join and would resent this pressure.

The Montana contacts also held different views about the potential market for the BOC. The contact familiar with local government said that the market is fairly small for this sector. At the county level, about 56 people exist in the state who do building operations type work and another 50 at the city level (in towns above 3,000

with a building and an operator). Thus, in his view, there are approximately 100 towns or cities where it is reasonable to send someone to training given the facility size and a designated operator who can benefit from the training. This contact also believed there is a significant market in the commercial sector, but it is difficult to find the right contact for marketing to this population. The other contact was more confident a market exists outside of city and county operators.

Both Montana contacts believe there are substantial markets in the school districts and through the power companies and that gaining their interest could be done quickly and easily. Two NWBOA contacts noted that projected population growth in Idaho and Montana will increase the market for the BOC in the coming decades.

When asked about expansion of the BOC to all of Montana Power's service territory, most of those we spoke with saw this only as an extension of the challenges to serving Montana in general. Because of the east/west population distribution, those we talked with felt that training might need to be offered more often in more sites. One contact noted that serving all of Montana would require creativity, and that the challenges are not unique to the BOC, but exist for all Alliance programs in Montana. Thus, lessons learned in one program should be applied to others.

NEEC contacts believe that a careful analysis of the baseline market study for Montana should be completed. Then, depending on where the market is, an implementation strategy should be developed. If the numbers warrant serving the whole state, then an advisory group could be recruited to assist with marketing, as has been done in Washington and Oregon. Another approach could be to offer incentives to get some Montana participants to travel to Spokane or other locations. This could be done using utility supported partial scholarships and other incentives such as NEEC has used in the past as well as new approaches (such as accommodation subsidies). NWBOA's primary approach is to follow the same strategy they have used in Idaho.

ACTIVITIES FOR NWBOA AND NEEC

Representatives of both NEEC and NWBOA are continuing their marketing and training efforts following agreement on reciprocal recognition.

NWBOA

Based on the findings in their market study, NWBOA hired a part-time marketing assistant to make calls to businesses to identify the right staff person for targeted mailings and to tell them more about the organization and the BOC opportunity. In

much the same way that NEEC has developed ties in Washington and Oregon, NWBOA is also strengthening its relationship with utilities in Idaho. NWBOA received funding from Idaho Power to develop a three-hour training on energy efficiency issues for Idaho Power customers and staff, and NWBOA will be allowed to invite key private sector managers to attend this training. NWBOA representatives have also attended events held by other organizations, such as the Idaho League of Cities, to increase visibility and develop cooperation.

NWBOA is also holding regional meetings throughout the state, with speakers on energy management, information on vendors, and opportunities for more networking. NWBOA contacts said they are optimistic about increasing private sector participation and expanding the support of Idaho Power and Montana Power. The board of NWBOA also has new members, one of whom said, "there is a lot of new energy. We aren't getting lost in this BOC business."

NEEC

In Oregon and Washington, 1999 courses are full and NEEC staff is preparing for the implementation in September of the first Level II course in Kent, Washington. Staff is exploring the possibility offering future courses in actual commercial or industrial buildings to make hands-on exercises easier and more meaningful. NEEC has also been continuing to expand the involvement of local utilities in coordinating the BOC courses. Doing so at two sites this year decreased the cost of the course by several thousand dollars. If this is possible in other areas, it might allow NEEC to serve locations where they have difficulty attracting the minimum number of enrollees.

Additional marketing activities planned by NEEC include trying to reach personnel in different levels of the organizations they contact. For example, human resources personnel may include a training coordinator or someone in charge of finding and giving approval to training for employees. NEEC would like to identify these opportunities to market the BOC. NEEC also continues to market the BOC to groups such as the hospital association.

Work continues on the licensing agreements and copyrights. NEEC staff is making initial contacts with interested parties outside the region and considering expansion to other states as a next step. Staff notes that the model they used in Oregon, expanding the BOC one state at a time, was successful. They believe this model will work for further expansion. Staff expect the future to produce a "patchwork" of BOC programs, with active states/regions spread among those not as active or inactive.

Several of those we interviewed expressed concern, however, over the continued problems between NEEC and NWBOA. As one contact noted, "it doesn't help our program, theirs, or expansion if there is some 'noise' in the background. The benefits of working cooperatively would accrue to all."

NEXT STEPS

All of those interviewed are concerned about the current impasse in the regionalization effort. Sample comments included:

- *"Everything needs to be put on the table. I'm still not sure what NWBOA wants to happen. They don't have a business plan. We need to get more clarity on what they want. And we also need clarity on what the Alliance wants."*

- *"We need SOMEONE to make a decision. Whether that person is from the Alliance or some independent party, we need to take care of this and move on. We are wasting valuable time and could lose the momentum we have started."*

The issues between NWBOA and NEEC need resolution to:

- Build on the momentum that the BOC has built among building operators and their employers for a high quality, regionally recognized certification; and

- Provide clarity to the certification process as it moves beyond the region.

FEBRUARY 2000 STATUS OF THE EFFORT TO REGIONALIZE THE BOC

On January 21, 2000, representatives from NEEC, NWBOA and the Alliance met with a facilitator to discuss the most significant issues facing regionalization and to develop solutions for those issues. Presented below are the specific areas of agreement reached by both parties:

Testing

1. NEEC and NWBOA will share and jointly add to a common bank of Level I testing questions that embody the standard on which both NEEC and NWBOA will judge individuals' eligibility for certification. That is, successfully passing the test developed from these questions will

establish the right of the participant to certification. Changes to the pool of questions in the common bank will be made available to both parties.

2. NEEC and NWBOA will establish a common bank of questions for Level II, in the same manner as they use for Level I.

Mobility/Portability

1. Level I training offered by NWBOA will include a project requirement, comparable to the project requirement in NEEC's Level I curriculum.

2. If a certified operator relocates, his or her certification will be recognized throughout the Pacific Northwest region.

3. Similar core areas of curriculum used by both parties means that someone can relocate during BOC training and continue the training at his or her new location.

4. NEEC and NWBOA will use a common bank of questions for Level II, providing regional recognition of Level II certification in the same manner as Level I.

Service Boundaries

1. Individuals may attend BOC training anywhere in the region they choose.

2. NEEC is the main certifying organization in Oregon and Washington and NWBOA is the main certifying organization in Idaho and Montana.

3. The individual participant's certification will be held by the main certifying organization in the state of his or her employment.

4. To minimize duplication of effort, NEEC and NWBOA will communicate their course schedules to each other in advance of the trainings.

Access to Names[32]

1. At all training sessions, NEEC and NWBOA will provide participants a sheet with check-off boxes listing all organizations about which they may be interested in receiving information.

2. NEEC and NWBOA will link their web sites with each other and with those of other operations-related trade associations.

3. NEEC and/or NWBOA will contact other related trade associations and share information about NWBOA.

4. Membership brochures from all operations-related trade associations will be made available at all BOC trainings.

5. NEEC may present information about its membership at NWBOA's annual meeting.

6. NEEC may inform other related trade associations that they may share their information with NWBOA.

[32] These agreements on access are pending approval from the NEEC Oregon and Washington BOC steering committees.

8. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS REGARDING NEEC

NEEC has a base of support among students and employers in Washington and Oregon and the long-term viability of the BOC appears promising in these states.

- Students and employers are very enthusiastic about the training and its usefulness,
- Employers show a high willingness to pay for the series and to incorporate BOC training into their hiring practices,
- Organizations are endorsing the training for employees and members, and
- Past curriculum changes appear to have addressed some early student concerns regarding the projects and testing process.

These findings, combined with the reduction in market transformation barriers described subsequently, all suggest that the NEEC BOC will be sustainable in the future market.

Goals

The Alliance provided funding to NEEC to accomplish the following objectives in 1999 for Washington and Oregon:

- Enroll an additional 175 Washington and 80 Oregon building operators, for an end of 1999 total of 415 enrollees in Washington and 140 in Oregon.
- Certify a cumulative total of 80 Washington and 35 Oregon building operators;
- Transfer curriculum to two additional training providers for an end of 1999 total of three; and
- Earn annual revenue of $60,000 in Washington and $11,000 in Oregon from training and certification fees.

As of September 30, 1999, the NEEC BOC venture continues to achieve its objectives. Enrollment has reached the goals, the curriculum has received recognition and accreditation by eleven organizations, and annual revenues far exceeds objectives. NEEC also exceeded the cumulative goal for certification, with 125 certified students.

Research Into Action's year-end 1998 MPER (MPER #4) presented six recommendations. Table 36 summarizes NEEC's progress toward these recommendations during 1999.

Table 36

PROGRESS TOWARD 1998 RECOMMENDATIONS

RECOMMENDATION	PROGRESS AS OF SEPTEMBER 30, 1999
Recommendation 1: **Continue to investigate opportunities for marketing to private sector in Oregon and Washington.**	Recent courses have shown an increase in enrollment by private and non-profit sectors.
Recommendation 2: **Do not slacken marketing efforts.**	NEEC continues to market the program. It has forged closer alliances with local sponsors of the series, which are often utilities. NEEC has asked sponsors to take a more active role in marketing and coordinating courses.
Recommendation 3: **Continue efforts to secure "recognition" and "accreditation" for the BOC as well as look for opportunities to transfer the curriculum to other organizations.**	One additional organization recognized the BOC in 1999. NEEC staff continue to work to resolve copyright and dissemination issues so that the course can be transferred to other education providers.
Recommendation 4: **Maintain pricing strategies.**	NEEC has followed recommendations to increase the cost of the BOC to a level that could support the program as soon as possible. The course cost will increase to $850 in 2000.
Recommendation 5: **Market BOC non-energy and energy benefits.**	No information is available to assess progress.

NEEC BOC Assessment

Curriculum

Students and employers consistently give high ratings to the usefulness of the NEEC BOC course material. The single most useful course appears to be HVAC, according to responses given a few months after each course series ended and in a later, long-term follow-up survey. The IAQ and energy conservation courses also consistently receive high ratings for their usefulness on the job. In the long-term follow-up survey, students included the building system overview course as among the most useful. This assessment differs significantly from the assessment given by students a few months after the series ended. This course, which students in shorter-term surveys called boring or lacking in hands-on practicality, appears to take on greater meaning over time.

Students express dissatisfaction with the large amount of material covered in the time allowed and the lack of hands-on activity in the course. This finding has been consistent across surveys. Similarly, few instructors feel that students have sufficient opportunity during the training to apply the concepts presented. We believe this situation contributes to the lack of students giving an "extremely satisfied" rating with the course. At the other end of the spectrum some students find the course too basic; therefore, their expectations of the BOC are not met. These divergent views reflect the mixed skill levels of students.

