Commonwealth of Virginia

State Corporation

Commission

Appendix to

Report to the Governor of the Commonwealth of Virginia and the Virginia General Assembly

Report: Evaluation of the Establishment of Uniform Protocols for Measuring, Verifying, Validating, and Reporting the Impacts of Energy Efficiency Measures; a Methodology for Estimating Annual Kilowatt Savings; and a Formula to Calculate the Levelized Cost of Saved Energy for Energy Efficiency Measures Implemented by Investor-Owned Electric Utilities in the Commonwealth

Pursuant to Chapters 255 and 517 of the 2016 Acts of the Virginia General Assembly

December 1, 2016

ACEEE
American Council for an Energy Efficient Economy
529 14th Street, N. W., Suite 600 ○ Washington, D.C. 20045 ○ 202.507.4000 ○ 202.429.2248 ○ www.aceee.org

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

---

[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]

---

[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

---

[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,

Maggie Molina
Program Director
Utilities, State and Local Policy Program
ACEEE
mmolina@aceee.org
202-507-4004

ACEEE Toolkit
American Council for an Energy-Efficient Economy

Energy Efficiency Evaluation, Measurement & Verification (EM&V)

May 2016

Introduction

Policymakers and utilities in the US have recently put increased focus on energy efficiency as a clean, low-cost and reliable utility system resource and policy strategy to meet long-term energy needs and climate goals. This increased attention calls for excellence in evaluation, measurement & verification (EM&V), which provides accurate, transparent and consistent metrics—based on good data—that assess the performance and implementation of energy efficiency projects, programs, and portfolios of programs. The US has more than three decades of experience implementing energy efficiency EM&V. One key challenge is how to balance rigor and accuracy with ease of implementation and evaluation costs. Recent advances in data availability and analytics are paving the way for new opportunities to improve accuracy while managing costs. Improved regional and national collaboration also hold new promise for elevating the confidence in energy efficiency as a resource.

In this toolkit we first describe the objectives of EM&V, followed by general approaches and typical steps in an EM&V process. We then discuss several key areas for consideration when developing a plan. Next we discuss how the industry is entering a new paradigm in EM&V shaped by improved data availability and analytics, as well as increased national and regional collaboration. Finally, we provide a detailed list of additional references for EM&V implementation.

Why EM&V?

Policymakers typically require that energy efficiency programs and projects be cost-effective. To this end, most states require that program administrators conduct independent, third-party EM&V. Energy efficiency EM&V serves three critical objectives: accountability of the impacts, risk management, and continuous improvement. To restate these objectives as questions:

1. *Accountability of the impacts: Did the program deliver its estimated benefits?*

EM&V activities document and measure the effects of a program and determine whether it met its goals. This often includes the energy and demand savings, as well as co-benefits such as emissions impacts, transmission and distribution benefits, or water savings.

2. *Risk management to support energy resource planning: How certain are these savings?*

Risk refers to the uncertainty of the realization of expected savings from an efficiency project or program. EM&V activities should be sophisticated enough to assess and maximize the level of confidence of estimated savings, which provides credibility to energy efficiency as a viable resource. An added risk is that, in the absence of good data, governments may under-invest in relatively cheaper and more beneficial energy efficiency programs, and

over-invest in more costly alternatives. EM&V activities aim to provide this data, thereby avoiding costly misallocation of public and private resources.

3. *Continuous improvement: What can be done to improve program performance in the future?*

Most importantly, EM&V activities should be used to go beyond compliance by evaluating why a program had the effect that it did, with an eye for both improving existing programs and providing a robust mechanism for estimating savings from planned programs.

Types of EM&V Assessments

It is important to first make a distinction between energy efficiency *projects* and energy efficiency *programs* or *portfolios of programs* because of differences in the scope of measurement and methods of evaluation for each. A project is a single activity that takes place at a single location, such as the installation of energy efficient lighting in an office. The term measurement and verification (M&V) alone refers to project-level analysis associated with the documentation of energy savings and verification of installation at individual sites (more on that later under savings determination approaches). In contrast, a program is a prolonged effort by an organization or collaborative of organizations that encompass a group of projects with similar characteristics and applications (e.g., an initiative to install advanced hot water heaters in residential buildings). A portfolio is a collection of programs that collectively address multiple technologies and market segments. The broader term evaluation, measurement and verification (EM&V) refers to program-level or portfolio-level analysis and includes a broader approach to evaluation.

At the program or portfolio level, a seminal resource for an in-depth review of EM&V program evaluation is the *Energy Efficiency Program Impact Evaluation Guide* from 2012 (and its precursor in 2007), prepared by the State and Local Energy Efficiency Action Network (SEE Action), which is co-facilitated by the US Department of Energy (DOE) and Environmental Protection Agency (EPA). As described in that report, the most common way to categorize efficiency program evaluations is as follows:

1. *Impact evaluations* assess outcomes of the changes attributable to an energy efficiency program. These evaluations answer questions for the first and second objectives described above about the accountability of the benefits and risk management.
2. *Process evaluations* assess program operations to identify and recommend areas of improvement. These evaluations answer questions for the third objective above about program improvement.
3. *Market evaluations* assess broad aspects of the marketplace with respect to energy efficiency. For example, a market effects evaluation characterizes changes in the structure or functioning of the market or the behavior of market participants that resulted from one or more program efforts. These evaluations help to answer questions for all three objectives.

These best-practice EM&V activities should be seen as cyclical -- occurring throughout the energy efficiency planning, implementation, and evaluation process. SEE Action's guide focuses mainly on impact evaluations, which is the center of the EM&V process. Additional information on process and market evaluations can be found in the various references listed at the end of this toolkit. DOE's Uniform Methods Project, which is described later, provides detailed model evaluation plans for specific energy efficiency measures and project

categories. Next we describe the high-level steps for an impact evaluation process based largely on the SEE Action guide.

Steps in an EM&V Impact Evaluation Process

1. *Define the evaluation objectives, scale and time frame in the context of policy objectives*

Evaluation planning should be incorporated in the planning for the efficiency program itself, for budgetary and staffing reasons, as well as for program design purposes. The basic objectives of any evaluation program are accountability, risk management, and program improvement. Other objectives may include the calculation of co-benefits, as described below. Scale is often a tradeoff between expected benefit from the EM&V process and the administrative costs of the program. Evaluation time frames are typically on the order of one year.

2. *Select an impact evaluation savings determination approach and define baseline scenarios.*

Evaluation methods depend on program objectives, and are discussed more fully in the referenced documents below. The baseline (or "business-as-usual" scenario) consists of an estimate of energy use and demand in the absence of any efficiency program interventions. Because energy savings cannot be directly measured, they must be calculated by comparing energy use and demand after efficiency program implementation with a baseline defined at the start of the program.

3. *Design and conduct data collection and analysis*

Decide upon the experimental or quasi-experimental design for the evaluation. Prepare the sampling plan and data collection instruments and protocols. Select data filtering and analysis methodologies. Implement the evaluation plan.

4. *Determine energy and demand savings (gross and/or net savings)*

Gross savings represent the changes in energy use and demand that result from program activities, regardless of what factors may have motivated the participant to take the energy efficiency actions. A sample of representative projects are selected, and their effects are measured and verified (taking the effects of uncontrollable forces like weather into account) to determine gross savings. Net savings are determined by adjusting gross savings to account for what would have happened without the program (free riders) and for program-induced spillover and market effects (see definitions later).

5. *Calculate co-benefits (according to policy objectives)*

Co-benefits may include avoided greenhouse gas emissions and other environmental benefits, energy price effects, economic impacts such as job creation and increases in income, non-energy benefits to program participants (e.g., health, comfort, reduced maintenance, etc.), national security impacts, and other technical system benefits. Methods exist for determining these co-benefits, according to the objectives of the energy efficiency program policy.

6. *Report the evaluation results and work with program administrators to implement recommendations and to resource planners and demand forecasters*

Key Issues for Consideration in an EM&V process

Here we provide more details about some specific elements of the EM&V process for further consideration. See ACEEE 2015 for additional information.

SAVINGS DETERMINATION APPROACH

There are inherent challenges in measuring energy efficiency impacts because it requires comparing actual energy use to what *would have happened absent the energy efficiency improvements*. This requires the use of a counterfactual scenario, i.e. estimating what the energy use would have been had the program or measure not been implemented. The SEE Action guide describes three general approaches to savings determination: 1) measurement and verification (M&V); 2) deemed savings; and 3) large-scale consumption data analysis with the use of control groups. The type of approach is a key area for consideration—and requires balancing evaluation costs with level of accuracy. Program administrators may want to use a variety of these approaches across their portfolio of programs.

Measurement and Verification (M&V)

M&V is applied at the project level, as described earlier, and means the determination of gross energy savings at individual sites or projects using one or more methods can involve metering measurements in combination with engineering calculations, statistical analysis, and/or computer simulation modeling. M&V guidelines and protocols have existed for decades (since the beginning of the energy performance contracting industry). Today the most widely used of which include the Federal Energy Management Program (FEMP) guidelines, the Efficiency Value Organization's (EVO) International Performance Measurement & Verification Protocol (IPMVP), and ASHRAE's Guideline 14-2014. More recently, the US DOE's Uniform Methods Project has become a resource for some M&V protocols. See the list of project-level M&V references at the end of this toolkit for links to these resources.

For energy efficiency programs, this M&V savings determination approach is most often used in custom programs targeting large customers, where the savings are dependent on the technologies applied and the specific customer characteristics. This approach can also serve as the basis for determining, in part, deemed savings values for prescriptive programs.

Deemed Savings

Deemed savings values are estimates for the energy and/or demand savings for a single unit of an installed energy efficiency measure that (1) have been developed from data sources (such as prior metering studies) and analytical methods that are widely considered acceptable for the measure and purpose, and (2) are applicable to the situation being evaluated. Individual parameters or calculation methods can also be deemed, e.g. effective useful life of a measure, or a set of engineering algorithms used to calculate the savings. (free-ridership and net-to-gross factors may also be deemed).

For energy efficiency programs, deemed savings approaches are generally used for projects with well-documented savings values, for example appliances, lighting, and computer equipment. This EM&V approach is popular because it is relatively low-cost and straightforward. ACEEE research from 2012 found that 36 states use some type of deemed

savings values in their evaluation frameworks, and that 26 states cite the use of sources or databases from other states (ACEEE 2012).

Large-scale consumption statistical analysis with the use of comparison groups

Comparison groups are a more elaborate way of determining energy savings and can result in a more informed understanding of program-induced energy savings. The SEE Action guide distinguishes between two kinds of control groups. Randomized controlled trials (RCT) randomly assign customers to either the treatment group, whose members participate in the program, or a comparison group, whose members do not participate. Quasi-experimental methods (QEM) use a comparison group that has not been randomly selected. Both methodologies compare the energy use of a control group not involved in program activities with that of efficiency program participants. Evaluators collect energy consumption data for both groups and calculate the difference between the two sets of data. Both comparison-group approaches require a relatively large and homogeneous population of energy users. They are most often used in residential programs, since they involve so many customers, usually with a limited number of energy consumption profiles. They can also be used for commercial programs with large numbers of participants, but relatively sophisticated statistical techniques are required.

Of the two kinds of control groups, RCT tends to be more accurate in assessing savings, but it is time-consuming, expensive, and cannot be applied to full-scale programs because it requires random assignment to participant and control (nonparticipant) groups. The simplest QEM approach is the pre/post method, which compares the energy use of program participants before and after the program; in effect, participants become their own control group. The QEM approach is more flexible and is more broadly applicable to programs. Randomized encouragement designs are an additional approach (See Uniform Methods Project's *Sampling Design Cross-Cutting Protocol* [April 2013]).

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.

TECHNICAL RESOURCE MANUALS

Technical Resource Manuals (TRMs) are databases or reports that hold information on the features and energy savings of large quantities of energy efficiency measures for use by an entire state or region. Deemed savings values and deemed calculations are usually documented in TRMs, as are other assumptions and metrics such as measure lifetimes. As of 2012, there were 17 state and regional TRMs in use across the U.S. (SEE Action 2012). Developing robust state or regional TRMs, with periodic reviews and updates, is a helpful way to improve consistency.

NET VS. GROSS SAVINGS

Evaluators are interested in examining the extent to which variables external to a program may affect energy use and thereby lead to over- or underreporting of energy savings. Using definitions from DOE's Uniform Methods Project (NREL 2014, Chapter 17):

- Gross savings impacts are "changes in energy consumption that result directly from program-related actions taken by participants in an energy efficiency program, regardless of why they participated."
- Net savings impacts are "changes in energy use attributable to a particular energy efficiency program. These changes may implicitly or explicitly include the effects of factors such as free-ridership, participant and non-participant spillover, and induced market effects."

Free-riders are participants who would have adopted energy efficiency measures in the absence of the program. Spillover is when the program inspires participants or nonparticipants to take other efficiency actions not directly targeted by the program. Induced market effects occur as a result of changes in the market inspired by the program (e.g. contractors change their previous equipment stocking and recommendation practices due to familiarity with a new technology promoted by the program). While it is considered best practice for net savings evaluations to account for free-ridership and spillover (and occasionally induced market effects), in practice many evaluators account for free-riders alone, thereby running the risk of undercounting total savings impacts.

An analysis by ACEEE examines details about state practices, precedents, and issues regarding net and gross savings (ACEEE 2014). The study's interviews with state and national experts made it clear that both net and gross savings can be useful toward assessing the three objectives of evaluation. For example, estimates of net savings help programs improve as they work to minimize free-ridership. Utility system planners are generally most concerned with what overall changes are occurring in consumption levels (i.e. gross savings), and less concerned with parsing out what portion of the change would happen without programs or is attributable to different parties. On the other hand, there is a need and often regulatory pressure to understand the net impacts attributable to programs, especially as a way to calculate things like cost-effectiveness and lost revenue policies in order to protect ratepayer interests and to apply limited program dollars where they will do the most good. Some states have taken the simplistic approach of assuming that free-ridership and spillover cancel each other out, so that gross savings equal net savings. That approach may ignore important differences between programs within a portfolio, and likely obscures important information about how particular programs are functioning.

COMMON PRACTICE BASELINE

In recent years, the "common practice baseline" approach has received increased attention. This approach is somewhere 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. This approach is commonly used in the Pacific Northwest and is recommended in EPA's draft EM&V guidance for evaluating energy efficiency savings under the Clean Power Plan (EPA 2015). As with other net savings approaches, the common practice baseline approach is designed to assess the savings attributable to efficiency program activities. A description and discussion of this approach can be found in the Uniform Methods Project's Chapter 17 (NREL 2014).

COST-EFFECTIVENESS SCREENING

Cost-effectiveness screening is one key element of the EM&V process, and it is used in various ways in different jurisdictions. Recent national collaboration on this topic has led to some helpful resources. The National Efficiency Screening Project (NESP), as described later, spearheaded the development of the Resource Value Framework (RVF) (ACEEE is a participating member of NESP). The RVF advocates that in designing energy efficiency cost-effectiveness screening tests, each state should adhere to several principles, including:

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. Should not exclude relevant benefits on the grounds that they are difficult to quantify and monetize
5. Should be transparent by using a standard template to explicitly identify their state's energy policy goals and to document assumptions and methodologies

EM&V COSTS

For program administrators, typical costs for energy efficiency EM&V are 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. In general, the level of costs and stringency of EM&V should be commensurate with the magnitude of savings and the degree of uncertainty around existing estimates of savings.

STAKEHOLDER WORKING GROUPS

Several states have had success with establishing stakeholder working groups that are responsible for oversight and input into decision making regarding EM&V considerations such as those described above. 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.

New Frontiers of M&V

Major new advances in data analytics and data availability are creating exciting opportunities in the area of automated M&V. The Northeast Energy Efficiency Partnerships (NEEP) outlines these trends in its report, *The Changing EM&V Paradigm*, across two major areas: 1) advanced data analytics and program enhancements (enabled by new software); and 2) advanced data availability (enabled by new hardware) (NEEP 2015). ACEEE is also examining how ICT can automate data collection and analysis, and how new analytical techniques are giving evaluators the ability to monitor and meter what is relevant and then extract what is needed to gain intelligence about energy consumption (see ACEEE 2015).

In that report, ACEEE provided case studies for the residential, commercial, and industrial customer segments. For example, one case study profiles a warehouse management

company that installed an intelligent lighting system, which has self-metering and historical data collection capabilities that enable to report energy savings in near real time. While some energy efficiency programs such as monitoring-based building commissioning (MBCx) have been using these types of techniques for several years, a broader class of energy efficiency programs could now potentially take advantage of automated M&V. At the same time, these new techniques can help build confidence in energy efficiency performance for a broad range of stakeholders (ACEEE 2015).

National and Regional EM&V Initiatives and Resources

States have been developing and implementing EM&V methodologies for decades. More recently, especially with the prospect of federal climate regulations, a broader recognition of the need to coordinate has led to national and regional initiatives focused on energy efficiency EM&V. Here we briefly describe these initiatives and list some key resources.

EM&V Working Group of the State and Local Energy Efficiency Action Network (SEE Action), co-facilitated by the US DOE and the US EPA

- Convenes experts from around the country on EM&V issues, specifically around three key focus areas: 1) support consistency and transparency for EM&V methods; 2) address emerging issues and technologies; and 3) increase adoption of best practices. ACEEE participates in the working group.
- Publishes numerous technical reports and guidance documents.
- In 2012 published a seminal EM&V resource for both novices and experts: *Energy Efficiency Program Impact Evaluation Guide.* Includes definitions, concepts, and steps for calculating energy and demand savings, avoided emissions, and other impacts.

Uniform Methods Project (UMP) by the Department of Energy (DOE)

- Develops M&V protocols for determining energy savings for commonly implemented program measures. The work is being done through collaboration with energy efficiency program administrators, stakeholders, and EM&V consultants.
- Aims to establish easy-to-follow protocols based on commonly accepted engineering and statistical methods for determining gross savings for a core set of commonly deployed energy efficiency measures.
- In 2013, published first set of protocols for determining energy savings from energy efficiency measures and programs; ongoing protocols are listed here. Chapter 17 addresses net savings methods.

