



Northwest Energy Education Institute
Market Progress Evaluation Report, No. 3

prepared by

Currents Consulting

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NORTHWEST ENERGY EFFICIENCY ALLIANCE

www.nweaalliance.org

529 SW Third Avenue, Suite 600
Portland, Oregon 97204
telephone: 503.827.8416
fax: 503.827.8437

NORTHWEST ENERGY EDUCATION INSTITUTE

MARKET PROGRESS EVALUATION REPORT #3 Final Report

Funded By:



NORTHWEST ENERGY EFFICIENCY ALLIANCE
www.nweea.org

Prepared For:

David Cohan

Northwest Energy Efficiency Alliance

Prepared By:

Jennifer Stout



Currents Consulting

3133 Douglas Circle
Lake Oswego, Oregon 97035
jstout@currentsconsulting.com

and

Steven Scott

MetaResource Group

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NORTHWEST ENERGY EDUCATION INSTITUTE MARKET PROGRESS EVALUATION REPORT #3

INTRODUCTION

The Northwest Energy Efficiency Alliance (the Alliance) is a non-profit group of electric utilities, state governments, public interest groups and industry representatives committed to bringing affordable, energy-efficient products and services to the marketplace. In mid-1998, the Northwest Energy Efficiency Alliance (the Alliance) contracted with and provided seed money to Lane Community College in Eugene, Oregon, for the start-up of the Northwest Energy Education Institute (NEEI). NEEI's goal is to offer affordable, readily accessible, and well-regarded training programs to energy management and building service professionals. It currently offers the following five training programs:

- *Energy Management Certification (EMC)*
- *Building Operator Certification (BOC) Levels I and II*
- *Residential Energy Auditor Certification*
- *Residential Inspector Certification*
- *Customized energy efficiency training programs at customers' facilities*

In February 2003, the Alliance contracted with Currents Consulting to prepare this third and concluding market progress evaluation report. The first two reports, prepared by Shel Feldman Management Consultants,¹ focused on the organizational challenges and accomplishments of NEEI during its start-up. Recommendations made in those reports included adding a program administrator, setting clear organizational priorities, and strengthening marketing efforts, including conducting a systematic assessment of the potential market for all of NEEI's course offerings.

While this report touches on some of the broader issues raised in the first two evaluations, its primary focus is on the *Energy Management Certification (EMC)* program because it is NEEI's "flagship" offering. It is an opportune time to assess the program's value to participants and the region since it now has a history of three years of course enrollment.

¹ *Northwest Energy Education Institute, Market Progress Evaluation Report No. 1* (June 1999, Report #E99-030), and *Market Progress Evaluation Report No. 2* (December 2000, Report #E00-070). Available at www.nwalliance.org under the Resources tab.



EVALUATION APPROACH

Preparation of this report involved the following:

- One in-person interview and several phone calls with the EMC program director to gather background information on the course and assistance in selecting case study candidates.
- Review of EMC course marketing materials.
- Review of participants' written project reports and documentation.
- Attendance at the oral project presentations.
- On-site interviews with a total of seven course participants and three participants' supervisors.
- Preparation of five detailed case studies (provided in *Appendix B*).

The case studies were selected based on the following criteria:

- The energy efficiency projects were located in the Pacific Northwest.
- The projects for the course had been implemented, energy savings documented, and formal reports prepared.
- The participants had completed "spillover" projects and activities that went beyond those required for the course, pointing to broader market effects and the potential for market transformation.
- The projects were representative of the range of benefits from attending the course.

Preparation of the case studies involved reviewing participants' written project reports and documentation, conducting on-site interviews, and making follow-up calls to participants as necessary. The participants and supervisors also reviewed and commented on the case studies.

OVERVIEW OF THE ENERGY MANAGEMENT CERTIFICATION COURSE

To change the way institutions and businesses value and use energy, a broad range of people within their facilities needs to be influenced. These include: (1) upper-level decision-makers, (2) nuts-and-bolts equipment operators, and (3) mid-level facilities and maintenance managers/supervisors. Within these three groups, the Alliance has focused most of its funding on equipment operators through the *Building Operator Certification* (BOC) program. BOC covers many of the same topics as the EMC, but with much greater emphasis on hands-on, technical training.



The Alliance has also done limited work with upper-level decision-makers through its support of the *One-2-Five* program, which attempts to raise companies' awareness of the impact of energy costs on profits and the importance of developing comprehensive energy strategies.² However, virtually all of the Alliance funding for *One-2-Five* was for industrial facilities.

EMC, by targeting the middle level of facilities and maintenance managers/supervisors at businesses and institutions, serves as a critical link between upper management and personnel at the hands-on operations level. Its participants are in a position to affect long-term energy efficiency policies, procedures, and O&M practices, as well as short-term use of energy in their facilities (e.g., occupant behavior and day-to-day operations and maintenance).

The EMC course approach and experience are unique in the Northwest region, and indeed in the United States.³ The effort was launched in 2000, and was modeled after a training program offered in New Zealand. It is currently presented once a year to a maximum of fifteen students, at a cost of \$3,500 per individual. The full program lasts a year and consists of the following three phases:

- ▶ **First Phase – Classroom and Hands-On Training.** Participants first attend an intensive, two-week, in-residence training session on the University of Oregon campus during the summer. It is a total immersion experience in the fundamentals and practices of energy efficiency. Students live and breathe energy efficiency with lectures and training sessions that start at 8:00 a.m. and often continue until 9:00 p.m. or later.

During the first year of the program, participants began jokingly calling this “boot camp” and the name has stuck. Participants live in student dormitories, attend class together, study together, and socialize together. They learn to juggle as a stress reliever and to build a team spirit. Not surprisingly, by the end of the course, there is a high level of camaraderie among both peers and instructors.

² More information on *On-2-Five* can be found at www.envinta.com/sub_level/EnVinta_one2five.html.

³ While the *Certified Energy Manager* (CEM) program (operated by the Association of Energy Engineers [AEE]) is a nationwide training/certification program, it is geared more towards energy management professionals who already have significant experience and want to acquire this particular qualification. It may be well-suited to those doing “engineering” type of work in energy management but who cannot meet the substantial and rigorous requirements for professional engineering registration. The CEM program clearly has a different target market and approach than EMC. However, the EMC course could be good preparation for the CEM exam if the applicant has met the other application requirements. CEM has stringent application requirements involving various combinations of academic training and field experience in energy management, ranging from a four year engineering degree and/or professional engineering registration, plus at least three years field experience, to ten years or more of verified experience. Qualified applicants can take the four hour exam without any specific preparation, or take one of AEE’s preparatory courses. No project work is required, although periodic re-certification requires some continuing education.



The curriculum covers lighting, building envelope, heating, ventilation and cooling, controls, energy auditing, and energy calculations.⁴ Each day is dedicated to a specific topic and one or more instructors spend the entire day working with the students. Most of the instructors are not paid staff, but professionals working in the energy management field, another aspect of EMC that makes it unique. The instructors' practical knowledge and experience is an effective way to convey energy management principals to students.

- ▶ **Second Phase – Project Implementation.** EMC is also the only certification program in the region in which students are required to implement an efficiency project, providing immediate hands-on experience and energy savings for the participant's organization. After returning to the workplace, participants identify prospective energy efficiency projects and spend the next year implementing one or more of them. They select their projects with the help of the course instructors, usually based on maximum return-on-investment and/or energy savings criteria.
- ▶ **Third Phase – Project Presentation.** One year following boot camp, participants return to the University of Oregon to present their project results to their fellow students, the NEEI staff, and students of the subsequent year's course. Students receive a plaque after completing all EMC course requirements.

COURSE PARTICIPANTS

The target market described on NEEI's website includes engineers, technicians, architects, facilities maintenance personnel, and energy managers. In our research for this report we found that 23 of 35 course participants or 66% were from public institutions such as schools, colleges, and city, county or state governments, and 20 could be described as middle-level facilities or maintenance managers. Two others were plant level staff and one was a teacher at a school district. The remaining attendees were from consulting firms, vendors/contractors, utilities, and energy agencies. Thirty-one of thirty-five participants were from the Pacific Northwest. A complete list of participants, including organization name, type, and state is provided in *Appendix A*.