The BOC instructors feel confident that they can transmit the skills students are intended to learn in their classes, but two-thirds feel that the students come into the course with some weaknesses that make teaching difficult. These range from poor mathematical skills to overall inexperience. Still, three-quarters of the instructors report that they were able to meet the training objectives and two-thirds believe the course materials greatly contributed to participants' learning.

Benefits

In the long-term follow-up survey, students identified an increased overall knowledge, an understanding of systems, and improved skills in HVAC and IAQ as major benefits they received from the training. This response differs from that obtained in the surveys of students a few months after the series ended that we conducted for this MPER. In those surveys, students most commonly said that the training provided a refresher in many areas. We believe this difference reflects differences in the types of students that were more recently trained. Many of the students at the more recent Tri-Cities training were experienced consultants working for a single employer. The employer had asked NEEC to offer the BOC at

that location. These students reported that the Level I course was very basic. In contrast, most past BOC series have had a variety of participants with a wide range of experience.

In both the long-term follow-up and the survey of students a few months after the series ended, more than half of the students said that the BOC had enabled them to improve occupant comfort and save money for their facilities.

In the long-term follow-up, more than 80% of employers found the BOC useful to their employee(s). The greatest benefits provided by the training were the increased self-respect and confidence of the employees and the greater respect and authority granted by others, from coworkers elsewhere in the organization to outside trades people.

Value

More than half of the students surveyed for this MPER who had completed the training a few months previously believed the BOC would help them advance on their current job. More than three-quarters of the students believed it would help them in finding a new job. The long-term follow-up surveys of students showed that the BOC has, in fact, assisted certified students in advancing. Of the 50% of students who reported that their compensation had increased since the training, more than half attributed the change to the training. Slightly fewer students (47%) said they had increased job responsibilities since the training, and half of these students attributed the change to the training.

As another indicator of the value that students accord the BOC, the proportion of students planning to put the BOC on their resume increased to 96% in 1998 from 83% in 1997. Employers also increasingly say they will look for the BOC on the resumes of future employees; 88% of employers in the long-term follow-up study said they would do so. Nearly every employer contacted for the surveys conducted a few months after the series ended said they would recommend the course to others; 37% of employers in the long-term follow-up survey said they had already recommended the program to others.

We also found employers in the long-term follow-up to have continuing interest in encouraging their employees to maintain certification through continuing education and to attend the Level II course than we found for the shorter-term surveys reported in past MPERs. This maintenance of interest suggests that the benefits of certification remain apparent to employers over time. We found that 17% of students in the long-term follow-up have already taken continuing education classes toward re-certification, and more than half plan to attend the Level II course.

As a final indication of the BOC's value, 60% of students contacted in multiple waves a few months after series completion indicated that additional employees from their organization will attend future training course series.

Willingness to Pay

Students indicated a lower willingness to pay to attend the BOC than their employers, a finding consistent with the fact that employers typically pay for the training. Public-sector employers appear to be a little more willing than private-sector employers for their employees to receive a comprehensive training and a two-year certification. Forty percent of public sector employers surveyed a few months after series completion were willing to pay $800 or more for the BOC training. Standardizing for the number of training hours, the cost of the BOC compares favorably with the cost of more common one-day classes. The level of support by employers for the BOC is high.

Reduction of Market Barriers

We believe that many of the barriers to a transformation of the building operators training market have been greatly reduced by the NEEC BOC effort. Performance uncertainties have been reduced as students and employers, over time, see the tangible benefits of training. For example, more than half of the students said they had been able to improve comfort and save money in their facilities as a result of the training. Students consistently report that the BOC is useful in their jobs. About half of the students who have received increased compensation or job responsibilities attribute the change to the BOC. A majority of students think that the training is an asset on their resumes and give importance to regional recognition.

By offering the course in more states and adding the Level II course, NEEC has reduced the barrier of availability. Still, barriers exist for students in rural areas in the eastern parts of Oregon and Washington. Barriers to awareness still exist, but NEEC has continued to identify new marketing opportunities through professional organizations, private employers, and public sector associations. Building awareness in the private sector remains essential for the future viability of the program, a conclusion confirmed by the baseline survey findings.

The barriers of transaction and hidden costs continue to some extent. Willingness to pay, to take time away from work to attend and complete projects, and to travel all are barriers to BOC participation. While these costs have been addressed for BOC students and their employers, the perception that these costs are substantial

remains, particularly among employers who have yet to enroll employees in the course. For these employers single day courses within one hour driving distance remain the preferred training option.

Access to financing does not appear to be a notable market barrier, except for the students themselves, who typically do not pay the registration fee. Our surveys have consistently shown that employers are willing to pay at higher levels than the BOC originally charged for the training. NEEC plans cost increases in the year 2000. NEEC will need to monitor whether the higher price becomes a significant barrier to participation.

NEEC has addressed the market barrier of organization practices that discourage cost-effective energy efficiency decisions by offering a comprehensive series to provide training with energy and non-energy benefits for students. For example, students cite the usefulness of the IAQ course as frequently as they do the energy efficiency course. Further adapting the series to include non-energy benefits might further reduce the organizational barrier.

NEEC has addressed the barrier of split incentives to some extent, as students in the long-term follow-up survey reported that they have been able to improve comfort and save money in their facilities. This occurred even though they are not necessarily the person charged with energy efficiency decisions.

Finally, we do not believe that the inseparability of product features is a significant barrier for students and employers. NEEC allows students to attend individual courses if they desire or to complete the entire series for certification. Eighty-seven percent of students complete the series, indicating that this inseparability of product features is not an obstacle to training.

Program Impacts

We were not able to conduct case studies of students' facilities. Two methods were used to test the assumptions for the program. One involved calculating savings based on average square footage for facilities managed by the BOC students. The second was a telephone survey with a sample of students from the follow-up survey. The average square footage for facilities managed by the BOC students is almost 10 times that in the assumptions. The survey indicated that about 10% of BOC graduates are involved in retrofit projects providing more extensive savings than the initial estimates. Given these two factors, we believe the program is well on its way to meeting or exceeding initial program estimates.

Issues with NEEC BOC Database

The evaluation has reviewed the NEEC BOC database at several points during the multi-year evaluation. In this last review we found the database remains difficult to use due to fields not being defined, fields not being constrained and formatted, and incomplete data entry, including key fields requested for the evaluation. While staff already familiar with the database can adequately use the database due to their knowledge of its construction, the database is not currently transferable to others. New staff unfamiliar with the database would have difficulty using it or could easily enter data incorrectly. In addition, the condition of the database hampers an independent review of the program or use of the data by others seeking to learn from the program's achievements.

CONCLUSIONS REGARDING NWBOA AND REGIONAL ISSUES

Goals

The goals for NWBOA's contract with the Alliance were to conduct two research projects, to market the BOC and certification to employers and to coordinate a process to regionalize the BOC. During 1999, NWBOA made progress on the last two goals, however, a series of administrative issues for regional implementation of the BOC remained unresolved in 1999. In January 2000, an agreement between NWBOA and NEEC resolved most of these issues.

Marketing Strategy

During 1999 NWBOA developed a marketing plan to implement the lessons learned from research conducted in 1998. Their marketing plan is focused on expanding into the private sector in Idaho and sets a goal of enrolling 75 students in NWBOA BOC courses in 1999 and 2000. In addition, NWBOA undertook to begin implementation of NWBOA BOC courses in Montana as part of an agreement with the Alliance.

Regionalization

In the long-term follow-up, about two-thirds of students and employers surveyed said they were aware that the NEEC BOC is recognized across the four-state region. Three-quarters of the employers and more than 80% of the students said such recognition was important to them.

RECOMMENDATIONS

Recommendation 1: Work to ensure the building operators' certification training has recognition throughout the four-state region.

A region-wide approach to BOC has been at the core of the market transformation goal. NEEC and NWBOA should continue to purse good faith efforts to implement the January 2000 agreements.

Recommendation 2: Continue to expand the NEEC BOC program.

NEEC should continue to expand its program reach into rural areas and into the private sector. Students surveyed for this MPER asked for more courses "east of the mountains." NEEC should continue to explore local sponsorship, technology options, and other means to increase delivery of the BOC course in remote areas. In addition, private-sector firms appear to be represented among past BOC students at a little over one-half the rate they appeared in the baseline survey (42%), although the proportion has increased over time. NEEC should continue its efforts to engage this sector in the trainings.

Recommendation 3: Continue to refine the NEEC BOC course series.

NEEC should continue to refine the BOC course series. In particular, NEEC should seek to increase the opportunity that students have during the training to apply the concepts presented. With such course refinement, the frequency with which students report that they are "extremely satisfied" with the series might increase. This recommendation, however, should not diminish NEEC's significant achievement: 80% of students have been satisfied or extremely satisfied with the training and only 2% of students have been dissatisfied.

Recommendation 4: Adapt NEEC BOC content and delivery to unique course sites.

When the BOC is offered at the request of specific employers, or in settings where only one employer sends students as occurred in the Tri-Cities in 1998-99, program staff should identify the experience, education level, and expertise of these students and meet with the employer. Using this information the training approach should be adapted to the needs of the site, to better meet the needs of students and their employer.

Recommendation 5: Continue to evaluate the 1999 and 2000 BOC trainings in all four states.

The Alliance should continue to evaluate the NEEC BOC training course series in Washington and Oregon and, using the same format, the NWBOA training course series in Idaho and Montana. Such an evaluation approach will provide data for a comparative analysis of the strengths of the two approaches and of the challenges they each face, and will generate information that can be used to improve both course offerings.

Recommendation 6: Redesign or substantially revise the NEEC BOC database.

NEEC should take steps to eliminate the irregularities and omissions found in the BOC program database. Specifically, NEEC should define all data fields, constrain data entries for fields so that entries will be not be out of bounds and the size of the database will remain manageable, and complete data entry for all fields. Only with a complete and accurate database can the achievements of the program be ascertained and used for case studies, for evaluation, or for demonstration of value to finding sources and clients.

APPENDICES

APPENDIX A

Portland Results

PORTLAND RESULTS

INTRODUCTION

The Portland BOC Course Series began June 4, 1998, and ended December 9, 1998. The Portland series was the first course series completed in Oregon as part of NEEC's contract with the Alliance. Thirty-two students attended the Portland course series or some portion thereof.

We scheduled the trainee and employer surveys to occur four months after the course series in April 1999. The four-month interval gave students time to reflect on the value of the course series and to apply the knowledge and skills gained on their job. The interval also provided time for employers to see changes, if any, in the employee's job performance.

We interviewed 15 students, meeting our research goal. The student interviews focused on their response to the course series and their ability to use their training on the job. Eleven of the students worked for public organizations/firms and three worked for private companies. One student characterized his organization as "privately owned, but funded through a public foundation."

The interviewed students provided the names and phone numbers of their supervisors. We spoke with eight of these supervisors, again meeting our research goal. We explored, from the employers' perspective, observed benefits of the training for their employee(s). We also assessed employers' interest in future training for their employees. Seven supervisors worked from public organizations; one worked for a private company.