National Efficiency Screening Project (NESP)

- Group of organizations and individuals (including ACEEE) working together to improve the way that utility customer-funded electricity and natural gas energy efficiency resources are screened for cost-effectiveness.
- Developed the Resource Value Framework (RVF) of principles and recommendations to provide guidance for states to develop and implement cost-effectiveness tests that are consistent with sound principles and best practices.

- During 2016 and 2017, NESP is working to develop a *National Standard Practice Manual for Energy Efficiency (NSPM)* designed to update and expand upon the *California Standard Practice Manual*.

Regional Technical Forum by the Northwest Power & Conservation Council

- Established in 1999 as an advisory committee to develop standards to verify and evaluate energy efficiency and conservation savings.
- Develops unit energy savings (UES) measures, standard protocols, and numerous guidelines.
- Uses subcommittees to review and provide oversight and/or guidance on projects, provide feedback to the RTF on specific issues, and help develop and update sector-specific measure savings and assumptions.

Regional Evaluation, Measurement and Verification Forum (EM&V Forum) by the Northeast Energy Efficiency Partnership (NEEP)

- Consists of nine jurisdictions across the Northeast and mid-Atlantic regions. Works to develop and support the use of consistent savings assumptions and standardized, transparent guidelines and tools to evaluate, measure and verify, and report the energy and demand savings, costs, and avoided emission impacts of energy efficiency.
- Steered by a committee of state public utility commissioners, energy office and air agency representatives; convenes stakeholders through regular events.
- Develops and collects numerous resources such as its glossary of terms.
- In 2015 published *The Changing EM&V Paradigm* which reviews key trends and new industry developments and their implications on current and future EM&V practices.

References

PROGRAM AND PORTFOLIO-LEVEL EM&V

[ACEEE] American Council for an Energy-Efficient Economy. *State and Local Policy Database.* database.aceee.org/state/evaluation-measurement-verification

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

ACEEE. 2012. Kushler, M. et al. *A National Survey of State Policies and Practices for the Evaluation of Ratepayer-Funded Energy Efficiency Programs.* Washington, DC: ACEEE. aceee.org/research-report/u122

ACEEE. 2014. Kushler, M. et al. *Examining the Net Savings Issue: A National Survey of State Policies and Practices in the Evaluation of Ratepayer-Funded Energy Efficiency Programs.* Washington, DC: ACEEE. aceee.org/research-report/u1401

[EIA] US Energy Information Administration. 2013. *State Energy Efficiency Program Evaluation Inventory.* www.eia.gov/efficiency/programs/inventory/

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

[DOE] Department of Energy. Uniform Methods Project. energy.gov/eere/about-us/ump-protocols

Joint Comments on Energy Efficiency in the Environmental Protection Agency's Proposed Rate-Based Federal Plan. 2016. aceee.org/regulatory-filing/joint-comments-rate-based-012116

State and Local Energy Efficiency Action Network. 2012. *Energy Efficiency Program Impact Evaluation Guide.* Prepared by Steve R. Schiller, Schiller Consulting, Inc. www4.eere.energy.gov/seeaction/publication/energy-efficiency-program-impact-evaluation-guide

[NEEP] Northeast Energy Efficiency Partnerships. *The Changing EM&V Paradigm.* Lexington, Mass.: NEEP. www.neep.org/changing-emv-paradigm

[NREL] National Renewable Energy Laboratory. 2014. *Chapter 17: Estimating Net Savings: Common Practices. The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures.* Golden, CO.: NREL. energy.gov/sites/prod/files/2015/01/f19/UMPChapter17-Estimating-Net-Savings.pdf

[NREL] National Renewable Energy Laboratory. 2013. *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures.* Golden, CO.: NREL. www.nrel.gov/docs/fy13osti/53827.pdf

[RAP] Regulatory Assistance Project. 2014. *Energy Efficiency Evaluation, Measurement, and Verification: A Regional Review of Practices in China, the European Union, India, and the United States.* www.raponline.org/document/download/id/7064

COST-EFFECTIVENESS SCREENING

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

[NEEP] Northeast Energy Efficiency Partnerships. 2014. *Cost Effectiveness Screening Guidelines.* Lexington, Mass.: NEEP. www.neep.org/cost-effectiveness-screening-guidelines-2014-0

[NESP] National Efficiency Screening Project. 2014. *Resource Value Framework.* www.homeperformance.org/sites/default/files/nhpc_nesp-recommendations_20140816.pdf

[RAP] Regulatory Assistance Project. 2012. *Energy Efficiency Cost-Effectiveness Screening: How to Properly Account for "Other Program Impacts" and Environmental Compliance Costs.* www.raponline.org/document/download/id/6149

PROJECT-LEVEL M&V

[ASHRAE] American Society of Heating, Refrigerating, and Air-conditioning Engineers. 2002. *Guideline 14-2014: Measurement of Energy, Demand, and Water Savings.* Atlanta, GA: American Society of Heating, Refrigerating, and Air-conditioning Engineers. www.ashrae.org.

[DOE] Department of Energy. Uniform Methods Project. energy.gov/eere/about-us/ump-protocols

[EVO] Efficiency Valuation Organization. 2009. *International Performance Measurement and Verification Protocol (IPMVP): Concepts and Options for Determining Energy and Water Savings, Volume 1.* www.evo-world.org.

[FEMP] Federal Energy Management Program. 2015. *M&V Guidelines: Measurement & Verification for Performance-Based Contracts, Version 4.0.* Washington, DC: Department of Energy, Federal Energy Management Program. energy.gov/sites/prod/files/2016/01/f28/mv_guide_4_0.pdf

ADVANCED ENERGY ECONOMY

the business voice of advanced energy

May 25, 2016

Joel H. Peck, Clerk
State Corporation Commission
Document Control Center
P.O. Box 2118
Richmond, Virginia 23218

RE: PUE-2016-00022, Ex Parte: In the matter of receiving input for evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures

Dear Mr. Peck,

Advanced Energy Economy ("AEE") appreciates this opportunity to provide information and input to the State Corporation Commission of Virginia ("SCC" or "Commission") on issues related to energy efficiency and evaluation, measurement, and verification ("EM&V"). Specifically, the following comments are in response to SCC Scheduling Order dated March 30, 2016 (Case No. PUE-2016-00022).

AEE comments are guided by two principles:

- SCC should adopt procedures that accurately reflect the contributions to cost-effective, reliable operation of the electricity system of all resources, including energy efficiency. Energy efficiency provides cost savings for ratepayers, enhances grid reliability, and is generally the least-cost resource for meeting new energy demand. An accurate and transparent measurement of these contributions is essential to providing a reliable basis for SCC decision-making.

- SCC should rely on well-established industry best practices rather than pursue individualized approaches for the Commonwealth. EM&V for demand side energy efficiency is a well-established field of analysis that has demonstrated itself to be a reliable basis for decision-making in myriad jurisdictions since the 1980s. In addition to well-established best practices, EM&V protocols also continue to evolve in response to continued innovation in analytics and information technology that drives cost reduction.

Specifically, these comments respond to the identified objectives for this case, including questions on benefit-cost analyses. AEE focuses its response on the issues raised in the SCC's Order, but also provides context for the significant opportunity for energy efficiency within the Commonwealth.[1]

About AEE

AEE is a national association of businesses making the energy we use secure, clean, and affordable. AEE also leads a State Coalition consisting of 15 partner organizations active in 26 states across the

[1] State Corporation Commission, Case No. PUE-2016-00022

country and representing more than 1,000 companies and organizations. Nationwide, the advanced energy industry AEE represents generates $200 billion in annual revenue, on par with the pharmaceutical industry, and employs an estimated 2.7 million workers, as many as grocery stores and supermarkets.[2,3]

Thanks to technological advances and innovation, we now have more options for meeting our energy needs than ever before in history. We call these options "advanced energy." Technology areas represented include energy efficiency, demand response, natural gas, wind, solar, smart grid, nuclear power, and advanced transportation systems. Used together, these technologies and services will create and maintain a higher-performing energy system—one that is reliable and resilient, diverse, cost-effective, and clean—while also empowering customers with new and better energy products and services.

As the least-cost resource energy resource in the Commonwealth, energy efficiency benefits Virginia and its ratepayers.

AEE strongly supports initiatives to level the playing field for energy efficiency in Virginia as a cost-effective means to reduce consumer costs, enhance grid reliability, and meet new demand. Energy efficiency is generally the least-cost option for meeting electricity needs today. One independent financial advisory firm estimated a levelized cost of energy (LCOE) for energy efficiency between zero and $50/MWh.[4] Similarly, the Lawrence Berkeley National Laboratory (LBNL) recently estimated that the U.S. average "total cost of saved energy" by customer-funded utility energy efficiency programs across all sectors is $46/MWh (or $0.046/kWh), based on an analysis of programs in 20 states from 2009-2013.[5] In comparison, the average price of electricity in Virginia is $92.70/MWh (or $0.0927/kWh).[6] In addition to these national studies, a study by the American Council for an Energy-Efficiency Economy (ACEEE), which focused on Virginia, found that "energy efficiency and demand response are the least-cost resources available to meet...growing demand and the quickest to deploy for near-term impacts."[7]

In addition to often being the least-cost energy resource, energy efficiency provides other benefits in the form of enhanced reliability and lower consumer bills. By lowering energy use through efficiency, consumers and businesses lower their electric bills. Increased energy efficiency directly helps participants of efficiency programs by lowering bills. Efficiency measures also reduces the price of energy for all consumers, thus indirectly benefiting non-participants. This energy price suppression is

---

[2] Navigant Research for AEE, *Advanced Energy Now Market Report 2016*, available at http://info.aee.net/aen-2016-market-report.

[3] http://blog.aee.net/at-2.7-million-jobs-nationwide-advanced-energy-is-a-major-employer-as-well-as-200-billion-market-force.

[4] Lazard, *Levelized Cost of Energy Analysis 9.0* (November 2015). Available at https://www.lazard.com/media/2390/lazards-levelized-cost-of-energy-analysis-90.pdf

[5] Lawrence Berkeley National Laboratory, *The Total Cost of Saving Electricity through Utility Customer-Funded Energy Efficiency Programs*, p. 11 (April 2015), *available at* https://emp.lbl.gov/sites/all/files/total-cost-of-saved-energy.pdf; Advanced Energy Economy Institute, *Competitiveness or Renewable Energy and Energy Efficiency in U.S. Markets*, p. 13.

[6] AEE Powersuite

[7] American Council for an Energy-Efficient Economy, *Energizing Virginia: Efficiency First* (September 2008), available at https://dmme.virginia.gov/DE/LinkDocuments/GEC/Energizing_VA_EfficiencyFirst_ACEEE_September2008.pdf

known as the Demand Reduction Induced Price Effect (DRIPE).[8] When deployed strategically, energy efficiency can also help Virginia avoid investment in more expensive generating capacity that would increase bills and rates for all ratepayers. These technologies also help to improve reliability by slowing load growth and reducing peak demand, helping the Commonwealth achieve its policy objective of energy independence under the Virginia Energy Plan.[9]

Investment in energy efficiency also presents an economic opportunity for Virginia. AEE has been tracking revenue in the global and national advanced energy industry since 2011. In 2014, energy efficiency took the lead as the largest segment of that industry in the United States, generating $60.1 billion in revenue.[10] In 2015, the U.S. building efficiency market continued to grow, generating $63.5 billion in revenue.[11] According to a recent national jobs survey, energy efficiency employs 1.9 million workers in the United States.[12] Current projections show that Virginia utilities can create thousands of temporary and permanent jobs in energy efficiency over the next 15 years. Increased investment can create additional employment opportunities, as well.[13]

Because of its untapped energy efficiency resource potential, Virginia is well-positioned to tap into this large and growing energy efficiency industry. Virginia currently ranks higher than other Southeastern states for energy efficiency potential due to its relatively modest existing efficiency programs, older building stock, and a conventional regulatory structure, which can undervalue efficiency programs and fail to provide full recognition of the potential of this resource.[14] Compared to other states, the Commonwealth lags behind other states in terms of investment in efficiency. Electric utilities in states such as Arkansas, Indiana, Kentucky, Texas, and West Virginia all invest more in energy efficiency as a percentage of utility revenue than the Commonwealth. Furthermore, each of these states have lower electricity rates.[15] Given that similar states are investing more in energy efficiency while keeping rates low, Virginia has the capacity to increase energy efficiency with little to no increase in rates.

The SCC can rely on existing, well-established EM&V practices when formulating its own approach to EM&V for energy efficiency.

EM&V is a well-developed field of analysis consisting of many firms, private companies, and hundreds of practitioners; supported by a rich pool of technical resources, professional organizations, training, and

---

[8] American Council for an Energy-Efficiency Economy Summer Study for Energy Efficiency Buildings, Paul Chernick, Resource Insight Inc., "Price Effects as a Benefit of Energy-Efficiency Programs (2014)." Available at http://aceee.org/files/proceedings/2014/data/papers/5-1047.pdf

[9] Title 67. Virginia Energy Plan, Chapter 1. Energy Policy of the Commonwealth, § 67-101.

[10] Advanced Energy Economy, *Advanced Energy Now 2015 Market Report* (March 2015). Available at http://info.aee.net/aen-2015-market-report, p. 29.

[11] Advanced Energy Economy, *Advanced Energy Now 2016 Market Report* (March 2016). Available at http://info.aee.net/aen-2016-market-report, p. 43.

[12] http://blog.aee.net/at-2.7-million-jobs-nationwide-advanced-energy-is-a-major-employer-as-well-as-200-billion-market-force

[13] Meisters Consultants Group, Inc., *Assessing Virginia's Energy Future* (April 2015). Available at http://info.aee.net/virginia-energy-future

[14] Synapse Energy Economics, *Regulatory Policies to Support Energy Efficiency in Virginia* (October 2014). Available at http://www.synapse-energy.com/sites/default/files/Regulatory%20Policies%20to%20Support%20Energy%20Efficiency%20in%20Virginia%2014-110.pdf

[15] Energy Information Administration, Form 861; AEE Powersuite

certification programs; and based on 30 years of experience. Numerous government entities and private customers rely on EM&V results and best practices to verify cost and energy savings, and to meet a variety of statutory, regulatory, and legal requirements, including carbon reduction and prudent use of ratepayer dollars.[16]

The EM&V industry has demonstrated that these best practices are a reliable basis for decision making, guiding the investment of billions of dollars annually in both public and private funds. Utilities and governmental agencies have been operating energy efficiency programs subject to EM&V since the mid-1980s.[17] Policymakers rely on EM&V for these programs and resource planning proceedings throughout the country rely upon estimates from energy efficiency EM&V studies to inform power procurement and transmission planning activities involving multiple billions of dollars each year.[18] The Energy Service Company (ESCO) industry in the U.S. transacts roughly $6 billion annually (generating an estimated 34 TWh of savings in 2012)[19] using contractual agreements between parties that rely on existing EM&V industry best practices.[20,21]

In addition to being a reliable basis for public and private decision-making, current best practices also successfully avoid many sources of potential bias. EM&V practitioners are accustomed to regulatory environments that require the need to avoid real or perceived conflicts of interest, potential double-counting of energy savings between or within jurisdictions, and other sources of potential bias.

As stated, there are currently reliable, trustworthy, and well established EM&V protocols. Additionally, there is continued innovation in EM&V to provide for further cost reductions.[22] The industry is currently providing innovative solutions in the form of "EM&V 2.0" tools. EM&V 2.0 is automating measurement approaches that were previously completed manually, thereby reducing costs and allowing utilities and evaluators to recognize savings data in near real-time and speed up the evaluation timeline.

EM&V 2.0 is allowing utilities to understand the performance of their programs continuously, as opposed to waiting for an ex-post report. As was recently reported by the Northeast Energy Efficiency Partnership's EM&V Forum, "Estimated savings reductions from automated consumption data analysis

---

[16] For example, in 2009, ten Northeastern and Mid-Atlantic states began the Regional Greenhouse Gas Initiative (known as RGGI), the country's first market-based program to reduce emissions of carbon dioxide (CO2) from power plants. RGGI states account for one-sixth of the population in the US and one-fifth of the nation's gross domestic product. See: Hibbard, Paul et al., "The Economic Impacts of the Regional Greenhouse Gas Initiative on Ten Northeast and Mid- Atlantic States: Review of the Use of RGGI Auction Proceeds from the First Three-Year Compliance Period," (Nov,15, 2011), Analysis Group. http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/economic_impact_rggi_report.pdf, and Hibbard, Paul et al., "The Economic Impacts of the Regional Greenhouse Gas Initiative on Nine Northeast and Mid-Atlantic States: Review of RGGIS's Second Three-Year Compliance Period (2012-2014)," (July 14, 2015), Analysis Group. http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis_group_rggi_report_july_2015.pdf

[17] See for example California Measurement Advisory Committee, and its predecessor organization, California Demand-Side Management Advisory Council. http://www.calmac.org

[18] See for example, California Energy Commission, 2015 Integrated Energy Policy Report (IEPR) revised demand forecast, committed energy efficiency savings and Additional Achievable Energy Efficiency (AAEE) analysis. https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=15-IEPR-03

[19] Juan Pablo Carvallo, Peter H. Larsen, Charles A. Goldman. Estimating Customer Electricity savings from Projects Installed by the U.S. ESCO Industry. Lawrence Berkeley National Laboratory. 2014.

[20] https://emp.lbl.gov/sites/all/files/lbnl-6877e_0.pdf. Information on the ESCO industry is available from Lawrence Berkeley National Laboratory (LBNL) at: https://emp.lbl.gov/projects/energy-saving-performance

[21] See also: National Association of Energy Service Companies. http://www.naesco.org/what-is-an-esco

[22] https://www4.eere.energy.gov/seeaction/system/files/documents/seeaction_emv_blueprint_052311_0.pdf

can provide rapid feedback to programs whether or not this analysis is used as the final evaluated savings." By allowing utilities to understand program performance throughout the course of the program year, utilities essentially measure-as-you-go. This innovation adds value for utilities, customers and evaluators.

