

The Consortium for Building Energy Innovation

CBEI is focused on generating impact in the small and medium-sized commercial buildings (SMSCB) retrofit market. CBEI is comprised of 14 organizations including major research universities, global industrial firms, and national laboratories from across the United States who collaborate to develop and demonstrate solutions for 50% energy reduction in existing buildings by 2030. The CBEI FINDINGS series highlights important and actionable technical, application, operation and policy research results that will accelerate energy efficiency retrofits when applied by various market participants. CBEI views these FINDINGS as a portal for stakeholders to access resources and/or expertise to implement

Building Re-Tuning (BRT) and the Need for Training

Commercial buildings account for almost 20% of the total U.S. energy consumption. A significant portion (up to 25%) of the energy used in commercial buildings is wasted because of improper operations. Many buildings still are not properly commissioned, operated, or maintained; and lack of proper maintenance often leads to inefficient operation and reduced lifetimes of equipment. Re-Tuning increases energy efficiency within the constraints of the existing building assets 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.

BRT is a systematic process to identify and correct building operational problems that lead to energy waste. It is implemented at no- or low-cost other than the labor required to perform the Re-Tuning process. Re-Tuning may include adjusting thermostats for actual occupancy patterns, or small, low-cost repairs such as replacing faulty sensors or caulking openings in the building envelope. By proactively utilizing the energy savings opportunities taught in Re-Tuning training, operations staff can save between 5 and 25% of all energy used in the building.

Building Re-Tuning has two approaches: ‘observation-driven’ and ‘data-driven’. The training is typically a blend of in-class instruction and discussion and on-site building investigation (building “walk down”). All Re-Tunings include on-site work, such as inspection of the building envelope for gaps and leaks (observation-driven BRT). Buildings with automation systems (BAS) further benefit from data-driven Re-Tuning which takes data from the BAS and performs analysis to identify potential inefficiencies such as improper scheduling or set-point resets.

Research Finding:

Value of Re-Tuning for Buildings

- Improve the building’s energy efficiency and tenant comfort
- Identify and correct no/low cost operational problems that lead to energy waste
- Identify problems that require physical repair such as broken sensors or stuck air dampers
- Re-Tuning skills can be developed by most people in positions in building operations and maintenance
- Low-cost method for improving building energy performance and reducing energy cost and carbon footprint
- Results in improved tenant comfort and fewer tenant complaints

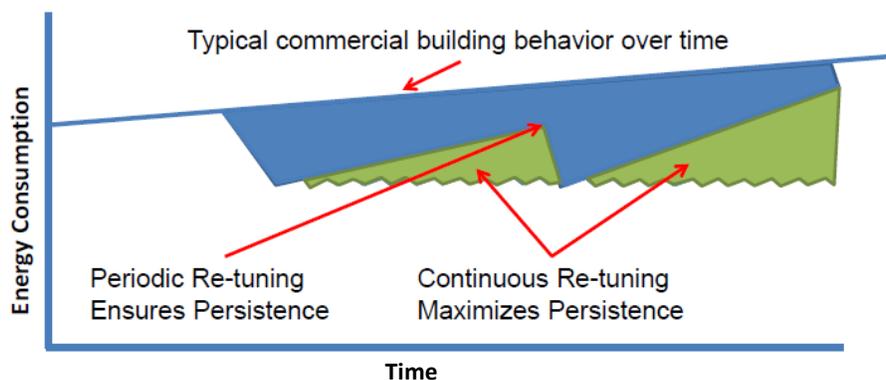
Re-Tuning Training Findings

- Is effective in training building operators as a means of improving building energy efficiency
- Needs market pull from building portfolio owners
- Could be adopted by parties with vested interests in technician training: unions, community colleges, vocational schools and private training and consulting companies
- Provides trainees with opportunity to develop valuable skills
- Re-Tuning should be repeated on a quarterly or more frequent basis to ensure ‘persistence’ of energy savings

Value of Re-Tuning Training

The purpose of Building Re-Tuning is to train facilities staff to discover and implement low-cost potential energy-saving measures, without negatively impacting occupant comfort. Re-Tuning often results in improved occupant comfort and fewer “hot and cold calls”. The Observation-driven program provides trainees with a well-established methodology for examining existing equipment, systems, sensors and controls in order to identify and correct sub-optimal O&M practices.

A critical element of Re-Tuning training is the focus on persistence. The figure below depicts an important benefit which is the transformative Re-Tuning training. Equipping building operations personnel with the Re-Tuning approach is designed to develop a change in mind-set that should yield a continuous effort focusing on building energy efficiency.