We present our results and analysis in three sections. First, we describe the findings from student interviews. Next, we describe the findings from employer interviews. In the third and final section, we provide our summary and conclusions on the Portland BOC series.

RESULTS OF STUDENT INTERVIEWS

The student interviews address the following topics: course benefits, student satisfaction, future interest in BOC training, willingness to pay, and willingness to recommend the course to others. Their responses to these topics follow.

Program Benefits

We asked students, now that the course had been over for a while, what they felt were the major benefits they had received from participating in the course. Their responses are shown Table A-1.

Table A- 1

MAJOR BENEFITS FROM ATTENDING THE BOC PROGRAM (N=15)

BENEFITS	NUMBER*
Good overview of whole building systems	5
Knowledge of energy conservation/energy efficiency and tools to achieve	3
Knowledge of new technologies/products/codes	3
General amount of knowledge/comprehensiveness	2
Confidence gained to operate equipment	1
Openness to try to new things	1
New information in areas I thought I already knew well	1
Ways in which building maintenance benefits those affected by it	1
Operational perspective on HVAC	1
Importance of following certain procedures	1
Information that helps me keep in touch with my customers	1

* *Multiple responses allowed.*

We also asked students if they had any disappointments about the course. Eight (53%) of the 15 said they had some disappointment with the course. Some of these responses focused on the quality of certain instructors. Other comments focused on the course content and structure.

- *"Two instructors were not ready to teach the course." (n=2)*

- *"Some of the instructors were really bad. The tests were also ambiguous. Too much material made depth impossible."*
- *"Some of it did not apply and some [material] was not presented well."*
- *"The course was geared toward large facilities, so sometimes I felt my questions were not addressed."*
- *"Energy Conservation Techniques was much more difficult than most of us expected. The math was overwhelming."*
- *"I was hoping there would be more hands-on activity."*

We asked students two questions to determine how important and useful to their daily work they found the course content areas to be. First, we asked the students to rank the course content areas in terms of the importance of the material for them to "know on the job." These rankings are shown in Table A-2.

Table A- 2

STUDENTS' RANKING OF IMPORTANCE OF COURSE AREAS ON THE JOB (N=14)*

COURSE	1= MOST	2	3	4	5	6	7= LEAST	TOTAL
Building Systems Overview	2	1	0	2	2	2	5	**14**
Energy Conservation Techniques	2	1	2	2	4	3	0	**14**
HVAC Systems and Controls	5	3	4	2	0	0	0	**14**
Energy Efficient Lighting	1	2	2	2	3	3	1	**14**
Building Maintenance Codes	2	1	0	1	0	2	8	**14**
Indoor Air Quality	1	5	3	2	1	2	0	**14**
Facility Electrical Systems	1	1	3	3	4	2	0	**14**

** One student attended four courses and was unwilling to rank the course list.*

We also asked the students to identify which of the classes have been most useful on the job thus far and which ones have not been useful. Students were permitted to

offer multiple classes as "most useful" to them. Many noted that every class had been useful, saying that they learned something from each one, even if the information was not directly related to their job. Their responses are shown in Table A-3.

Table A- 3

STUDENTS' RATINGS OF USEFULNESS OF COURSE AREAS TO THEIR JOB (N=15)*

COURSE AREA	MOST USEFUL	NOT USEFUL
Building System Overview	1	1
Energy Conservation Techniques	2	0
HVAC System and Controls	10	0
Energy Efficient Lighting	3	1
Building Maintenance Codes	1	3
Indoor Air Quality	7	1
Facility Electrical Systems	1	0

** Totals not equal to n; students only listed those courses useful or not useful.*

To probe this issue further, we asked students identifying a course as useful the basis of their assessment. Responses for "most useful" typically focused on the fact that the topic could be applied to issues they currently face. Four said indoor air quality is a current focus, either due to a specific problem or to changes in regulations for their buildings. Two noted that the course provided knowledge in areas where the student had little or no previous experience/knowledge or where rapid change was occurring. Sample comments include:

- "*We are going through an indoor air quality problem now so that was very helpful.*"
- "*Just becoming aware, especially in indoor air quality, of how easy it is to develop problems without being aware.*"

- *"Helped me to go in and touch the equipment rather than automatically calling a repair person."*
- *"The way the course [HVAC] was taught made it most useful. The instructors used lots of demonstrations."*
- *"HVAC was most useful because it's the best opportunity to save energy in the building."*
- *"The overview just stays in my mind."*
- *"We are in the middle of a major remodel and the codes section has come in very handy."*
- *"I have used it for long range planning."*

We asked students if they thought that applying the knowledge learned from the course series had improved their job performance. One said "no" and gave no reason for this response. All of the remaining 14 said that applying the course knowledge had improved their job performance. Example comments include:

- *"It made the control end of my job easier. Energy conservation made me more aware, so that I look at more than just doing lighting retrofits."*
- *"I have the opportunity and ability to really participate in energy recommendations."*
- *"An architect started talking recently about lighting and the benefits of retrofitting during remodeling. The course made me aware and knowledgeable in this area and allowed me to talk with him about the options."*
- *"Gave me more credibility with my supervisors and gave me the tools to take to them to show how we could make changes that will save money."*
- *"I had to fill in for one of my bosses at an energy conference and the course helped me to use that information."*
- *"I have already helped with a tour on energy efficient lighting to an outside group."*
- *"This week when someone asked a boiler question in our building, I was able to reflect back to class and answer."*

- *"Better able to give more reliable information to my customers."*
- *"Just generally more pro-active in my approach."*
- *"I've done some monitoring and testing of indoor air quality already."*

To further assess the ability of students to use the knowledge learned during the course, we asked each if their supervisor provides the support they need to apply the skills and knowledge gained through the BOC program. Thirteen (87%) of students said they receive the support they need. One said his supervisor was also signed up to take the course.

Student Satisfaction

We asked the students to reflect on their overall satisfaction with the course now that some time has gone by. On a scale of 1-5 where five is extremely satisfied, all 15 students gave a rating of three or higher. Their responses are shown in Table A-4.

Table A- 4

STUDENT SATISFACTION WITH CERTIFICATE PROGRAM (N=15)

SATISFACTION RATING	NUMBER	PERCENT
5 = Extremely Satisfied	4	26.7%
4	9	60.0%
3	2	13.3%
TOTAL	15	100.0%

Those rating their satisfaction level as "4" or "5" explained that they use everything they learned, the course was thorough, and the range of material was impressive. A couple of students noted that some of the material could have been structured better and some of the instructors could have been better. One student said that the course was mainly a refresher, while two others thought there was too much material for the time allotted. Of the two who were less satisfied, one said two instructors were very poor and one noted "it was a long way to drive for a bad class."

Beyond overall satisfaction, we asked students if they thought the certificate would help them professionally, either in advancing on their current job or were they to seek a new job. Their responses are shown in Table A-5. All 15 of the students noted that they think the certificate would be helpful were they looking for a new job. Current job mobility is limited either because they are at the top in their job category or because there is "no place to move up" in their organization.

Table A- 5

USEFULNESS OF CERTIFICATE IN JOB PROSPECTS
(N=15)

WHETHER CERTIFICATE IS GOOD FOR JOB PROSPECTS	YES		NO		DON'T KNOW/ NOT SURE	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
Advancing in Current Job*	10	66.7%	4	26.7%	1	6.7%
Looking for a New Job	15	100%	0	00.0%	0	0.0%

** Total not equal to 100% due to rounding.*

Students' Future Interest in BOC Training

We asked students to assess future interest in BOC training through several questions: Do they expect other staff in their facility to attend the course; do they anticipate taking continuing education courses for re-certification; and what is their level of financial commitment to this type of course. Table A-6 shows their responses to the question "do you expect others from your organization to enroll in the BOC?" One third of students thought someone from their organization would enroll in future course series.

Table A- 6

EXPECTATION OF OTHERS TO ENROLL IN BOC
(N=15)

EXPECTATION OTHERS IN ORGANIZATION WILL ENROLL IN BOC	NUMBER	PERCENT*
Yes	5	33.3%
No	8	53.3%
Don't Know/Not sure	2	13.3%

* *Total not equal to 100 percent due to rounding.*

We asked those who said others would attend to estimate how many might enroll. Four said one additional person would attend; one student said that up to 20 additional staff would likely attend. Of those who thought no others would attend, most explained that they were the only maintenance employee or that funds were too limited to send any others. Two who were unsure about others attending said, "it would depend on the topics offered" and "only if we add more staff."

When asked if they planned to complete continuing education classes for re-certification, 10 (66.7%) said they intend to do so. Two respondents said they do not intend to take continuing education classes and three were unsure.

We also asked students to assess the value of the course at the present cost of $650 and in comparison to theoretical costs of $750 and $950. We asked respondents whether, given the current cost of $650, they felt the course offered good value for the money. Then we asked if they would still feel this to be true at the rates of $750 and $950. Their responses are shown in Table A-7.

As shown, almost all of the students believe the course to be a good value up to $750. However, three felt that the course would be of value at the highest cost estimate of $950. In this group of respondents, many were from small city governments or other small facilities and noted that the cost level can quickly go above what their organizations can afford, especially for organizations with a single facilities maintenance employee.

Table A- 7

STUDENT ASSESSMENT OF VALUE RELATED TO COST
(N=15)

COURSE GOOD VALUE FOR THE COST	COST $650		COST $750		COST $950	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
Yes	15	100.0%	14	93.3%	3	20.0%
No	0	00.0%	0	00.0%	10	66.7%
Don't Know	0	00.0%	1	6.7%	2	13.3%
TOTAL	**15**	**100.0%**	**15**	**100.0%**	**15**	**100.0%**

We asked students what maximum cost they personally would be willing to pay for certification of this type and what they believed their company or employer would be willing to pay. Their responses are summarized in Table A-8.

Table A- 8

MAXIMUM WILLINGNESS TO PAY FOR 2-YEAR CERTIFICATION
(N=15)

MAXIMUM AMOUNTS	AMOUNT WILLING TO PAY FOR SELF		AMOUNT STUDENT BELIEVES EMPLOYER WILLING TO PAY	
	NUMBER	PERCENT	NUMBER	PERCENT
Zero	5	33.3%	1	6.7%
<=$500	1	6.7%	0	0.0%
$501-$600	0	0.0%	0	0.0%
$601-$700	2	13.3	3	20.0%
$701-$800	2	13.3	3	20.0%
More than $801	1	6.7%	2	13.3%
Don't Know	4	26.7%	6	40.0%
TOTAL	**15**	**100.0%**	**15**	**100.0%**

As shown, students are less willing to pay for the course when they bear the cost. Only one student reported a willingness to pay up to $800.