Table 1 provides an overview of each year's participants by customer type.

⁴ The course content is described in detail at www.nweei.org.



Table 1: EMC Course Participants by Type

Year	Total Participants	Institutional Customers ⁵	Consultants	Vendors and Contractors	Utility Staff and Energy Agencies
2000	7	6	0	0	1
2001	14	9	1	2	2
2002	14	8	3	1	2
Total	35	23	4	3	5

Table 2 provides a breakdown of participants by state. As shown, 71% of students to date have been from Western Oregon, 14% from Western Washington, 3% from Eastern Washington, and 12% from out of the region. Attendance from Western Washington has been steadily increasing. The program continues to build its national marketing efforts—including to Eastern Washington, Eastern Oregon, Idaho, and Montana—through personal contacts, mailings, presentations at energy conferences, and outreach to associations.

Table 2: EMC Course Participants by State

Year	Total Participants	Western Oregon	Western Washington	Eastern Washington	Out of State
2000	7	7	0	0	0
2001	14	8	1	1	4
2002	14	10	4	0	0
Total	35	25	5	1	4

The five selected case studies were from Oregon because of the predominance of Oregon participants in the first two years of the course. Based on the evaluators' review of all the participant reports available, the selected case studies are representative of the range of benefits the course offers to participants.

Among the seven participants in the year 2000 course, six completed projects for the program. In the year 2001 class, seven of fourteen participants have completed projects, three are in process, and four did not complete a project. Among the four that did not complete projects, none were from institutional facilities. The fourteen participants from 2002 are still in the project planning and implementation phase. So far, the EMC director has heard that five participants have projects

⁵ All were public institutions. One was with a property management company and had responsibility for a public building.

under way; the definite number of completed projects will not be known with certainty until the summer of 2003.

The predominance of course participants who were middle-level facility and maintenance managers from public institutions was probably not intentional on the part of the program marketers, but these are the types that have so far been attracted to the program, which appears to be particularly well-suited to this type of participant. They are not necessarily the people turning the wrenches in their facilities, but may oversee staff that does the hands-on work. Many of these participants had some basic understanding of energy efficiency prior to taking the course, but needed more specific knowledge on how to identify and prioritize energy saving opportunities, select appropriate technologies, analyze costs and savings, and select and manage contractors.

Among participants, we also identified two who were general project managers with little or no knowledge of energy efficiency prior to taking the course. Their supervisors asked them to enroll because they wanted to give them new responsibilities that would involve energy efficiency. Because of the supportive atmosphere of the course and the accessibility of instructors, these participants were able to keep up with the course materials, including the more complex analysis, and said they had a very positive experience. A third was a teacher at a school district who paid his own way to take the course.

EMC appears to be particularly valuable to school districts, colleges/universities, and city, county, and state governments where there may be many savings opportunities, but few staff with technical training to identify and address them. The quotes below from the case study interviews provide a sense of the extremely positive experience had by participants in the course:

- “[The course] hit the mark on everything. Calculations, selling the project to management... You had enough [information] to talk the talk but you could also find someone to help you. We’re building an environmental kingdom here [at the County]. It was a great program. I talk about it still. It was a fun learning experience and challenging.” *Energy Conservation Specialist, Multnomah County*
- “The instructors were just stupendous. Support from NEEI staff was superb and very professional, both the instructional guidance and equipment such as data loggers. The staff at NEEI was very accessible...The program and preparation [for completing our projects] were fantastic. I especially appreciated the training in using my powers of observation and paying attention to details where energy savings could occur.” *Maintenance Mechanic/Energy Coordinator, North Santiam School District*
- “The instructors were great. They were obviously really knowledgeable in their field. Roger picked people who were top notch. It impressed me that we had so many good people.” *Statewide Resource Coordinator, Oregon Department of Administrative Services*



COURSE OUTCOMES

Based on the participant and supervisor interviews conducted for the five case studies, participants found the EMC particularly valuable in the following ways. They:

- ▶ **Learned to identify, prioritize, and implement energy saving projects.**
- ▶ **Gained comfort with energy calculations including life-cycle cost analysis.** This brought analytical rigor to their projects, helping them sell these projects to management and also to have confidence in their project results.
- ▶ **Developed confidence to oversee the work of staff and contractors.** Most participants will not actually install measures, but the course gives them the knowledge to oversee the work of facilities staff and contractors.
- ▶ **Changed their thinking** through the EMC immersion experience so they see facilities maintenance and operations through an energy efficiency “lens.”
- ▶ **Became leaders in energy efficiency in their organizations.**
- ▶ **Developed supportive professional relationships in energy efficiency** with EMC class peers and instructors.
- ▶ **Learned to sell energy efficiency projects to management** and to give more effective presentations. A portion of the course focuses on this and students we interviewed said it was particularly useful.

One supervisor remarked that the participants from his organization “act as the [organization’s] conscience for energy efficiency.” He said he believes that the EMC course’s “immersion” approach was key to changing participants’ thought processes and perspective. He is encouraging staff to change their mindset even further in terms of assessing sustainability projects using life-cycle cost analysis, net present value, durable cost analysis, etc.

In conducting the research for this report, we noted that the most successful participants in the course had started their careers in a hands-on position in operations and maintenance, and then moved up to a mid-level manager position. Their work at the O&M level gave them a particular ability to understand the perspective of staff at this level. In addition, participants were most successful if their direct management strongly supported their participation in the course and their pursuit of energy efficiency opportunities. Thus, the EMC course gave them knowledge and skills in energy efficiency to be an effective “link” in the energy efficiency “supply chain” between operations-level staff and upper management.



FINDINGS

“Spillover” from the course is impressive and goes beyond discrete projects.

As evidenced in the case studies, the spillover from the program consists of more than participants implementing numerous projects beyond those required for course completion. The intensive immersion experience of the course changes participants’ thinking about their organizations. They begin to see all aspects of organizational management through the lens of energy efficiency, including equipment procurement/purchase, organizational policies and practices, and facility operations and maintenance. Further, they gain the skills and confidence to become leaders in energy conservation within and sometimes beyond their organizations, and to make important ongoing contributions to energy efficiency.

Case Study Examples:

- The five case studies describe over 50 spillover projects and activities currently underway that are directly attributable to the knowledge, skills, and motivation gained by participants in the course. It is clear that participants will continue to identify and implement additional energy efficiency projects.
- Since attending the course, three participants have been directly involved in the development of broad policies and procedures that will continue to impact energy efficiency practices well into the future. Highlights include:
 - The participant from Oregon State Department of Administrative Services (DAS), helped prepare a DAS policy on water and energy conservation that, together with other specific projects and improved O&M, have helped DAS reduce electricity consumption in its buildings by about 20% in the last two years. (The case study provides more details on the specifics of the participant’s role in preparing the DAS policy.) This represents annual savings of about 10,000 MWh or 1.14 aMW based on billing analysis conducted by the participant. (Note that these savings have not been formally audited and are not weather-adjusted.)
 - At the North Santiam (Oregon) School District, the course participant launched a program for purchasing only ENERGY STAR[®] office equipment and appliances, and a five-year District-wide energy efficiency plan.
 - A participant who now works for Multnomah County (Oregon) has developed a County Energy Policy and adopted the EMC life-cycle cost analysis spreadsheet for energy projects as the County standard.
- Three participants have implemented sophisticated, real-time energy monitoring and control systems that link most, if not all, buildings in their facilities. Another participant is planning to do so.



Organizations can reap numerous benefits from having staff attend the course.

- **Staff Development.** Motivated participants emerge from the course with the skills, knowledge, and confidence to lead energy efficiency efforts and oversee the work of contractors.
- **Enhanced Management Understanding.** The analytical skills and increased confidence gained by participants help them present their proposed projects more effectively to management, particularly in the area of life-cycle cost analysis.
- **Shared Knowledge and Staff Involvement.** Participants often share their knowledge with other staff and involve them in identifying and implementing projects.
- **Recognition.** The case studies provide numerous examples of how participants and their departments or organizations have received formal and informal recognition for their efforts in energy efficiency.
- **Cost-Effective Investment.** The EMC course is usually a cost-effective investment in human resources, particularly if the participant is motivated and has management support.

