Buildings Technology Research and Development Subcommittee Meeting

April 15, 2010

Location: 950 L'Enfant Plaza DOE
Time: 1:30-3:30 p.m.

Attendees[1]	**Agency/Office**	
Shyam Sunder	DOC/NIST	BTRD Co-chair
Roland Risser	DOE/EE-Buildings	BTRD Co-chair
Kevin Hurst	EOP/OSTP	
Paul Domich	DOC/NIST	BTRD Ex-Sec
Cyndi Vallina	EOP/OMB	
Brian Holuj	DOE/EE-Buildings	
Alan Schroeder	DOE/EE-Buildings	
William Grosshandler	NIST	
Robert Chapman	NIST	
Hunter Fanney	NIST	
Sean McDonald	PNL	
Dale Manty	EPA	
Joni Teter (telephone)	EPA/GSA	
Peter Aitchenson	HHS	
Bob Kollm	US Postal Service	
David Hawk	Smithsonian	
Bruce Arthur	AOC	
Ilker Adiguzel	USACE	

Next Meeting: May 20, 2010 1:30 - 3:30 PM, 950 L'Enfant Plaza DOE

Meeting Calendar:

May 20, 2010
June 17, 2010 (WH HPGB Summit)
July 15, 2010
August 19, 2010
September 16, 2010
October 21, 2010
November 18, 2010
December 16, 2010

Introductions: Subcommittee Executive Secretary Paul Domich (NIST) opened the monthly meeting of the Subcommittee for Buildings Technology Research and Development (BTRD) welcoming the agency representatives and thanking them for their participation. Participants provided self-introductions.

[1] Active Members not attending identified in light gray

Review of Minutes: Roland Risser requested review and approval of the Minutes for March 25, 2009. One change was noted.

Submetering Activities in the DOE Commercial Building Alliances: Brian Holuj (DOE) opened the discussion by reporting that the DOE Commercial Building Alliances are interested in the issue of submetering and have looked into benchmarking and metering in general. On the telephone were DOE National Laboratory technical experts from PNNL, LBNL, and NREL. These invited guests are the technical leads for the commercial real estate, retail, and hospital Commercial Building Alliances. The benchmarking activities (including submetering) have focused on identifying and defining key metrics. At the foundational level, discussions on benchmarking and metering/submetering have suffered from confusion in commonly-used definitions and terminology. This barrier is being addressed by DOE/Nat'l Labs with the development of a more consistent and comprehensive lexicon for metering.

Within the Retail Alliance, the component focused on shopping centers has begun a 12 month study on submetering and has distributed a questionnaire to alliance participants. From the partial results received thus far, little or no submetering is present. Primary issues include determining who pays for the equipment and installation, varying facility configurations (central plant vs. roof-top units), and diverse electrical distribution layouts and equipment configurations which prohibit cost effective installations.

Cost paybacks from submetering are not well documented with no definitive examples available on positive cost/benefit performance. In addition, submetering is an enabling technology which in itself does not conserve energy or reduce consumption. Rather, submetering is often used to change user behavior by directly billing tenants based on usage, by identifying improperly configured building systems, or by increasing awareness by occupants on their usage and behavior patterns. Other issues include where to place submeters to acquire the best usage data. Submetering can become an integral component to continuous commissioning of buildings.

Submetering can be performed at the building, the building system level (e.g., HVAC systems, lighting, etc), or by the building "space". Effective implementation of submeters requires equally effective use of submetering data and the availability of data analysis tools. These tools may include autonomic operation and visualization capabilities to allow the trained building manager with dynamic operational control as well as fault detection. Autonomic operation and fault detection requires robust and complex control systems and communication networks. Technology offerings in this area are complex and confusing to most building owners and operators although benefits can be substantial. Bank of America has successfully implemented submetering across their enterprise of over 1500-3000 buildings resulting in enormous amounts of system data and has

demonstrated the submetering technology can scale well. Proper analysis and/or visualization tools are essential to transform data into actionable responses.

From the Retail Shopping Center analysis in general, submetering is not cost effective and there is a need to better understand where it can be made cost effective. Brian Holuj closed the discussion with a note that federal building owners are members of the Commercial Building Alliances.