Additionally, EM&V 2.0 has the potential to reduce the costs associated with EM&V. According to a recent report by ACEEE, EM&V 2.0 tools can "...perform more accurate and timely EM&V at a lower cost. For one thing, remote automated data gathering is likely to be less expensive than traditional onsite inspection. This means that either the overall cost of EM&V can be reduced or higher-quality EM&V can be accomplished within a given budget. For example, information can be collected over longer periods of time to track the persistence as well as the volume of savings. And since [EM&V 2.0] can be scaled quickly, it can evaluate more projects and more programs with marginal incremental costs."[23]

I. To address uniform protocols for energy efficiency measures, the SCC should adopt best practices in the industry that recognize different approaches to technologies, such as the Uniform Methods Project, as well as continued innovation that drives further cost reduction.

AEE recommends that the SCC adopts an approach towards efficiency that recognizes different approaches to technologies as well as rate classes. The Commission should establish a broad set of protocols for measures of technologies such as heating, ventilation, and air condition (HVAC), lighting, insulation, windows, demand response, combined heat and power, waste heat and power, and transmission and distributed efficiency.

As the SCC attempts to identify best practices throughout the industry, the best existing resource is the U.S. Department of Energy's Uniform Methods Project (UMP), which offers a solid foundation to account for a variety of efficiency technologies for EM&V measures. The UMP protocols are based on best practices in use today, and are aligned with other government efforts that require accurate EM&V, such as the Clean Power Plan. These protocols are well-understood by industry and professionals allowing for easier compliance. Additionally, the UMP protocols can be adapted for a Virginia-specific market that can work for all stakeholders.

The state of Arkansas provides an illustrative example on uniform protocols for EM&V. All investor-owned utilities are subject to the same protocols, including both natural gas and electric utilities. Each utility contracts with an independent evaluator to review EM&V for efficiency programs. The Arkansas Public Service Commission (PSC) then works with its own independent evaluator to certify the cost of programs and annual savings. The resulting report provides clarity to utilities on the value of efficiency programs on an annual basis. This process allows for examination of prior year targets and current annual savings and costs. The PSC and its evaluator can then send recommendations to utilities on how to improve future programs.

AEE also believes that deemed savings can provide an affordable and simple method for calculating savings from projects and programs. Deemed savings were developed to simplify measurement, lower costs and reduce risk for utilities tasked with delivering savings through demand side management

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

programs. We recommend the Commission develop robust protocols to ensure that deemed savings are based on studies of actual savings and results that are Virginia-specific.

The Commission should also develop a protocol for public comment to update deemed savings values. As part of the public input process, the SCC should base deemed savings on local data that is updated regularly. Similarly, the Commission should require customizing the regional Technical Reference Manual currently in use in the Commonwealth to more accurately reflect local conditions and local weather normalization data specific to Virginia, for more accurate and precise savings calculations. The Commission may use savings values from other states, if necessary, but should ensure that these values are from states with similar population characteristics, housing characteristics, and climate. The Commission should attempt to limit the use of out of state deemed savings values and update any out of state values with studies completed with actual Virginia data as quickly as possible. Under the correct circumstances, deemed savings is an appropriate approach for EM&V.

Separately, AEE recommends that the Commission adopt EM&V protocols that are based on analysis of actual usage whenever practicable. New techniques like software and data analytics are providing cost reductions in EM&V. A billing analysis involves analyzing usage data from premises before and after the installation of measures, normalizing that data (based on weather and other exogenous changes) and calculating the savings. Billing analysis approaches are currently used in specific programs in several states and are being codified as the primary practice for many programs in California. Furthermore, the Commission, customers and utilities can benefit from using billing analysis, since it allows savings to be measured at the meter and can more accurately reflect customer experience with programs. The results of billing analysis reports completed in Virginia, from EM&V 2.0 or traditional methods, should also provide the basis for deemed savings values used in the state.

II. The Commission should adopt a methodology that measures the results of energy efficiency at the portfolio level and in the aggregate, not at the household level.

Any methodology adopted by the Commission should measure the results of energy efficiency at the portfolio level, rather than measure by measure, or even program by program. For example, programs for low income families may be less cost effective, but they should be allowed as part of an overall portfolio of programs that is cost effective. If the SCC does not measure efficiency at the portfolio level, the Commission should review at the program level. As part of this process, it is important that Virginia forecasts estimated savings with a high degree of accuracy.

Following comments above, AEE believes billing analysis can be used to inform use of deemed savings as a methodology for estimating kilowatt hour savings for efficiency measures. Some of the most rigorous methodologies measure savings in aggregate, rather than at the household level. AEE does not recommend that household-level savings be required, since that will lead to estimates instead of actual measurements. For example, residential behavioral energy efficiency measured with a randomized control trial provides aggregate savings, not household level. The best resource for this are the UMP protocols.[24]

[24] http://energy.gov/sites/prod/files/2015/02/f19/UMPChapter17-residential-behavior.pdf

III. The SCC should use industry benchmark values for levelized cost of energy as a guide and reference when evaluating energy efficiency resources and alternative generation resources.

The Commission should use industry benchmark values for levelized cost of energy as a guide and reference for an appropriate comparison between energy efficiency resources, and the alternative of generating power. Several of those benchmarks are cited above, e.g. NREL, ACEEE, and Lazard & Co. These benchmarks can be used for general planning and priority-setting. They should not, however, be used for evaluating cost effectiveness.

When calculating the cost of saved energy specific to Virginia ratepayer-funded programs, we encourage the Commission to follow industry best practices that provide a fair analysis of efficiency as a least-cost resource. As noted above, several studies conducted by reputable organizations like Lazard and ACEEE demonstrate that efficiency is the lowest cost resource available to Virginia. Furthermore, since Virginia lags behind other states in investment in efficiency, the Commonwealth can likely benefit from efficiency opportunities with small payback periods because of the existing pool of untapped resources.

While AEE believes that Cost of Saved Energy is a good analytical metric, it is only one input to a robust cost effectiveness testing methodology, which should consider a range of costs and benefits, such as long-term impacts on avoided costs for transmission and distribution. AEE would welcome the opportunity to participate more fully in helping define a sound approach to cost effectiveness testing approach.

IV. The SCC should apply cost-effectiveness tests equally across Virginia and utility service areas as well as improve the application of these tests.

In response to the SCC's comment on cost benefit analyses, the application of cost effectiveness tests should be applied equally across the Commonwealth and across various utility service territories. Additionally, the application of cost effectiveness tests can be improved. For example, AEE believes that the Ratepayer Impact Measure (RIM) test and Total Resource Cost (TRC) test can be improved to expand the market in Virginia. First, the RIM test does not provide utilities and regulators with specific information needed to assess rate and equity impacts. The RIM test specifically assesses the lowest *rates*, rather than the lowest *cost*. Therefore, an energy efficiency program may lower the overall bill for a Virginia customer compared to a situation where there is no energy efficiency program, but be rejected because of an increase in rates. Although this is a simplification, it is less expensive to buy 4 KWh at $0.08/kwh than 5 KWh/at $0.07/KWh, and energy efficiency results in fewer KWh being purchased. We believe that Virginia can benefit from a more comprehensive analysis on the impact of rate vs. *bill* impacts from efficiency programs.

The TRC test can also be improved by including non-energy benefits in the determination. As referenced, the Arkansas PSC recently approved the inclusion of non-energy benefits within the TRC stating that it

> "more accurately recognizes a portion of the value of [energy efficiency] programs to the subset of ratepayers that participate in [energy efficiency] programs, for the purpose of ensuring that

> ratepayers in the aggregate neither overpay for, nor are deprived of, cost-effective resources. In this regard, accurate inclusion of [non-energy benefits] within the TRC promotes, rather than erodes, the benefit of ratepayers in the aggregate."

In assessing aggregate ratepayer benefits, the Arkansas PSC also found that "benefits include reductions in the cost of service that benefit program participants and non-participants alike, such as the reduced total cost of fuel, reduced fuel prices, deferred capacity acquisition, avoided line losses and the deferred need for transmission and distribution infrastructure."[25,26]

AEE also recommends that the Commission study the Resource Value Framework (RVF) as a tool for cost-effectiveness screening. The RVF was developed as a part of the National Efficiency Screening Project (NESP), a group of organization and individuals that are working together to improve the way that electricity and natural gas energy efficiency resources are screened for cost-effectiveness. The NESP recommends that all states use the RVF for developing and implementing cost-effectiveness tests. The RVF can benefit Virginia's cost benefit analyses by providing transparency into the valuation of energy efficiency programs so the Commission, utilities, and other stakeholders are aware of what variables are considered in the determination of approving efficiency programs. The RVF is not a single cost-effectiveness screening test; rather, it provides a framework of principles and recommendations designed to provide flexibility to Virginia's specific needs, interests, and policy goals.[27]

How to Realize Virginia's Energy Efficiency Potential

Efficiency can and should be an essential component of the Virginia Energy Plan. Establishing accurate and reliable EM&V protocols for energy efficiency is an essential first step towards tapping Virginia's energy efficiency potential. AEE supports SCC's efforts to go beyond the statutory requirement of exploring EM&V approaches, broadening the scope to other measurements of energy efficiency such as LCOE. In keeping with this intent, AEE recommends that SCC consider other opportunities to realize the benefits of energy efficiency. These opportunities include revenue decoupling, performance incentives, and stronger cost-effectiveness testing. Proper EM&V protocols will support these other initiatives and AEE believes that SCC should consider them as it considers EM&V.

As a result, AEE recommends that the SCC take under review full revenue decoupling for electric utilities. A full revenue decoupling mechanism would allow utilities to recover authorized revenues and would remove the utility bias towards higher volumetric electricity sales, and thus remove any disincentive to invest in energy efficiency. This policy would also align with other state policy goals, including the voluntary EERS program and the Governor's stated goal of reducing retail electricity consumption 10% by 2019. A series of utility case studies by ACEEE, which involved several interviews with utility representatives, found that decoupling (along with other supportive regulatory frameworks such as energy efficiency shareholder performance incentives and energy savings targets)

---

[25] Arkansas Public Service Commission, Docket No. 13-002-U, Order No. 30

[26] The Arkansas PSC also determined energy efficiency programs benefit both program participants and non-participants over the long run when programs are properly designed and screened for cost-effectiveness. Doc. No. 06-004-U, Order No. 12 at 32.

[27] For more information see The National Efficiency Screening Project, *The Resource Value Framework: Reforming Energy Efficiency Cost-Effectiveness Screening* (August 2014), available at http://www.homeperformance.org/sites/default/files/nhpc_nesp-recommendations_20140816.pdf.

elevated the role of energy efficiency within the utility business models.[28] Particularly since natural gas utilities in Virginia already have revenue decoupling, AEE recommends that the SCC review the impacts of decoupling for electric utilities.

Additionally, AEE supports the consideration of a performance incentive mechanism. While decoupling removes inherent disincentives to investment in advanced energy, it does not provide a positive incentive to utilities to invest in least-cost resources such as efficiency and demand response. As such, a decoupling mechanism, which leaves utilities neutral to any decrease in throughput, can be complemented by performance incentive mechanisms to provide utilities with an additional incentive to pursue investment in these technologies, or in technologies that enable their deployment by customers.

Strong cost-effectiveness screening can also support a robust market for energy efficiency in Virginia. Our comments will address each test in full below, but we provide an overview here. In general, AEE believes that energy efficiency programs should be evaluated on both their costs to be deployed and on the full spectrum of benefits received by the electric system from increased energy efficiency. Energy efficiency service providers have identified the absence of a clear and robust cost-effectiveness framework as a regulatory barrier impeding investment in efficiency in the Commonwealth. For example, AEE supports the inclusion of non-energy benefits such as reduced total cost of fuel, reduced fuel prices, deferred capacity acquisition, avoided line loss and the deferred need for transmission and distribution infrastructure, as other states have pursued.[29]

Conclusion

AEE appreciates the opportunity to provide information and input to the SCC on issues related to energy efficiency and EM&V. We look forward to participating in the important dialogue initiated by the SCC about energy efficiency in Virginia. AEE and our member companies would also welcome an opportunity to comment at the public session on July 12, 2016.

If you have any questions or need additional information, please contact:

Dylan Reed
Advanced Energy Economy
Email: dreed@aee.net
Mobile: 570.877.3549

[28] *See* York et al. 2013. *Making the Business Case for Energy Efficiency: Case Studies for Supportive Regulation.* http://aceee.org/research-report/u133

[29] Arkansas Public Service Commission, Docket No. 13-002-U, Order No. 30

American Electric Power
[illegible]
Richmond, Virginia [illegible]
[illegible]

May 25, 2016

BY ELECTRONIC FILING

Noelle J. Coates
Senior Counsel - Regulatory Services
(804) 698-5541 (P)
(804) 698-5526 (F)
njcoates@aep.com

Hon. Joel H. Peck, Clerk
State Corporation Commission
Document Control Center
Tyler Building, First Floor
1300 E. Main Street
Richmond, VA 23219

In Re Commonwealth of Virginia,
State Corporation Commission
Ex Parte: In the matter of evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures
Case No. PUE-2016-00022

Dear Mr. Peck:

Pursuant to paragraph 5 of the Commission's March 30, 2016, Scheduling Order in this docket, please find attached for filing the Comments of Appalachian Power Company.

Very truly yours,

Noelle J. Coates

Enclosures

cc: Service List

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION

In Re Commonwealth of Virginia, State Corporation Commission Ex Parte: In the matter of evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures	))))))	**Case No. PUE-2016-00022**

COMMENTS OF APPALACHIAN POWER COMPANY

On March 31, 2016, the State Corporation Commission issued a Scheduling Order that sought the input from interested persons and entities prior to submitting its report of findings and recommendations to the Governor and General Assembly regarding "the establishment of uniform protocols for measuring, verifying, validating, and reporting the impacts of energy efficiency measures implemented by investor-owned electric utilities providing retail electric utility service in the Commonwealth and the establishment of a methodology for estimating annual kilowatt savings and a formula to calculate the levelized cost of saved energy for such energy efficiency measures," as required by legislation enacted during the 2016 General Assembly session.[1] Pursuant to Paragraph 5 Scheduling Order, please find attached for filing the Comments of Appalachian Power Company ("APCo" or the "Company").

A. Uniform protocols for measuring, verifying, validating and reporting the impacts of energy efficiency measures

The establishment of uniform protocols for Evaluation, Measurement and Verification ("EM&V"), as well as for reporting of program energy and demand impacts, would be an effective means to evaluate the overall effectiveness of energy efficiency and demand response programs. Uniform EM&V Protocols would provide a common framework and set of reference

[1] 2016 Va. Acts Ch. 255

points for conducting cost-effective impact and process evaluation of Demand Side Management ("DSM") Programs. Among other things, these protocols should describe the types of information that must be collected in order to conduct a comprehensive examination of a program's overall effectiveness, the recommended frequency for conducting these program evaluations, and the key metrics that must be reported during evaluation activities.

The ideal method to develop robust uniform protocols for EM&V and reporting is to develop a Virginia-specific Technical Reference Manual ("TRM"). With a TRM, the savings from many energy efficiency measures can be estimated reliably, within a level of confidence, through engineering algorithms. TRMs typically include "deemed savings" for these energy efficiency measures using two methods: deemed and partially deemed. Deemed measures are fairly straightforward calculations with stipulated savings values and/or inputs to engineering algorithms. Partially deemed measures require measurement or quantification of some key inputs to the engineering algorithms used to calculate energy and demand savings. The use of deemed and partially deemed savings calculations is a standard approach in the energy efficiency industry for non-custom measures. In addition, a robust TRM should also describe methodologies and formulae for the calculation of savings for "custom" measures where more rigorous calculations are necessary. In general, these more complex measures require site-specific information to determine energy and demand savings with the projects being confirmed with field verification.

Rather than developing a state-specific TRM, a more cost effective method might be to review TRMs already adopted by other states. The Commission could consider such TRMs for adoption, perhaps with some modification, for the utilities in Virginia. There are known prior

instances of this, including the adoption of the Arkansas TRM by the states of Louisiana and Mississippi.

Adopting a TRM would require periodic updates to capture any needed changes to savings calculations or processes and procedures. Nevertheless, having these established uniform EM&V protocols would provide needed guidance to utilities, the Commission and other stakeholders to provide a structured yet robust reporting of energy efficiency program effectiveness and potentially lowering the cost of EM&V activities. However, care should be taken to ensure such protocols are not overly burdensome and difficult to implement. Protocols should, to the extent possible, be streamlined, well defined and straightforward to reduce uncertainty with program savings calculations. Trying to capture marginal increased certainty of program savings / impacts (over acceptable levels of confidence), for example, would unnecessarily increase evaluation costs. Additional evaluation costs could push a program that would otherwise be cost-effective to a ratio that would not pass the cost-effectiveness standards.

B. <u>A methodology for estimating annual kilowatt savings for such energy efficiency measures</u>

The Company currently utilizes the Mid-Atlantic TRM for its Virginia programs as the basis for determining, whenever possible, energy and demand impacts resulting from DSM programs. All EM&V activities and results are coordinated by an independent third party evaluation contractor on behalf of the Company. Although the Mid-Atlantic TRM is a regional TRM, it provides a good proxy to determine baseline conditions and the impacts associated with the installation of a variety of basic energy efficiency measures in Virginia.

However, the depth of the Mid-Atlantic TRM, as it relates to the deemed savings estimates as well as formulae for more complex energy efficiency measures, is lacking. This is particularly true with measures for the commercial and industrial class customers. As an

example, there are no deemed savings estimates or formulae available for high efficiency motors, variable frequency drives (except for a limited purpose for Heating, Ventilation and Air Conditioning ("HVAC") applications), or any type of custom energy efficiency projects. The measure chapters included in the Mid-Atlantic TRM are comprised of deemed savings for simplistic measures, lacking custom measure protocols in entirety.

Thus, the development of a Virginia-specific TRM, or the adoption of a robust TRM currently in place in another state, would simplify the EM&V process, provide more certainty to the utilities and the Commission related to EM&V results, aid in the development of new programs, and could ultimately lower the overall cost of evaluation activities. This strategy would simplify, and in fact enhance, program evaluation efforts and quantify predictable, yet reliable (within a reasonable level of confidence), energy savings estimates for a wide variety of energy efficiency measures.