As another indicator of satisfaction and value, we asked students whether they would refer the BOC to people who do the same type of job as themselves and what they would say if they did so. All of the 15 students interviewed said they would recommend the course. The following comments suggest what they would say to others about the course:

- *"It is one of the best courses I've taken for overall knowledge."*
- *"It's a confidence builder. It teaches the economic benefits of good maintenance and how to save your organization money. The big plus is meeting people in your own field."*
- *"I would tell them how it motivated me to be more active."*
- *"The course is a good thing to bring people in the industry into a respectful situation where maintenance is viewed as important."*
- *"It's a good broadening experience that makes you think outside the day-to-day routine. Sharing experience with others who do the same type of work was really great and an unexpected benefit."*
- *"It's a great opportunity to network in your field and share problems."*
- *"It gives you a better perspective. There is a lot of material out there. While it is hard to be an expert in all, the course gives you some knowledge in each area."*
- *"It's a great overview and the books alone are worth the money."*
- *"It's a good well-rounded course."*
- *"It's a real glossy overview, but it's still beneficial."*

We also asked students if they would put the BOC on their resume. Fourteen (93.3%) said "yes"; one said "no."

Finally, we asked students if they had any further comments. Sample comments include:

- *"I enjoyed meeting others, networking, and getting contacts. We developed a list of outside contractors that people in the class have been happy with. That has been very beneficial."*
- *"Overall it was a good course and the pacing was good."*
- *"The course is basically good but would be better if streamlined and had better instructors."*
- *"The courses cover too much material—especially electrical. Stretching it out would have helped many of us do better on our exams."*
- *"The course materials read as brief discussion of the course presentation, but course instructors didn't have time to touch on each topic. Need to improve written materials so they stand on their own."*

RESULTS OF EMPLOYER INTERVIEWS

The employer interviews addressed the following topics: course benefits, employer satisfaction, future interest in BOC training, willingness to pay, and willingness to recommend the course series to others. Their responses to these topics follow.

Course Benefits

We asked the employers to tell us whether, from their observation, the BOC training seemed useful to their employee(s) and whether they had observed any differences in the way the employee(s) did their job since taking the course. Table A-9 summarizes their responses.

When asked whether the employer had noted any differences in how the employee does his or her job since the training, comments included:

- *"In particular, he has a better understanding of HVAC. We had no training before. Now he is just more effective overall with our systems."*
- *"A higher level of confidence and enthusiasm."*
- *"Now asks questions about decisions that will affect equipment use."*
- *"Just overall a little more aware."*

Table A- 9

EMPLOYER RATINGS OF BOC IN GENERAL
(N=8)

RESPONSE	TRAINING USEFUL		OBSERVED DIFFERENCES	
	Number	Percent	Number	Percent
Yes	8	100.0%	4	50.0%
No	0	0.00%	4	50.0%
Don't know	0	0.00%	0	00.0%
TOTAL	**8**	**100.0%**	**8**	**100.0%**

As with students, we asked the employers to rank the course content areas for their importance to the employee "to know on the job." Their responses are shown in Table A-10.

Table A- 10

EMPLOYER RANKING OF IMPORTANCE OF COURSE AREAS ON THE JOB
(N=8)

COURSE	1 = MOST	2	3	4	5	6	7 = LEAST	TOTAL
Building Systems Overview	3	1	0	1	1	2	0	8
Energy Conservation Techniques	0	3	2	3	0	0	0	8
HVAC Systems And Controls	4	0	0	2	1	1	0	8
Energy Efficient Lighting	1	0	1	1	2	3	0	8
Building Maintenance Codes	0	3	0	0	1	0	4	8
Indoor Air Quality	0	0	4	1	1	0	2	8
Facility Electrical Systems	0	0	2	0	2	2	2	8

Employers ranked the building systems overview and HVAC systems and controls as the areas most important for their employees. While students also rated HVAC as important, they were more likely to rank indoor air quality, along with systems overview, as important.

Employer Satisfaction with the BOC

We asked employers to rate their overall satisfaction with the BOC course series. Using a scale of 1-5 where five equals extremely satisfied, all eight employers gave the course series either a "4" or a "5." Table A-11 shows the employers' ratings.

Table A- 11

EMPLOYER SATISFACTION WITH CERTIFICATE PROGRAM (N=8)

RANKING	NUMBER	PERCENT
5 = Extremely Satisfied	2	25.0%
4	6	75.0%
TOTAL	**8**	**100.0%**

Two of those who gave the course a four noted that they could not give it a five because:

- *"I only know that employee thought the course was lacking in depth, and was just a broad overview."*
- *"Can't give it a five because staff felt that some of the instructors were not prepared."*

We also asked employers to describe the major overall benefit that the employer's organization received from their employee(s) attending the BOC training. Their responses included:

- *"It made the employees more aware of the system, so improved efficiency. Even the training itself is more efficient. I don't have to shop around for*

courses and try to put together a package. This saves me a great deal of time."

- *"He was new to the position. So, it gave him a heightened awareness of his responsibility in the efficient maintenance of the building."*
- *"There is just more emphasis now on energy efficiency in maintaining our buildings."*
- *"Credibility in that department."*
- *"Increased their understanding of our customers needs."*
- *"Any training helps."*

EMPLOYERS' FUTURE INTEREST IN THE BOC

We asked employers if they planned to send additional staff to the BOC course: six indicated that they did. One of these six noted that the organization now requires each group of new apprentices to take the BOC course. The two employers who do not plan to send other employees said that "there are no others" to send due to small staff size. When asked if there were any organization changes occurring that might affect their decision to send more employees, all eight supervisors interviewed commented that they were stable and did not foresee any changes.

We also asked the employers if they would encourage their employee(s) to take continuing education classes for re-certification. All eight said they would do so, with one qualifying this by saying "only if my employee wants to."

When asked if they would look for BOC certification on the resumes of staff when hiring, four (50%) of the employers surveyed said they would look for it. Four said they did not know if they would look for it in hiring.

To further gauge interest in the BOC, we asked employers to indicate their future interest in the program and their willingness to pay for a course of this type. As with students, we asked the employers to assess the value of the course at its current cost of $650, and then at hypothetical costs of $750 and $950. Table A-12 shows the employers' responses.

Table A- 12

EMPLOYER ASSESSMENT OF VALUE RELATED TO COST
(N-8)

COURSE GOOD VALUE FOR THE COST	COST $650		COST $750		COST $950	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
Yes	8	100.0%	7	87.5%	3	37.5%
No	0	00.0%	1	12.5%	3	37.5%
Don't Know	0	00.0%	0	00.0%	2	25.0%
TOTAL	**8**	**100.0%**	**8**	**100.0%**	**8**	**100.0%**

All of the employers rated the course as a good value for the current cost and seven said it would be a good value for $750. Three thought it would be a good value for $950. To further clarify their views on willingness to pay, we then asked employers how much they would be willing to pay for their building operations staff to be certified for *two* years. Six indicated they would be willing to pay over $800 for two-year certification. Their responses are summarized in Table A-13.

As another measure of satisfaction and value of the course, we asked employers if they would refer the BOC to other employers for their employees. All eight (100%) of the employers said they would recommend it. They might recommend it with the following comments:

- *"It's a good overview, especially of energy efficiency."*
- *"The topics of systems integration, lighting and HVAC are fairly confusing and seldom is the energy perspective included. So this is an opportunity to learn about savings in these areas."*
- *"Persons in these positions often do not have a degree. So, this is a quick way to get an overview, and education and certification for maintenance staff."*
- *"It is one-stop shopping and good quality."*
- *"Brings back to the organization a broader view. People tend to get introverted into their own tasks and it is difficult to network with others from different perspectives—hard to do the day-to-day work and keep your*

eye on the horizon at the same time. This course pulls employees out of their day-to-day focus."

- *"Just any training with good overview is important for this type of staff."*

Table A- 13

MAXIMUM WILLINGNESS TO PAY FOR 2-YEAR CERTIFICATION (N=8)

MAXIMUM AMOUNTS	EMPLOYER WILLING TO PAY	
	NUMBER	PERCENT
Zero	0	00.0%
</=$500	0	00.0%
$501-$600	0	0.00%
$601-$700	1	12.5%
$701-$800	0	00.0%
More than $801	6	75.0%
Don't Know	1	12.5%
TOTAL	**8**	**100.0%**

With all eight of the employers indicating they would encourage their staff to take continuing education courses, we asked the employers what topics they would like to see covered in the Level II program or in continuing education classes. The following were cited:

- American with Disabilities Act compliance
- Alarm system issues
- Environmental issues
- Lighting system refresher
- HVAC "fixes" - stunning examples

SUMMARY AND CONCLUSIONS

As with most of the BOC course series, we found high satisfaction among Portland students and their employers. We also found both student and employers rating the course as good value for the current cost and for an additional $100.

Portland students found the HVAC course very useful on the job, as was the building systems overview and indoor air quality. This finding is comparable to that from previous course series. Also comparable to other course series, employers assessed the HVAC and systems overview courses as most useful to their employees.

Over half the students expressed some disappointment with either an instructor or the complexity of the course. In conversations with BOC staff in July, we spoke with them about the negative comments about two instructors from Portland students. BOC staff said these instructors were replaced soon after their classes were completed, so this problem should not persist. Concern over the complexity of some courses has been a problem for some students in all course series. While the concern has been partially remedied, it cannot be eliminated while maintaining the interest of those students with more advanced capability.

In the final Region-wide BOC MPER, we will include a sample of students attending one additional course series in Oregon and their employers. This will allow for some comparison between the Oregon and Washington BOC training efforts.

APPENDIX B

Medford and Tri-Cities Results

MEDFORD AND TRI-CITIES RESULTS

INTRODUCTION

As of September 1, 1999, two NEEC-offered courses met the criterion of having been complete at least three months prior to the evaluation. The course series conducted in the Tri-Cities Washington area and in Medford were completed in the spring of 1999. Twenty students attended each course series.

Table B-1 shows students and employers surveyed, by business type.[33] The "other" category covers those who are contractors for a national laboratory.

Table B-1

STUDENT AND EMPLOYERS BY BUSINESS TYPE

BUSINESS TYPE	STUDENT (N=13)		EMPLOYER (N=10)	
	FREQUENCY	PERCENT	FREQUENCY	PERCENT
Public	8	61.5%	7	70.0%
Private	1	7.7%	1	10.0%
Non-profit	2	15.4%	1	10.0%
Other	2	15.4%	1	10.0%
TOTAL	**13**	**100.0%**	**16**	**100.0%**

As with past course series evaluations, we attempted contact with every student in order to reach the goal of completed interviews with half of the students in each

[33] We used the survey instrument from past course series evaluations, revised to include new questions on respondent knowledge of regional recognition of the BOC and the value of this recognition.

series. Only seven students from Tri-Cities and six students from Medford were available or willing to be interviewed. We sought to interview ten supervisors, or half of the student goal. We met that goal by completing interviews with six Tri-Cities employers and four Medford employers.