Case Study Examples:

- The North Santiam School District invested \$2,000 to send their Maintenance Mechanic/Energy Coordinator to the course (he arranged for a scholarship and course discount to cover the other \$1,500). He attended during the summer and so did not need to take time off from work. He conducted financial analysis using the EMC spreadsheet tool that indicated that the projected cost savings (about \$40,000 per year) from his proposed energy efficiency projects, in combination with tax credits, rebates, and low interest loans, would cover the loan payments, thus making the projects revenue-neutral. In addition, the initial capital investment by the District was only \$30,000 on a \$491,000 project. This analysis was key to winning Board approval. In fact, savings have turned out to more than cover the loan payments. He recently provided a project update to the Board and received kudos.
- The Oregon Parks and Recreation Department (OPRD) recently won the *State of Oregon 2001 Resource Steward of the Year* award. The award recognizes the OPRD's sustainability efforts including energy and water efficiency, recycling, and sustainable design and construction. This award was given by the Oregon Department of Administrative Services (DAS) Resource Conservation Management Program. It was a fellow EMC course participant with DAS who nominated the OPRD.



Significant energy and non-energy benefits are being achieved.

Total estimated annual energy savings for just the projects completed for the course in the five case studies were 1,346,000 kWh⁶. Savings were available for only a few of the spillover projects since many were in process or only recently implemented when this report was prepared.

Besides energy cost savings benefits, there were important non-energy benefits described in the five case study examples. These included:

- Improved occupant comfort
- Extended equipment life
- Reduced operations and maintenance costs
- Streamlining of equipment purchasing
- Strengthening and standardization of policies and procedures
- Increased staff awareness of energy efficiency
- Staff involvement at all levels in identifying project opportunities

Participants benefit personally and professionally from the EMC course.

Among the five case studies, the following personal and professional benefits were described by participants:

- The knowledge, skills, and confidence to become a leader in identifying, analyzing, prioritizing, and implementing energy efficiency projects at the organization.
- Knowledge and confidence to oversee and check contractors' proposals and on-site work.
- Development of presentation skills, particularly to management.
- Expanded job responsibilities and in some cases job promotions or new job opportunities.
- Both informal and formal recognition and encouragement by participants' supervisors, other staff, and sometimes by outside organizations or departments.
- Camaraderie and mutual support among students during and after the course.

⁶ As estimated by the EMC course participants and reviewed by the course instructors.

Case Study Examples:

- One participant has moved from his position as Energy Educator with the Oregon Tigard-Tualatin School District to being Energy Conservation Specialist in Environmental Services with the Facilities and Property Management Division of Multnomah County.
- A second was promoted from Design Engineer to Programs and Facilities Maintenance Lead.
- A third moved from a clerical to a professional position.

All of these promotions substantially enhanced the student's influence in the area of energy efficiency.

The fiscal difficulties of Northwest states, particularly Oregon and Washington, may impact participation in future courses and also the participants' ability to implement energy efficiency projects.

With the current fiscal difficulties, public officials and heads of public sector organizations and institutions are cutting funding wherever they can. Training budgets will be scrutinized, and every expenditure will need to be justified, which will lead to more difficulty in supervisors approving people to attend the course.

In the first three years of the EMC course, most students have been from public institutions in Western Oregon.

Over 71% of students to date have been from Western Oregon, 14% from Western Washington, 3% from Eastern Washington, and 12% from out of the region. To date there have not been any participants from Eastern Oregon, Idaho, or Montana. Convincing students to attend from these other areas has been challenging, despite diligent marketing efforts.



Table 3: Summary Matrix of Case Studies

Year	Participant Organization	Facility Type(s)	Title of Participant(s)	Project Location	Course Project Description	Spillover Projects	Energy Benefits	Non-Energy Benefits
2000	Oregon State Department of Administrative Services (DAS)	Office building; print plant	Statewide Resource Coordinator; Energy Analyst	Salem, Oregon	Lighting retrofits, building schedule changes, program-mable thermostats, occupancy sensors, adjust temperature setpoints.	Projects in 40 more DAS buildings; 20% energy reduction. New policy on energy and water conservation.	<i>Course Projects:</i> 120,600 kWh/year <i>Spillover Projects:</i> 10,000 MWh/year or 1.14 aMW based on billing analysis by participant	<ul style="list-style-type: none"> • Better light quality and levels. • Improved occupant comfort. • Extended equip. life and reduced maintenance.
2000	Tigard-Tualatin School District	High school; middle school; swim center	Energy Educator (now Energy Conservation Specialist with Multnomah County)	Tigard, Oregon	Lighting retrofits and boiler replacement.	Numerous projects in new position at County. New County Energy Policy.	<i>Course Projects:</i> 94,700 kWh/year <i>Spillover Projects:</i> Overall electricity and gas down 10% at District.	<ul style="list-style-type: none"> • Better gym lighting levels & evenness. • Improved pool safety. • Less maintenance.
2000	Oregon Parks and Recreation Department (OPRD)	OPRD admin building; state park buildings & campground facilities	Energy Conservation Engineer; Design Engineer (<i>after course, promoted to Programs and Facilities Maintenance Lead</i>)	Statewide, Oregon	Lighting retrofits, shell measures, O&M measures, HVAC measures, and water conservation measures.	Retrofit of 25 restrooms. Improved utility tracking and reporting.	<i>Course Projects:</i> 265,200 kWh/year <i>Spillover Projects:</i> Projects still in process.	<ul style="list-style-type: none"> • Better light quality and levels. • Improved occupant comfort. • Extended equip. life and reduced maintenance.
2001	Portland Bureau of Environmental Services	Wastewater treatment plant	Lead Electrician	Portland, Oregon	Lighting retrofits; maintenance changes in pumping; operations changes; and HVAC changes.	Developing real-time monitoring. More lighting retrofits. Exploring pumping efficiency.	<i>Course projects:</i> 439,400 kWh/year <i>Spillover projects:</i> 13,500 kWh/year; others in process.	<ul style="list-style-type: none"> • Better light quality and levels. • Extended equip. life and reduced maintenance.
2001	North Santiam School District	Elementary school; middle school	Maintenance Mechanic/ Energy Coordinator	Santiam, Oregon	Lighting retrofits, control system retrofits	ENERGY STAR® purchase program, district-wide controls installation; summer shutdown, vending misers.	<i>Course projects:</i> 425,700 kWh/year <i>Spillover projects:</i> Savings being monitored.	<ul style="list-style-type: none"> • Better light quality and levels. • Improved occupant comfort. • Extended equip. life and reduced maint.



APPENDIX A: LIST OF EMC COURSE PARTICIPANTS





EMC COURSE PARTICIPANTS

Year	Organization Name	Type	Location	Title of Course Participant	Project Status
CLASS OF 2000					
2000	State of Oregon - Facilities Division, Dept. of Admin. Services	Public institution	Salem, OR	Statewide Resource Coordinator	Completed
2000	Oregon Office of Energy	Energy Agency	Salem, OR	Energy Analyst	Completed
2000	Tigard-Tualatin School District, now with Multnomah Co.	Public institution	Portland, OR	Formerly Energy Educator; now Energy Conservation Specialist	Completed
2000	Oregon Department of Parks and Recreation	Public institution	Salem, OR	Energy Conservation Engineer	Completed
2000	Oregon Department of Parks and Recreation	Public institution	Salem, OR	Formerly Design Engineer; now Programs & Facilities Maintenance Lead	Completed
2000	State of Oregon - Facilities Division, Dept. of Admin. Services	Public institution	Salem, OR	Construction Project Manager	Completed
2000	Lane Community College	Public institution	Eugene, OR	HVAC Technician	None completed
CLASS OF 2001					
2001	Portland Bureau of Envir'l Services Wastewater Treatment Plant	Public agency	Portland, OR	Lead Electrician	Completed
2001	North Santiam School District	Public institution	Stayton, OR	Maintenance Mechanic/Energy Coordinator	Completed
2001	Kaiser Hospital	Public institution	Sacramento, CA	Energy Manager, now Construction Manager	Completed
2001	Calif. EPA Building (Thomas Properties Group)	Public institution	Sacramento, CA	Building Manager	Completed
<i>Continued</i>					



