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May 25, 2016

Mr. Joel H. Peck, Clerk
c/o Document Control Center
State Corporation Commission
P.O. Box 2118
Richmond, VA 23218

Re: Case No. PUE-2016-00022

Dear Mr. Peck,

The American Council for an Energy-Efficient Economy (ACEEE) welcomes this opportunity to provide comments to the Virginia State Corporation Commission (SCC) on the above-referenced docket on the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures. ACEEE is a nonprofit research organization based in Washington, D.C. that conducts research and analysis on energy efficiency. ACEEE is one of the leading groups working on energy efficiency issues in the United States at the national, state, and local levels. We have been active on energy efficiency issues for more than three decades. In Virginia, we developed an energy efficiency potential study covering electricity savings opportunities, and for several years have provided technical assistance on energy efficiency topics to various stakeholders.

We provide these comments along with an attached technical resource by ACEEE (Attachment A), *Energy Efficiency Evaluation, Measurement and Verification (EM&V),* which is a 10-page document highlighting the basics of EM&V program evaluation, some key areas for consideration, and a number of selected references that provide greater depth of analysis on the issues identified. Our comments below begin with some introductory remarks on the objectives and key challenges of EM&V, followed by comments in direct response to the Commission's questions related to "Objectives" and the "Cost/Benefit Questions," and finally a summary of our observations.

Introduction

Energy efficiency EM&V methodologies and practices must meet the three critical objectives of evaluation:

1. *Accountability of the impacts: Did the program deliver its estimated benefits?*
2. *Risk management to support energy resource planning: How certain are these savings?*
3. *Continuous improvement: What can be done to improve program performance in the future?*

In meeting these objectives, a key challenge is balancing rigor and accuracy with ease of implementation and costs. There is no one way to strike this balance. Instead, it requires a series of decisions at the portfolio level, program level, and measure level, and a transparent and collaborative process with stakeholder input. In general, we find that the level of costs and

rigor of EM&V should be commensurate with the magnitude of savings and the degree of uncertainty around existing estimates of savings. For example, this may mean that different programs within a portfolio of programs require different EM&V approaches, and that periodic assessments examine whether the level of rigor versus costs are meeting the core objectives of evaluation.

For program administrators, typical costs for energy efficiency EM&V are currently 3-5% of annual portfolio budgets (based on data from the Consortium of Energy Efficiency). The cost of EM&V varies with the frequency, complexity, and scope of data collection and analysis. Depending on the desired level of certainty in the results, measurements may be taken on an entire system or a single parameter, on every measure or a sampling of projects, more or less often, and for longer or shorter periods. Recent advances in data analytics and data availability provide a ripe opportunity to use enhanced EM&V techniques while also managing costs. ACEEE recently examined opportunities for these tools in a detailed report.[1]

SCC Objectives

(i) ***Uniform protocols for measuring, verifying, validating, and reporting the impacts of energy efficiency measures***

Uniform protocols are a useful means to ensure consistency and transparency in the EM&V process. While states have been developing and implementing EM&V methodologies for decades, recently a broader recognition of the need to coordinate has led to more national and regional initiatives focused on energy efficiency EM&V.[2] These national and regional initiatives are explained in more detail in Attachment A, along with links to some of their key resources and ongoing projects. We recommend that Virginia draw upon this large toolkit of best practices, protocols, and resources such as reporting guidelines when developing state-specific uniform protocols and incorporating Virginia-specific information and data.

One mechanism which several states have used successfully is to establish a stakeholder working group that is responsible for oversight and input into decision making regarding EM&V considerations such as those described above.[3] Having a well-designed collaborative stakeholder process to oversee EM&V activities and reporting can help assure that evaluation is independent and objective, and minimize subsequent disputes and litigation over reported results. Because EM&V is an ongoing activity -- occurring throughout the energy efficiency planning, implementation, and evaluation process--- there is need for continuous involvement

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[1] ACEEE. 2015. Rogers, E. et al. *How Information and Communications Technologies Will Change the Evaluation, Measurement, and Verification of Energy Efficiency Programs.* Washington, DC: ACEEE. aceee.org/research-report/ie1503

[2] For example, the Uniform Methods Project by the US Department of Energy (DOE) http://energy.gov/eere/about-us/ump-home and the National Efficiency Screening Project http://www.nationalefficiencyscreening.org/; See also the State and Local Energy Efficiency Action Network's (SEE Action) *Energy Efficiency Program Impact Evaluation Guide*; http://www4.eere.energy.gov/seeaction/publication/energy-efficiency-program-impact-evaluation-guide

[3] For example, see Michigan: http://www.michigan.gov/mpsc/0,1607,7-159-52495_53750_54587-217193--,00.html ; and Arkansas: and see Garland, Glen. "Collaborating for Success – How Arkansas Got it Right." 2008. http://aceee.org/files/proceedings/2008/data/papers/5_183.pdf; For a national overview of best practices, see *Energy Efficiency Collaboratives* by SEE Action: https://www4.eere.energy.gov/seeaction/system/files/documents/EECollaboratives-0925final.pdf

by an EM&V stakeholder group throughout the process. We encourage the SCC to consider working with stakeholders to establish such a working group / collaborative in Virginia.