STUDENTS

Program Benefits

We first asked students, now that the course had been over for a while, what they felt were the major benefits they received from attendance. Their responses are shown Table B-2.

Table B- 2

MAJOR BENEFITS FROM ATTENDING THE BOC PROGRAM (N=13)

BENEFITS*	NUMBER
Good Refresher	3
Knowledge of HVAC	2
Increased Overall Knowledge/General Awareness	1
Understanding of Whole Building Systems	1
Knowledge of IAQ	1
Knowledge of Energy Conservation/Energy Efficiency/Resource Management	1
Reference Materials	1
Understanding of Equipment	1
Understanding of Our Facilities	1
Knowledge of Utility Costs	1
More on Code Compliance	1

** Multiple responses allowed.*

Next, we asked students to rank the skill areas covered in the BOC series from one to seven, based on their assessment of the courses' usefulness on the job. As we often find, the HVAC course was rated as most useful (a 1 or 2) by 11 of the students, followed by the course on electrical systems (7) and energy conservation techniques (3). The responses are shown in Table B-3.

Table B- 3

STUDENTS' RANKING OF IMPORTANCE OF COURSE AREAS ON THE JOB (N=13)

COURSE	1= MOST	2	3	4	5	6	7= LEAST	TOTAL
Building Systems Overview	0	0	2		3	4	4	13
Energy Conservation Techniques	3	0	4	2	1	1	1	13
HVAC Systems and Controls	6	5	1	0	1	0	0	13
Energy Efficient Lighting	0	1	3	3	2	3	1	13
Building Maintenance Codes	1	1	1	1	3	2	4	13
Indoor Air Quality	1	1	2	5	1	1	2	13
Facility Electrical Systems	2	5	0	2	2	2	0	13

We also asked students to identify which of the classes have been most useful on the job and which ones have not been useful. Their responses are shown in Table B-4.

As shown, HVAC was rated as most useful. Of those respondents identifying useful areas, we asked them why these areas were most useful. Responses for "most useful" most often focused on the fact that the topics were ones used often in their daily work activities or provided specific information in an area of current interest.

- *"We have various HVAC systems in different buildings. The course helped me get more familiar with each one."*
- *"It helps us recognize if there are problems in the research buildings. Air balance is important."*

Those citing courses as "not useful" noted that:

- *"The Codes are already established for me."*
- *"Overview just gives the general. I have done maintenance work for 25 years and have had exposure to other trades already."*
- *"I don't have control over IAQ, so can't make the changes recommended."*

Table B- 4

STUDENTS' RATINGS OF USEFULNESS OF COURSE AREAS TO THEIR JOB (N=13)*

COURSE AREA	USEFUL		NOT USEFUL		DON'T REMEMBER/CAN'T SAY/NOT CITED		TOTAL
	FREQUENCY	PERCENT	FREQUENCY	PERCENT	FREQUENCY	PERCENT	PERCENT
Building System Overview	2	15.4%	0	0.0%	11	84.6%	100.0%
Energy Conservation Techniques	2	15.4%	0	0.0%	11	84.6%	100.0%
HVAC System and Controls	5	38.5%	0	0.0%	8	61.5%	100.0%
Energy Efficient Lighting	1	7.7%	0	0.0%	12	92.3%	100.0%
Building Maintenance Codes	1	7.7%	3	23.1%	9	69.2%	100.0%
Indoor Air Quality	2	15.4%	3	23.1%	8	61.5%	100.0%
Facility Electrical Systems	2	15.4%	0	0.0%	11	84.6%	100.0%

We asked students if they thought that applying the knowledge learned from the course series had improved their job performance. All thirteen (100%) said yes. Of those who said that applying the course knowledge had improved their job performance, specific examples included:

- *"I have better understanding to solve problems faster."*

- *"Learned more than one way to do things. I can do more. We don't have to call contractors as often. I have more confidence."*
- *"I just understand equipment and facility a lot more. I understand about routine maintenance benefits."*
- *"Made me more aware of IAQ as a legitimate concern."*

For the first time in the student surveys we asked if they had been able to improve the comfort of the occupants of their buildings or saved the facility money as a result of what they learned. Their responses are shown in Table B-5. As shown, two-thirds of the students surveyed reported they have been able to improve the comfort of their occupants *and* save the facility money as a result of attending the BOC course.

Table B- 5

STUDENT ABILITY TO IMPROVE COMFORT, SAVE MONEY (N=13*)

BENEFIT	NUMBER	PERCENT
Improved Comfort of Occupants	0	0.0%
Saved Money	1	8.3%
Both Improved Comfort and Saved Money	8	66.7%
Neither Improved Comfort nor Saved Money	3	25.0%
TOTAL	**12**	**100.0%**

* *One student said he could not tell yet if he had accomplished either of these improvements.*

We asked each student, if their supervisor has provided the support they needed to apply the skills and knowledge gained through the BOC program. All of the students said they receive the support they need.

Student Satisfaction

We asked the students to reflect on their overall satisfaction with the course. Table B-6 shows their responses. These satisfaction levels are comparable to those found in earlier evaluations, with 85% of students saying they are satisfied or extremely satisfied with the BOC.

Table B- 6

STUDENT SATISFACTION WITH CERTIFICATE PROGRAM (N=13)

SATISFACTION RATING	NUMBER	PERCENT
5=Extremely Satisfied	3	23.1%
4	8	61.5%
3	2	15.4%
2	0	0.0%
1=Not at All Satisfied	0	0.0%
TOTAL	**13**	**100.0%**

Those rating their satisfaction level as “4” or “5” said the course offered a lot of training for the effort required, led one to think from a systems perspective, and helped re-focus one's efforts. Those less satisfied primarily found the course to "elementary' for their level of experience.

Beyond overall satisfaction, we asked follow-up students a series of questions to explore whether attending the BOC would be useful in advancing on their current job or in finding a new job, if necessary. Their responses are shown in Table B-7.

Table B- 7

USEFULNESS OF CERTIFICATE IN JOB PROSPECTS (N=13)

WHETHER CERTIFICATE IS GOOD FOR JOB PROSPECTS	YES	%
Advancing in Current Job*	7	58.3%
Looking for A New Job	10	76.9%

As shown, three-quarters of the students believe the BOC would be helpful if looking for a new job. While fewer believe it would help them in the current position, most said so because advancement is limited by company size, budget, or other constraints.

For the first time in this evaluation, we also asked the students if they were aware that the BOC is recognized in the four-state northwest region and if this type of multi-state recognition is important. Twelve (92.3%) of the students were aware of the multi-state recognition and 10 (76.9%) said that such recognition is important to them.

Students' Future Interest In The Program

We asked the students to assess future interest in the program through several questions, including their intention to take continuing education courses and whether additional employees of their organizations were likely to enroll in the BOC. Nine of the 13 indicated they would take continuing education courses and seven of the 13 indicated others would likely attend the BOC. Table B-8 shows these responses.

Table B- 8

STUDENT CONTINUING EDUCATION PLANS: OREGON AND WASHINGTON (N=13)

EDUCATION ACTIONS/PLANS	Yes		No		DON'T KNOW	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
Anticipate Continuing Education for Re-Certification	9	69.2%	2	15.4%	2	0.0%
Others To Enroll	7	53.9%	5	38.5%	1	7.7%

Of those expecting others to enroll from their organization, three said one additional staff member would attend, and four said two or more (up to 6) would attend the course in the future. We then asked the students what topics they would like to see covered in continuing education classes or in the Level II program. Sample comments included:

Continuing Education:

- *"More depth to any offered."*
- *"More hands-on on refrigeration and heating."*
- *"Structural insulation.*
- *""More preventive maintenance and advanced IAQ."*
- *"More in-depth in conservation and running buildings at maximum efficiency."*
- *"Advanced controls, calibration and function. More time for tasks and less on theory."*

Topics for Level II:

- *"HVAC, with focus on electrical issues."*
- *"NEC Codes."*

- *"IAQ, HVAC, Electrical conservation, and water conservation."*
- *"What is a wise building model in today's environment? How can you recoup your costs?"*
- *"More on controls, digital, pneumatic, and electric.*

To better understand how much students are willing to pay for the BOC course, we asked them the amount they would be willing to pay to be certified for two years. Because students rarely pay their own BOC course fees, we also asked them to indicate the amount they believe their employer would be willing to pay for their two-year certification.

Tables B-9 and B-10 summarize the responses. As in previous evaluations, students believe employers will pay more for the certification than they are willing to pay themselves. Almost half of the 13 students said their employer would pay $800 or more for the two-year certification.

Table B- 9

STUDENT REPORT OF WILLINGNESS TO PAY
(N=13)

LEVEL STUDENT WILLING TO PAY	FREQUENCY	PERCENT
$0	1	7.7%
$35-$600	3	23.1%
$601-$800	3	23.1%
More than $800	3	23.1%
Don't Know	3	23.1%
TOTAL	**34**	**100.0%**

Table B- 10

STUDENT REPORT OF EMPLOYER WILLINGNESS TO PAY (N=13)

LEVEL EMPLOYER WILLING TO PAY	FREQUENCY	PERCENT
$0	1	7.7%
$35-$600	0	0.0%
$601-$800	4	30.8%
More than $800	6	46.2%
Don't Know	2	15.4%
TOTAL	**13**	**100.0%**

As another indicator of satisfaction and value, we asked students if they would recommend the BOC to others who do the same type of job as themselves and what they would say if they did so. All thirteen (100%) said they would recommend the program to others. When asked what they would say in their recommendation, responses included:

- *"For those with varied backgrounds, this will expose them to other trades and ideas."*
- *"It's a good refresher and brings you up-to-date."*
- *"It's really good and I've handed out the pamphlets we received to lots of our staff."*
- *"Makes people more hirable and accountable."*

We also asked follow up students if they have put the BOC on their resume. Twelve (92.3%) said "yes"; one said "no."

Finally, we asked students if they had any further comments. Few gave additional comments, but of those responding, sample comments included:

- *"Great instructors and a really beneficial course."*

- *"The best thing the BOC provided was knowing people in the geographic area that I can network with. All of the instructors have e-mail addresses and seem really available for help later on."*
- *"I'd like to see it offered on the east side -Yakima, Spokane."*

EMPLOYERS

Program Benefits

To assess program benefits, we asked if employers felt the BOC had been useful to their employee(s) and whether they had observed any differences in the way the employee(s) has done their job. As can be seen in Table B-11 all 10 employers were very satisfied with the training and nine had observed differences in the way their employee conducted themselves on the job.