Year	Organization Name	Type	Location	Title of Course Participant	Project Status
2001	Anchorage School District	Public institution	Anchorage, AK	Facilities Manager	Completed
2001	Bethel School District	Public institution	Eugene, OR	Physics Teacher	Project behavioral. No formal report.
2001	Federal Aviation Administration	Public institution	Renton, WA	Facilities Manager	In process
2001	Oregon State Capitol	Public institution	Salem, OR	Electrician	In process
2001	Hillsboro School District	Public institution	Hillsboro, OR	Facilities Specialist and Safety Manager	In process
2001	Raven Electric	Vendor/contractor	Anchorage, AK	Electrician Supervisor	Complete
2001	Energy Northwest	Consultant	Richland, WA	Nuclear Engineer	None completed
2001	PacifiCorp	Utility	Portland, OR	Project Manager	None completed
2001	Northwest Energy Efficiency Alliance	Energy Agency	Portland, OR	Project Coordinator	None completed
2001	Doug Palmer Electric	Vendor/contractor	Eugene, OR	Owner	None completed
CLASS OF 2002					
2002	Tualatin Hills Park and Recreation District	Public institution	Beaverton, OR	Energy Manager	In process
2002	The Evergreen State College	Public institution	Olympia, WA	Plant/ Mechanical Systems Manager	In process
2002	The Evergreen State College	Public Institution	Olympia, WA	Facilities Engineer	In process
2002	Issaquah School District	Public Institution	Issaquah, WA	Resource Conservation Manager	In process
2002	Oregon Office of Energy	Energy Agency	Salem, OR	Energy Specialist	In process
2002	Oregon Office of Energy	Energy Agency	Salem, OR	Energy Specialist	In process
2002	University of Oregon	Public Institution	Eugene, OR	Energy Accountant	Status unknown
<i>Continued</i>					



Year	Organization Name	Type	Location	Title of Course Participant	Project Status
2002	Southern Oregon University	Public Institution	Ashland, OR	Plant Operations Supervisor	Status unknown
2002	Bellevue Community College	Public Institution	Bellevue, WA	Automations Engineering	Status unknown
2002	Oregon State University	Public Institution	Corvallis, OR	Energy Manager	Status unknown
2002	Peraska Corporation	Consultant	Beaverton, OR	Energy Consultant	Status unknown
2002	C2R Consulting	Consultant	Portland, OR	Consultant	Status unknown
2002	--	Consultant	Portland, OR	Mechanical Engineer	Status unknown
2002	Siemens Building Technologies	Vendor/contractor	Portland, OR	Service Operations Supervisor	Status unknown





APPENDIX B: CASE STUDIES

This section contains case studies representing EMC course projects for the following organizations:

- **Oregon State Department of Administrative Services (DAS)**
- **Tigard-Tualatin School District, Oregon**
- **Oregon Parks and Recreation Department (OPRD)**
- **Portland Bureau of Environmental Services Wastewater Treatment Plant, Oregon**
- **North Santiam School District, Oregon**





OREGON STATE DEPARTMENT OF ADMINISTRATIVE SERVICES

BACKGROUND

Title and Energy-Related Responsibilities of Course Participants:

The projects completed at the Oregon State Department of Administrative Services (DAS) involved the collaboration of two course participants: the Statewide Resource Coordinator with DAS and an Energy Analyst with the Oregon Office of Energy (OOE).

Facility/Plant Type:

The projects for the course were at an office building and a printing plant.

Enrollment:

The supervisor of the DAS participant wanted to expand the recycling program to include energy and other resource efficiency. The participant had been managing the recycling program but needed more technical background in energy efficiency to help her coordinate an all-resources program. The EMC course was brought to the attention of the supervisor by a staff person in the DAS O&M group who had seen it on the Internet and the supervisor approached the participant about going. In the case of the participant from OOE, this office has a working relationship with the Northwest Energy Education Institute so the participant was aware of the course and decided to take it to further develop his technical knowledge of energy efficiency to supplement his project management skills.

COURSE PROJECTS

Course Project Description:

The projects completed for the course involved the following electricity saving measures:

- **State of Oregon “Real Estate” Building.** Eliminated four hours from the building operation schedule; converted lighting to T-8s; delamped where lighting levels were found to be excessive; began turning office machines off on weekends and holidays; installed new programmable thermostats; raised temperature setpoints in the cooling season; eliminated special A/C units for computer room; installed occupancy sensors in certain areas. Some of the HVAC-related measures described above have also helped cut gas consumption during the heating season as the building is heated with natural gas.
- **State of Oregon Print Plant.** Delamped in selected office areas. Gas savings were achieved by lowering temperature setpoints (building is heated by a gas-fired boiler).



Annual Energy and Cost Savings⁷:

Energy savings were determined for four measures in the office building (delamping, conversion to T-8s, occupancy sensors, and elimination of special A/C units) and one measure in the print plant (delamping).

- **Estimated Annual Energy Savings:** 120,600 kWh
- **Estimated Annual Cost Savings:** \$13,300

Non-Energy Benefits:

- Better light quality and levels.
- Improved comfort of building occupants.
- Extended equipment life and reduced maintenance.

“SPILLOVER” PROJECTS AND ACTIVITIES

Below is a description of projects and activities led by the participant from DAS that were influenced by the course, but go well beyond the specific work completed to meet the course requirements.

Spillover Project Description:

Electricity saving measures were implemented in 36 DAS-owned and four DAS-operated buildings.

- De-lamping over 18,000 lamps in the DAS buildings, grounds, and parking structures.
- Decreasing the electric heating system run times by 3 to 5 hours and adjusting thermostat settings by 3 to 5 degrees.
- Reducing temperatures for electric water heaters to 120 degrees.
- Asking employees to remove space heaters and other private appliances.
- Increasing employee awareness of plug loads, including asking employees to turn off computers, monitors, and task lights when not in use.

⁷ As estimated by the EMC course participant.



- Installing “Vending Misers” on all cold beverage machines where possible.

Several of the measures above also reduced gas usage in buildings with gas heating systems (decreased run times and thermostat adjustments) and water heaters (temperature reduction).

In addition, the following projects are completed or in process:

- **DAS Public Utility Building.** The participant is working with an engineer to develop a plan to replace an outdated HVAC system that uses an underground well pump to provide water to a single-pass cooling system. The project will reduce demand spikes as well as save energy and water.
- **DAS Supreme Court Building.** The participant is working to correct a poor load factor and reduce demand spikes caused by an outdated heating system. This situation is exacerbated by the fact that the current accounting system does not allow DAS to charge back for demand.
- **DAS L&I and Revenues Buildings.** The participant is working with the consulting firm that is doing a system upgrade to make sure the firm’s engineers have all the necessary data to design an energy efficient retrofit.
- **DAS Employer Building.** The DAS participant worked on the agency’s first project involving an energy services company (ESCO), and was responsible for verifying the ESCo’s savings guarantee.
- **DAS Policy On Water and Energy Conservation.** The participant helped prepare this unique policy that includes personal appliances (e.g., space heaters, office refrigerators, and Christmas lights). Her involvement in the policy was possible because the course enabled her to move from a clerical position with the recycling program to a professional position with the all-resource program. She researched about half of the energy saving items in the policy to assess their feasibility and energy savings. As the participant said “before the [EMC] course I wouldn’t have even known what to research.” She reviewed policy drafts and was active in the policy planning committee of 20 agencies that own and manage land and property. Altogether, these 20 agencies oversee 32 million square feet of property of which DAS property comprises 3 million square feet. Her research and involvement were key in making the policy as thorough as it is. The policy has in turn been adopted by other jurisdictions as word has spread and it has become available on the State’s web site. For example, the City of Eugene, Oregon, and Multnomah County in Oregon have both adopted it. In the latter case, another participant of the EMC course heard about it from his fellow classmate and pushed for the County to adopt it when he took his new position there as Energy Conservation Specialist. Agencies from other states have also called to ask to use it.
- **DAS Quarterly Newsletter.** The newsletter has been broadened to include energy efficiency.