If such an alternative TRM were to be adopted, the following criteria should be examined when assessing best-fit for Virginia:

1) The adopted TRM should contain a broad measure list, inclusive of fully-deemed savings, partially-deemed protocols, and descriptions of custom protocols for non-standard measures.
2) The adopted TRM would ideally contain both electric and natural gas savings, so as to allow for all utilities in Virginia to use the same source for program savings (in accordance with the Commission's intent in the Scheduling Order to address both fuels through this process).
3) The adopted TRM should contain protocols pertaining to the timing, depth, and need of impact and process evaluations.
4) To the extent possible, the TRM should align with Virginia weather zones.

There are several protocols that can be utilized to inform and help guide the development of a TRM. Two of the more common and widely utilized protocols are described below.

i. Example Protocol #1 – IPMVP

The International Performance Measurement and Verification Protocol ("IPMVP") is an important and widely used guidance document for determining the level of effort required to conduct EM&V studies. These protocols are project-level, and are an internationally-recognized and accepted set of procedures for the calculation of energy and demand savings from custom projects. The IPMVP provides guidelines about the "level of effort" required to document energy efficiency savings. The IPMVP presents various EM&V options that help guide savings verification methods and levels of effort.

Additional information related to the IPMVP Protocol options can be found at http://evo-world.org/en/

ii. Example Protocol # 2 – Uniform Methods Project

Another protocol, which expands on the IPMVP protocol described above, is the Uniform Methods Project ("UMP") protocol. This protocol, which is being developed in conjunction with the U.S. Department of Energy, adds detail to the IPMVP protocol to describe specific procedures for application to program and portfolio level evaluations. The two sets of protocols are cohesive and complimentary insomuch as UMP chapters reference IPMVP guidelines for project-level analysis, while adding further detail on how the IPMVP is applied to program or portfolio evaluation.

The UMP is a work in progress with additional protocols being developed over time.

More information related to the Uniform Methods Project can be found at http://energy.gov/eere/about-us/ump-home

C. A formula to calculate the levelized cost of saved energy, as well as defining the inputs for such formula, for energy efficiency programs

The levelized cost of saved energy (LCOSE) can be calculated using the formula below. For the purpose of clarity, the inputs defined below assume calculations for the LCOSE for a hypothetical utility energy efficiency program implemented in the year 2016.

Levelized cost of saved energy algorithm

$$\text{Capital Recovery Factor} = \frac{A \times ((1 + A)^B)}{((1 + A)^B) - 1)}$$

$$\text{LCOSE} = \frac{(C \times \text{Capital Recovery Factor})}{D}$$

Where:

A = The Utility's Weighted Average Cost of Capital (WACC) for 2016

B = Estimated Program Measure Life in Years (the weighted average measure life for all measures included in the specific 2016 energy efficiency program)

C = Total Direct Program Costs incurred during 2016, excluding net lost revenues and margins

D = Annual kWh saved in 2016 for this specific energy efficiency program

The following provides a specific example of how LCOSE should be calculated:

Assumptions:

Total 2016 costs for a specific DSM Program = $1,500,000

- Includes program delivery, marketing, utility administration, customer incentives and evaluation costs

Total 2016 kWh savings from this program = 5,000,000 kWh

Discount rate (utility 2016 WACC) = 7%

Estimated program measure life = 10 years

- Weighted average measure life of measures installed for this program in 2016

$$\text{Capital Recovery Factor (CRF)} = \frac{0.07 \times ((1 + 0.07)^{10})}{((1 + 0.07)^{10}) - 1} = 0.1424$$

$$\text{LCOSE} = \frac{(\$1{,}500{,}000 \times 0.1424)}{5{,}000{,}000 \text{ kWh}} = \textit{\$0.0427/kWh}$$

The LCOSE, ostensibly a way to compare energy efficiency programs to each other or even to compare energy efficiency programs to other resource options, has limitations that, if not appreciated, could lead to incorrect conclusions. Primarily, this metric does not give credit to, or differentiate programs or generation resources on the capacity value they have. If two resources have the same levelized cost, but one is simultaneously meeting peak demand requirements (or reducing peak demand requirements) and one is not, which one is more economic? It is this omission of a primary component of value that diminishes the utility of this metric.

D. Whether the application of costs and benefits is consistent across utilities

It is reasonable and helpful to the Commission, as well as all interested stakeholders, that cost benefit tests are calculated consistently by all utilities. The Company applies the four cost benefits tests required by the Commission; the Total Resource Cost Test (non-Societal), Utility Cost Test, Ratepayer Impact Test, and Participant Test using the California Standard Practice Manual as its guide. The utilization of the California Standard Practice Manual, and its definitions of the four cost benefit tests, is industry standard. Although the Company does not have any specific examples of whether or not the application of costs and benefits are consistent across utilities, the lack of uniform EM&V protocols would suggest there could be differences in how utilities approach EM&V efforts.

E. Whether consistent application of costs and benefits across utilities is necessary or reasonable

The Company does not support the use of the same costs and benefits across utilities. For example, data specific to a particular utility such as avoided energy and capacity costs, weighted

average cost of capital, and revenues should be utilized to make resource decisions as significantly different circumstances among utilities will likely exist.

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

With any evaluation, there is a level of risk that estimations of energy savings are inaccurate. However, there also are different levels of acceptable margin of error, sometimes referred to as level of confidence in statistical analyses. Well established and uniform protocols would help manage the risk of inaccuracy and reduce the margin of error by specifying the information and data required to properly document and calculate savings. Some of the primary benefits of EM&V activities are to determine whether a program is cost effective, whether existing program design can be modified to further improve cost effectiveness, or whether a program should continue at all. The EM&V process, in itself, doesn't impact the benefits that participants and other ratepayers realize as the result of the energy efficiency program's existence.

It should be noted that good EM&V practices relates to the level of effort required to obtain meaningful results while, at the same time, managing program evaluation costs. It is very important to consider the costs associated with obtaining additional, incremental information to develop more precise estimates of program impacts with the incremental benefits that may be realized, if any. This goal is best-served through the focusing of EM&V effort and expenditure of areas requiring additional monitoring but with higher impact. Having comprehensive deemed savings for low-risk, predictable measures would minimize program evaluators time and expense to allow more focused and enhanced efforts on areas that require more site specific data retrieval and after the fact analysis (such as custom measures for large commercial and industrial customers).

The Company would urge caution with defining any enhanced EM&V protocols that could provide additional uncertainty related to overall program impacts, increase costs, provide marginal increased certainty over acceptable levels of confidence, and/or be overly burdensome to implement.

Respectfully submitted,

APPALACHIAN POWER COMPANY

By _____
Counsel

May 25, 2015

James R. Bacha (VSB #74536)
Hector Garcia (VSB # 48304)
AMERICAN ELECTRIC POWER SERVICE CORPORATION
1 Riverside Plaza
Columbus, Ohio 43215
Tel: 614-716-3410; Fax: 614-716-1613
jrbacha@aep.com
hgarcia1@aep.com

Noelle J. Coates (VSB #73578)
AMERICAN ELECTRIC POWER SERVICE CORPORATION
3 James Center
1051 E Cary St., Suite 1100
Richmond, Virginia 23219
Tel: 804-698-5541
njcoates@aep.com

Counsel for Appalachian Power Company

160550069

CERTIFICATE OF SERVICE

I hereby certify that on this 25th day of May 2016 a true copy of the foregoing Comments of Appalachian Power Company as delivered by hand or mailed, first-class, postage prepaid, to the following:

Ashley B. Macko, Esq.
K. Beth Clowers, Esq.
State Corporation Commission
Tyler Building, 10th Floor
1300 E. Main Street
Richmond, Virginia 23219

C. Meade Browder, Jr., Esq.
Division of Consumer Counsel
Office of Attorney General
202 North Ninth Street
Richmond, Virginia 23219

Rodney Dickens
Allegheny Power
800 Cabin Hill Drive
Greensburg, Pennsylvania 15601

William K. Castle
Appalachian Power Company
1051 E Cary Street, Suite 1100
Richmond, Virginia 23219

John Ebert
Appalachian Natural Gas
P O Box 2543
Abingdon, Virginia 24212

Kevin Akers
Atmos Energy Corporation
801 Crescent Center Drive
Suite 600
Franklin, Tennessee 37067-6226

James S. Copenhaver
Columbia Gas of Virginia, Inc.
1809 Coyote Drive
Chester, Virginia 23836-2400

Paul Koonce
Dominion Virginia Power
120 Tredegar Street
Richmond, Virginia 23219

Department of Mines, Minerals
1100 Bank Street
Richmond, Virginia 23219

Rick Lovekamp
Kentucky Utilities
P O Box 32030
Louisville, Kentucky 40232

Lonnie Bellar
LG&E Energy Corporation
220 W Main Street
Louisville, Kentucky 40202

John S. D'Orazio
Roanoke Gas Company
P O Box 13007
Roanoke, Virginia 24011

Lance G. Heater
Southwestern Virginia Gas Company
208 Lester Street
Martinsville, Virginia 24112

Robert Duvall
Virginia Natural Gas, Inc.
544 South Independence Blvd
Virginia Beach, Virginia 23452-1104

Adrian Chapman
Washington Gas Light Company
6801 Industrial Rd
Springfield, Virginia 22151

Madria Barnes

From:	msheth@ajw-inc.com
Sent:	Wednesday, May 25, 2016 5:26 PM
To:	PUE_Comments
Subject:	Case Comments Submission for Case # PUE-2016-00022
Importance:	High
Follow Up Flag:	Follow up
Flag Status:	Flagged

The following case comments were submitted online Wednesday, May 25, 2016 **at** 5:25:38 PM

Full Name: Ms. Mona Sheth
Group or Organization: AJW, Inc.
Address Line One: 2200 Wilson Boulevard
Address Line Two: Suite 310
City, State, Zip: Arlington, VA 22201
Email: msheth@ajw-inc.com
Case Number: PUE-2016-00022
Comments: Submitted by Mona Sheth of AJW, Inc. on behalf of the Third-Party Delivered Energy Efficiency Coalition -------- State Corporation Commission Document Control Center P.O. Box 2118 Richmond, Virginia 23218 THE THIRD-PARTY DELIVERED ENERGY EFFICIENCY COALITION'S EVALUATION, MEASUREMENT, AND VERIFICATION (EM&V) COMMENTS ON THE VIRGINIA STATE CORPORATION COMMISSION'S SCHEDULING ORDER I. INTRODUCTION AND BENEFITS OF ENERGY EFFICIENCY The Third-Party Delivered Energy Efficiency (TPDEE) Coalition welcomes the opportunity to submit comments in regards to the State Corporation Commission's (SCC) March 30, 2016 Scheduling Order (Case No. PUE-2016-00022): The Commission will conduct an evaluation to consider the establishment of: (i) uniform protocols for measuring, verifying, validating, and reporting the impacts of energy efficiency measures; (ii) a methodology for estimating annual kilowatt savings for such energy efficiency measures; and (iii) a formula to calculate the levelized cost of saved energy for such energy efficiency measures (collectively, "Objectives"). Energy efficiency is a proven, low-cost means of reducing carbon dioxide (CO2). Through energy efficiency, potentially wasted electricity use can be cost-effectively redeployed to where it can address new or growing demands—thereby eliminating the need for investment in new generation. Energy efficiency also provides many public benefits in addition to reducing greenhouse gases (GHGs). Increased utilization of energy efficiency measures creates jobs across the manufacturing, construction, financial, environmental, energy, and technological supply chains. Additionally, by reducing wasteful energy expenditures, facilities as diverse as hospitals and manufacturing facilities can become more cost-effective, making them more competitive and increasing their ability to sustain and increase budget resources available to hire and retain employees. Because of its untapped energy efficiency resource potential, Virginia is well-positioned to tap into this large and growing energy efficiency industry. Virginia currently ranks higher than other Southeastern states for energy efficiency potential due to its relatively modest existing efficiency programs, older building stock, and a conventional regulatory structure, which can undervalue efficiency programs and fail to provide full recognition of the potential of this resource. The Lawrence Berkeley National Laboratory (LBNL) recently estimated that the U.S. average "total cost of saved energy" by customer-funded utility energy efficiency programs across all sectors is $46/MWh (or $0.046/kWh), based on an analysis of programs in 20 states from 2009-2013. In comparison, the average price of electricity in Virginia is $92.70/MWh (or $0.0927/kWh). Measurement and verification (M&V) methodology varies by necessity

depending on the type of energy efficiency program or project that is being verified. Residential appliance replacement incentives, whole-campus performance contract projects, and industrial process efficiency projects each have well-established, but unique M&V protocols. To provide meaningful support for energy efficiency projects, a state must allow projects to use an accepted M&V protocol that is most appropriate given the nature of the project. The comments below will outline some commonly accepted industry protocols that could be included as part of Virginia's uniform protocols for measuring, verifying, validating, and reporting the impacts of energy efficiency measures. II. BACKGROUND ON THE THIRD-PARTY DELIVERED ENERGY EFFICIENCY COALITION The Third-Party Delivered Energy Efficiency (TPDEE) Coalition welcomes the opportunity to submit comments in regards to the State Corporation Commission's (SCC) March 30, 2016 Scheduling Order (Case No. PUE-2016-00022). The TPDEE Coalition is comprised of three important segments of the market-driven energy efficiency sector: energy service companies (ESCOs), industrial energy efficiency (IEE) entities, and above-code energy efficiency facilitators. The participating ESCOs and organizations include: • AECOM • Ameresco • Energy Systems Group • Honeywell • Ingersoll Rand/Trane • Johnson Controls, Inc. • Schneider Electric • Siemens • United Technologies • National Association of Energy Service Companies (NAESCO). Industrial energy efficiency companies and organizations that provide or promote industrial efficiency activities include: • ABB • Danfoss • Eaton • General Electric • Ingersoll Rand/Trane • Institute for Industrial Productivity • Lutron • National Electrical Manufacturers Association • Rockwell Automation • Schneider Electric • Siemens This Coalition and its members have been active on energy efficiency issues in the Commonwealth of Virginia and met with state officials at the Department of Environmental Quality (DEQ), Department of Natural Resources (DNR), and Department of Commerce (Commerce) regarding the Clean Power Plan and other issues related to energy efficiency. TPDEE measures and projects complement and support the objectives of the Commonwealth by reducing electricity demand, helping Virginia achieve energy savings, reducing CO2 emissions, and serving as a significant resource for meeting power system capacity requirements. Importantly, TPDEE projects and approaches can provide states greater flexibility in meeting regulatory compliance goals through low-cost GHG abatement measures. III. TPDEE APPROACHES AND MEASURES The following section provides descriptions of three different types of TPDEE projects that have benefitted the Commonwealth of Virginia: Performance Contracting: Performance-based contracting (PC) for energy savings provides a one-stop procurement process that enables building owners to use savings from avoided energy consumption to pay for new energy-efficient equipment and services. PC is regarded as a turnkey mechanism to undertake and complete energy savings projects without reliance on upfront capital funds from the customers. PC projects are developed and installed by ESCOs, and tend to be focused on achieving significant energy reductions (typically between 15-30% and in some cases 30-60%) through comprehensive energy retrofit projects usually at multi-building facilities. Approximately 85% of ESCO revenue comes from a combination of what is commonly known as the "MUSH" market (municipalities, universities, schools, hospitals) and the federal buildings market. Growing rapidly in the past few decades, the U.S. ESCO sector is now a mature industry that provides energy efficiency savings via market-based, third-party delivered and verified projects. The energy savings guarantee is unique to PC – federal and state laws require ESCOs to guarantee that improvements will generate sufficient energy cost savings to pay for the project over the term of the contract. The guarantee is an integral aspect of PC as the ESCO bears the financial risk for the performance of the project. To accomplish this, rigorous measurement and verification (M&V) is regularly conducted on all installed energy conservation measures (ECMs) and retrofitted buildings in a project. Lawrence Berkeley National Laboratory (LBNL) has estimated that an additional 17 billion square feet is immediately available in "ESCO-addressable" buildings, which represents the near-term untapped market potential for PC. Industrial Energy Efficiency: The industrial sector, which includes manufacturing, mining, construction, and agriculture, accounts for roughly one-third of all end-use energy demand in the United States and remains the largest energy user in the U.S. economy. Studies have estimated that there is the potential to cost-effectively save 18-20% of industrial energy use. Reductions in industrial energy consumption of this magnitude, whether delivered through ratepayer or private-sector initiatives, create an enormous opportunity to contribute to state energy efficiency efforts. Importantly, savings associated with private-sector delivered IEE can provide benefits under any approach adopted by states, significantly reduce emissions of GHGs, and provide states with low-cost compliance options that can contribute in a meaningful way to federal regulatory