FEMP Advanced Metering Activities: Ab Ream (DOE/FEMP) provided an overview of the FEMP metering guidance to federal agencies required by EPACT 2005 and EISA 2007. The Energy Policy Act of 2005 (EPAct 2005), Section 103, requires all federal agencies to install metering and advanced metering where found to be cost-effective, according to guidelines developed by the Department of Energy. DOE collaborating with representatives from the metering industry, the utility industry, energy services industry, energy efficiency industry, energy efficiency advocacy organizations, national laboratories, universities, and federal facility managers developed the guidelines. EISA extended metering requirements to natural gas and steam.

Federal agencies were instructed to implement metering to the “maximum extent practicable” and the installation of metering and advanced metering wherever feasible by:

- the capability of providing useful data and information that leads to improved energy management practices or operations and maintenance improvements resulting in energy and/or energy-related cost savings;
- the sensible application of metering technology; and
- cost-effectiveness, which is based on a 10-year simple payback, assuming annual savings of at least 2%, or higher depending on the use of the metered data to implement energy savings and other cost savings measures.

Submetering can be used for revenue billing, time of use metering, real-time pricing, load aggregation, energy use diagnostics, power quality reporting, energy savings performance contracts (ESPC) contracts, and planning and reporting.

As part of the metering guidance, the group defined advanced metering and related terms, provided a framework for estimating costs and benefits, and methods for prioritizing buildings for metering upgrades. Also provided in the guidance is a template for developing a metering plan and performance measures. The objective for advanced metering can be either economic or to facilitate analysis of buildings and building systems. The resulting effect on improved energy conservation by the installation of advanced meters in the federal enterprise was not measured or recoreded by FEMP.

Ream suggested that meters alone may contribute to a 1-2% reduction in energy use independent of other conservation actions due to increased awareness.

Leveraging the submetering data can lead to proactive equipment maintenance with saving of the order of 5-15%. Advanced metering is also an important component to continuous re-commissioning.

Joni Teter (GSA) and Sean McDonald (PNNL) noted that recently the PNNL "Metering Best Practices Guide" was updated. Regarding GSA facilities, the energy billing approach for their tenants is not uniform across their portfolio. Challenges also exist with respect to the age of the building and whether low cost metering solutions can effectively be integrated into the aging/dated infrastructure systems. Modern equipment and appliances often have metering capabilities built in and that can be accessed. Other areas of interest include ongoing submetering pilot projects mandated by state, local, and municipal groups around the country including those in CA, WA, and CO.

Currently, analysis tools for portfolio energy management and analysis have shortcoming that must be addressed. This includes the energy Portfolio Manager and Energy Plus and other current offerings.

Summary of Potential Submetering Challenges: Roland Risser (DOE) provided a summary of the submetering challenges identified during the presentations and subcommittee discussions:

- lack of a standardized lexicon/terminology
- cost of submetering – installation and equipment
- improving how is the submetering data used
- business case development for multiple scenarios
- improved data collection, analysis, and visualization tools
- transforming benchmarking and submetering data into actionable outcomes and conclusions
- tying submetering into the commercial building environments
- complexity of commercially available products
- better leveraging visualization tools
- leverage outcomes of mandated submetering pilot studies

As a path forward, several ideas were discussed. First, given the success of Bank of America in submetering and autonomic control, additional examples of successful metering implementations and their related business cases should be identified. In addition to BOA, WalMart has also invested in metering and other energy efficiency activities. Development of an open source model for submetering data aggregation is an opportunity that would provide a tool for building owners, installers, and product developers and encourage groups to begin implementing systems. The USGBC is also close to finishing a test project on submetering at the plug level and is evaluating both technologies and human behavior in reducing energy costs. The Subcommittee will invite a USGBC representative to discuss their activities and current progress.

Action Item: Domich will draft an outline of the barriers identified for submetering along with a timeline for fully developing these issues in a short white paper.

White House Summit on Net-Zero Energy, High-Performance Green Buildings: Paul Domich provided a short overview of the current status of a spring workshop for federal high-performance green buildings organized by the Subcommittee. The date for the workshop will be June 17th and 18th. The EOP Council on Environmental Quality has engaged in the development of the morning session and will be working with the WH Cabinet Office in scheduling keynote and panel speakers.

Action Item: Subcommittee members are asked to identify the names of up to 10 people and their titles from their agency who should be invited to the Summit.

BTRD Presentation to the COT: Roland Risser and Shyam Sunder (NIST) are scheduled to present on April 23rd an overview of Subcommittee activities to their governing organization, the NSTC Committee on Technology.

Closure: Risser closed the meeting at 3:30 p.m. and thanked the agency representatives and guests for their participation.