Table B- 11

EMPLOYER OBSERVATIONS
(N=10)

OBSERVATION	NUMBER	PERCENT
Has Training Been Useful to Employee?		
Yes	10	100.0%
No	0	0.05%
TOTAL	**10**	**100.0%**
Observed Differences in Way Employee Does Job?		
Yes	9	90.0%
No	1	10.0%
TOTAL	**16**	**100.0%**

When asked what they had observed or the differences they had seen, sample responses included:

- *"They do more with less. They understand how all the systems in many buildings work together."*
- *"He thinks about what he's doing a little more and he's more confident."*
- *"Staff is more alert to conservation opportunities."*
- *"He brings up energy efficiency suggestions which have been implemented."*

We asked the employers, as we did the students, to rank the skill areas covered in the BOC from one to seven in terms of their usefulness to the employee when they do their job. Employer responses are shown in Table B-12. As with students, the employers most often rate HVAC as useful, with five ranking this a 1 or a 2. Five also ranked faulty electrical systems a 1 or a 2. Unlike students, however, employers rank the building systems overview course high, with five giving this course a 1 or a 2.

Table B- 12

EMPLOYERS' RANKING OF IMPORTANCE OF COURSE AREAS TO KNOW ON THE JOB (N=10)

COURSE	1= MOST	2	3	4	5	6	7= LEAST	TOTAL
Building Systems Overview	3	2	2	2	0	1	0	**10**
Energy Conservation Techniques	1	0	1	3	1	1	3	10
HVAC Systems and Controls	5	0	2	2	1	0	0	10
Energy Efficient Lighting	0	0	1	0	4	2	3	10
Building Maintenance Codes	1	0	1	2	3	2	1	10
Indoor Air Quality	0	3	1	0	0	4	2	10
Facility Electrical Systems	0	5	2	1	1	0	1	10

Employer Satisfaction and Future Interest In The Program

Seven (70%) of employers said they were "satisfied" or "extremely satisfied" with the BOC training. Two said they were neither satisfied nor dissatisfied with the

course. These two employers stated that their lower rating was related to their expectations for the course; they had expected a higher level of training than the BOC Level I offered.

We asked employers to assess future interest in the program through several questions: will they encourage their employee to take continuing education courses for re-certification and whether they plan to send additional employees to the course. Table B-13 shows their responses to these questions.

Seven of the 10 employers stated that they would encourage employees who have already attended the BOC to complete re-certification requirements. Six of the employers said they plan to enroll additional employees.

Table B- 13

EMPLOYER EXPECTATION OF OTHER ENROLLMENT
(N=10)

EDUCATION ACTIONS/PLANS	Yes		No		DON'T KNOW	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
Encourage Continuing Education for Re-Certification	7	70.0%	1	10.0%	2	20.0%
Others To Enroll	6	60.0%	3	30.0%	1	10.0%

We also asked the employers what they expect their employees to gain from attending continuing education classes or from attending a Level II training series. Their comments point to the value they see in the BOC as a course series that increases the knowledge and skills of building operators. Sample comments include:

Continuing Education:

- *"Keep growing in their understanding of opportunities. Since we expect so much from them, I need them to be confident and comfortable with all facets of the job."*
- *"I want him to keep his journeyman's license as well, so he needs continuing education to gain a higher level of competence."*

- *"Technical and codes refresher."*
- *"Just an amplified perspective. Sharpen his ability to deliver customer satisfaction."*

Level II:

- *"Ventilation, electrical systems, and control systems."*
- *"Troubleshooting and codes."*
- *"Boilers, combustion efficiency, air balancing, and retrofitting HVAC systems."*
- *"Demonstrate the value of spending money on preventive maintenance instead of corrective maintenance and repair."*
- *"IAQ, especially with some information for custodians. For example, using more cleaning solutions and agents doesn't necessarily work better."*

We asked the employers, as we did with students, if they are aware that the BOC certification is recognized in the four-state region and whether such recognition is of value to them as an employer. Nine (90%) of the employers were aware of the multi-state recognition given the BOC and six (60%) said that such recognition was important to them.

As with students, we asked the employers to evaluate the cost of the program and the maximum they would be willing to pay for their employee's two-year certification. All of the surveyed employers thought the program was a good value at $650 or at $750. At $950, however, five (50%) thought the program was a good value for the cost, and five did not. As Table B-14 shows, three of the ten employers were willing to pay more than $800 for a course series that would certify their employees for two years. As noted earlier, two of these employers felt the course series was set at a lower level than they had expected. This expectation appears to have affected their assessment of willingness to pay.

Table B- 14

EMPLOYER WILLINGNESS TO PAY
(N=10)

LEVEL EMPLOYER WILLING TO PAY	FREQUENCY	PERCENT
$0	0	0.0%
$35-$600	1	10.0%
$601-$800	4	40.0%
More than $800	3	30.0%
Don't Know	2	20.0%
TOTAL	**34**	**100.0%**

As another indicator of satisfaction and value, we asked employers if they would recommend the BOC for the employees of people who do the same type of job as themselves and what they say in their recommendation. All ten (100%) of the employers said they would recommend the BOC. Samples of what they would say in their recommendation included:

- *"It makes your employees more knowledgeable and more confident."*
- *"A good addition to skills portfolio."*
- *"It adds value and you will recoup your cost very quickly from energy savings and maintenance improvements."*
- *"BOC training offers employees the opportunity to gain perspective on integrated facility systems."*

Lastly, we asked employers if they would look for the BOC on resumes of job applicants. Nine (90%) said they would do so.

CONCLUSIONS

As found in previous MPERs, most students (84%) stated that they were highly satisfied with the BOC training. Some of the students, however, had considerable expertise prior to the training. For these students, the series served primarily as a refresher course. Students ranked the HVAC Systems and Controls course and the Energy Conservation Techniques course as most important to their job. Two-thirds of students reported that they had already had an opportunity to apply what they learned from the training and that, as a result, they had improved occupant comfort and saved their employer money. Two-thirds of students anticipated that they would pursue re-certification and more than half of the students expect that other staff from their organizations will take the BOC training.

All of the employers interviewed thought that the training had been useful for their employees, and 90% of employers had observed differences in the way their employees did their jobs. More than two-thirds of the employers will encourage their employees to seek re-certification, and over half of employers expect to send other staff members to the BOC training. Twenty percent of employers surveyed did not know what they would be willing to pay for their employees' training and two-year certification. Of those who stated a value, nearly 90% stated they would be willing to pay $601 or more; 37% said they would be willing to pay more than $800.

APPENDIX C

BOC Enrollment Forms

BOC ENROLLMENT FORMS

To Come.

APPENDIX D

Data Collection Instruments

INTERVIEW GUIDE

NEEC BOC PROGRAM STAFF

1998/99 BOC EVALUATION: MID-YEAR 1999 FOLLOW-UP

Name _____

Organization _____ **Title** _____

Phone Number/Address _____

I. Overview

1. What are the current goals of the BOC program? Have these changed since we spoke earlier this year?

2. The three programs in Washington, Oregon, Idaho (and now Montana) are continuing to work to join together to regionalize the training and certification process.

   a. What is your current view of this effort?

   b. What barriers/problems have come up since we last spoke?

   c. How have these been resolved?

d. How would you characterize the relationship between the entities involved?

e. What differences do you see in the organizations - NEEC and NWBOA - that contribute to or hinder a cooperative effort and regional certification? [PROBE: differences in structure; philosophy; staff, board members, etc.]

f. What do you see as the future for a regional certification? [PROBE: is it feasible? Are there other alternatives?]

g. What else needs to happen to make regionalization of the certification effort possible?

3. Knowing what we know now about what has worked for WA, OR, and ID, what is needed to make implementation of the BOC successful in Montana?

   a. What is your sense of the market for the training in MT? –Sharon, here I would really like to see emphasis placed on differences between marketing plans for our early adopters and laggards. I'd like to get a sense for whether or not they have thought that far and how they might handle a severe decline in interest after the first couple of training sessions.

II. BOC Program Implementation

4. Describe how the BOC is operating in your state at this time.

   a. What are you doing now to market the series?

   b. Are there any new materials being used for marketing?

   c. Are there any new techniques for marketing that have been used since we spoke earlier this year?

   d. Have these strategies been effective?

5. Have there been any changes in the relationships between BOC and the region's utilities since we last spoke? (Specifics?)

6. Have you seen any changes in the credibility that the BOC has with employers you speak with?

7. Do you see any potential weaknesses in program design or delivery at this point?

III. Teaching Process

9. The last time we spoke, the Level II course materials were being developed by a team of consultants. How is the process going?

   a. Have there been any problems in developing the Level II materials? For which course?

10. Student feedback from the Portland course indicated some problems with the new instructors. How was this addressed in 1999? How are these instructors doing now? Are there any continuing challenges with new instructors?

IV. Market Response

11. Since we spoke earlier this year, have you become aware of any additional educational providers or associations expressing interesting in the BOC curriculum?

   a. Have you consulted with others on such training?

   b. Copyright of the materials was identified as a barrier to sharing the curriculum when we last spoke. How is this process progressing?

12. Have you received any additional recognition from industry groups or associations?

V. Conclusions

13. What lessons have been learned from program delivery in the first part of this year?

    a. What are the current strengths of the BOC program as it moves through the third year of implementation?

    b. What are the current weaknesses of the BOC program?

14. What one thing do you think has most improved the BOC this year?

15. What changes would you like to make in the BOC program in the future?

16. Is there anything I haven't asked you about that you would like to add?

boc98-99/stafffolrev/10/25/98

INTERVIEW GUIDE

NEEC BOC PROGRAM TRAINEES

1998/99 BOC EVALUATION: MID-YEAR 1999 FOLLOW-UP

Name _____ **Class Location** _____

Title _____

Company Name _____ **Phone Number** _____

Address _____

Introduction: I am ------. Cynthia Putnam and John Doyle gave me your name as a person who had recently 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 a few months after completion. Do you have time to talk for about 10 minutes?

1. Now that the course has been over for a while, what have been the major benefits to you from attending the Building Operator Certification program?

   a. Do you have any disappointments about the program?

      Yes

      No

      Don't know

2. I want to go through the courses you took. The courses covered six skill areas and an overview. Please rank them from 1-7 as to which is most important (1) and which is least important (7) for you to know on the job. (MAY HAVE TO READ LIST AND GET #1 AND #7 THEN GO THROUGH OTHERS)

   i. Building system overview _____
   ii. Energy conservation techniques _____
   iii. HVAC systems and controls _____
   iv. Energy efficient lighting _____
   v. Building maintenance codes _____
   vi. Indoor air quality _____
   vii. Facility electrical systems ____

   a. Thinking about these skill areas again, which ones have been most useful on the job?

   b. Which ones have not been useful on the job?

[For all checked, follow up about why these were checked

COURSE AREA	USEFUL [A]	NOT USEFUL [B]
Building System Overview		
Energy conservation techniques		
HVAC system and controls		
Energy efficient lighting		
Building maintenance codes		
Indoor air quality		
Facility electrical systems		

   c. What made that/those course(s) most useful to you on your job?

d. What about this/these course(s) was not useful to you on your job?

e. Do you think that applying the knowledge you learned from the course series has improved your job performance

Yes (Ask 2ee.)

