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RE: Feb. 17, 2017 EERS Workshop 2: Program Cost-Effectiveness Test & Approach for Assessing Non-Energy Impacts

Christine:

Here are some follow-up comments and web links related to my comments at the 2/17/2017 EERS Workshop.

(A) Incorporating Productivity Improvements as a Non-Energy Benefit in Commercial, Industrial and Institutional Energy Efficiency Measures

There is considerable literature and evidence indicating gains in worker productivity associated with building energy efficiency measures. A helpful 2014 compendium is the IEA's "Capturing the Multiple Benefits of Energy Efficiency." Chapter 5 of this report goes into considerable detail about industrial productivity improvements associated with energy efficiency. From the executive summary, p. 22:

"Industry often views energy as an operational cost; energy savings are perceived as incidental benefits of other investments rather than as a central value-generating proposition. Yet, industrial energy efficiency measures deliver substantial benefits in addition to energy cost savings – enhancing competitiveness, profitability, production and product quality, and improving the working environment while also reducing costs for operation and maintenance, and for environmental compliance. Introducing multiple benefits can help to better align energy efficiency with strategic business priorities, thereby strengthening the business case for investment. The value of the productivity and operational benefits derived can be up to 2.5 times (250%) the value of energy savings..."

Another example with an extensive literature review is:

Ernst Worrell, John A Laitner, Michael Ruth, Hodayah Finman, Productivity benefits of industrial energy efficiency measures, *Energy*, 28: 11, September 2003, Pages 1081-1098,

(<http://www.sciencedirect.com/science/article/pii/S0360544203000914>)

As another 2/17 commenter from NEEP indicated, there is also evidence of increased student cognitive performance in buildings with high energy efficiency performance. I have seen considerable anecdotal evidence in New Hampshire as well, particularly from better quality and better-controlled lighting, better control of indoor air, reduced waste heat, reduced human radiational heat gain or loss, etc.

The evidence extends more broadly into “green” buildings, such as those with LEED ratings. An article about recent studies is at:

<http://www.greenbuildingadvisor.com/blogs/dept/green-building-news/study-green-buildings-may-boost-occupants-health-productivity>

Reduced absenteeism as well as increased office worker productivity were noted in the Michigan State University studies that were profiled in this 2010 article.

Just as the impacts of energy efficiency were examined holistically in this EERS Workshop 2, so too is the building systems science approach to energy efficiency and related measures. Energy efficiency is not just about saving energy, it is about building and occupant performance. The market failure that is endemic with insufficiently valuing energy efficiency is often connected to the inability or unwillingness of market actors to recognize these benefits. This market failure answers, to a large degree, the common question: “If energy efficiency is so great, why isn’t it implemented on a wider scale without incentives?”

It is worth noting that many health-based non-energy benefits of energy efficiency are related to improved mechanical ventilation systems. A carbon dioxide sensor that regulates ventilation rates in a classroom will prevent CO₂ levels from reaching a threshold where it could affect cognitive performance. The installation of bathroom exhaust ventilation systems in homes can help prevent the growth of illness-inducing mold. Such mechanical ventilation measures may actually *increase* energy consumption while also providing considerable non-energy benefits. Therefore as part of its evaluation of non-energy impacts, I encourage NHPUC to also consider *non-energy measures* that are commonly included with a package of energy efficiency installations, even if the measure energy savings are zero or negative. This is already common with the NH HPwES and NH WAP/HEA installations, although it is disheartening to see NH HPwES mechanical ventilation measures are no longer incentivized.

(B) Recognition of Energy Savings from Non-Measure-Based Programs

As I mentioned during EERS Workshop 2, from my perspective as an educator with an academic background in behavior change programs, there appears to be a whole missing element to New Hampshire’s nascent EERS program, that is energy efficiency programs not specifically tied to measures.