BRT Observation-Driven Program

The original BRT Training¹ program was developed by Pacific Northwest National Laboratory (PNNL). CBEI was tasked by the Department of Energy (DOE) with taking the PNNL program and modifying it for wide-spread distribution and creating a sustainable deployment model to support mass market penetration. The strategy for achieving this objective was to develop a “train-the-trainer” program and partner with a national organization(s) to test the train-the-trainer model. DOE, Building Owners and Managers Association (BOMA) International and CBEI joined together to jointly test and deploy the train-the-trainer model for delivering BRT training. The initial ‘Observation-Driven’ train-the-trainer program was for small-to-medium sized buildings without building automation systems.

CBEI BRT Train-the-Trainer Deployments

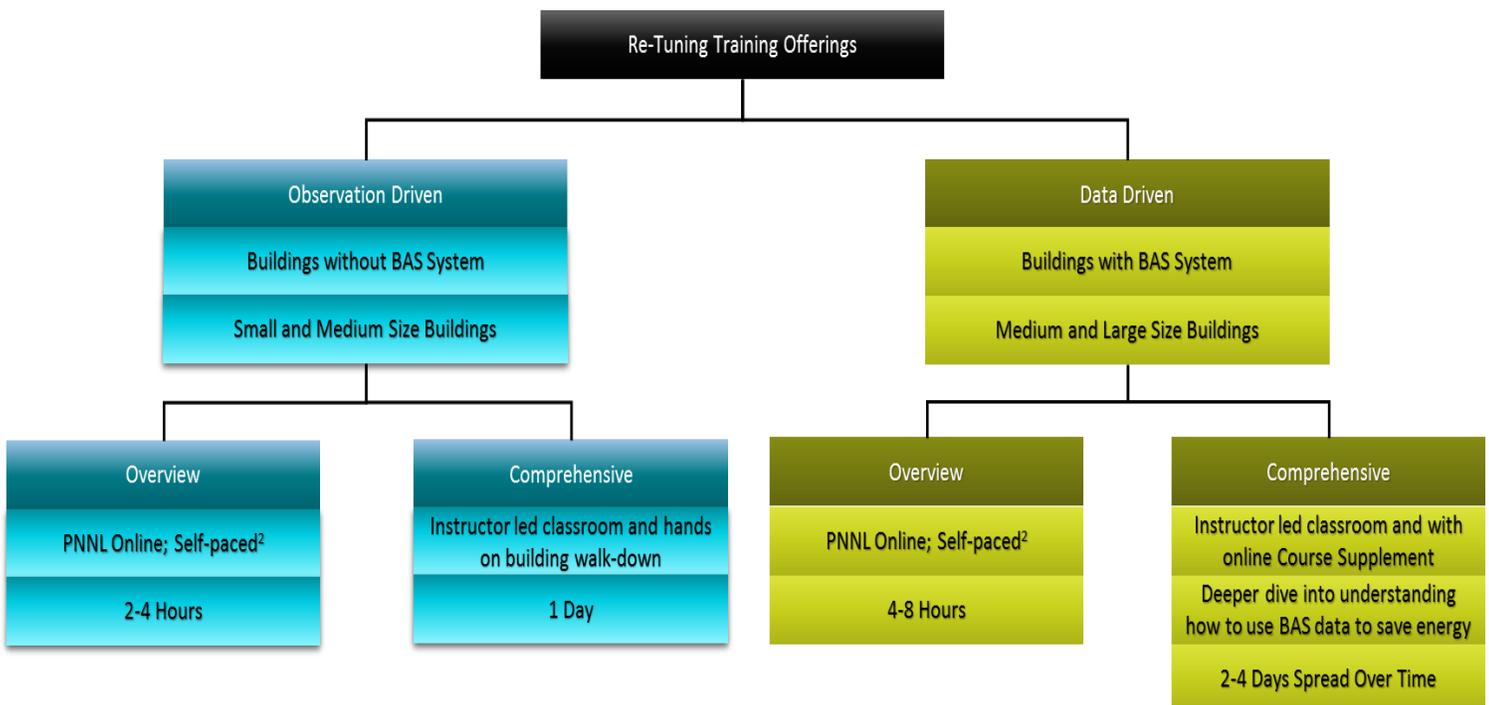
Building Re-Tuning Training as shown in the figure on page 3, consists of two versions: observation-driven which is applicable for all buildings and data-driven which is for buildings with BAS. Within these two methodologies, two trainings pathways have been developed: overview and comprehensive. The overview training online course introduces the concept of using a systematic methodology and a few tools (observation, occupant queries, a hand held infrared (IR) temperature probe, and an IR camera) to identify problem areas in need of Re-Tuning. The overview leads the learner toward more comprehensive training. The comprehensive training inculcates learners with a systematic focus and methodology designed to empower building operators and provide them with the ability to continuously Re-Tune their facilities.