No (Go to 2f)

Don't know (Go to Q2f)

ee. If so, in what ways?

f. Have you been able to improve the comfort of the occupants of save money as a result of what you learned?

Yes - improved comfort

Yes - saved money

No - neither

g. Were you the right person from your organization to attend the series?

Yes (Go to Q3)

No (Go to 2ff)

Don't know

gg. If not, why not?

3. Does your supervisor provide the support you need so that you can apply the skills you learned in the BOC training? (Please explain.)

   Yes

   No

   a. Who would be the best person at your company to ask for opinions about whether the program is a good investment for the company?

      Name & Title: _____

      Phone Number _____

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

      Fax Number _____

4. Using a scale from 1 to 5, where 1means not at all committed and 5 means very committed:

   How committed would you say your company/organization is to energy efficiency in the operation of the building(s)?

   1 2 3 4 5

5. Now that you have had a few months to reflect, on a scale of 1-5, from not at all satisfied to extremely satisfied, how satisfied are you with the training you received? (in case anyone asks, but do not read: 1=not at all satisfied, 2=not satisfied, 3=neither satisfied or not satisfied, 4=satisfied, 5=extremely satisfied.)

1 2 3 4 5

a. Why do you say that?

6. Do you think having a Building Operator Certificate will be good for advancing on your current job, or getting a new job if needed? [circle all that apply]

Current job	Yes	No
New job	Yes	No
Other (Record:	Yes	No

a. Why do you say that? (Ask for all responses)

7. Did you know that the BOC Certificate is recognized in Washington, Oregon, Idaho and Montana?

Yes

No

a. Is this type of multi-state recognition important to you?

Yes

No

DK

8. Do you expect any other staff at your facility will enroll in the Building Operator Certification Program?

Yes (GO to Q8a)

No (Go to 8b)

Don't know (Go to 8b)

a. If yes, how many? _____

b. Is anything happening in your facility that might affect whether other staff enroll in the BOC?

Yes (Go to 8c)

No (Go to Q9)

c. Is your company/organization currently:

1 growing

2 downsizing

3 stable

4 Other (record:

9. At this time, do you anticipate taking continuing education classes for re-certification?

   Yes

   No

   Don't know

   a. What topics would you like to see covered in the Building Operator continuing education classes for the Level I certification?

   b. What topics would you like to see covered in the Building Operator Certification Level II program?

10. The cost of the certification course you took was $650. This was a discounted fee. Now that you have had a few months to reflect, given your experience with the program so far, does the certification program seem to be a good value for the cost?

    Yes

    No

    a. If the cost were $750, would it still seem to be a good value?

       Yes

       No

       Don't know

    b. If the cost were $950, would it still seem to be a good value?

Yes

No

Don't know

c. What would <u>you</u> be willing to pay to be certified for two years?

$_____

Don't know

d. What do you think your company/employer would be willing to pay for you to be certified for two years?

$_____

Don't know

11. Would you recommend the Building Operator Certificate program to people doing the same type of work as yourself?

Yes (Go to Q11a)

No (Go to Q11b)

Don't know (Go to Q11b)

a. What would you tell them?

b. Would you put the BOC on your resume?

Yes

No

Don't know

12. Do you have any additional comments?

13. Finally, could you verify for me if your organization, _____, is a publicly or privately owned enterprise?

    1. Public

    2. Private

    3. Other (specify: _____)

boc/98-99/traineerev99sept/8/99

INTERVIEW GUIDE

NEEC BOC PROGRAM TRAINEE EMPLOYERS

1998/99 BOC EVALUATION: MID-YEAR 1999 FOLLOW-UP

Name _____

Title _____ **Company/Org.** _____

Training Location _____ **Employee(s)** _____

Phone Number/Address _____

Introduction: I am ------. Your employee(s) _____ participated in a Building Operator certification program training in ___dates of training _____. I am conducting an evaluation with some of the students and their employers to find out what benefits the program has provided. Do you have about 10 minutes to answer a few brief questions?

1. From what you have observed, was the training obtained in the program useful to the job your employee(s) _____ is/are currently doing?(add: Any specific examples?)

   Yes

   No

   Don't know

   a. Have you observed any differences in the way your employee(s) _____ does/do his/her/their job since taking the training?

      Yes

No

Don't know

b. The course covered six skill areas and an overview. Please rank these from 1-7 as to which is most important (1) and which is least important (7) for your employee(s) to know on the job.

i. Building system overview _____
ii. Energy conservation techniques _____
iii. HVAC systems and controls _____
iv. Energy efficient lighting _____
v. Building maintenance codes _____
vi. Indoor air quality ____
vii. Facility electrical systems

2. It has been ------ months----- since the training was completed. On a scale of 1-5, where 1=not at all satisfied and 5=extremely satisfied, how satisfied are you with the training program? (For reference only, do not read: 1=not at all satisfied, 2=not satisfied, 3=neither satisfied or not satisfied, 4=satisfied, 5=extremely satisfied).

1 2 3 4 5

a. Why do you say that?

b. (If less than 5) What types of changes would you like to see that would improve your satisfaction with the program?

3. Do you anticipate any other facilities staff will enroll in the Building Operator Certification Program?

Yes

No

Don't know

(ASK FOR ANY RESPONSE ABOVE)

a. Which of the following factors might change this number? Is your company currently:

1. growing
2. downsizing
3. stable
4. Other (Specify: _____)

b. Do you expect any of these changes in the next year?

Yes (Ask 3c)

No (Go to Q4)

c. Which of these changes do you expect in the next year?

1. growing
2. downsizing
3. stable
4. Other (specify: _____)

4. Overall what would you say is the major benefit your organization received by having this employee(s) attend the BOC program?

a. What specifically does having your employee receive the BOC certification mean for your department? (If the employee has not received the certification, ask whether there would be a benefit to the department if the employee did?)

b. Are you aware that certification is recognized in Washington, Oregon, Idaho and Montana?

Yes

No

c. Does this level of reciprocity have any value to you as an employer?

Yes

No

DK

d. What topics would you like to see covered in the Building Operator Certification Level II program?

5. Now that you have had some time to assess the value of the training, will you encourage your employee(s) _____ to take continuing education classes for re-certification?

Yes

No

Don't know

If no, why not?

If yes, What would you expect your employee to gain from continuing education classes?

a. What topics would you like to see covered in continuing education classes for the Level I certification?

b. Will you encourage your employee(s) _____ to take Level II BOC course? (If the employer doesn't know what these levels mean, briefly explain the Level II program -- more advanced builds on previous training, preventive maintenance.)

Yes

No

Don't know

If no, why not?

If yes, What would you expect your employee to gain from Level II BOC course?

c. What topics would you like to see covered in the Building Operator Certification Level II program?

6. Do your managers/supervisors support training for the building operations and maintenance staff?

Yes

No

7. I would like you to give some thought to the value of the program. The cost of the certification course when _____ took the course was $650. This was a discounted fee. Given your experience with the program does the certification program seem to be good value for the cost?

   Yes

   No

   Don't know

   a. If the cost were $750,would it seem to be a good value?

      Yes

      No

      Don't know

      If no or don't know, what would make it worth $750?

   b. If the cost were $950, would it seem to be a good value?

      Yes

      No

      Don't Know

      If no or don't know, what would make it worth $950?

   c. What would you be willing to pay for your building operations staff to be certified for two years?

      $_____

8. Overall, would you recommend the Building Operator Certificate program to other (fill in title: e.g., facility managers) such as yourself, for their employees?

   Yes (ask 8a)

   No (Go to 8b)

   Don't know

   a. What would you tell them?

   b. Would you look for BOC on resumes for staff you might hire?

      Yes

      No

      Don't know

9. Do you have any additional comments about the program?

10. Finally, could you verify for me if your organization, _____, is a publicly or privately owned enterprise?

    1. Public

    2. Private

    3. Other (specify: _____)

boc98-99/emplfollrev99/8/99

INTERVIEW GUIDE

NEEC BOC PROGRAM TRAINEES

1998/99 BOC EVALUATION: LONG TERM FOLLOW-UP

Name _____ **Class Location** _____

Title _____

Company Name _____ **Phone Number** _____

Address _____

Introduction: I am ------ and I am conducting a follow-up survey with students who completed the Building Operator Certification Program in the past two years.

(If spoken with before) We talked with you -- when --- and are now conducting another follow-up)

(Only if not spoken with before) We are conducting an evaluation of the certification program and are following up with students to obtain their views of the program now that a year or so has gone by since completion of the course Do you have time to talk for about 10 minutes?

1. Now that the course has been over for a year or more, what have been the major benefits to you from attending the Building Operator Certification program?

2. The course included seven skill areas. As I read each skill area, please tell me which ones have been useful on the job? (Read list)

b. Which ones have not been useful on the job?

[For all checked, follow up about why these were checked

COURSE AREA	USEFUL [A]	NOT USEFUL [B]	DON'T REMEMBER, CAN'T SAY IF USEFUL
Building System Overview			
Energy conservation techniques			
HVAC system and controls			
Energy efficient lighting			
Building maintenance codes			
Indoor air quality			
Facility electrical systems			

a. What made that/those course(s) useful to you on your job?

b. What about this/these course(s) was not useful to you on your job?

c. Do you think that applying the knowledge you learned from the course series has improved your job performance?

Yes (Ask 2d.)

No

Don't know

d. If so, in what ways?

e. Have you been able to improve the comfort of the occupants of save money as a result of what you learned?

Yes - improved comfort

Yes - saved money

No - neither

f. Thinking back on the course, now that you have applied your knowledge what if anything would you like to see added to the Level I course series?

3. Since you completed the course, has your supervisor provided the support you needed to apply the skills you learned in the BOC training? (Please explain - ask for examples.)

Yes

No

a. If interviewed previously: The last time we spoke you gave me the name of _____ as the best person at your company to ask for opinions about whether the program was a good investment for the company. Is this person still available? If no, is there someone else who could evaluate the value of your attending the BOC to your company?

If not spoken with before: Could you please tell me who would be the best person at your company to ask opinions about whether the program was a good investment for the company?

Name & Title: _____

Phone Number _____

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

Fax Number _____

4 The training was completed __date____. Now that you have had some time to reflect on the course on a scale of 1-5, from not at all satisfied to extremely satisfied, how satisfied are you with the training you received? (in case anyone asks, but do not read: 1=not at all satisfied, 2=not satisfied, 3=neither satisfied or not satisfied, 4=satisfied, 5=extremely satisfied.)

1 2 3 4 5

a. Why do you say that?