compliance. To help meet their energy efficiency policy goals, states are increasingly looking to tap the large cost-effective resource potential in U.S. industry. IEE, delivered through the use of an energy management system and participating in the Department of Energy's Superior Energy Performance (SEP) program is one possible method to measure and verify private-sector delivered IEE savings. Organizations that implement and certify their facilities under this program will meet the target-setting, reporting, monitoring, and verification requirements for an approvable compliance pathway. Ensuring that the nation's industrial sector (and manufacturing base in particular) remains competitive by encouraging the elimination of wasteful energy spending is a key public policy goal that can bolster local economies, create jobs, and make states attractive destinations for industry. Above-code Certification: Above-code certification is a proven strategy to achieve energy efficiency in buildings. Above-code certification provides third-party verification that a building or portfolio of buildings has achieved savings in electricity over the baseline applicable building code. Examples of above-code certification include ENERGY STAR, developed by EPA and Leadership in Energy and Environmental Design (LEED), overseen by the U.S. Green Building Council. Above-code building certification systems can be used in new construction and existing buildings. They generally include minimum requirements along with a suite of credits and projects earn more points for deeper efficiency gains. These systems together with ongoing performance monitoring are effective tools for achieving whole building energy efficiency. They provide integrated improvements across building systems: building envelopes, lighting, hot water, heating ventilation and air conditioning (HVAC), including strategies and equipment efficiencies. LEED certification establishes minimum energy efficiency requirements based on ENERGY STAR or improved design efficiency beyond the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) standard baselines. Each project receiving above-code certification goes through well-established and rigorous processes and documentation. Above-code building certification is an attractive compliance measure because it increases the electricity efficiency of buildings, which represent 70% of retail electricity use in the United States. Appropriate evaluation, measurement, and verification (EM&V) is critical in achieving greater market activity in all TPDEE projects and helping the Commonwealth reduce the carbon intensity of the power sector more quickly and cost-effectively. IV. The Coalition Urges the SCC to Recommend Current Practices and Industry-Standard Protocols as part of its Uniform Protocols As a general matter, we support and promote the following EM&V principles: EM&V should (1) ensure that savings from energy efficiency are quantifiable and verifiable; (2) balance the accuracy and reliability of results with the associated costs of EM&V; (3) avoid excessive interference with existing practices that are already robust, transparent and effective; and (4) recognize that EM&V is routinely evolving to reflect changes in markets, technologies and data availability. We encourage the SCC to list all of the major protocols used by TPDEE projects, including IPMVP, Federal Energy Management Program (FEMP) M&V Guidelines, and the Department of Energy (DOE) Superior Energy Performance Measurement and Verification Protocol for Industry. TPDEE approaches encompass a variety of voluntary projects that are performed at different types of buildings and which use robust industry-standard protocols to measure and verify the energy savings. Below, PC is described in greater detail to illustrate the rigorous nature of the work and the verification. Similar procedures are followed on a number of TPDEE projects, including industrial energy efficiency projects and above-code certification projects. PC is named for the contractual performance guarantee made by the ESCO that the project, once installed, will deliver the expected energy savings. The guaranteed energy savings delivered via this contractual arrangement necessitates a high degree of proof of savings. To accomplish this, rigorous M&V using industry-standard protocols (e.g. International Performance Measurement and Verification Protocol (IPMVP)) is conducted on all installed ECMs and retrofitted buildings in a project. ESCOs and their customers rely upon the use of well-established, industry-standard protocols implemented by experienced professionals. Prior to the installation of any ECMs under a PC, the ESCO performs an investment grade audit (IGA), which includes extensive evaluations of how and when energy and water are used at the project site. The IGA provides measure-specific and time of day information needed for the detailed engineering and cost estimates upon which the ESCO bases the savings guarantee. Once the project ECMs are installed, their performance is measured and compared with the savings estimated by the IGA. Annual reconciliation reports, often reviewed and approved by third-party consultants on behalf of the customer, are used to compare actual and guaranteed savings. Savings shortfalls, if any, are usually remedied by having the ESCO repair a piece of malfunctioning

equipment or having the ESCO supply additional retrofits. Once the guarantee period of the contract is complete, ongoing persistence of savings may be ensured by on-site inspections to determine that equipment remains in place, and is properly maintained and operated. The results of PC M&V are highly standardized and therefore highly replicable and can be easily and efficiently audited. The typical rigor of M&V performed under a PC is entirely consistent with the level of rigor that the SCC would require. M&V procedures provide performance data for each ECM, building, and project—data which can then be aggregated by states and can provide standardized, replicable, and auditable information regarding avoided electricity consumption. The high degree of accuracy provided by PC M&V protocols can provide states with certainty regarding the CO2 reductions associated with PC projects. Industrial energy efficiency projects also use existing condition baselines. As an example, a manufacturing facility that implement a strategic energy management program under the International Organization for Standardization (ISO) 50001 may participate in the Department of Energy's Superior Energy Performance (SEP) program. The SEP program uses independently verified data to establish a baseline of energy consumption. Then, the facility (1) tracks progress of energy performance improvement (including electricity); (2) accounts for variables such as weather and production using regression analysis; and (3) calculates cumulative and annual improvements on many different metrics. We encourage the SCC to distinguish between energy efficiency programs and projects, which require diverse implementation of M&V in the marketplace. In fact, EM&V is a term that has typically been associated with ratepayer efficiency programs, while efficiency projects conduct M&V. We believe that recognition of the industry-standard protocols is a very important part of EM&V guidance. Virtually all ESCO projects are done under IPMVP or the FEMP M&V guidelines. Many of these projects are implemented to satisfy Congressionally-mandated energy use reduction goals, with project savings monitored by FEMP and national labs. EM&V must balance "the need for rigor and accuracy with the effort and cost associated with quantification and verification." We believe that the EM&V guidance should list all of the major protocols used by TPDEE projects, including IPMVP, Federal Energy Management Program (FEMP) M&V Guidelines, and the Department of Energy (DOE) Superior Energy Performance Measurement and Verification Protocol for Industry. V. The Coalition Requests that the SCC Embrace Flexibility among Various Energy Efficiency Approaches We strongly urge the SCC to consider multiple baselines that may be used by all efficiency programs and projects. For example, while a common practice baseline (CPB) may be an appropriate baseline for a ratepayer-funded energy efficiency program that relies on rebates and incentives on specific pieces of equipment within the context of a particular state or local building code, and pays incentives to the program administrator based on the actual accomplishments of its programs, it is not appropriate for all efficiency activities. Using the local CPB as the basis for calculating the emissions reductions for efficiency means that a state is mandating a political, rather than a scientific, methodology for calculating energy savings and emissions reductions. TPDEE projects focus on whole building approaches that reduce energy savings from its current operating baseline. For example, a TPDEE project that occurs at a campus of buildings may include hundreds or thousands of individual energy ECMs. TPDEE projects currently use internationally recognized M&V protocols. Thus, the current operating baseline implemented by ESCOs in accordance with industry-standard protocols should be an acceptable regulatory baseline in the SCC's recommendations.

Association of Electric Cooperatives
Virginia, Maryland & Delaware

Samuel R. Brumberg
ASSOCIATION COUNSEL

Publishers of COOPERATIVE LIVING

May 25, 2016

VIA ELECTRONIC FILING

Hon. Joel H. Peck, Clerk
Virginia State Corporation Commission
Document Control Center
1300 East Main Street, First Floor
Richmond, Virginia 23219

Re: Comments of Virginia's Electric Cooperatives regarding Energy Efficiency Evaluation, Measurement & Verification Case No. PUE-2016-00022

Dear Mr. Peck:

Following this letter you will find an original copy of the *Comments of the Virginia Electric Cooperatives*, submitted by the Virginia, Maryland & Delaware Association of Electric Cooperatives for filing in the above-referenced proceeding. Thank you for bringing this filing to the attention of the Commission, and please do not hesitate to contact me if you have any questions regarding this filing.

Very truly yours,

Samuel R. Brumberg

Enclosure

cc: Service List
Ashley B. Macko, Esquire, SCC Associate General Counsel
K. Beth Clowers, Esquire, SCC Staff Attorney
Mr. Cody Walker, Deputy Director, Division of Energy Regulation
CEOs of Virginia's Electric Cooperatives
Mr. Jack Reasor, CEO, VMDAEC
Mr. Richard Johnstone, Executive Vice President, VMDAEC
Mr. Brian Mosier, Vice President of Governmental Affairs, VMDAEC
Mr. Andrew Vehorn, Director of Legislative Affairs, VMDAEC
Regulatory and Governmental Affairs Liaisons & Selected Others

P.O. Box 2340, Glen Allen, VA 23058 • 4201 Dominion Blvd., Glen Allen, VA 23060
(804) 346-3344 • FAX: (804) 346-3448

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION
at Richmond

COMMONWEATH OF VIRGINIA	)	
	)	
At the relation of the	)	
	)	
STATE CORPORATION COMMISSION	)	Case No. PUE-2016-00022
	)	
Ex Parte: In the matter of receiving input for evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures	)	

COMMENTS OF THE VIRGINIA ELECTRIC COOPERATIVES

These *Comments* are submitted pursuant to the Virginia State Corporation Commission's ("Commission") March 30, 2016, *Scheduling Order* ("Order") which initiated a public consultation as required by Chapters 395 and 516[1] of the 2016 Acts of Assembly to evaluate the establishment of uniform protocols for measuring, verifying, validating, and reporting the impacts of energy efficiency measures implemented by investor-owned electric utilities providing retail electric utility service in the Commonwealth and the establishment of a methodology for estimating annual kilowatt savings and a formula to calculate the levelized cost of saved energy for such energy efficiency measures. The *Order* invited other parties, including the Commonwealth's Electric Cooperatives, natural gas companies, industry, and other stakeholders, to also submit public comments.

A & N Electric Cooperative, BARC Electric Cooperative, Central Virginia Electric Cooperative, Community Electric Cooperative, Craig-Botetourt Electric Cooperative,

---

1 2016 Va. Acts chs. 255, 517.

Mecklenburg Electric Cooperative, Northern Neck Electric Cooperative, Northern Virginia Electric Cooperative,[2] Prince George Electric Cooperative, Rappahannock Electric Cooperative, Shenandoah Valley Electric Cooperative, and Southside Electric Cooperative, through the Virginia, Maryland & Delaware Association of Electric Cooperatives ("VMD Association") (collectively, "Virginia Cooperatives" or "Cooperatives"),[3] hereby file these *Comments of the Virginia Electric Cooperatives* in this proceeding.

INTRODUCTION

The Virginia Cooperatives are utility consumer services cooperatives organized under the laws of the Commonwealth of Virginia, and the VMD Association is their statewide service organization. As the Commission is aware, the Cooperatives are owned by and operated for the benefit of their member-consumers, and their operations are conducted on a not-for-profit basis. A cooperative's primary corporate objective is to provide safe and reliable electric service to its member-owners at the lowest reasonable cost.

Following the General Assembly's mandate, the Commission issued its *Order*. The following are the Virginia Cooperatives' comments in response to the Commission's *Order*.

2 NOVEC agrees, in part, with the points made in these *Comments* and will revise and extend their remarks at the July 12, 2016, public session to be held by the Commission in this docket.

3 Powell Valley Electric Cooperative ("PVEC") is a member of the VMD Association. PVEC is a utility consumer services cooperative organized under the laws of the Commonwealth of Virginia, with service territory in Virginia and Tennessee. It purchases its power at wholesale from the Tennessee Valley Authority ("TVA"), a federal government agency. Due to this arrangement, it is unique among the Virginia Cooperatives and governed by a combination of federal and Virginia law concerning its electric distribution operations. Its rates are regulated by the TVA. It is regulated as to service, but not as to rates, by this Commission.

COMMENTS

I. Introduction

A. Executive Summary

The Cooperatives are supportive of efforts to more precisely measure energy efficiency in ways that are cost-effective. Fundamentally, energy efficiency is a good thing, and increasing it across the Commonwealth is a goal the Cooperatives share with many stakeholders.

The Cooperatives' *Comments* in this proceeding will focus generally on making two core policy suggestions regarding energy efficiency in the Commonwealth. First, the Cooperatives are not opposed to the Commission recommending the adoption of a uniform or statewide Technical Resource Manual ("TRM") for the Commonwealth, *so long as* sufficient flexibility would remain for utilities to depart from any single, uniform standard for good cause shown. Second, the Cooperatives believe that for program-specific cost recovery, the existing cost/benefit standards should remain as they are.

B. The Cooperatives and Energy Efficiency

The Cooperatives are highly supportive of energy efficiency efforts throughout the Commonwealth and believe strongly in the efficacy of energy efficiency ("EE") to be an important tool in meeting both Virginia Energy Plan goals as well as other environmental goals, as well as valuable and appropriate customer service function of utilities. The Cooperatives, with their focus on serving our member-owners and providing affordable, reliable electric service at the lowest reasonable cost, have encouraged energy efficiency and conservation long before they became fashionable or necessary to meet legislative or regulatory goals. In addition, the Cooperatives do much to raise consumer awareness of energy use, including the now-widespread adoption of

prepaid electric service,[4] as well as optional, proactive automatic notification of abnormal daily consumption and educating member-owners about their electricity use. These programs and initiatives can also be used to achieve EE goals.[5]

The Cooperatives are grateful for the opportunity to comment and remain appreciative for the opportunity to make their views known to the Commission and to contribute to the public discourse on behalf of their member-owners.

II. Substantive Comments

A. Establishment of Technical Standards

The Cooperatives care deeply about what EM&V standards are adopted in the Commonwealth, as such standards can greatly affect the costs and burden of EE programs. The Cooperatives *are not opposed to the adoption of a uniform TRM for the Commonwealth.* This could be a state-specific TRM or the adoption of an existing regional TRM, including the mid-Atlantic TRM. A uniform standard could be very helpful in establishing a "baseline" against which various EE programs could be measured.

All EM&V protocols are not created equal, however. The establishment of a uniform EM&V standard or TRM for Virginia could be an expensive and complicated undertaking. Any TRM would have to be monitored and updated by Staff, as well as input taken regularly from

---

[4] While not traditionally thought of as EE programs (and while they would still be subject to a separate approval—not as EE programs), prepaid electric service has the ability to change consumer behavior and, in so doing, bring about more efficient consumption and usage of energy by consumers. *See, e.g.*, National Rural Electric Cooperative Association, *Claiming Savings from Prepaid Programs: Does Prepay Change Behavior and Drive Conservation*, February 2016 (on file with counsel). While some would argue that energy savings from prepaid electric service is the result of the prepaid meter being turned off (or service being suspended) for long periods, the data does not appear to indicate that is the case for most prepaid electric service customers.

[5] For additional information on longstanding initiatives of the Cooperatives in this field, *see also*, Comments of the Virginia Electric Cooperatives, Commonwealth of Virginia, *ex rel.* State Corporation Commission, *Ex Parte: In the matter of determining achievable, cost-effective energy conservation and demand response targets that can be realistically accomplished in the Commonwealth through demand side management portfolios administered by each generating electric utility identified by Chapters 752 and 855 of the 2009 Acts of the Virginia General Assembly*, Case No. PUE-2009-00023; *and see* Virginia Electric Cooperatives, *Self-Assessment Report*, Case No. PUE-2009-00121.

interested parties. Use of a preexisting TRM may avail Virginia of the ability to have a uniform set of protocols without, perhaps, having to invest a significant amount of time and resources in crafting a new, Virginia-specific TRM.

As member-owned utilities serving predominantly rural areas, flexibility is an important factor for the Cooperatives. Any recommendation to adopt a TRM for Virginia should include the ability of any utility to depart from it for good cause shown. The Cooperatives may need to depart from a uniform TRM for various reasons—demographic, geographic, topographic, etc.[6] There may also be a reason for a Cooperative to depart from a uniform TRM because it wishes to test or experiment with an EE program that may not be appropriate for a larger or an investor-owned utility. These "departures" should be allowed for good cause shown. Flexibility is a must.

Finally, as the Commission is aware, a majority of the Virginia Cooperatives are members of a FERC-regulated wholesale generation and transmission cooperative, Old Dominion Electric Cooperative ("ODEC"). ODEC is in the early stages of exploring ways to standardize EM&V and achieve more uniform measurements of EE results amongst its Members. The Cooperative business model lends itself to economies of scale and cooperation among cooperatives. This process should be allowed to continue.

B. Cost/Benefit Questions[7]

The existing tests for purposes of cost/benefit analysis should not be replaced. To the extent there is any consideration of recommending changes to the cost/benefit analysis tests,[8] we

---

6 *See also infra* at 7 (§ II(D)).

7 *See Order* at 2; *and see id.* at n.3 and accompanying text.

8 For instance, some of the political debate preceding the passage of the legislation that initiated the instant proceeding revolved around what the cost/benefit tests should be, how strict they are, whether they should be more lenient, and other similar elements of discussion.

believe that the tests are acceptable as they currently exist in the Code. The current provision that an EE program should not fail because of the failure of any single test[9] should remain in the Code.

Sometimes, the Ratepayer Impact Measure ("RIM") tests functions as a "screening" test that is used routinely by the Cooperatives when evaluating whether to even take a program forward or not. This includes screening for evaluation, measurement, and verification ("EM&V") costs and whether those would negate any, or all, the savings generated by the EE program.

The RIM test alone should not necessarily be a determinative test, though it does an excellent job for limiting or eliminating harm to other/nonparticipating ratepayers. Each utility should have the flexibility to make an application to the Commission if a particular EE program or initiative makes sense for its customers. It is highly unlikely that a Cooperative would take forward for Commission approval an application with a significant ratepayer impact, but because the Cooperative is in the best place to judge what is appropriate for its member-owners, the option should remain open.

C. Measuring Savings

The use of "deemed savings" should definitely remain an option—it is simple, efficient, and cost effective. Deemed savings is an appropriate substitute for more costly and extensive EM&V processes, especially when applied to EE initiatives that are well-established, whose benefits and results are well-accepted, and when the beneficial actions of either the utility or the consumer, or both, are easily quantified.

As purchasers of energy as opposed to generators of energy, "levelized cost of energy" ("LCOE" or "LCSE," or "levelized cost of saved energy") may not be directly applicable to cooperatives. The Cooperatives look to external market-based indicators when evaluating their

[9] Va. Code § 56-576.

cost savings from EE measures. For the most part, the Cooperatives have long-term, all-requirements wholesale power contracts. Each Cooperative has different wholesale power arrangements—some are members of a generation and transmission ("G&T") cooperative, some are not. In each instance the Cooperatives have contracts that serve either as a proxy for, or a direct reflection of, market prices, and therefore represent the Cooperative's avoided cost.

It is important to note that, while wholesale power costs can be avoided, some costs, such as the fixed costs of distribution facilities, cannot be avoided. The Cooperatives are distribution utilities. Generally speaking, a portion of recovering the fixed costs of the distribution system depends on revenues from volumetric sales. EE, then, in some cases, can create cost-recovery challenges for distribution utilities like the Cooperatives. This makes ensuring that all costs, including the transactional costs associated with EM&V, are adequately captured all the more important.

D. The Cooperative Difference

The Cooperatives, as member-owned utilities, are in a position to choose and decide what EE programs are right for their member-owners. Cooperatives are governed by and operated for the sole benefit of their member-owners. The membership of an electric cooperative—its owners and its customers—elect their own directors to a cooperative's Board who then select the cooperative's management. The Cooperatives are in the best position to determine what sort of EE programs are appropriate for their membership—taking into account the things that make any electric utility unique: demographics, housing stock, consumer behaviors and patterns, geography, topography, existing infrastructure, cost factors, etc.

The Cooperatives have a long history of supporting EE initiatives when those programs make sense for the Cooperatives' member-owners. For an additional summary of how the Cooperatives approach energy efficiency efforts, please see Exhibit A.