- **State Sustainability Policy.** The DAS participant helped write the “green” building portion of the policy which impacts construction, deconstruction, renovation, new leases, and deconstruction.
- **State of Oregon Resource Team.** The DAS participant coordinates this team comprised of resource coordinators from 15 different state agencies. Following attendance at the course, the DAS participant broadened the group’s focus from recycling to include energy and water conservation. The DAS participant describes the committee members as “my eyes and ears of energy issues in state buildings.” The members have helped identify opportunities for lighting and HVAC savings, as well as helped with plug load education among building tenants.

Annual Energy and Cost Savings:

The new DAS policy on water and energy conservation, along with the other specific projects described above and improved O&M have helped DAS reduce electricity consumption in the 3 million square feet it owns and manages by about 20% in the last two years as compared to its year 2000 usage. This represents annual savings about 10,000 MWh or 1.14 aMW based on billing analysis conducted by the participant. (Note that these have not been formally unaudited and are not weather adjusted.)

Non-Energy Benefits:

- Better light quality and levels.
- Improved comfort of building occupants.
- Extended equipment life and reduced maintenance.

ORGANIZATIONAL AND PERSONAL BENEFITS OF EMC COURSE

Benefits Within and Beyond the Organizations:

- **DAS: Staff Development and Program Expansion.** The course provided the participant the knowledge needed to expand the DAS recycling program to include energy efficiency, help prepare the DAS policy on water and energy and the state sustainability policy, and expand the State of Oregon Resource Team’s responsibilities to include energy.
- **DAS: Success in meeting the Governor’s Call for Energy Conservation.** The participant is now responsible for tracking the progress of DAS towards meeting the 2001 Governor’s Call for Energy Conservation calling for state agencies to cut their energy consumption 10% over the year 2000 baseline.



- **Oregon Office of Energy: Staff development.** The course enabled the participant to gain technical knowledge to be more comfortable and skilled in his job.

Personal and Professional Benefits For Participants:

- **DAS Participant:** The course enabled the DAS participant to move from a clerical position with the recycling program to a professional position with the all-resource program and take on substantially more responsibility and challenge.
- **DAS Participant:** Because of the EMC course, the participant now has more technical knowledge to support her energy efficiency recommendations to the O&M group. Her increased knowledge has enhanced the O&M group's respect and trust, and has led to more follow-up on her suggestions. The participant also feels she can now more actively participate in O&M staff meetings and offer suggestions.
- **OOE Participant:** The participant already had program management experience but as a new employee at OOE he needed more technical knowledge about energy efficiency to do particular aspects of his job such as reviewing Business Energy Tax Credit (BETC) applications.
- **OOE Participant:** The participant was specifically looking to develop his knowledge of energy auditing and believes the course met his needs well in this area.
- **OOE Participant:** The participant specifically mentioned the benefits of having access to the instructors and forming a close-knit student group for later communication and assistance.

Verbatim Remarks:

- "The instructors were great. They were obviously really knowledgeable in their field. Roger picked people who were top notch. It impressed me that we had so many good people." *DAS participant*



TIGARD-TUALATIN SCHOOL DISTRICT AND MULTNOMAH COUNTY PROPERTY MANAGEMENT DIVISION

BACKGROUND

Title and Energy-Related Responsibilities of Course Participant:

At the time he attended the EMC course, the participant was Energy Educator with the Tigard-Tualatin School District. He was responsible for all aspects of maintenance and energy management for nine elementary schools, three middle schools, and two high schools. He is now Energy Conservation Specialist in Environmental Services with the Facilities and Property Management Division of Multnomah County. He is responsible for identifying, assessing, and implementing energy-efficiency related projects in 120 owned and leased facilities totaling 3.7 million square feet. Facility types include libraries, health clinics, correctional facilities, road maintenance shops, and general office space. He works cooperatively with staff throughout the county, particularly maintenance, and also works on projects with the County's Manager of Sustainability.

Facility/Plant Type:

The participant completed three lighting efficiency projects specifically for the EMC course in his previous position as Energy Educator at the Tigard-Tualatin School District. The projects were at a high school, a middle school, and a swim center. In his current position with Multnomah County, the participant has already completed numerous additional energy efficiency projects in various facility types including retro-commissioning on a correctional facility, a large lighting retrofit, and multiple small lighting retrofits. His major ongoing focus is on staff behavior modifications as mandated through the County Energy Policy.

Enrollment:

The participant saw a flyer on the course and his attendance was funded from the school district's general funds.

COURSE PROJECTS

Course Project Description:

The projects at the Tigard-Tualatin School District completed for the EMC course included the following energy saving measures/actions implemented in summer 2000:

- **Middle School Gym:** Replaced 50 750-watt incandescent fixtures with 38 400-watt metal halide fixtures.



- **High School Gym:** Replaced 31 400-watt mercury vapor fixtures with 21 400-watt metal halide fixtures with clear acrylic refractors to bounce light off the ceiling, and replaced 2, 300-watt incandescent night lights with 2, 40-watt compact fluorescents.
- **Swim Center:** Replaced 18, 400-watt mercury vapor down light fixtures with 18, 250-watt metal halide fixtures with clear acrylic refractors to bounce the light off the ceiling. Eight, 400-watt flood lights were eliminated that had made seeing the bottom of the pool difficult.
- Replaced two electric-fired boilers with gas-fired boilers.

Annual Energy and Cost Savings:⁸

- **Estimated Annual Electric Energy Savings for All Projects:** 94,700 kWh⁹
- **Estimated Annual Cost Savings:** \$4,750
- Overall, the participant achieved a 20% reduction in electricity and gas consumption and a 10% reduction in water consumption during his tenure with the School District.

Non-Energy Benefits:

- Dramatic improvement in the middle and high school gym lighting levels and evenness.
- Improved safety at the swim center by reducing glare that had obscured the pool bottom.
- Reduced maintenance of lighting systems.

“SPILLOVER” PROJECTS AND ACTIVITIES

Below is a description of projects and activities led by the participant after he attended the EMC course that go well beyond the specific work completed to meet the course requirements. In this case, spillover effects are being achieved through the participant’s efforts in his new position as with Multnomah County. (A change in management at the Tigard-Tualatin School District has led to reduced support for energy management activities there. Since the participant’s departure, the new management has not brought in a new staff person, so energy efficiency efforts have slowed.)

⁸ As estimated by the EMC course participant.

⁹ Does not include savings from replacement of the electric boilers with gas-fired boilers.

Spillover Project Description:

- **Retro-Commissioning** on a correctional facility.
- **Lighting Retrofits.** A large lighting retrofit and multiple small lighting retrofits.
- **Improved Use of the DDC System.** The DDC system now links over 40 county facilities of various types, providing real-time energy data and remote control capabilities. A system-programmed holiday shut-down procedure has been implemented.
- **County Energy Policy.** The participant together with the Manager of Sustainability recently rewrote the County Energy Policy. The policy focuses on mandatory behavioral changes such as turning off computers and lights and eliminating personal space heaters, and also includes temperature setpoints.
- **Use of EMC Course Spreadsheets as County Standard.** The life-cycle cost analysis spreadsheets provided in the course have become the standard tool used by the County to analyze energy project benefits and costs.
- **Energy Management Software User Group.** Five students from the course formed a user group for energy management software (Utility Manager 4.0) that meets quarterly and brings technical staff out for trainings.
- **Outreach to Build EMC Course Attendance.** The participant is working with other organizations such as the Oregon Energy Office and Portland General Electric to help fund enrollment of other students in the course.

Annual Energy and Cost Savings:

The participant is in the process of estimating energy savings from the projects and efforts described above.

