

Re-Tuning Commercial Buildings: A Low-Cost Path to Energy Efficiency and Cost Savings

Commercial buildings account for almost 20% of the total U.S. energy consumption. A significant portion (up to 20%) of the energy used in commercial buildings is wasted because of improper operations.

Today, large commercial buildings use sophisticated energy management and control systems (EMCSs) to manage a wide and varied range of building systems. Although the capabilities of the EMCSs have increased, many buildings still are not properly commissioned, operated, or maintained. Lack of proper maintenance leads to inefficient operation and reduced lifetimes of equipment.

Re-tuning EMCSs ensures maximum energy efficiency and comfort for building occupants. Although a poorly tuned system can maintain comfort, it may do so at a high energy cost while compensating for undetected operational inefficiencies.



Pacific Northwest National Laboratory (PNNL) is changing the way heating, ventilating, and air conditioning (HVAC) systems in commercial buildings are operated, serviced, and maintained. PNNL trains building operators, managers, and businesses that install and service HVAC equipment to optimally re-tune large commercial buildings. Re-tuning buildings reduces energy use of HVAC systems by 5 to 20%.

PNNL initiated the Commercial Building Re-Tuning project for the U.S. Department of Energy's Building Technologies Program. The PNNL-developed approach to training produced significant energy savings for military and federal buildings during the Western power crisis of the early 2000s and, more recently (2007), as part of a project funded by Washington State. PNNL is leveraging this prior experience to transfer tools and expertise to building operators and HVAC service providers.

The goals of the re-tuning project are to:

1. Educate organizations, commissioning and energy service providers about how the buildings can be re-tuned to save energy.
2. Teach the techniques and skills used to perform re-tuning.
3. Develop a pipeline of skilled re-tuning trainers.
4. Show that commissioning and energy service providers can provide re-tuning as a service for a fee.

PNNL uses two approaches to realizing the energy savings opportunities in large commercial buildings.

The project offers two paths for participation:

1. Participating as a service provider and
2. Participating by becoming a trainer of re-tuning service providers.



For the first path, PNNL offers service providers training in the process of re-tuning. Through a combination of classroom training and hands-on re-tuning guided by instructors, participants learn how to perform re-tuning for commercial buildings. Organizations are expected to participate in training with the intention of offering re-tuning as a service to their customers or of using re-tuning on their own portfolio of buildings.

For the second path (becoming a trainer), participants learn how to perform re-tuning but with the intention of offering courses to train others on the re-tuning process. In addition to training participants how to re-tune commercial buildings, PNNL provides materials and technical support to trainees in developing their courses and training programs.

PNNL hopes that by demonstrating how building owners can save energy by improving their operations, they will continue to use re-tuning with all buildings in their portfolios. After organizations complete classroom and hands-on field training, they

are required to re-tune additional buildings. PNNL expects that organizations will re-tune additional 10 or more buildings.

In addition, by proving the value of re-tuning, PNNL anticipates companies/trainers will continue to provide re-tuning training as a service for a fee. Should these goals be realized, we all benefit from a more energy-efficient building stock.

Participation of committed organizations and trainers is key to ensure that re-tuning of HVAC systems continues beyond this project. PNNL will work with property managers, energy service providers, utility partners, trade organizations, and others to identify suitable candidate organizations and commissioning and energy service providers. As an additional incentive, PNNL intends to reimburse the participating commissioning and energy service providers for their time spent on the train-the-trainer project.

Near the end of the project, PNNL will debrief each participating organization and the commissioning and energy service providers. During the debrief, PNNL, along with the participating organizations and providers, will discuss opportunities for improving the training and streamlining the re-tuning protocol so that the process might be modified to optimize the overall cost-effectiveness. PNNL will evaluate, measure, and document the impacts of the re-tuning.

The Re-tuning Methodology

The re-tuning methodology is highly structured to identify and implement no-cost/low-cost energy savings opportunities. The method consists of tests and corrective actions for mechanical equipment and controls that are the most impactful and can be made with the time and resources available in this program.

In conducting re-tuning, organizations will be required to report the following:

- » information on the building
- » the HVAC equipment/systems
- » the EMCS
- » the dates of service
- » all inspections and tests completed
- » problems identified
- » remedial actions taken to tune the equipment/systems
- » other observations regarding the HVAC equipment/systems
- » monthly building energy consumption for 12 months before initial re-tuning and 12 months after it
- » other information useful to this pilot project.

Training materials provide an annotated checklist of potential actions and provide instructions for a sequence of inspections and tests for HVAC service providers to perform at each site. Specific low-cost corrective actions will be prescribed based on the inspection and test results. The program will be tailored to identify the easiest to find, highest impact problems and to correct them in the most cost-effective way.

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