5. Since completing the BOC have any of the following changes occurred in your job? (Circle all that apply)

1. Change in Job title
2. Increased responsibilities
3. Increase in compensation
4. Change in Job Location (if yes probe to see if State Changed)

IF YES TO ANY:

a. Do you think having the Building Operator Certificate helped you to make these changes?

Yes

No

Don't Know

b. Why do you say that? (Ask for all responses)

IF NO:

aa. Do you think having a Building Operator Certificate will be good for advancing, on your current job, or getting a new job if needed?

1. Current job
2. New job
3. Other (record)_____

bb. Why do you say that? (Ask for all responses)

6. Did you know that the BOC Certificate is recognized in Washington, Oregon, Idaho and Montana?

Yes

No

a. Is this type of cross state recognition important to you?

Yes

No

DK

7. At this time, have you taken any courses/continuing education classes for re-certification?

Yes (Go to Q7a)

No (Go to Q8)

a. What types of classes/courses have you attended?

b. Do you anticipate taking any continuing education classes for re-certification?

Yes

No

Don't know

8. Are you planning to attend the Level II BOC course?

Yes

No

Don't know

a. What would you expect to gain from attending a Level II training series?

b. What topics would you like to see covered in the Building Operator Certification Level II program?

9. What do you think your company/employer would be willing to pay for you to be certified for two years?

$_____

Don't know

10. Have you recommended the Building Operator Certificate program to people doing the same type of work as yourself?

Yes (Go to Q10a)

No (Go to Q10b)

a. What did you tell them?

b. Have you put the BOC on your resume?

Yes

No

11. Do you have any additional comments?

12. Finally, could you verify for me, is your organization, _____, a publicly or privately owned enterprise?

    1. Public

    2. Private

    3. Other (specify: _____)

boc/98-99/trainee long term fin/8/99

INTERVIEW GUIDE

NEEC BOC PROGRAM TRAINEE EMPLOYERS

1998/99 BOC EVALUATION: LONG TERM FOLLOW-UP

Name _____

Title _____ **Company/Org.** _____

Training Location _____ **Employee(s)** _____

Phone Number/Address _____

Introduction: I am ------. Your employee(s) _____ participated in a Building Operator certification program training some time ago.

(If spoken with before) We talked with you --when-- and are now conducting another follow-up.

(If not spoken with before) I am conducting an evaluation with some of the students and their employers to find out what long term benefits the program has provided . Do you have about 10 minutes to answer a few brief questions?

1. From what you have observed, has the training obtained in the program been useful to the job your employee(s) ?(add: Any specific examples?)

   Yes

   No

   Don't know

a. Have you observed any differences in the way your employee(s) _____ does/do his/her/their job since taking the training? (Explain)

Yes

No

Don't know

2. There were seven skill areas covered in the course. As I read these skill areas, please tell me which ones have been useful to your employee (s) on the job? (Read list)

b. Which ones have not been useful on the job?

[For all checked, follow up about why these were checked

COURSE AREA	USEFUL [A]	NOT USEFUL [B]	DON'T REMEMBER, CAN'T SAY IF USEFUL
Building System Overview			
Energy conservation techniques			
HVAC system and controls			
Energy efficient lighting			
Building maintenance codes			
Indoor air quality			
Facility electrical systems			

a. What made that/those course(s) useful to your employee?

b. What about this/these course(s) was not useful to your employee?

3. The training was completed _____date_____. On a scale of 1-5, where 1=not at all satisfied and 5=extremely satisfied, how satisfied are you with the training program? (For reference only, do not read: 1=not at all satisfied, 2=not satisfied, 3=neither satisfied or not satisfied, 4=satisfied, 5=extremely satisfied).

1 2 3 4 5

a. Why do you say that?

4. Do you anticipate any other facilities staff will enroll in the Building Operator Certification Program?

Yes, some already have (how many)#_____

Yes, some will (how many)#_____

No

Don't know

5. Overall what would you say is the major benefit your organization received by having this employee(s) attend the BOC program?

a. What specifically does having your employee receive the BOC certification mean for your department? (If the employee has not received the certification, ask whether there would be a benefit to the department if the employee did?)

b. Are you aware that certification is recognized in Washington, Oregon, Idaho and Montana?

Yes

No

c. Does this level of reciprocity have any value to you as an employer?

Yes

No

DK

6. Now that you have had some time to assess the value of the training, will you encourage your employee(s) _____ to take continuing education classes for re-certification? (If the employer doesn't know what these levels mean, briefly explain the continuing education requirement -- Level I is entry level continuing education helps maintain certification.)

Yes

No

Don't know

If no, why not?

If yes, What would you expect your employee to gain from continuing education classes?

a. What topics would you like to see covered in continuing education classes for the Level I certification?

7. Will you encourage your employee(s) _____ to take Level II BOC course? (If the employer doesn't know what these levels mean, briefly explain the Level II program -- more advanced builds on previous training, preventive maintenance.)

Yes

No

Don't know

If no, why not?

If yes, What would you expect your employee to gain from Level II BOC course?

a. What topics would you like to see covered in the Building Operator Certification Level II program?

8. I would like you to give some thought to the value of the program. The cost of the certification course when _____ took the course was $650. This was a discounted fee. Given your experience with this employee (s) since the program, does the certification program now seem to have been good value for the cost?

   Yes

   No

   Don't know

   a. If the cost were $750,would it seem to be a good value?

      Yes

      No

      Don't know

      If no, what would make it worth $750?

   b. If the cost were $950, would it seem to be a good value?

      Yes

      No

      Don't Know

      If no, what would make it worth $950?

c. What would you be willing to pay for your building operations staff to be certified for two years?

$_____

9. Have you recommended the Building Operator Certificate program to other (fill in title: e.g., facility managers) such as yourself, for their employees?

Yes (ask 9a)

No (Go to 9b)

Don't know

a. What did you tell them?

b. Do you look for BOC on resumes for staff you might hire?

Yes

No

Don't know

10. Do you have any additional comments about the program?

11. Finally, could you verify for me is your organization, _____, a publicly or privately owned enterprise?

    1. Public

    2. Private

    3. Other (specify: _____)

boc98-99/empl long term/8/99

INSTRUCTOR COURSE EVALUATION

WAVE 2

1998/99 BOC EVALUATION

Name _____

Date _____

Check off which course this evaluation addresses:

COURSE NO. →	101	102	103	104	105	106	107
Location:							

---

1. What are the three to five key skills you hope students learn from your course?

   1.

   2.

   3.

   4.

   5.

2. Did you feel that you were able to transmit all of these key skills in the course?

   Yes ___

   No ___

   If not, which skills were most difficult to transmit and why?

3. Of the prepared course presentations, what is the percentage of lecture to percentage of hands-on activities?

   Lecture Hands-on

   _____ + _____ =100%

4. What is the percentage of discussion to the percentage of prepared course presentation?

   Discussion Prepared Course Presentation

   _____ + _____ =100%

5. Considering your previous business/professional experience, are you the right person to instruct this course?

   Yes ___

   No ___

   If not, Why?

The following questions use a scale from "very much so" to "not at all." Please rate your assessment for each of the following.

	VERY MUCH SO	FOR THE MOST PART	SOME-WHAT	ONLY SLIGHTLY	NOT AT ALL
6. Were the stated training objectives met?	—	—	—	—	—
7. Was the sequence of the content logical for participants?	—	—	—	—	—
8. Did the training activities facilitate the sharing of work experiences among participants (i.e. opportunity to network)?	—	—	—	—	—
9. Did participants have sufficient opportunity during training to effectively practice or apply the information/concepts presented?	—	—	—	—	—
10. Will the training materials be valuable to participants on the job?	—	—	—	—	—
11. Did the course materials contribute to participants learning during the training?	—	—	—	—	—
12. Is the content appropriate for participants' level of experience?	—	—	—	—	—
13. Is the content up to date regarding current practices and/or technology?	—	—	—	—	—
14. Were you given sufficient time to prepare for instructing this course?	—	—	—	—	—
15. Did you have sufficient opportunity to provide participants with any practical insights (i.e., best practices and/or lessons learned)?					

SCALE FOR #16 is Fully enough time to not at all enough time

16. How would you rate the amount of time allotted for this training?	—	—	—	—	—

SCALE FOR #17 is Very high quality to very low quality

_ _ _ _ _

17. In terms of preparing participants to do their jobs better, how would you rate the overall quality of the training?

18. Do you have any examples or stories from this last class of ways in which you were able to involve students in the course material or times when you felt students demonstrated that they really understood the course material?

19. Have you noticed any particular areas of weakness based on responses to the skill tests?

_ Yes

_ No

If yes, What are they?

20. Who was your training coordinator?

_ Jim Gilroy

_ Lee Benner

_ John Doyle

_ Other _____

a. In what ways was the training coordinator most helpful?

b. Were there any problems with the coordination?

21. The training coordinators provide a wide range of support services to the instructors. Which of the following would you feel comfortable doing yourself (in the absence of a training coordinator)?

Yes	No	
_	_	Bringing all materials to class
_	_	Making arrangement for rooms
_	_	Arranging for AV equipment
_	_	Meeting and greeting students
_	_	Posting tests grades from the previous class
_	_	Answering questions about tests
_	_	Collecting projects and discussing them with students
_	_	Representing the BOC program and responding to questions about the program

22. Would you be comfortable without a training coordinator in future classes?

_ Yes

_ No

If no, why not?

23. What would you like to change in the course?

24. How does the BOC compare to previous courses you have taught? Would you say it was:

    1. Better
    2. Same
    3. Worse
    4. Other (specify: _____

25. Do you have any additional comments?

PLEASE MAIL THIS FORM IN THE ENCLOSED ENVELOPE TO:

Research Into Action

P.O. Box 12312

Portland, OR 97212

boc98-99/instructpacket/11/98

APPENDIX E

Database Review

DATABASE REVIEW

We reviewed the NEEC BOC database in the process of extracting information on the number of people who NEEC has contacted that fall into categories such as enrollee, registered student and certified. As in previous reviews of the database we found problems that make the database an inadequate tool for assessing project progress. As long as current staff does not leave, the database can be interpreted, but if there were any staff turnover, the database would require significant effort to interpret.

The following three recommendations would resolve many of the problems in the database and enable searches and sorts to proceed expeditiously.

1. Define all fields, currently one cannot always find definitions for the field or the valid response in the key.

2. Complete data entry for all fields (e.g., only 60 contacts had data in the square footage field leaving 278 of those who have completed a course series with no entry in the field).

3. Constrain entries in fields and format the fields to match the constraints.

4. Do not mix text and numeric entry in fields.

5. Limit field size to control database size (e.g., middle initial field should be 1 column not 8).

6. Do not duplicate fields (e.g., e-mail appears twice).

7. Constrain date fields to a single format (e.g., the certification date field uses multiple date formats).

8. Include a field for completion not just dates of completion (e.g., certified yes/no as well as date certified would be useful).