EISA Legislative Drivers for Life Cycle Cost Effective Submetering
April 7, 2010

EISA directs all Federal agencies to reduce energy and water use through measures aimed at efficiency, conservation and increased use of renewables. Agencies are directed to implement/install technologies, systems and practices that are determined to be "life cycle cost effective." GSA has specific requirements relating to construction, renovation, maintenance and leasing of facilities, as well as measuring the effectiveness of these measures - submetering is a key strategy to achieve these ends. Following are relevant excerpts from EISA driving GSA's perspective that identifying life cycle cost effective submetering technologies, systems and practices would be transformative in addressing EISA (and EO 13514) requirements.

Definitions

EISA § 432 (D) LIFE CYCLE COST-EFFECTIVE.—The term 'life cycle cost-effective', with respect to a measure, means a measure, the estimated savings of which exceed the estimated costs over the lifespan of the measure…

EISA § 432 (E) PAYBACK PERIOD.— (i) …the term 'payback period', with respect to a measure, means a value equal to the quotient obtained by dividing—

(I) the estimated initial implementation cost of the measure (other than financing costs); by

(II) the annual cost savings resulting from the measure, including—

(aa) net savings in estimated energy and water costs; and

(bb) operations, maintenance, repair, replacement, and other direct costs.

Note: GSA interprets the relevant "measure" to be the effective life of the lease, which is (in most cases) 5-10 years

EISA § 401 (11) GSA FACILITY. …means any building, structure, or facility, in whole or in part (including the associated support systems of the building, structure, or facility) that—

(i) is constructed (including facilities constructed for lease), renovated, or purchased, in whole or in part, by the Administrator for use by the Federal Government; or

(ii) is leased, in whole or in part, by the Administrator for use by the Federal Government—

(I) except as provided in subclause (II), for a term of not less than 5 years; or

(II) (II) for a term of less than 5 years, if the Administrator determines that use of cost-effective technologies and practices would result in the payback of expenses.

EISA § 401 (9) OPERATIONAL COST SAVINGS…means a reduction in end-use operational costs through the application of cost-effective technologies and practices or geothermal heat pumps, including a reduction in electricity consumption relative to consumption by the same customer or at the same facility in a given year... that achieves cost savings sufficient to pay the incremental additional costs of using cost-effective technologies and practices including geothermal heat pumps by not later than the later of the date established under sections 431 through 434, or—

(i) for cost-effective technologies and practices, the date that is 5 years after the date of installation; and

(ii) for geothermal heat pumps, as soon as practical after the date of installation of the applicable geothermal heat pump.

EISA § 401 (6) COST-EFFECTIVE TECHNOLOGIES AND PRACTICES... means a technology or practice that—

(A) will result in substantial operational cost savings by reducing electricity or fossil fuel consumption, water, or other utility costs, including use of geothermal heat pumps...

Agency Requirements

- All Agencies are directed to evaluate energy and water use in 25% of their facilities every year (completely auditing the entire portfolio every four years). Facility & energy managers are required to implement all life cycle cost effective measures identified no later than two years after completion of the audit. EISA §432 (insert, 2-4)
    - Facility managers are required to benchmark data from all metered buildings through DOE; this information is to be made publicly available. EISA §432 (insert, 8)
- When making capital energy investments (i.e., replacing HVAC or renovating, expanding, remodeling), Agencies must employ the most energy efficient designs, systems and equipment based on life cycle cost effectiveness. EISA §434(a)
- GSA-specific requirements:
    - Construction/renovation: GSA to install energy efficient lighting fixtures and bulbs in construction, alteration & acquisition of buildings wherever feasible, with feasibility determined on a life cycle cost effective basis EISA §323(c); All future prospectus' must include an estimate of the building's projected energy performance and a description of the energy efficiency and renewable energy systems to be used EISA §323(a); buildings must be designed to meet the energy reduction targets established in EISA §433(a)
    - Leases: GSA to include minimum performance requirements for energy efficiency & renewables in all leases EISA §323(b); from 2010, all leases must be Energy Star certified (with certain exceptions); if not Energy Star certified (excepted), the lease must require renovation of all life cycle cost effective energy improvements within one year of occupancy EISA §435(a)
    - Maintenance: Lighting fixtures and bulbs replaced in the normal course of operations are to be energy efficient (feasibility determined on a life cycle cost effective basis) EISA §323(c)

GSA to establish programs to accelerate use of cost-effective technologies at GSA facilities (including lighting technologies), establish methods to track success and provide technical assistance and operational guidance