Non-Energy Benefits:

- **Lighting Retrofits:** Improved lighting quality and reduced maintenance.
- **DDC System:** Real-time monitoring and remote control of facility energy usage. This streamlines energy usage monitoring and should boost energy savings over time.
- **Use of EMC Course Spreadsheets As the County Standard:** This has improved the sophistication with which energy projects are analyzed, and has made consideration of life-cycle cost analysis integral to decision-making.



ORGANIZATIONAL AND PERSONAL BENEFITS OF EMC COURSE

Benefits Within and Beyond the Organization:

- The County has a skilled and motivated staff person to lead energy efficiency efforts and oversee the work of contractors. The particular skills and knowledge gained in the EMC course make a powerful combination with the participant's natural entrepreneurial and problem-solving abilities, and his experience and perspective from working at all organizational levels and with all types of staff. He also knows that understanding an organization's management structure, decision making process, and perspective/concerns is critical to successful energy projects. For example, he observed that county correctional facilities are run in a military style and adjusted the DDC system to match that scheduling. In another example, the participant requested permission to make a required maintenance check of fire extinguishers at county facilities, and while he was there took the opportunity to talk with staff about energy efficiency and assess project opportunities. Had he not linked the energy assessment to a safety check, he might not have been able to gain an audience.

Personal and Professional Benefits for Participant:

- The participant said the EMC course was a critical factor in being selected for his current position with the County, and in his success so far in completing a number of projects and initiatives. He believes the hands-on project work in the course and the training in doing calculations was particularly valuable.
- The participant thought the half day on presenting and selling energy projects at different organizational levels was particularly useful. He learned how to analyze project benefits and costs and present those results to both management and maintenance in terms they could understand and relate to.
- Camaraderie among students has been very valuable. They often see each other in professional meetings and share ideas. Five of them have formed a user group for their energy management software.

Verbatim Remarks:

- *Participant:* “[The course] hit the mark on everything. Calculations, selling the project, programmatic. You had enough [information] to talk the talk but you could also find someone to help you. We're building an environmental kingdom here [at the County]. It was a great program. I talk about it still. It was a fun learning experience and challenging.”



OREGON PARKS AND RECREATION DEPARTMENT

BACKGROUND

Title and Energy-Related Responsibilities of Course Participants:

Two staff people from the Oregon Parks and Recreation Department (OPRD) attended the EMC course.

- One participant was the Energy Conservation Engineer with OPRD. This staff person's current responsibilities include coordinating the energy efficiency-related aspects of field projects, as well as managing overall project documentation, permitting, and construction. She tracks the OPRD's utility consumption including energy, gas, oil, water, and wastewater using a utility management program. She is part of a facility planning group that identifies and recommends projects involving energy efficiency. Her position changed in the wake of attending the course to include broader programmatic work (rather than individual projects) and having a greater focus on energy efficiency.
- Prior to attending the course, the other staff person was a Design Engineer focusing on the civil engineering aspects of project design. Following course completion, he was promoted to Programs and Facilities Maintenance Lead and his responsibilities were expanded to include oversight of all resource efficiency aspects of projects including designing comprehensive projects such as "Green Buildings," reviewing plans provided by field staff for equipment retrofit and sending out and reviewing bids. He is also part of the facility planning group described above.

Facility/Plant Types:

The participants completed course projects at a wide range of OPRD facilities including the park administrative headquarters in Salem, park historic buildings, meeting and dining facilities, and campground facilities such as cabins, restrooms, and showers.

Enrollment:

The participants' supervisor made a "two for one" arrangement with the EMC course director and approved the funding.

COURSE PROJECTS

Course Project Description:

Twenty-four projects were completed during the 1999-2001 biennium and reported on as part of the EMC course. These projects addressed a number of different "utilities" including electricity,



water/sewer, propane, stove oil, diesel, natural gas, and solid waste. They are part of a broad and deliberate effort to bring the OPRD along a path of sustainability in its operations; this effort includes a goal of 25% energy reduction by the year 2009 (based on year 2000 usage).

The twenty four projects included 42 different measures related to resource efficiency and sustainability. Twenty five of those measures involved electricity savings as follows: seven lighting measures, seven shell measures in electrically heated buildings, one electrical equipment O&M measure, one heating, ventilation, and cooling measure, and nine water conservation measures. The water measures save electricity by reducing energy used to pump well water into the facilities and wastewater out to the drainfields. The remaining 17 measures reduced usage of other resources such as natural gas, propane, and wood (by using building materials made from recycled plastic, for example).

Annual Energy and Cost Savings:

Electric energy savings were calculated by the course participants for two of the electricity-related efficiency measures. Both were lighting projects in existing buildings (OPRD headquarters and facilities at Nehalem Bay State Park), and totaled estimated savings of 265,200 kWh. Savings for the other electricity-related measures were not calculated because they involved new construction or other circumstances that made it difficult to establish a baseline and make meaningful comparisons. (Total gas savings of 4,800 therms were also calculated for several other projects.)

Non-Energy Benefits:

- Better light quality and levels particularly in the OPRD headquarters.
- Improved comfort of occupants and state park visitors and campers.
- Extended equipment life and reduced maintenance.

“SPILLOVER” PROJECTS AND ACTIVITIES

Below is a description of ongoing projects and activities that are influenced by the EMC course, but go beyond the specific work completed to meet the course requirements.

Spillover Project Description:

- **Building Retrofits.** The OPRD is retrofitting 25 restrooms around the state. Measures include replacing incandescent lighting with fluorescents, installing occupancy sensors, retrofitting toilets, and installing metered showers and faucets. A number of old water heaters are being replaced with new energy efficient propane heaters, and one propane



water heater is being replaced with a solar water heating system. These projects are to be completed by June 2003.

- **Enhanced Utility Tracking and Reporting.** Tracking and reporting of electricity and gas usage became a state requirement in 2001, and the EMC course has helped the participants optimize their use of the “Z-Power” tracking software to track multiple utilities. One of the course participants is responsible for developing the Z-Power database of billing and equipment information. They are currently tracking electricity, natural gas, propane, and water/sewer, and plan to add solid waste. The data from Z-Power are compiled by the OPRD Assistant Director into a formal report to state legislators.

Annual Energy Savings:

Annual energy savings figures were not available yet for these spillover projects as they are still in process.

Non-Energy Benefits:

- **Building Retrofits:** Extended equipment life and reduced maintenance.
- **Z-Power Tracking Software:** This tool will greatly streamline the process of resource tracking and should lead to greater reductions in usage.

ORGANIZATIONAL AND PERSONAL BENEFITS OF EMC COURSE

Benefits Within and Beyond the Organization:

- **Greater Staff Competency In Energy Efficiency.** The two participants gained greater competency in identifying, analyzing, recommending, and ultimately managing the implementation of energy efficiency projects at the OPRD. Their skills were strengthened in facilities auditing, building component and equipment research and specification, equipment sizing, and life-cycle cost analysis. With these skills, the participants also can more effectively review contractors’ bids, equipment selection, and on-the-ground work. In one case, one of the participants challenged the recommendation made by an outside engineering firm for a particular water heater. Her alternative recommendation involving extensive research and life-cycle cost analysis, won out as the better choice in terms of energy and costs savings and maintenance, as well as needed capacity. Specific information provided by the EMC course on lighting design and lighting levels has also been particularly valuable in equipment specification. One participant is getting additional training through PGE on new lighting technology innovations.