¹see: <http://buildingretuning.pnnl.gov/>

CBEI’s focus in the first year of this endeavor was on observation-driven building Re-Tuning training, particularly for the small and medium-sized commercial building sector. Having selected the “train-the-trainer” approach for mass distribution of the program, a series of training modules specifically focused on effectively delivering comprehensive training to technicians and others charged with operation of buildings was created. The model developed in partnership with BOMA International took content from the PNNL training and supplemented it with training materials designed to teach adult learners as well as additional content to ensure the BOMA trainers would be well-positioned to teach Building Re-Tuning. A trainers’ guide for Building Re-Tuning training was also developed and an online learning management system for management of course materials was created. The BRT course materials are still under development. Contact CBEI for the most current program materials. (info@cbei.psu.edu)

BOMA International has dozens of affiliates around the U.S. which are connected to thousands of building owners and managers. The underlying premise of this effort is that there are many BOMA members throughout the country who ---are knowledgeable about building energy and with the right curriculum they are able to teach others about Building Re-Tuning. BOMA International and CBEI had the resources to pilot the train-the-trainer program in two BOMA markets. A competitive process was established within BOMA to solicit interest in hosting a pilot train-the-trainer program. Two markets were selected – BOMA Wisconsin and BOMA San Diego. The first train-the-trainer program was delivered in Milwaukee, Wisconsin in October 2014. CBEI created the curriculum for that program and developed the BRT Training Guide. Feedback from that session generated a number of changes to the program including the addition of another module on training the adult learner. A revised version of the program was delivered to a BOMA San Diego audience in February 2015. Feedback was again incorporated and further changes were made.

This “final” train-the-trainer program was delivered to CBEI’s second national distribution partner, APPA (Leadership in Educational Facilities), in May 2015, and again in July 2015 to a BOMA audience in



² see: <http://retuningtraining.labworks.org/training/lms>

Lessons Learned

The central challenge is how to achieve scale in BRT. Preliminary findings from the two BOMA pilot trainings in Milwaukee and San Diego indicate that most of the attendees are not likely to train others in building Re-Tuning. While the attendees indicated that the training was beneficial and they are incorporating the techniques into their own practices, most of them are not formally training others.

Based on this experience, BOMA shifted its approach and decided to tap into its cadre of BOMA Fellows³. These are buildings professionals with deep knowledge of facilities, typically with extensive teaching and training experience and people who are dedicated to improving the state of the industry. BOMA International brought a group of Fellows from all over the country to Washington DC in July 2015 to participate in the train-the-trainer program. This was an initiative that was paid for by BOMA to accelerate Re-Tuning training among BOMA members.

Many of the participants in that program indicated an interest in delivering BRT with their local BOMA affiliate. BOMA International is currently in the process of establishing a process for supporting local affiliates in delivering BRT. APPA is also currently developing a national deployment model, intending to start a program in the Spring of 2016.

³ The BOMA International Fellows Program honors BOMA members for exemplary and sustained contributions to the industry, their profession, the community and BOMA at all levels, and is a call to continued leadership and service.

Consortium for Building Energy Innovation

4960 South 12th Street
 The Navy Yard
 Philadelphia, PA 19112
 p: 215-218-7590
 e: info@cbei.psu.edu

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Moving Forward

BRT has proven to be effective in transferring knowledge and techniques that are designed to improve energy efficiency in existing building operation. Training building operators is a cost-effective means of improving building energy efficiency.

CBEI's current focus is on data-driven BRT training. CBEI's second year project activities are directed at testing a model for widespread deployment of data-driven training. The model being developed is somewhat different than the observation-driven train-the-trainer model, the approach is to work with training and consulting companies who can bring the training materials to market, working closely with our distribution partners – BOMA, APPA, and others to come.

The Re-Tuning course should be promoted to entities with members who have a vested interest in technician training such as: BOMA affiliates using Fellows as trainers, APPA (Leadership in Educational Facilities), community colleges offering HVAC technician training, for profit technical training institutes, and labor unions.

The Re-Tuning effort will consider market pull efforts to convince building portfolio owners of the economic return. An important audience for this would be the Better Building Summit attendees in 2016.

