

Saving Electricity in the State of Washington: Improving Efficiency of Commercial Buildings

Battelle's Pacific Northwest Division, with funding from the State of Washington, has initiated a multi-year project to help improve electric energy efficiency of commercial buildings throughout the state. Battelle will focus on changing the way heating, ventilation and air-conditioning (HVAC) systems in large and small commercial buildings are operated, serviced and maintained.



Commercial buildings in Washington are the state's fastest growing electricity consuming sector, fueled by a decade of economic growth. The sector consumes about 36 percent of the entire state's electric energy at a cost of about \$1.7 billion annually. Many experts estimate that between 10 and 30 percent of that electric energy is wasted because of inefficient operations, costing rate payers millions annually.

Battelle will be using innovative methods and technologies for capturing electricity savings that were developed by researchers at the Pacific Northwest National Laboratory (PNNL¹). These innovations typically reduce power use of HVAC systems by up to 20 percent and potentially could save rate payers \$114 million annually, or resources to power 200,000 homes.



As part of the project, Battelle will train energy service providers to retune building control systems and to install condition-monitoring technology on rooftop air conditioning units. Participating businesses will receive classroom and hands-on training to ensure successful completion of the project. In addition, Battelle will work with trade associations, trade schools, community colleges, and secondary vocational programs to develop and update the curricula to keep practicing service providers familiar with the latest tools and techniques and train the next generation of service providers.

Large Commercial Buildings: Retuning for Efficiency

Large commercial buildings today use sophisticated building automation systems (BASs) to manage a wide and varied range of building equipment. While the capabilities of BASs have increased over time, many buildings still do not fully use their capabilities and are not properly commissioned, operated or maintained, which leads to inefficient operation, increased energy use, and reduced lifetimes of the equipment. Tuning BASs, much like tuning automobiles periodically, ensures maximum building energy efficiency and the comfort of building occupants. A poorly tuned system can maintain comfortable condition but at a higher energy cost to overcome inefficiencies.



¹ Operated for U.S. Department of Energy by Battelle Memorial Institute

For this task, Battelle is leveraging previously successful experience in tuning large commercial buildings and applying it to building control and HVAC systems and other systems such as lighting controlled by the BASs of commercial buildings 100,000 sq. ft and larger.

Battelle staff will train HVAC service providers selected for this project. Training will include both classroom and hands-on retuning of one building after which, each participating company will be required to tune 5 to 10 additional buildings.

Participants will be reimbursed for staff time for training and retuning of buildings under the program. The program will encourage service provider companies to continue to offer the retuning service customers after completion of the project.

Small Commercial Buildings: An Ounce of Prevention

A significant portion of electricity costs in small commercial buildings comes from HVAC systems and lighting. Small commercial buildings typically have several air-conditioning units. These units are often run until a catastrophic failure occurs, such as complete loss of cooling caused by a failed compressor, failed condenser fan, failed supply fan, or significant loss of refrigerant. System failures are expensive, usually requiring units to be replaced, while minor adjustments and maintenance can lower energy bills and prevent system failures.

A low-cost wireless condition monitoring and diagnostic technology, developed by researchers at PNNL in collaboration with industry, can help prevent system failures and save energy. As part of the project, the technology will be installed on an estimated 200 air-conditioning units in small commercial buildings (<50,000 sf) throughout the state. This system automatically detects and diagnoses improper operation of rooftop HVAC

systems and enables continuous monitoring of the status of these systems, enabling condition-based servicing. The technology, which alerts operators and service providers via the Internet when problems occur, can help prevent damage as well as keep equipment operating at peak efficiency and reigning in electric bills.

Participating HVAC service providers will be trained to install the monitoring and diagnostic system and will, after installation:

- Regularly monitor the condition of the units using the system
- Make cost-effective repairs and maintenance that have been identified by the condition monitoring system, and
- Log all the repairs and maintenance to the participating HVAC units in an online log provided by Battelle.

The project will provide the monitoring system and service free to participants for the duration of the project. HVAC service providers selected to participate in the project will be reimbursed for the time their staff spend installing the monitoring and diagnostic systems.

Outreach to Businesses and Educational Institutions: Training the Current and Future Generation of Service Providers

To ensure the lasting impact of this project on commercial sector, electricity consumers in the State of Washington, Battelle will provide outreach to businesses and education institutions by:

- Training the providers of HVAC services in the methods and technologies tested and demonstrated in this project and in the general principles and practices of good energy management
- Educating students who have or may choose career paths related to

the HVAC servicing or building energy management fields

- Publicizing the results of the project to other HVAC service providers who are not part of the training and to customers to encourage widespread adoption of these energy-saving methods.

The first of these will focus on training businesses and personnel currently providing installation, servicing, and operation of building controls, HVAC and lighting systems. The second effort will focus on training the next generation of HVAC technicians and business owners by targeting those preparing to enter this field in the next few years. The training methods developed under this project will be transferred and curricula will be developed in collaboration with vocational education programs at the secondary school level and with selected trade schools and community colleges across the state to create a pipeline of qualified technicians in the future. The third outreach component will involve disseminating knowledge about the benefits of HVAC system tuning and condition-based maintenance to the business community, both providers and customers of HVAC services. Battelle staff in conjunction with state employees, service providers, and customers will write articles for trade and professional publications about the results of the project. A clear demonstration of cost savings will provide a powerful incentive for businesses to adopt the technologies demonstrated in the project.

For more information, contact

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