E. Current State of EE Programs at Virginia's Electric Cooperatives

While no Cooperative has a Commission-approved EE program as of the date of this filing, many of the Cooperatives do have approved demand response ("DR") programs, which provide system-wide benefits, and the costs of which are included in base rates. One Cooperative, Rappahannock Electric Cooperative, has a case pending before this Commission that would allow it to recover additional incremental DR costs through a rider.[10]

Several Cooperatives have EE initiatives that exist on a more informal basis. In addition to prepaid electric service, these include consumer education programs, lighting coupon programs, changes to security lighting tariffs to enable the use of LED technology, thermostat programs (funded at no cost to the distribution Cooperative), and others. For a list of all EE-related offerings at the Cooperatives, please see Exhibit B. Cooperatives are leaders in this field.

III. Conclusion

We believe that utilities should be able make their own decisions, without mandates, concerning which EE programs to bring to the Commission for approval. This would maintain the status quo, keep decision-making on EE programs local, enabling utilities to use the RIM test for screening should they choose to do so. The implementation of EE programs should continue to be considered on a case-by-case basis. The consideration of EE programs should take into account program investments, operating costs, and program savings, and for ongoing monitoring of such

---

[10] *See, e.g.*, Application of Rappahannock Electric Cooperative, *For approval of a modified incentive for A/C switch demand-side management program; and for approval of a rate adjustment clause to recover the costs of the demand-side management program pursuant to § 56-585.3 A 5 of the Code of Virginia*, Case No. PUE-2016-00019.

programs, only the least burdensome, yet sufficiently accurate, EM&V measures should be required. The Cooperatives urge that the Commission recommend no existing changes to the Code of Virginia in regards to the cost/benefit tests.

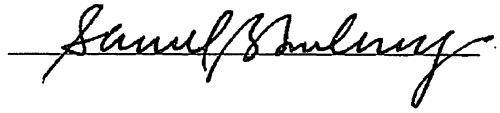
While a statewide baseline would be helpful, flexibility must be included in the adoption of any statewide uniform protocols. No TRM or EM&V protocols should be absolutely mandated for the Cooperatives. The Cooperatives should have flexibility to apply an ODEC, regional, national, or Cooperative-specific standard for good cause shown.

The Cooperatives remain very much in favor of better tools for EE EM&V which are cost-effective.

CONCLUSION

WHEREFORE, the Virginia Cooperatives respectfully request that the Commission accept these *Comments of the Virginia Electric Cooperatives*, consider the issues raised and discussed herein, and take responsive actions. The Cooperatives do plan to participate in the public comment session on this matter, scheduled for July 12, 2016. Finally, the Cooperatives would ask for any additional relief that the Commission may deem to be just and proper.

Respectfully submitted,

By: 

Samuel R. Brumberg
Association Counsel
Virginia, Maryland & Delaware Association of Electric Cooperatives
4201 Dominion Boulevard, Suite 101
Glen Allen, Virginia 23060
Tel.: 804-968-7164
Fax: 804-346-3448
sbrumberg@odec.com

Dated: May 25, 2016

Exhibit A

The Cooperatives' Approach to Energy Efficiency

The Cooperative approach to energy efficiency is driven by the Cooperative mission—service to member-owners—and includes:

- An emphasis on energy savings as primary "compensation" to the member-owner;
- Incentive structures for management that prioritize energy savings, not energy sales;
- Key accounts managers working with commercial and industrial member-owners;
- Working with member-owners individually and educating them one-on-one, including education about:
    - Prepaid electric service programs,
    - Portable heaters,
    - Home thermostat/temperature settings,
    - Damaged heat ducts under manufactured homes, and
    - Proper functioning of well pumps;
- Longstanding support for demand-side management and demand response programs;
- Among the first utilities in the Commonwealth to widely install water heater and air conditioning switches in residential homes (lowering system-wide demand and, in turn, wholesale power costs);
- Judicious use of incentives, attempting to maximize value and consumer motivation while minimizing cross-subsidization from non-participating consumers; and
- Pioneering use of prepaid electric service programs, including at Rappahannock Electric Cooperative, Southside Electric Cooperative, Northern Neck Electric Cooperative, and Prince George Electric Cooperative. Other Cooperatives are actively considering offering a prepaid electric service program.

Exhibit B

Informal Energy Efficiency Offerings at Virginia's Electric Cooperatives

What follows is a brief list of just some of the informal EE-related offerings available at Virginia's Electric Cooperatives. Not all of these programs are available at every Cooperative.

- Customer service representatives are trained in offering energy-saving advice to Cooperative member-owners;
- Member-owners with high bill complaints are offered the opportunity to meet with a certified advisor;
- Phone messaging is used for outreach;
- Energy audits are offered, including some with advanced "blower door" testing;
- Paid advertising is used across a wide variety of media;
- Bill inserts and bill notices are used for consumer education;
- Email and video messages are used for member-owners using e-billing;
- Email and video messaging for "peak event" announcements requesting member-owners to alter their kWh usage during a peak event;
- Energy advice is provided at community events;
- Social media is used for outreach and interaction with members;
- Websites are used for outreach, as well as used to offer tools, like the Home Energy Suite, to perform an online analysis of energy usage;
- Customer-specific usage monitoring is available, both on the website and on mobile devices, including high usage alerts in various formats;
- LED lighting replacement programs and coupon programs;
- Financing programs; and
- Home air filter programs.

The Business Council for Sustainable Energy

May 24, 2016

SCC-CLERK'S OFFICE
DOCUMENT CONTROL CENTER
2016 MAY 25 P 12: 26

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

RE: State Corporation Commission Scheduling Order Case No PUE-2016-00022

Dear Commissioners:

The Business Council for Sustainable Energy (BCSE) appreciates the opportunity to submit the following comments regarding the upcoming Virginia State Corporation Commission's (SCC) pending review of the establishment of protocols and methodologies aimed at measuring the impact of utility-scale energy efficiency measures. (Case No. PUE-20106-00022)

BCSE is a coalition of companies and trade associations from the energy efficiency, natural gas, propane, and renewable energy sectors, and also includes independent electric power producers, investor-owned utilities, public power, commercial end-users, and environmental and energy market service providers.

Founded in 1992, the Council advocates for policies at the state, national, and international levels that increase the use of commercially-available clean energy technologies, products, and services. The coalition's broad-based business membership is united around the revitalization of the economy and the creation of a secure and sustainable energy future for America.

Over the last few decades, energy efficiency products and services have led to ongoing improvements in the nation's energy productivity. As a result, the US has seen a decoupling between growth in GDP and growth in energy consumption, with GDP up 83 percent over the last 25 years, while energy consumption grew only 17 percent.[1]

These gains are due in part to state policies and programs that encourage energy efficiency within the electricity sector. Nationwide, utility spending on energy efficiency grew 25 percent per year from 2006 to 2011, and continues to grow, with budgeted spending for utility scale electricity efficiency activities at a record $6.2 billion in 2014. These dollars have been put to good use. From 2010 to 2015, as spending increased, consumers actually saw *reductions* in their electricity use and bills. The average U.S. residential customer used 6.2 percent less electricity, despite owning more gadgets, and paid about $80 less in real dollars on their electricity bills annually.[2]

[1] See 2016 Sustainable Energy in America Factbook, http://www.bcse.org/wp-content/uploads/BCSE-2016-Factbook-Launch_DC-Event_resized.pdf p.5.
[2] U.S. Energy Information Administration, Electricity Data Browser. Real dollars calculated using GDP Deflator.

Energy efficiency is generally a least-cost option for meeting electricity needs. Because of its untapped energy efficiency resource potential, Virginia is particularly well-positioned to take advantage of this large and growing resource. According to the American Council for an Energy Efficient Economy (ACEEE), the Commonwealth dedicates only 0.01 percent of its state-wide electricity revenues to efficiency programs, placing it well below the national average of 1.52 percent, and last in the region.[3]

BCSE is encouraged to see the SCC begin to study protocols for evaluating, measuring, verifying (EM&V) the impacts of energy efficiency programs. It is a wise first step in strengthening the role that efficiency can play within the Commonwealth's electricity sector. A uniform EM&V protocol among utilities would contribute greatly to the level of confidence among both regulators and consumers that future investments in efficiency programs will benefit Virginia ratepayers and the overall economy.

Fortunately, EM&V is a well-developed field of analysis consisting of many firms, private companies, and thousands of practitioners, and is well documented through the National Association of Regulatory Utility Commissioners.[4] Utilities and regulators have been operating efficiency programs subject to EM&V since the mid-1980s. While clearly there are circumstances unique to the Commonwealth, BCSE encourages the SCC to consider these resources as it seeks to develop its own EM&V protocols.

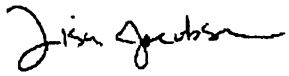
For example, the US Department of Energy's Uniform Methods Project (UMP) is an excellent resource, providing a variety of technologies for EM&V measures. The UMP protocols are based on best practices in use today, and are aligned with other governmental efforts that require accurate EM&V, such as the EPA's Clean Power Plan. The protocols are well-understood by industry and professionals alike, and could be adopted for a Virginia-specific market.

A second tool, coined "EM&V 2.0" by the State Energy Efficiency Network in 2014, is a suite of information and communications technological innovations that are designed to automate certain EM&V methods. The purpose of EM&V 2.0 is to allow for utilities, regulators, and others to review the performance of efficiency programs on an ongoing basis. A recent report by ACEEE provides an excellent overview of EM&V 2.0.[5]

These examples represent just two of the numerous proven EM&V protocols for utility scale energy efficiency programs area readily available and can readily be applied to the unique circumstances within the Commonwealth.

BCSE looks forward to working with the SCC, local utilities, and others in the coming year to develop this important first step in building a more advanced efficiency program in Virginia. Please do not hesitate to contact me if you have any questions.

Sincerely,



Lisa Jacobson
President, Business Council for Sustainable Energy

---

[3] See http://database.aceee.org/sites/default/files/docs/spending-savings-tables.pdf. States in the region include NJ, MD, IA, IL, PA, OH, MI, DC, IN, TN, KY, NC, WV, DE, and VA.

[4] Search "EM&V" under the NARUC Resource Library, at http://pubs.naruc.org/resources/library/index.cfm?event=getAdvancedSearch&mode=advancedSearch.

[5] See http://aceee.org/research-report/ie1503.

James S. Copenhaver
Senior Counsel
Legal

1809 Coyote Drive
Chester, Virginia 23836

May 25, 2016

VIA ELECTRONIC FILING

Joel H. Peck, Clerk
State Corporation Commission
c/o Document Control Center
Tyler Building, First Floor
1300 East Main Street
Richmond, Virginia 23219

RE: Commonwealth of Virginia
ex rel.
State Corporation Commission

Ex Parte: In the matter of receiving input for evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures
Case No. PUE-2016-00022

Dear Mr. Peck:

Enclosed please find a copy of the Comments of Columbia Gas of Virginia, Inc., Virginia Natural Gas, Inc, and Washington Gas Light Company as permitted in the Commission's March 30, 2016 Scheduling Order in the above referenced proceeding.

Thank you for your attention to this matter.

Sincerely,

James S. Copenhaver

JSC/mmf
Enclosures

cc: Ms. Kimberly B. Pate
Mr. William F. Stephens
Mr. Cody D. Walker
C. Meade Browder, Jr., Esq.
Ashley Macko, Esq.
K.B. Clowers, Esq.
Meera Ahamed, Esq.
Jennifer D. Valaika, Esq.

COMMONWEALTH OF VIRGINIA

STATE CORPORATION COMMISSION

COMMONWEALTH OF VIRGINIA, *ex rel.* **STATE CORPORATION COMMISSION**	)	
Ex Parte: In the matter of receiving input for evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures	)	CASE NO. PUE-2016-00022

COMMENTS OF COLUMBIA GAS OF VIRGINIA, INC., VIRGINIA NATURAL GAS, INC. AND WASHINGTON GAS LIGHT COMPANY

On March 30, 2016, the Virginia State Corporation Commission ("Commission") issued a Scheduling Order inviting stakeholder input in conjunction with the Commission's development of a Report to be submitted to the Governor and the General Assembly pertaining to the measurement of the impact of energy efficiency measures.[1] Columbia Gas of Virginia, Inc. ("CGV"), Virginia Natural Gas, Inc. ("VNG") and Washington Gas Light Company ("WGL") (collectively, the "Gas Utilities") appreciate the opportunity to participate in this proceeding and jointly submit the following Comments, as permitted in the Scheduling Order.

Executive Summary

The Natural Gas Conservation and Ratemaking Efficiency Act[2] ("CARE Act") prescribes the cost/benefit analysis to be performed in determining whether an energy efficiency program or portfolio is cost-effective. Consistent application of the

[1] Senate Bill 395 provides for the Commission to "evaluate the establishment of uniform protocols for measuring, verifying, validating, and reporting the impacts [of electric utilities'] energy efficiency measures...and the establishment of a methodology for estimating annual kilowatt savings and a formula to calculate the levelized cost of saved energy for such energy efficiency measures." The Report is to be submitted to the Governor and the General Assembly by December 1, 2016. The Commission expanded the scope of its consideration of energy efficiency measures to include natural gas utilities to provide for a more thorough evaluation. Scheduling Order at 2.

[2] Virginia Code §§ 56-600 *et seq.*

requirements of the CARE Act and transparency in the manner in which energy efficiency programs and portfolios will be measured, verified and validated are critical to the development of cost-effective energy efficiency programs that further the objectives of the CARE Act as well as the Energy Policy of the Commonwealth of Virginia[3] ("Virginia Energy Policy"), including the actions set forth in the Virginia Energy Plan.[4] Those objectives include managing the level of consumption of existing energy resources in relation to economic growth, promoting cost-effective conservation of energy and fuel supplies, and providing customers with long-term, meaningful opportunities to more efficiently consume natural gas and mitigate their expenditures for natural gas.

(1) *Cost-effectiveness tests and the associated standard of review*

Cost-effectiveness tests and the associated standard of review applied by the Staff and Commission to natural gas conservation and energy efficiency programs and measures should be applied consistently across natural gas utilities to avoid jeopardizing the development, approval, and implementation of cost-effective conservation and energy efficiency programs. Consistent application of the requirements of the CARE Act is critical to the development of cost-effective energy efficiency programs that further the statutory objectives of the Virginia Energy Policy and the CARE Act. The standard of review should thus be refined to eliminate obstacles to the implementation of cost-effective conservation and energy efficiency programs. The current obstacles include the following:

- The Commission's policy objective to reduce impacts of energy efficiency programs and measures to non-participating customers can conflict with the statutory objective to increase opportunities for customers to participate in conservation and energy efficiency measures. These often competing objectives result in the elimination of marginally cost-effective conservation and energy efficiency measures that would further the objectives of the CARE Act and the Virginia Energy Policy.

---

[3] Virginia Code §§ 67-100 *et seq.*

[4] The current Virginia Energy Plan was issued October 1, 2014 by the Department of Mines, Minerals and Energy in accordance with Virginia Code §§ 67-200 *et seq.*

- The principle that an energy efficiency measure is not cost-effective if the measure reflects a negative net present value ("NPV") under the Rate Impact Measure ("RIM") Test, unless that negative RIM NPV is offset by an equivalent or greater positive NPV for the measure under the Total Resource Cost ("TRC") Test, inappropriately eliminates measures based on the results of a single cost-effectiveness test, where the measure passes the remaining three tests. The resulting elimination of a measure based solely on the results of the RIM test is also inconsistent with the Commission's previous determination that a "multi-perspective" approach strikes an appropriate balance of all stakeholders affected by a proposed measure and that reliance upon the RIM test as a threshold test would inappropriately screen out conservation and energy efficiency measures.

- Low-Income and Elderly Programs are improperly included in the cost/benefit analysis of a portfolio of conservation and energy efficiency measures. Low-Income and Elderly Programs increase opportunities for customers to participate in conservation and energy efficiency measures and, by statute, may be "deemed" cost-effective. However, the inclusion of Low-Income and Elderly Programs in a utility's portfolio cost/benefit analysis requires all other programs have a positive NPV of sufficient magnitude to offset the negative NPV of the Low-Income/Elderly Program, which runs counter to the statutory objective to encourage participation by low income and elderly customers.

- The cost of infrastructure avoided as a consequence of natural gas conservation and energy efficiency programs is recognized throughout the industry and should be reflected in the cost-effectiveness analysis of CARE plans.

- The Commission's analysis of CARE Plans should recognize the ancillary benefits of Education and Outreach Programs and their contribution toward customers' favorable views of conservation and energy efficiency offerings.

(2) *Better defined evaluation and verification protocols*

The application of the cost/benefit tests should be enhanced through better defined evaluation and verification protocols for estimating savings actually realized. However, the scope and magnitude of evaluation and verification protocols must be balanced against the incremental costs and benefits of evaluation and verification activities in order to avoid Evaluation, Measurement and Verification "EM&V")[5] costs that are not justified based on the incremental level of validation to be achieved.

- Acceptance and adherence to industry-standard approaches to M&V is necessary to develop accurate and transparent savings results for CARE programs. These

[5] Note that these Comments refer to both EM&V and Measurement and Verification ("M&V"). M&V refers to data collection, monitoring, and analysis used to calculate gross energy and demand savings from individual sites or projects. M&V can be a subset of program impact evaluation. In general, the differentiation between evaluation and project M&V is that evaluation is associated with programs and M&V is associated with projects.

approaches may include a range of techniques based on the magnitude of impacts and uncertainty in savings and should consider both accuracy and cost of conducting the M&V assessment to achieve an appropriate balance in the value of information received from the M&V. Industry-accepted guidance documents and protocols are readily available to inform EM&V approaches.

- Specific EM&V approaches should balance accuracy with costs to optimize the value of information obtained from EM&V efforts. It is not always appropriate, or feasible, to directly measure the impacts, or to directly measure all input variables used to determine savings impacts. Industry standard EM&V approaches outlined in the International Performance Measurement and Verification Protocol ("IPMVP") and other guidance documents offer the ability to customize the approach to individual situations.

- The Gas Utilities' annual EM&V budgets, as a percentage of total program costs, have generally increased since the initiation of each Gas Utility's initial CARE Plan to accommodate the scope of the evaluation. Moreover, the Gas Utilities' annual EM&V budgets exceed national averages, suggesting that the Gas Utilities' annual EM&V budgets are higher than necessary to sufficiently validate the benefits of their conservation and energy efficiency programs, given the availability of recognized industry estimates for measure savings and industry recognized methods for further verifying such estimates, where appropriate.