Another mechanism to ensure consistency and quality of evaluation is to have an independent third-party expert that reviews EM&V findings from each utility. The purpose of the expert would be to ensure that the utility evaluations are conducted appropriately, and that the state receives the information it needs for decision-making regarding the energy efficiency programs.

Technical resource manuals (TRMs), which are reports or databases that hold information on the features and energy savings of energy efficiency measures, are also a helpful way to improve consistency by clearly communicating information such as deemed savings values and deemed savings calculations. TRMs are typically developed for entire states or regions, and require periodic reviews and updates. For Virginia, the existing mid-Atlantic TRM is a helpful and appropriate resource to draw upon. State-specific information could then be used as available and necessary to make certain amendments or supplements. The stakeholder working group is an appropriate way to determine and clarify a path forward.

(ii) ***A methodology for estimating annual kilowatt savings for such energy efficiency measures***

As discussed in more detail in Attachment A, there are three general methodologies for estimating energy savings from energy efficiency measures, i.e. "savings determination approaches:"

1. *Project-level measurement & verification* (typically used for custom projects targeting large customers; uses one or more methods that can involve on-site metering and measurements in combination with engineering calculations, statistical analysis, and/or computer simulation modeling);

2. *Deemed savings* (estimates for a single unit of an installed measure that have been developed from data sources such as prior metering studies and that are applicable to the situation being evaluated; these are generally used for specific energy efficiency measures with well-documented savings values, for example certain appliances, motors, lighting technologies, etc.);

3. *Large-scale consumption statistical analysis with the use of comparison groups* (for certain programs with substantial energy savings and large numbers of participants, periodic statistical analyses with comparison groups are helpful to the overall EM&V process. These can also help calibrate deemed saving estimates).

We encourage a range of approaches for estimating savings from energy efficiency programs in Virginia, and we encourage transparency in the decision-making process via a stakeholder working group as suggested above.

Common Practice Baseline

Another area that stakeholders in Virginia might want to consider, specifically as it relates to establishing net vs. gross savings determinations,[4] is the "common practice baseline" approach.

[4] See the accompanying Attachment A for further discussion on net vs. gross savings determination.

This approach is somewhat in-between net and gross savings approaches in that it measures savings relative to what is determined to be common practice without a program, but makes no further adjustments. As with other net savings approaches, the common practice baseline approach is designed to assess the savings attributable to efficiency program activities. This approach is commonly used in the Pacific Northwest and has gained more attention recently, for example it is recommended in EPA's draft EM&V guidance for evaluating energy efficiency savings under the Clean Power Plan.[5] A description and discussion of this approach can be found in the Uniform Methods Project's Chapter 17.[6]

Another point we would like to emphasize regarding methodologies for estimating savings is that these evaluation methodologies described above are well-established, through decades of experience around the nation. There is an entire industry of independent evaluation professionals who regularly apply and test these methodologies. Stakeholders in Virginia do not need to try to "re-invent the wheel," nor to try to pick a single methodology. Rather, a good role for the SCC and a stakeholder working group would be to establish a good structure for monitoring and reviewing the work of the independent evaluation professionals. Those professionals should be tasked with the assignment to apply the best combination of established methodologies that can be accommodated within available evaluation budgets.

(iii) ***A formula to calculate the levelized cost of saved energy for such energy efficiency measures***

Levelized cost of saved energy (CSE) is typically used as a way to compare costs of energy efficiency program portfolios and sub-portfolios to costs of other energy resource options. This metric serves as a complement to full cost-benefit analysis. ACEEE regularly examines trends in energy efficiency program costs and CSE, and in a 2014 publication we lay out the standard approach for calculating the levelized CSE for electricity and natural gas energy efficiency measures from the utility or program administrator perspective.[7] The Lawrence Berkeley National Laboratory (LBNL) also examined trends in levelized cost of saved energy for program administrators in a major 2014 report.[8]

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[5] [EPA] US Environmental Protection Agency. 2015. *Evaluation Measurement and Verification (EM&V) Guidance for Demand-Side Energy Efficiency (EE) - Public Input Draft.* https://www.epa.gov/cleanpowerplantoolbox/evaluation-measurement-and-verification-emv-guidance-demand-side-energy

[6] NREL 2014

[7] Molina, M. 2014. *The Best Value for America's Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs.* aceee.org/research-report/u1402. See page 15 for the levelized CSE calculation and discussion.