- **A Thought Process Change.** The participants’ supervisor believes the “immersion” approach of the EMC course is key to changing participants’ thought processes and perspective so they view projects through an energy efficiency “lens.” He remarked that the participants form the core of an OPRD working group that “acts as the [organization’s] conscience for energy efficiency.” He is in the process of encouraging staff to change their mindset even further in terms of assessing sustainability projects using life cycle cost analysis, net present value, durable cost analysis, etc.
- **Better Ability to Present Project Merits to Management.** With better analytical skills the participants can recommend projects to managers based on life-cycle cost savings. This increases the likelihood managers will approve the projects even if first cost may be higher.
- **More Effective Negotiation Of Purchase of Efficient Equipment.** Because of the EMC course, the participants are more effective in negotiating the state’s contracting process to make sure equipment with optimal efficiency is purchased and, in some cases, that specific brands are specified. The EMC course training in life-cycle cost analysis and equipment specification is critical as the OPRD staff must have a high degree of confidence in their assessment of the equipment’s energy savings and performance.
- **Ability to Respond to Oregon’s Sustainability Mandate.** The two EMC course participants form the core of the OPRD sustainability team, and energy efficiency is integral to their efforts. The participants’ training is helping them respond to the Governor’s Executive Order on Sustainability (issued in May 2000) that mandates all state agencies to develop policies and programs for achieving sustainability (as defined in the mandate) by 2025.
- **State-Wide Recognition For Sustainability Efforts Including Energy Efficiency.** The Field Operations division of the OPRD won the State of Oregon 2001 Resource Steward of the Year award. The Field Operations division includes all state parks and the OPRD engineering section. The award recognizes the OPRD’s sustainability efforts including energy and water efficiency, recycling, and sustainable design and construction. This award is given by the Oregon Department of Administrative Services (DAS) Resource Conservation Management Program. It was a fellow EMC course participant with DAS who nominated the OPRD. The OPRD was also recently given an award for sustainability from the National Prefabricated Building Association.
- **Enhanced Ability to Motivate and Gain Support o Other Staff.** The participants’ EMC training has bolstered their knowledge and enthusiasm. In turn they have been able to motivate other OPRD staff to help them with their projects and identify other saving opportunities. They have also been able to garner the support and trust of park rangers and other facilities maintenance staff because so far the equipment the participants have recommended is requiring less maintenance and is more reliable. One example is the new Voyager-brand water heaters; facilities staff were initially skeptical but have become enthusiastic supporters. This trust is invaluable as facilities staff are critical in



maintaining savings, and identifying new savings opportunities. The participants also give presentations at park meetings to share information and hear feedback.

- **Leadership in Department-Wide Sustainability.** One of the participants now heads up a committee at the OPRD whose charge is to develop a list of energy efficient and sustainable projects.

Personal and Professional Benefits for Participants:

- Knowledge, skills, and confidence to become leaders in sustainability projects including energy efficiency at the OPRD.
- For one participant, the course was instrumental in his promotion from Design Engineer to Programs and Facilities Maintenance Lead as described earlier. The course led to expansion of responsibilities for the other participant as well.
- Presentation skills and confidence. The participants present recommended projects to the OPRD managers and report project progress and results at the monthly all-staff meetings. This information is also reported in the “FYI” e-mail that goes out to all staff.
- Direct recognition through staff support and indirect recognition through the formal awards described above.



CITY OF PORTLAND BUREAU OF ENVIRONMENTAL SERVICES – WASTEWATER TREATMENT PLANT

BACKGROUND

Title and Energy-Related Responsibilities of Course Participant:

The title of the participant is Lead Electrician. He is responsible for all aspects of electrical maintenance at the wastewater treatment plant including energy efficiency. At the time this case study was prepared, he was spending about one quarter of his time on energy efficiency. However, an effort is underway to allow him to devote more of his time to energy management.

Facility/Plant Type:

City of Portland, Bureau of Environmental Services Wastewater Treatment Plant located in North Portland.

Enrollment:

The participant's supervisor heard about the course from his utility representative. The participant had shown strong prior interest in energy-related issues and projects so his supervisor asked him if he would like to attend. Funding came from a combination of in-house training monies and a utility rebate on the course cost. In-house funding was not difficult to obtain.

COURSE PROJECTS

Course Project Description:

The projects completed for the course included six energy saving measures/actions implemented from March through June of 2002:

- **Deepwell Pump:** Use of a lubricating oil additive in a pump to improve efficiency.
- **Headworks Heating and Ventilation System:** Calculation of required air changes for motor room led to elimination of one-half of the air handlers, and operation of the remaining air handler fan is at reduced speed.
- **Sludge Hopper Facility Lighting:** Installation of photocells reduced hours of operation by one-half for high-pressure sodium fixtures.
- **Work Facility Lighting:** Replacement of 116 high bay high intensity discharge fixtures with 91 T-5, 4-lamp fluorescent fixtures. Project took advantage of utility rebate program.



- **Occupancy Sensors:** Occupancy sensors (including sensors for air motion and movement) were installed in 78 locations where they would not compromise work safety. The project took advantage of an existing utility rebate program.
- **Tunnel Lighting Modifications:** Better scheduling of T-8 lighting use coupled with timed switches and delamping where appropriate.

Annual Energy and Cost Savings:

- **Estimated Annual Electric Energy Savings¹⁰ for All Projects Above:** 439,400 kWh
- **Estimated Annual Electric Energy Cost Savings:** \$26,000
- **Average Simple Payback:** 1.8 years

Non-Energy Benefits:

- Work facility lighting upgrades resulted in improved lighting levels and lighting quality. Staff remarks: “It’s great, I don’t need as many fixtures as before.” “It’s like a breath of fresh air.” “I think it’s absolutely great.”
- More efficient lighting resulted in reduced maintenance time and costs for lamp and ballast replacement.
- Occupancy sensors eliminated need to monitor and turn off lights manually.

“SPILLOVER” PROJECTS AND ACTIVITIES

Below is a description of additional projects and activities that were influenced by the course, but go well beyond the specific work completed by the participant to meet the course requirements.

Spillover Project Description:

- **Sophisticated Real-Time Monitoring Capabilities.** The class participant is helping lead an effort to install web-based, real-time energy monitoring equipment for the entire wastewater treatment plant. This will greatly enhance staff’s ability to track overall energy use, measure pre- and post-project usage, and identify opportunities for further reduction. The motor control centers and large individual motors will be monitored. The

¹⁰ As estimated by the EMC course participant.

participant is tailoring generic web pages to create a user-friendly interface for plant operations staff and managers. Portable energy monitoring equipment will also be used.

- **Screenhouse Building Lighting Retrofit.** The participant is removing 49 400-watt metal-halide fixtures and installing 25 fluorescent fixtures equipped with 2 T-8 lamps.
- **Sludge Processing Building.** The participant is in the process of assessing potential savings from lighting retrofit opportunities. These will qualify for a power company rebate of approximately 29%.

Annual Energy Savings:

- **Estimated Annual Electric Energy Savings:** 13,500 kWh for the screenhouse retrofit and 72,100 kWh for the sludge processing facility.
- **Estimated Annual Electric Energy Cost Savings:** \$850 and \$4,550 respectively.

Non-Energy Benefits:

- Higher lumens of light per square foot.
- Safer working conditions.
- Reduced cost for replacement lamps and ballasts.
- The ability to have instant-on lighting capability.

ORGANIZATIONAL AND PERSONAL BENEFITS OF EMC COURSE

Benefits Within and Beyond the Organization:

- **Development of Leadership In Energy Efficiency.** The course helped build the participant's skills and knowledge to lead energy efficiency efforts within and beyond his facility. At the time this case study was prepared, he was spending about one quarter of his time on energy efficiency, but staffing arrangements were being made to enable him to spend more time on energy management.
- **Recognition of Energy Efficiency Efforts.** The participant has presented his projects to in-plant staff and in turn has been recognized within the Wastewater Group for his efforts. His supervisor regularly reports to fellow managers to maintain support and interest, and generate additional ideas. The participant has also presented to BES staff and the Association of Professional Energy Managers.



- **Ever-Broader Involvement of Other Plant Staff** in identifying, planning, and completing energy efficiency projects. Of particular value is having this person at the staff level sharing his knowledge with other staff and motivating them to be “eyes and ears” for energy efficiency opportunities. The participant assesses the costs and benefits of the projects he and other staff identify and makes recommendations to management. The participant and the staff then implement the approved projects. As the class participant’s supervisor remarked, “Other staff are keeping an eye out and making suggestions all the time. There is a long list of energy savings projects to be done.”