- Guiding principles in determining appropriate EM&V for a particular program or measure should include: prioritizing the M&V budget; assessing the relative uncertainty of savings impacts; use of industry-standard approaches; and an appropriate balance of the rigor and cost of EM&V activities.

(3) *Retention of cost-effective measures*

The CARE Act provides that neither a program nor a portfolio may be eliminated based on the results of a single test. The prohibition against eliminating a program or portfolio based on the results of a single test should be clarified to preclude the elimination of a measure based on the results of a single test. An individual measure may further the purposes of the CARE Act and the Virginia Energy Policy. Moreover, the retention of cost-effective conservation and energy efficiency measures will often increase the realistically possible number of participants in such measures and help reduce the potential number of non-participating customers that will be required to pay for the Plan.

Scope of Commission Evaluation

The Commission provided, in its Scheduling Order, that an Evaluation should be conducted in order to consider the establishment of: (i) uniform protocols for measuring, verifying, validating, and reporting the impacts of energy efficiency measures; (ii) a methodology for estimating annual kilowatt savings for such energy efficiency measures; and (iii) a formula to calculate the levelized cost of saved energy for such energy efficiency measures (referred to in the Scheduling Order as the "Objectives").

The Commission noted that the evaluation and measurement of energy savings are typically measured against projected savings included in cost/benefit analyses. Accordingly, the Commission provided that the Evaluation should also encompass the methodologies by which utilities calculate the components of the cost/benefit tests in proceedings requesting approval to implement energy efficiency programs, including: (i) whether the application of costs and benefits is consistent across utilities; (ii) whether consistent application of cost and benefits across utilities is necessary or reasonable; and (iii) whether the application of the cost/benefit tests can be improved by enhanced evaluation and verification protocols for estimating savings actually realized (referred to in the Scheduling Order as the "Cost/Benefit Questions").

In addition to general comments, the Commission seeks specific input concerning existing measurement and verification protocols and their applicability for Virginia as well as appropriate formulae for developing the cost of saved energy resulting from energy efficiency programs and appropriate inputs for such formulae.

The Gas Utilities' Comments are organized along the lines of the three Cost/Benefit Questions. The Gas Utilities will also address Objective (i), relating to the establishment of uniform protocols for measuring, verifying, validating, and reporting

the impacts of energy efficiency measures, in its response to Cost/Benefit Question (iii).[6] These Comments also address (in the responses to Cost/Benefit Questions) the Commission's request for specific input concerning existing measurement and verification protocols and their applicability for Virginia as well as appropriate inputs for developing the savings resulting from energy efficiency programs. Finally, the Gas Utilities recognize that the recommendations herein may differ from those of electric utilities and other stakeholders due to the unique aspects of each industry and the laws and regulations applicable thereto.

Comments of the Gas Utilities

I. The application of costs and benefits do not appear to be consistent across natural gas utilities. (*Response to Cost/Benefit Question (i)*)

The cost-effectiveness tests and the associated standard of review of the Gas Utilities' respective CARE measures and programs do not appear to be consistently applied across natural gas utilities. The resulting uncertainties create obstacles to the seamless development, approval and implementation of cost-effective conservation and energy efficiency programs. While differences in utility-specific assumptions and portfolios of programs may play a role in the inconsistencies in Commission approval or rejection of virtually identical measures for different utilities, the Gas Utilities submit that such inconsistent approvals are driven, at least in part, by inconsistent application of cost-effectiveness tests and the associated standard of review applied to CARE Plans, which are explained further in Section II of these Comments.

Inconsistencies in the approval of comparable measures include rebates for tank water heaters, tankless water heaters, and attic and floor insulation. For example, although the Commission approved CGV's commercial ENERGY STAR Gas Storage

[6] These Comments do not address Objectives (ii) and (iii), which relate to annual kwh savings and a formula to calculate the levelized cost of savings for electric utilities.

Water Heater (≤75,000 btu/hr) measure in 2009,[7] CGV was required to withdraw that measure as a condition of the reauthorization of its CARE Plan in 2012.[8] Similarly, the Commission rejected WGL's Storage Water Heater (≤75,000 btu/hr) measure in 2013,[9] and then approved VNGs High Efficiency Tank Water Heater measure in 2013.[10] Another example relates to tankless water heaters. The Commission approved CGV's commercial High Efficiency Tankless Water Heater (≥200,000 btu/hr) measure in 2009[11] and 2012,[12] but rejected WGL's Tankless Water Heater (≥200,000 btu/hr) measure in 2013.[13] In addition, the Commission approved CGV's Attic and Floor Insulation measures in 2009,[14] 2012,[15] 2014[16] and 2016,[17] but rejected WGL's comparable Attic and Floor Insulation measure in 2015.[18]

---

[7] *Application of Columbia Gas of Virginia, Inc., For approval to implement a natural gas conservation and ratemaking efficiency plan including a decoupling mechanism*, Case No. PUE-2009-00051, Final Order (Dec. 4, 2009) at 9-10 (hereafter, the "2009 CGV Case").

[8] *Application of Columbia Gas of Virginia, Inc., For authority to amend and extend its natural gas conservation and ratemaking efficiency plan*, Case No. PUE-2012-00013, Final Order (Aug. 6, 2012) see Attachment A at 2 (hereafter, the "2012 CGV Case").

[9] *Application of Washington Gas Light Company, For authority to amend its natural gas conservation and ratemaking efficiency plan*, Case No. PUE-2012-00138, Order Approving Amended Natural Gas Conservation and Ratemaking Efficiency Plan (April 2, 2013) at 10 (hereafter, the "2012 WGL Case").

[10] *Application of Virginia Natural Gas, Inc., For approval of a natural gas conservation and ratemaking efficiency plan and rider*, Case No. PUE-2012-00118, Order Approving Natural Gas Conservation and Ratemaking Efficiency Plan (May 30, 2013) at 5 (hereafter, the "2012 VNG Case").

[11] 2009 CGV Case, *supra* at Attachment A at 2.

[12] 2012 CGV Case, *supra* at 2.

[13] 2012 WGL Case, *supra* at 10.

[14] 2009 CGV Case, *supra* at Attachment A at 2.

[15] 2012 CGV Case, *supra* at 13.

[16] *Application of Columbia Gas of Virginia, Inc., For authority to amend its natural gas conservation and ratemaking efficiency plan pursuant to Chapter 25 of Title 56 of the Code of Virginia*, Case No. PUE-2013-00114, Final Order (April 10, 2014) at 9 (hereafter, the "2013 CGV Case").

[17] *Application of Columbia Gas of Virginia, Inc., For authority to amend and extend its conservation and ratemaking efficiency plan pursuant to Virginia Code §56-602*, Case No. PUE-2015-00072, Final Order (Oct. 29, 2015) as amended by an Order Approving Amended Natural Gas Conservation and Ratemaking Efficiency Plan (Feb. 23, 2016) at 8 (hereafter, the "2015 CGV Case").

[18] *Application of Washington Gas Light Company, For authority to amend its natural gas conservation and ratemaking efficiency plan*, Case No. PUE-2015-00138, Final Order (April 29, 2016) at 8 (hereafter, the "2015 WGL Case").

Energy efficiency cost-effectiveness requirements and associated Commission policies governing the review and approval of CARE programs should be clearly articulated and consistently applied across jurisdictional natural gas utilities. The CARE Act prescribes the cost/benefit analysis to be performed in determining whether an energy efficiency program or portfolio is cost-effective. A consistent understanding of energy efficiency cost-effectiveness requirements and associated Commission policies governing the review and approval of CARE programs is critical to the development, approval and implementation of cost-effective conservation and energy efficiency programs in furtherance of the objectives of the Virginia Energy Policy and the CARE Act.

II. Consistent application of costs and benefits across natural gas utilities is necessary to the development of cost-effective energy efficiency programs that further the objectives of the Virginia Energy Policy and the CARE Act. (*Response to Cost/Benefit Question (ii)*)

A. Statutory Objectives

The Virginia Energy Policy is set forth in Chapters 1 and 2 of Title 67 of the Code of Virginia. In establishing the Virginia Energy Policy, the General Assembly recognized various "objectives" pertaining to energy issues that are designed to advance the health, welfare and safety of Virginia residents. Those objectives include "[m]anaging the rate of consumption of existing energy resources in relation to economic growth;" "[u]sing energy resources more efficiently;" and "[f]acilitating conservation."[19] Moreover, in order to achieve the foregoing objectives, the General Assembly directed that, *inter alia*, it shall be the policy of the Commonwealth to "[e]nsure that the combination of energy supplies and energy-saving systems are sufficient to support the demands of economic growth" and to "[p]romote cost-effective conservation of energy and fuel supplies."[20]

[19] Virginia Code § 67-101(4), (6) and (7).
[20] Virginia Code § 67-102(2) and (4).

In furtherance of the Virginia Energy Policy, the General Assembly enacted the CARE Act, which incorporates the objectives of the Virginia Energy Policy:

> A. Consistent with the objectives pertaining to energy issues set forth in §67-101 and the policy elements stated in §67-102, it is in the public interest to authorize and encourage the adoption of natural gas conservation and ratemaking efficiency plans that promote the wise use of natural gas and natural gas infrastructure through the development of alternative rate designs and other mechanisms that more closely align the interests of natural gas utilities, their customers, and the Commonwealth generally, and improve the efficiency of ratemaking to more closely reflect the dynamic nature of the natural gas market, the economy, and public policy regarding conservation and energy efficiency. Such alternative rate designs and other mechanisms should, where feasible:
>
> 1. Provide utilities with better tools to work with customers to decrease the average customer's annual average weather-normalized consumption of natural gas;...
>
> 4. Provide customers with long-term, meaningful opportunities to more efficiently consume natural gas and mitigate their expenditures for the natural gas commodity...;
>
> 5. Recognize the economic and environmental benefits of efficient use of natural gas; and
>
> 6. Preserve or enhance the utility bill savings that customers receive when they reduce their natural gas use.[21]

The significance of the objectives of the CARE Act in furthering the Virginia Energy Policy in general, and conservation and energy efficiency in particular, are apparent from the General Assembly's directive that the CARE Act "shall be construed liberally to accomplish [the foregoing] purposes" of the CARE Act.[22]

B. The Standard of Review Applied to CARE Plans May Impede the Statutory Objectives

The standard of review of CARE Plans has evolved over time in a manner that precludes the implementation of certain cost-effective conservation and energy efficiency programs. In addition, individual policies that may be appropriate in isolation are often contradictory and collectively may eliminate cost-effective programs, in contravention of statutory objectives promoting conservation and energy efficiency.

---

[21] Virginia Code § 56-601(A).
[22] Virginia Code § 56-601(C).

Increased Opportunities for Customer Participation

The Commission highlighted the importance of developing programs that are designed to offer greater opportunities for customer participation in its 2008 Order Approving VNG's CARE Plan.[23] In that case, the Commission concluded that "for the Plan to be cost effective under the Act, the annual funds proposed by the Company should be allocated in a manner that appreciably increases the realistically possible number of participants in significant conservation measures[.]"[24] The Commission recognized, in the VNG Order, that designing a CARE Plan in this manner would "help to reduce the potential number of non-participants that will be required to pay for this Plan."[25]

The Gas Utilities agree that the public interest is served by designing CARE Plans in a manner that increases opportunities for participation and thus reduces the potential number of non-participating customers. However, the Commission often rejects conservation and energy efficiency measures that would expand opportunities for increased participation by otherwise non-participating customers due to the financial impact of those measures on non-participants. The inherent inconsistency in the dual objectives of: (i) increasing opportunities for participation; and (ii) reducing financial impacts on non-participating customers is explained below.

Reduction in Impact on Non-Participating Customers

Conservation and energy efficiency programs proposed by each of the Gas Utilities are often rejected or modified because the portfolio of measures and programs

---

[23] *Application of Virginia Natural Gas, Inc., For approval to implement a natural gas conservation and ratemaking efficiency plan including a decoupling mechanism and to record accounting entries associated with such mechanism,* Case No. PUE-2008-00060, Order Approving Natural Gas Conservation and Ratemaking Efficiency Plan (Dec. 23, 2008) at 13 (hereafter, the "2008 VNG Case").

[24] *Id.*

[25] *Id.*

failed to reduce the impact on CARE Plan non-participants.[26] The elimination of marginally cost-effective measures or programs in order to mitigate the impact of a CARE Plan on non-participating customers is inconsistent with the statutory objectives of the CARE Act and the Virginia Energy Policy, which are designed to promote cost-effective conservation and energy efficiency measures.

The CARE Act only requires that conservation and energy efficiency programs or a portfolio of programs further the objectives of the CARE Act by: (i) decreasing the average customer's annual, weather normalized consumption or total bill; (ii) avoiding energy costs or consumption the customer may otherwise have incurred; and (iii) being cost-effective.[27] There is no requirement in the CARE Act, the Rules identifying the CARE Plan filing requirements[28] or the Rules governing cost/benefit tests[29] that require a CARE Plan to minimize the impact on non-participating customers.

Moreover, a requirement that a CARE Plan be designed to minimize the impact on non-participating customers appears to be inconsistent with the Commission's finding in the 2008 VNG Case that CARE Plans be designed to increase the likely number of participants in a CARE Plan. The promotion of a wide range of cost-effective measures and programs can be designed to reduce the number of non-participating customers. However, each measure or program has unique costs and benefits. The elimination of measures or programs solely because they are less cost-effective than others (*i.e.* in order to maximize cost-effectiveness) naturally results in fewer measures

---

[26] See e.g., 2012 CGV Case, *supra* at 14-15, wherein the Commission approved a significant reduction in CGV's proposed CARE Plan measures because the reduction in measures "mitigates the negative economic impacts upon non-participating residential and small general service customers by substantially reducing the scope of Columbia's Amended CARE Plan, as well as the costs that must be borne by these non-participating customers." See also, 2012 WGL Case, *supra* at 10, wherein the Commission reiterated its concerns over the financial impact on non-participating customers in rejecting a significant number of WGL's proposed programs and measures.

[27] Virginia Code § 56-600.

[28] 20VAC5-201-85. Conservation and Ratemaking Efficiency Plans.

[29] 20VAC5-304-20.

or programs and thus fewer opportunities for various segments of a utility's customers to participate.

Requirement that TRC Benefits offset RIM Costs

In approving energy efficiency programs under the CARE Act, the Commission has followed the principle that an energy efficiency measure is not cost-effective if the measure reflects a negative NPV under the RIM Test unless that negative NPV is offset by an equivalent or greater positive NPV of the measure under the TRC Test.[30] The Staff has consistently reiterated that requirement in recommending the rejection or modification of various conservation and energy efficiency measures.[31] A requirement that a negative RIM NPV be offset by an equal or greater positive TRC NPV appears to eliminate measures based solely on the results of a single test (where a program otherwise satisfies three of the four cost/benefit tests), in contravention of the CARE Act.[32]

The elimination of a program or portfolio of energy efficiency measures based solely upon the failure to satisfy the requirements of the RIM test is also inconsistent

---

[30] See e.g., 2012 WGL Case, *supra* at 9, wherein the Commission found that "[f]or the programs we approve, we find that the NPV TRC Test benefits are sufficiently high when compared to the NPV RIM Test costs." See also *Application of Virginia Natural Gas, Inc., For authorization to amend its conservation and ratemaking efficiency plan pursuant to Chapter 25 of Title 56 of the Code of Virginia*, Case No. PUE-2014-00068, Order Approving Amended Natural Gas Conservation and Ratemaking Efficiency Plan (Dec. 30, 2014) (hereafter, the "2014 VNG Case") at 7, wherein the Commission approved a VNG gas furnace measure only after VNG reduced the proposed incentive for the measure because the revised incentive "results in a better balance of benefits and costs between program participants and non-participants" and cites the Staff's comparison of the RIM costs and the TRC benefits.

[31] See e.g., *Application of Columbia Gas of Virginia, Inc. For authority to amend its natural gas conservation and ratemaking efficiency plan pursuant to Chapter 25 of Title 56 of the Code of Virginia*, Case No. PUE-2013-00114, Staff Report (February 28, 2014) at 17-18, where the Staff recommended as follows:

> When these present value discounted program costs are compared to the NPVs for the appropriate cost/benefit tests for the High-Efficiency Tankless Water Heater Measure in Table 1, it can be seen that the program costs attributed to this measure exceed the positive NPV benefits of the RIM Test, indicating that the total NPV costs exceed the total NPV Benefits under the RIM Test.
>
> ... Staff does not believe that the Company has shown either measure to be cost-effective and does not recommend they be approved at this time.

[32] Virginia Code § 56-600.

with the Commission's explanation of the purpose and scope of applicability of the various cost/benefit tests in its promulgation of the Rules Governing Cost/Benefit Measures for DSM Programs:

> Although the Commission is sympathetic to the request for [the Commission] to choose a threshold test, we are concerned that use of a threshold test would prematurely eliminate programs that may ultimately prove to be in the public interest. We concur with the criticism of some commenters that the RIM Test, as a threshold measure, would inappropriately screen out conservation programs. The TRC Test as a threshold measure, on the other hand, would screen out strategic load building programs which, when viewed in relation to a utility's total resource plan and load shape, may prove to be beneficial. Thus, we are unable to establish a threshold test. The information provided by each individual analysis will serve to provide more comprehensive information about the expected impact, costs, and benefits of a particular program. We agree that a multi-perspective approach strikes the proper balance for all parties affected by a proposed program.[33]

The Commission clearly recognized that each test provides valuable information about the projected impact of a program and that a "multi-perspective approach strikes the proper balance of all parties affected by a proposed program"[34] in the development of cost-effective conservation and energy efficiency programs.

Inclusion of Low Income and Elderly Programs in Portfolio Analysis

The costs and benefits (*i.e.*, the negative NPV) of programs that are designed to address the needs of low-income and elderly customers have traditionally been included in the cost/benefit analyses of CARE Plans,[35] even though the definition of a "cost-effective conservation and energy efficiency program" does not require the inclusion of

---

[33] *Commonwealth of Virginia, ex. rel. State Corporation Commission Ex Parte: In Re: Investigation of Conservation and Load Management Programs,* Case No. PUE-1990-00070, Order Issuing Rules on Cost/Benefit Measures (June 28, 1993) at 12-13.