[8] LBNL. Lawrence Berkeley National Laboratory. 2014. *The Program Administrator Cost of Saved Energy for Energy Efficiency Programs.* https://emp.lbl.gov/publications/program-administrator-cost-saved. See page 14 for the levelized CSE calculation and discussion.

As described in the ACEEE report, the CSE calculation is:

CSE in $/kWh = (C) x (capital recovery factor)/(D)
where:
Capital recovery factor = [A*(1+A)^(B)]/[(1+A)^(B)-1]
A = Real discount rate
B = Estimated average measure life in years
C = Total annual program cost
D = Annual energy (kWh or therms) saved by energy efficiency programs

While the formula to calculate CSE is straightforward, the inputs to the calculation are most important and deserve careful consideration, e.g. net savings versus gross savings (or common practice baseline approach as discussed above) and an appropriate discount rate. Also, the use of the CSE is an important consideration. Again, CSE is typically most applicable to comparing portfolios of energy efficiency programs to other supply-side resource options, not as a way to determine whether individual programs should be included in a portfolio. Rather, cost-benefit tests are used to determine the cost-effectiveness of individual energy efficiency measures or programs.

For the discount rate input, the current common practice of assuming the utility weighted average cost of capital (WACC) for energy efficiency cost-effectiveness screening has been criticized as undervaluing the reduced risk of energy efficiency program expenditures versus supply-side investments.[9] To reflect the lower financial risk of efficiency investments, some jurisdictions have adopted alternative discount rates for energy efficiency valuation in the Utility Cost (UCT) and Total Resource Cost (TRC) tests, such as a societal discount rate or a risk-adjusted discount rate. In the Northwest, for example, the preferred approach is to use a risk-free discount rate for both supply resource and energy efficiency, and then to explicitly model resource risk (i.e., fuel price, environmental regulation, capital cost, and so forth) in the analysis of resource options.[10] This approach improves transparency by requiring that the type and magnitude of risk estimates for each resource are displayed.

Both the ACEEE and LBNL reports cited above provide detailed discussion of these inputs and factors to consider, and ACEEE would welcome the opportunity to provide further feedback on specific areas for consideration.

[9] Woolf, T., E. Malone, K. Takahashi, and W. Steinhurst. 2012. *Best Practices in Energy Efficiency Program Screening: How to Ensure that the Value of Energy Efficiency is Properly Accounted For.* Prepared for the National Home Performance Council by Synapse Energy Economics. Cambridge, MA.: Synapse Energy Economics.

[10] Northwest Power and Conservation Council. 2010. *Sixth Northwest Conservation and Electric Power Plan. Appendix N.* Accessed March 2014.
http://www.nwcouncil.org/media/6332/SixthPowerPlan_Appendix_N.pdf

SCC Cost/Benefit Questions

(i) ***Whether the application of costs and benefits is consistent across utilities***

(ii) ***Whether consistent application of costs and benefits across utilities is necessary or reasonable***

ACEEE recommends that it is useful and reasonable to use a consistent approach to cost-benefit analysis, i.e. cost-effectiveness testing, across utilities. While certain inputs may vary by utility jurisdiction, e.g. avoided energy and capacity costs, the overall approach should be consistent. This reduces confusion, and will provide better data on energy efficiency for various stakeholders, including resource planners.

ACEEE has found that the most widely used benefit-cost test is the Total Resource Cost (TRC) test, followed by the Utility Cost Test (UCT). We have also observed that the Ratepayer Impact Measure (RIM) test has become almost universally rejected[11] as a primary test for decision-making, because it does not really measure the cost-effectiveness of an energy efficiency program. Rather, it is an indicator of the distribution of already sunk utility system costs. For that reason, we recommend that states not use the RIM test to make determinations about the cost-effectiveness of energy efficiency programs.