Sometimes labelled as “non-resource allocation” or “market transformation” programs, with many other state EERS programs, there is considerable effort placed with these important programs that help move a state towards an informed and engaged citizenry. This is not just about marketing measure-based programs, it is about energy literacy, procedural knowledge, a well-trained workforce, and behavior change. An energy-literate population understands the multiple benefits of energy efficiency, and is more likely to engage in energy efficiency actions without extensive measure-based incentives.

A particularly helpful section is in:

“Energy Efficiency Program Impact Evaluation Guide” Dec. 2012, SEE Action, DOE/EE-0829
[https://library.cee1.org/sites/default/files/library/10028/doe see action program impact evaluation guide 12622.pdf](https://library.cee1.org/sites/default/files/library/10028/doe%20see%20action%20program%20impact%20evaluation%20guide%2012622.pdf)

See section 7.10: “Impact Evaluation for Unique Energy Efficiency Program Types,” pp. 7-23 – 7-30. Quotes from this section:

“In the last several years, there has been substantial interest in broadening energy efficiency program portfolios (particularly the residential programs) to include behavior-based programs that use strategies intended to affect how consumers use energy in order to achieve energy and/or demand savings. These programs typically include outreach, education, competition, rewards, benchmarking, and/or feedback elements.” (p. 7-23)

Education and training (E&T) programs are seen as very important strategies for expanding energy efficiency’s reach as a sustained, long-term resource. Education and training programs may be targeted to either end-use customers or other market actors (e.g., trade allies) whose activities influence the energy-related choices of end-use customers. These programs can include advertising, public service announcements, education efforts, training activities (e.g., for contractors, building operators, and designers), outreach efforts, demonstration projects, and other information or communication based efforts. (p. 7-25)

This 7-10 section goes on to also describe market transformation, codes and standards, and demand response programs. Also included are brief descriptions of methodologies for evaluating energy savings from these non-measure-based (non-resource acquisition) activities. The energy savings from technical assistance, training, energy use feedback, energy scoring, or an energy customer engagement platform may be difficult to measure, but they are real and are often very cost effective.

It is worth pointing out a particular training program that Lakes Region Community College currently provides. It is the “Building Operator Certification” program, providing education and procedural knowledge training to large building facilities managers. Already NH’s energy utilities financially support this program. And already there is a rich body of evaluation data showing the non-measure-based energy savings, in more efficient operations and maintenance, resulting from participation in this training. Yet these energy savings are not being claimed in New Hampshire. So here is a ready-made example where the all the pieces are already in place for attributing energy savings to education.

Building Operator Certification, Energy Savings and Evaluation Reports
<http://www.theboc.info/why-boc/energy-savings-evaluation-reports/>

Additional resources:

Behavior Resources, Consortium for Energy Efficiency (CEE)

<http://www.cee1.org/content/behavior-resources>

Excellent resource showing the range of behavioral EE programs and their evaluation around USA. All 4 NH energy utilities are members of CEE.

Behavior-Based EMV Resources, SEE Action, US DOE

<https://www4.eere.energy.gov/seeaction/publications?topic=4&audience=36&long=&short=&title=>

Search results showing examples of behavioral EM&V studies.

2016 Update to the Triennial Plan, by VEIC (Efficiency Vermont), Nov. 2015.

<https://www.efficiencyvermont.com/Media/Default/docs/plans-reports-highlights/2015/efficiency-vermont-triennial-plan-2015-2017-2016-update.pdf>

See section 3.4 (pp. 22-29) for “market advancement” (non-resource acquisition) energy efficiency programs in Vermont, including energy literacy, codes advancement, public education, applied research and development, information technology, planning, evaluation, etc.

It is unlikely that anyone would disagree that these market transformation components – education, training, public awareness, benchmarking, behavior change, uses of codes and metrics, feedback, R&D, etc. -- are helpful components in an energy efficiency program. However, the proof is in the pudding. Where does the funding come from for these programs? There appears to be a structural problem with how the NH EERS order (NH PUC Order # 25,932) is set up. It is a resource-acquisition concentric order. How these important market transformation components should be integrated into this Order is a subject that needs further consideration.

Yours sincerely,

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