Personal and Professional Benefits for Participant:

- The knowledge, skills, and confidence to become a leader in identifying, analyzing, prioritizing, and implementing energy efficiency projects at his facility, including the development of web-based energy monitoring.
- Further development of managerial skills in motivating other staff to identify and help implement energy efficiency projects.
- The opportunity to become a full-time energy manager.
- Presentation skills and confidence. Has presented on energy efficiency opportunities and projects to the Wastewater Group staff, to the Association of Professional Energy Managers (APEM), and to Bureau of Environmental Services managers. Has offered to give presentations to and work with other City bureaus.
- Recognition and encouragement by his supervisor and other staff in the Wastewater Group. Recognition of energy efficiency projects in the wastewater group’s newsletter *UpFront*, including recognition as the 2002 *Value Statement Award* winner for the Wastewater Group.



NORTH SANTIAM SCHOOL DISTRICT

BACKGROUND

Title and Energy-Related Responsibilities of Course Participant:

As Maintenance Mechanic/Energy Coordinator with the North Santiam School District, the course participant is responsible for all aspects of maintenance and energy management for two combined elementary and middle schools, one elementary school, one middle school, one high school, District offices, and all other structures located on the District grounds.

Facility/Plant Type:

The participant completed projects at an elementary school and a middle school for his EMC coursework.

Enrollment:

The participant's supervisor heard about the course through a mailing and encouraged the participant to take the course. The supervisor himself had attended a similar energy management course in California and had found it very beneficial. The supervisor knows this staff person as a highly motivated self starter with a keen interest in continuing education and professional development, and so thought he would be a perfect candidate. The participant himself heard about the course at the 2001 Oregon School Facilities Managers Association (OSFMA) convention held in Eugene, Oregon. The participant arranged for funding himself seeking out and obtaining a \$1,000 scholarship from PacifiCorp and receiving an "early bird" registration discount of \$500. With the fee reduced to \$2,000, the participant was able to convince the superintendent to fund the balance through District training monies. The time commitment was not a problem for the participant as the course took place during the summer.

COURSE PROJECTS

Course Project Description:

The course participant identified the project opportunities by analyzing billing information to determine which buildings had the highest usage and then performing facility walk-throughs along with the contractor hired to implement the projects. The projects for the EMC course included the following energy saving measures/actions and were completed by October 2002.

- **Elementary School:** Lighting retrofits including compact fluorescents, electronic ballasts, T-8s, metal halide lamps, and LED exit signs. Daylighting was also used. A distributed digital control (DDC) upgrade was performed on eight roof top units, one air handler, 23 finned tube radiators, and one low-pressure steam boiler. The equipment is all



controlled by a main control panel that in turn reports to a central computer running software designed to accommodate activities such as trending and custom scheduling.

- **Middle School:** Lighting retrofits including compact fluorescents, electronic ballasts, T-8s, metal halide lamps, and LED exit signs. Also performed a controls upgrade involving demolition of the existing pneumatic control system and installation of a DDC system on 6 multi-zone units, three air handlers, and one hot water boiler. The centralized control and scheduling features are the same as those described above for the elementary school.

Annual Energy and Cost Savings:¹¹

- **Estimated Annual Energy Savings for All Projects:** 425,700 kWh and 27,600 therms.
- **Estimated Annual Cost Savings:** \$21,500 electricity savings and \$12,000 gas savings.
- Electricity and gas consumption are both down by 30%.

Non-Energy Benefits:

- Occupants report they are more comfortable. There is better control of ambient temperature and the levels and quality of lighting are greatly improved (including elimination of buzz and flicker). The participant is developing a formal plan to track test scores before and after retrofit to assess whether the retrofits have measurable impacts in this regard.
- Extended equipment life and reduced maintenance from both the equipment retrofits and the installation and programming of the centralized control system.

“SPILLOVER” PROJECTS AND ACTIVITIES

Below is a description of projects and activities led by the participant after he attended the course that go well beyond the specific work completed to meet the course requirements.

Spillover Project Description:

- Installed vending misers on seventeen vending machines (approximate annual cost savings of \$2,000 based on estimates by the maintenance staff).
- District-wide adjustment of HVAC set points.

¹¹ As estimated by the course participant.



- An aggressive preventive/predictive maintenance program.
- Annual summer shutdown of all non-essential equipment, i.e. HVAC, freezers, refrigerators, limited lighting only for essential work crews. (The maintenance staff estimated that the summer shutdown saved \$19,500 in utility costs alone in its first year.)
- Education of District staff on simple energy saving measures.
- Development of a 5-year energy efficiency plan. Phase I consists of the projects above. Phase II will include a DDC upgrade and a lighting retrofit at the District high school. Phase III will be the design of two new schools utilizing energy efficient construction design.
- Launch of a program whereby all equipment purchased by the District will be ENERGY STAR[®].
- Potential District-wide installation of controls software to maximize savings.

Annual Energy Savings:

The maintenance staff will continue to monitor energy and costs savings as their budget allows.

Non-Energy Benefits:

- Non-energy benefits are expected to be similar as those described above for the middle and elementary school projects. In addition, implementing both the 5-year efficiency plan and the ENERGY STAR[®] program will help streamline equipment purchase decisions.

ORGANIZATIONAL AND PERSONAL BENEFITS OF EMC COURSE

Benefits Within and Beyond the Organization:

- The school district now has a staff person with the skills and knowledge to lead energy efficiency efforts and oversee the work of contractors. The contract for the school retrofits was about \$500,000. It was complex and required the participant to conduct considerable review and negotiation at the outset, and do hands-on project management throughout implementation.
- The estimated annual electricity and gas cost savings from the energy projects are saving more than \$40,000 per year. These annual savings, in combination with tax credits, rebates, and low interest loans, are more than covering the loan payments, thus making the projects revenue-positive. In addition, the initial capital investment by the District was only \$30,000 on a \$491,000 project. This was key to winning Board approval.



- The participant is a team player willing to share his knowledge from the course with others on the District maintenance team. He is currently helping a fellow staff person gain skills to oversee the Phase II project described above.
- The course was particularly valuable in helping the participant identify additional opportunities in operations and maintenance as part of the measures proposed by the contractor. The participant's supervisor remarked: "We did things right the first time and that was a result of the course."
- This staff person was already a highly motivated self-starter before the course, but the course gave him new tools and an even higher level of commitment and confidence. His productivity, and in turn his value to the District, increased markedly following the course because of what he learned.
- The District School Board gained a new understanding and appreciation of the importance of life cycle cost analysis. As the participant's supervisor remarked, the board has "put their arms around" this approach.
- Praise and recognition for efforts by the District School Board were received in a school board meeting open to the public.

Personal and Professional Benefits for Participant:

- The knowledge, skills, and confidence to become a leader in identifying, analyzing, prioritizing, and implementing energy efficiency projects at the District.
- Knowledge and confidence to oversee and check contractors' proposals and on-site work.
- Presentation skills. Presented to the Santiam School Board and convinced them to fund his projects.
- Enhanced skills in financial analysis: The participant used the EMC spreadsheet to do the financial analysis that indicated that the cost savings (about \$40,000 per year) from his proposed energy efficiency projects, in combination with tax credits, rebates, and low interest loans, would cover the loan payments, thus making the projects revenue neutral. In addition, the initial capital investment by the District was only \$30,000 on a \$491,000 project. This analysis was key to winning Board approval. In fact, savings are turning out to more than cover the loan payments. He recently provided a project update to the Board and received kudos.
- Increased responsibility.
- Ongoing training. The participant highly values opportunities to continue to build his knowledge. He recently attended a training on the controls software to be used at the schools. The software includes security, fire alarm enunciation, and lighting. The



software will also trend failure for equipment and predict failure. The District may replace equipment proactively to maximize savings.

- Recognition and encouragement by his supervisor, other staff, and the District board.

Verbatim Remarks:

- *The participant commented that* “The instructors were just stupendous. Support from NEEI staff was superb and very professional both the instructional guidance and equipment such as data loggers. The staff at NEEI was very accessible...The program and preparation [for completing our projects] were fantastic. I especially appreciated the training in using my powers of observation and paying attention to details where energy savings could occur.”
- *The participant’s supervisor said,* “His overall work performance improved because the course gave him an avenue to improve his work.”