ACEEE has also found that even for the commonly-used cost-effectiveness tests, in many jurisdictions there is either an inconsistent or sometimes inappropriate application of those tests. For example the TRC test, although most widely used as the primary test, can be challenging to implement because it requires all costs and all benefits (including participant costs and benefits in addition to utility costs benefits). While costs to utilities and participants are relatively straightforward, some of the participant benefits can be less straightforward, and as a result these benefits are often underreported. Another example is the utility system benefits, e.g. avoided energy and capacity costs, which are often underreported. We encourage stakeholders in Virginia to review ACEEE's recent national review that examined best practices on utility system benefits of energy efficiency.[12]

Because of these challenges in ensuring consistent and appropriate use of the various tests, we recommend that the Commission use a guide developed by the National Efficiency Screening Project for analyzing and screening energy efficiency measures and programs based on their benefits and costs.[13] The guide provides a set of principles that resulted from a national collaboration of a diverse set of energy efficiency program stakeholders and technical experts. Under these principles, energy efficiency cost-benefit analysis should:

1. Support the public interest
2. Account for the energy policy goals of each state
3. Ensure that tests are applied symmetrically, where both relevant costs and relevant benefits are included in the screening analysis
4. Not exclude relevant benefits on the grounds that they are difficult to quantify and monetize

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[11] In our last national survey in 2012, Virginia was the only state that reported still using the RIM test as its primary cost-effectiveness test. We understand that subsequent legislation in Virginia has clarified that four different tests should be considered, and that no single test should be the primary determinant.

[12] Baatz, B. 2015. *Everyone Benefits: Practices and Recommendations for Utility System Benefits of Energy Efficiency*. Washington, DC: ACEEE. http://aceee.org/everyone-benefits-practices-and-recommendations

[13] http://www.nationalefficiencyscreening.org/rvf-template

5. Be transparent by using a standard template to explicitly identify their state's energy policy goals and to document assumptions and methodologies

By following these principles, the SCC and stakeholders can improve transparency and consistency of cost-effectiveness results.

(iii) ***Whether the application of the cost/benefit tests can be improved by enhanced evaluation and verification protocols for estimating savings actually realized.***

This again comes back to using various savings determination approaches described above. Because the use of appropriate EM&V techniques improves accuracy of various savings estimations, they can also improve the cost-benefit calculations because they provide better estimates of the energy savings. EM&V techniques are well-developed and have been used in countless contested-case regulatory proceedings, in dozens of states around the nation. By using qualified and experienced evaluation professionals, and establishing an appropriate oversight process, regulators and all stakeholders in Virginia can be confident in the evaluation results produced, and can use that information in cost/benefit analyses.

Summary of Observations

(i) *Uniform protocols for measuring, verifying, validating, and reporting the impacts of energy efficiency measures*

a. Review existing, well-established practices in EM&V discussed in this document and supporting materials in order to establish a stable and transparent framework for participants to engage with.
b. Develop a stakeholder working group or collaborative. Several states (e.g. AR, MI etc.) have found that a stakeholder collaborative helps to design and refine EM&V practices to improve outcomes, consistency, and reduce costs.
c. Consider using a third-party to review individual utility evaluations. This process provides an independent and consistent assessment of the practices employed by utilities and their contractors.

(ii) *A methodology for estimating annual kilowatt savings for such energy efficiency measures*

a. Leverage national best practices for savings determination approaches and use stakeholder input from within Virginia to determine the appropriate EM&V practices to apply to different components of Virginia's energy efficiency portfolio.
b. Address "net vs. gross" savings determination including consideration of establishing a common practice baseline approach.

(iii) *A formula to calculate the levelized cost of saved energy for such energy efficiency measures*

a. Ensure stakeholders are aligned on the role and use of "cost of saved energy" (CSE) in decision-making, e.g. comparing portfolios of energy efficiency programs to supply-side options.
b. Consider the various approaches and reasons for establishing and adjusting discount rates used in CSE calculations; likewise for energy savings determinations.

(iv) *Whether the application of costs and benefits is consistent across utilities and;*

(v) *Whether consistent application of costs and benefits across utilities is necessary or reasonable*

a. Leverage the National Efficiency Screening Project to accelerate Virginia's use of consistent and transparent cost-effectiveness screening practices.
b. Use a stakeholder working group as a means to improve consistency of energy efficiency cost-effectiveness screening.

(vi) *Whether the application of the cost/benefit tests can be improved by enhanced evaluation and verification protocols for estimating savings actually realized.*

a. Best practice EM&V is both an iterative and evolving field. Virginia is entering the conversation at an exciting time in which there is a rich field of existing best practice that can enable stakeholders to more quickly establish a working framework while integrating emerging practices and technologies to improve results and reduce costs over time.

ACEEE welcomes this opportunity to provide comments, and as needed can provide additional information on national trends and state examples of energy efficiency EM&V.

Sincerely,

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