[34] *Id* at 13.

[35] See, e.g. 2009 CGV Case, *supra* at 2; 2012 CGV Case, *supra* at 13; 2013 CGV Case, *supra* at 10; 2014 CGV Case, supra; 2015 CGV Case, *supra*; 2008 VNG Case, *supra*; 2012 VNG Case, *supra*; 2014 VNG Case, *supra*, (as amended); 2015 VNG Case, *supra*; 2012 WGL Case, *supra* at 7; and 2015 WGL Case, *supra* at 8.

low-income and elderly programs in the cost/benefit analysis.[36] VNG excluded its Low Income Program from the cost-effectiveness analysis of the portfolio of its Amended CARE Plan in 2014. In initially denying approval of VNG's Amended CARE Plan, the Commission noted that "[a]lthough the CARE Act does not require energy efficiency programs for low-income and elderly customers to pass any of the cost/benefit tests in § 56-600 of the Code in order to be deemed cost-effective, we still examine the impact of the...Low-Income Program on the total CARE Plan program portfolio in order to evaluate the impact on non-participating customers."[37]

Significantly, the CARE Act requires a CARE Plan to include "provisions to address the needs of low-income or low-usage residential customers"[38] and provides that energy efficiency programs resulting in "measurable and verifiable energy savings to low-income or elderly customers may also be *deemed* cost-effective"[39] even if such low-income or elderly program reflects a negative NPV.

Low-Income and Elderly Programs provide energy savings to disadvantaged customers who do not have the means or ability to participate in typical CARE programs. While low-income and elderly programs result in measurable and verifiable energy savings, they typically reflect a negative NPV but may be "deemed" cost-effective in furtherance of the goal of reducing the potential number of non-participating customers. However, the inclusion of the negative NPV of low-income and elderly programs distorts the analysis of the remaining programs, which must reflect a positive NPV that exceeds any negative NPV of the low-income and elderly program that is deemed cost-effective.

---

[36] See Virginia Code §56-600, which specifically requires the cost-effectiveness test to include consideration of administrative costs as well as education and outreach costs, but is silent with respect to consideration of the costs of low-income and elderly programs.

[37] *Application of Virginia Natural Gas, Inc., For authorization to amend its conservation and ratemaking efficiency plan pursuant to Chapter 25 of Title 56 of the Code of Virginia,* Case No. PUE-2014-00068, Order Denying Amended Natural Gas Conservation and Ratemaking Efficiency Plan (Dec. 30, 2014).

[38] Virginia Code §56-602(A)(iv).

[39] Virginia Code §56-600 (emphasis added).

Accordingly, Low-Income and Elderly Programs should be excluded from the portfolio analysis of a CARE Program.

Avoided Costs Included in Cost-Effectiveness Analysis

The CARE Act and the Virginia Energy Policy are designed to manage the rate of consumption of natural gas and promote cost-effective consumption of energy and fuel supplies as well as to mitigate the attendant release of greenhouse gas emissions. A collateral benefit of reducing natural gas consumption, particularly during peak periods, is to reduce the infrastructure (transmission and distribution facilities) needed to deliver natural gas to end-use consumers. In order to reflect this latter benefit, it is common practice for gas utilities to include transmission and distribution facility investments as an avoided cost benefit in the cost/benefit evaluation of natural gas conservation and energy efficiency programs. Transmission and distribution facility investments should likewise be included in the cost/benefit analysis of conservation and energy efficiency programs proposed in CARE Plans.

CARE Plans are evaluated by a series of cost-effectiveness tests that are commonly used throughout the country by both gas and electric utilities. It is widely acknowledged that these tests originated in California and have been published in the California Standard Practice Manual.[40] Thus, it is interesting to examine how the originators of these tests define the avoided cost to be used in their application.

In 2004, the California Public Utility Commission (CPUC) developed new avoided cost estimates for use in the California Standard Practice Manual cost/benefit

[40] California Standard Practice Manual: Economic Analysis of DSM Programs, July 2002, available at http://www.energy.ca.gov/greenbuilding/documents/background/07J_CPUC_STANDARD_PRACTICE_MANNUAL.pdf.

tests. In a 2004 paper[41] summarizing "the new avoided cost estimates developed by the California Public Utility Commission (CPUC), the fundamental methodology for developing the estimates, and the guiding principles of their development," Price and Kollman characterize the new natural gas avoided cost estimates as follows:

> The benefits of conservation are computed as the sum of the following components...[e]lectricity and natural gas commodity, adjusted for energy losses...**and [t]ransmission and distribution (T&D) capacity, which captures the reduced demand related capital expenditures, line capacity losses and maintenance costs associated with energy savings.**[42]

Thus, it is apparent that the tests relied upon by the CARE Act were designed to recognize avoided distribution and other costs as an important benefit of conservation and energy efficiency programs.

Similarly, an Avoided-Energy-Supply-Component (AESC) Study Group in New England develops a regional estimate of avoided energy supply costs for use in the cost/benefit evaluation of natural gas conservation and energy efficiency programs. The latest estimate was published on April 3, 2015 in a document entitled Avoided Energy Supply Costs in New England: 2015 Report[43] (the 2015 Report"). The stated purpose of the document is as follows:

> This 2015 Avoided-Energy-Supply-Component Study ("AESC 2015," or "the Study") provides projections of marginal energy supply costs that will be avoided due to reductions in the use of electricity, natural gas, and other fuels resulting from energy efficiency programs offered to customers throughout New England.

---

[41] Snuller Price and Eli Kollman, New California PUC Avoided Costs for Energy Efficiency Evaluation, available at http://eceee.org/files/proceedings/2004/data/papers/SS04_Panel5_Paper20.pdf.

[42] *Id.* at 5-230 (emphasis added).

[43] Avoided Energy Supply Costs in New England: 2015 Report, Prepared for the Avoided-Energy-Supply-Component (AESC) Study Group, March 27, 2015, Revised April 3, 2015 available at http://www.ripuc.ri.gov/eventsactions/docket/4580-NGrid-TRM4-AESC_report.pdf.

In defining natural gas avoided costs, the 2015 Report notes:

> Initiatives that enable retail customers to reduce their natural gas use also have a number of benefits. The benefits from those reductions include some or all of the following avoided costs:
>
> - Avoided gas supply costs due to a reduction in the annual quantity of gas that has to be produced;
> - Avoided pipeline costs due to a reduction in the quantity of gas that has to be delivered; and
> - Avoided local distribution infrastructure costs due to delays in the timing and/or reductions in the size of new projects that have to be built resulting from the reduction in gas that has to be delivered. [44]

While the 2015 Report recognizes that "the ability to avoid the retail margin varies by LDC," it is clear that it considers the avoided natural gas transmission and distribution costs to be valid components of as appropriate natural gas avoided cost estimate.

The neighboring regulatory jurisdiction of Maryland also includes a measure of avoided distribution costs in its respective estimates of natural gas avoided costs. The April 2014 report entitled, "Assessment of the Costs Avoided through Energy Efficiency and Conservation Measures in Maryland"[45] describes natural gas avoided costs as a result of natural gas conservation and energy efficiency programs as follows:

> Avoided natural gas costs are based on three components: projected Henry Hub (HH) wholesale gas prices; projected transmission costs; and projected distribution costs.[46]

In addition, many other regulatory jurisdictions prescribe the avoided cost calculation for use in the cost/benefit evaluations of electricity conservation and energy efficiency programs (e.g., Pennsylvania). Each of these jurisdictions include an estimate of the avoided costs of transmission and distribution investments as a part their estimates of avoided costs. Non-gas costs in the avoided cost estimates should be

---

[44] Avoided Energy Supply Costs in New England: 2015 Report at 1-11 (emphasis added).
[45] Available at http://www.psc.state.md.us/.
[46] *Id.* at 44.

included in natural gas energy efficiency program cost-effectiveness testing. It is a best practice in the industry and supported by various studies and groups.

In summary, the cost of infrastructure avoided as a consequence of natural gas conservation and energy efficiency programs is recognized throughout the industry as a component of the cost/benefit test and should be reflected in the cost-effectiveness analysis of CARE Plans.

Additional Considerations

Education and Outreach Programs afford customers with valuable information designed to encourage customers to (i) take advantage of conservation and energy efficiency opportunities offered through a Gas Utility's CARE Plan and (ii) pursue other conservation and energy efficiency opportunities on their own initiative. While it is difficult to measure the specific benefits of an Education and Outreach Program, it clearly adds value and furthers the objectives of the CARE Act and the Virginia Energy Plan by providing customers with valuable information that often encourages conservation and energy efficiency beyond the measures included in an approved CARE Plan. Accordingly, while the costs of an Education and Outreach Program may appropriately be considered in the quantification of the cost-effectiveness of a CARE portfolio, the Commission's analysis should, at least subjectively, recognize the unquantifiable benefits of Education and Outreach programs (e.g. by authorizing programs and measures that are only marginally cost-effective).

The unquantifiable benefits of Education and Outreach efforts are also apparent from the fact that CARE initiatives and Education and Outreach Programs are viewed favorably by customers. Each of the Gas Utilities have found that their customers appreciate conservation and energy efficiency offerings provided by their respective

natural gas utility and are viewed favorably by customers as a consequence of their Education and Outreach efforts and conservation and energy efficiency offerings.[47]

Summary

Cost-effectiveness tests and the associated standard of review applied by the Commission to natural gas conservation and energy efficiency programs and measures should be applied consistently across natural gas utilities to avoid jeopardizing the development, approval and implementation of cost-effective conservation and energy efficiency programs that further the statutory objectives of the Virginia Energy Policy and the CARE Act. The standard of review should thus be refined to eliminate obstacles to the implementation of cost-effective conservation and energy efficiency programs.

III. The application of the cost/benefit tests should be enhanced through better defined evaluation and verification protocols for estimating savings actually realized. However, the scope and magnitude of evaluation and verification protocols must be balanced against the incremental costs and benefits of evaluation and verification activities. (*Response to Cost/Benefit Question (iii)*)

The Gas Utilities acknowledge the important role that EM&V plays in assuring the cost-effectiveness of conservation and energy efficiency measures and programs.

---

[47] CGV was included in the most recent JD Power Gas Utility Residential Customer Satisfaction Studies, which rank perceptions of customers and non-customers within CGV's service territory. The importance of energy efficiency programs is reflected in favorability ratings among utilities offering energy efficiency programs versus utilities not offering energy efficiency programs. In the 2015 JD Power Study, CGV experienced a 34% higher customer satisfaction rating from those customers familiar with its energy efficiency programs. The current 2016 JD Power midpoint results (6 months) reflect a continuation of the importance placed on a utility having energy efficiency programs. The 2016 survey responders ranked CGV the fourth highest Midsize Utility nationally in the energy efficiency/conservation awareness category.

Similarly, VNG customers appreciate their utility's efforts to promote energy efficiency. In a recent study released by Cogent Reports, VNG was ranked as the third best "Environmental Champion" in its energy segment and region. The study results validate VNG's efforts to educate customers about the importance of energy efficiency and prove that customers notice and appreciate when their utility offers energy efficiency programs.

WGL conducts a survey of program participants every quarter to gauge program sentiment and identify areas of improvement. Typically, VA CARE customer satisfaction scores range from 85% to 93%.

Common and consistent expectations of the scope and timing of EM&V activities are also critical in planning, proposing and executing conservation and energy efficiency measures in a manner that furthers the objectives of the Virginia Energy Policy and the CARE Act.

A. Cost/Benefit Tests

As defined in Va. Code § 56-600 of the CARE Act, cost-effectiveness is determined by analyzing conservation and energy efficiency programs "using the Total Resource Cost Test, the Societal Test, the Program Administrator Test, the Participant Test, the Rate Impact Measure Test, and any other test the Commission deems reasonably appropriate."

These tests were first developed for the evaluation of demand side measures in California in the early 1980s. The most recently published California Standard Practice Manual: Economic Analysis of Demand-Side Management Programs and Projects[48] describes the tests required by the CARE Act as follows:

- The Participant Test – This test determines whether the demand side measure is cost-effective for the party who receives the demand side treatment.
- The Ratepayer Impact Measure Test – This test determines the impact that the demand side measure will have on non-participants. Because of this, the test is often referred to as the Non-Participants Test, and measures the rate impacts of the utility offering the program.
- The Total Resource Cost Test – This test is designed to measure whether the demand side measure is cost-effective from society's standpoint. Because this test can be derived as the sum of the Participant Test and the Ratepayer Impact Measure Test, it is often referred to as the All Ratepayers Test.

[48] California Standard Practice Manual: Economic Analysis of Demand-Side Management Programs, October 2001, available at http://www.energy.ca.gov/greenbuilding/documents/background/07-J_CPUC_STANDARD_PRACTICE_MANUAL.PDF

- The Program Administrator Cost Test – This test is designed to measure the cost-effectiveness of a demand side measure as a utility resource alternative.

The application of the foregoing tests should be enhanced through better defined evaluation and verification protocols for estimating savings actually realized, as explained in the following Section of these Comments.

B. EM&V Protocols

Acceptable EM&V protocols should be better defined and reasonably standardized. Generally, energy efficiency program evaluation has two key objectives:

1) To document and measure the effects of a program and determine whether it met its goals with respect to being a reliable energy resource.
2) To help understand why those effects occurred and identify ways to improve current programs and select future programs.[49]

Comprehensive EM&V should include the assessment of impacts, the study of market effects, and process improvement review. The outcomes from well implemented EM&V inform program planning, existing program implementation, or efforts to redesign a program. Industry accepted EM&V activities may include a variety of approaches based on the characteristics of the installed energy efficiency technologies, from direct measurement of impacts to verification of project installation to validation of deemed savings. Developing a documented framework or guiding principle agreed upon by the impacted program administrators will ensure a consistent level of rigor and accuracy in assessing energy efficiency accomplishments.

The IPMVP is a guidance document that provides standardized approaches for measuring and verifying savings from energy and water efficiency projects. The framework of M&V options detailed in the IPMVP are widely referenced and used as

[49] Model Energy-Efficiency Program Impact Evaluation Guide – A Resource of the National Action Plan for Energy Efficiency, United States Environmental Protection Agency, November 2007.

standard protocols in the energy efficiency industry. The IPMVP provides that "savings cannot be directly measured, since they represent the absence of energy use."[50] Accordingly, EM&V attempts to determine the impacts of the energy efficiency measure installed through a variety of measurement and verification techniques.

The IPMVP includes four options for conducting M&V, including: (i) measurement of key energy efficiency measure or equipment parameters; (ii) measurement of all energy efficiency measure parameters; (iii) measurement of an entire facility's energy consumption; and (iv) simulation of a facility's energy consumption.

The goal of EM&V, as it applies in Virginia, should be clarified and agreed upon as an initial step in development of EM&V protocols. In considering the national and regional landscape for other evaluation frameworks, it is important to note that in some jurisdictions, where there are specific energy efficiency program performance standards or targets with financial incentives or penalties tied to specific accomplishments, EM&V provides the determination of these accomplishments. However, other jurisdictions may not require the same level of rigor and precision. In Virginia, the goal of EM&V in the context of natural gas conservation and energy efficiency measures has been to accurately quantify the impacts of such measures in utility-sponsored efficiency programs, which informs the cost-benefit assessment of the programs, recognizing that there are no specific energy efficiency performance standards or mandates applicable to natural gas utilities in Virginia.

Acceptance of and adherence to industry-standard approaches to EM&V is necessary to develop accurate and transparent savings results for CARE programs. These approaches may include a range of techniques based on the magnitude of impacts and uncertainty in savings and should consider both accuracy and cost of conducting the EM&V assessment to achieve an appropriate balance in the value of information received

---

50 International Performance Measurement and Verification Protocol, pg 4. Available at www.nrel.gov/docs/fy02osti/31505.pdf.

from the EM&V. Industry-accepted guidance documents and protocols are readily available to inform EM&V approaches, which include:

- The IPMVP, which offers a framework for measuring and verifying impacts of energy efficiency measures, recognizing that the magnitude and uncertainty of impacts, as well as M&V costs should be considered when selecting the appropriate M&V approach for a particular measure.
- The Environmental Protection Agency's National Action Plan for Energy Efficiency Model Energy Efficiency Program Impact Evaluation Guide, which describes approaches and considerations for evaluating energy efficiency programs.
- The Department of Energy's Uniform Methods Project, which is based on IPMVP approaches, but provides a more detailed approach for specific energy efficiency measures. The Residential Furnaces and Boilers Evaluation Protocol is an example of such a protocol.
- Technical Reference Manuals, which include savings algorithms and input assumptions for specific energy efficiency measures developed for a particular service territory or jurisdiction.

C. Appropriate Scope of EM&V

The Gas Utilities also propose that the scope and magnitude of EM&V be better defined. The Gas Utilities' annual EM&V budgets, as a percentage of total program costs, have generally increased since the initiation of each Gas Utility's initial CARE Plan and currently range from 4.85% (VNG) to 6.9% (WGL).[51] In contrast, annual EM&V

[51]

UTILITY	CARE PLAN APPROVAL YEAR	ANNUAL EM&V AS A % OF TOTAL PROGRAM COSTS	CASE NO.
CGV	2009	*2.1%*	*PUE-2009-00051*
CGV	2012	5.8%	PUE-2012-00013
CGV	2016	6.1%	PUE-2015-00072
VNG	2008	N/A - deferred to next rate case	PUE-2008-00060
VNG	2012	3.15%	PUE-2012-00118
VNG	2014	3.15% (initial)	PUE-2014-00068
VNG	2014	5.58% (revised)	PUE-2014-00068
VNG	2015	4.85%	PUE-2015-00129
WGL	2009	2.7%	PUE-2009-00064
WGL	2012	3.8%	PUE-2012-00138
WGL	2015	6.9%	PUE-2015-00138

expenditures (by U.S. region) range from 1.42% to 2.34% of total program costs among natural gas utilities surveyed by the American Gas Association ("AGA").[52] These comparative annual EM&V expenditures strongly suggest that the Gas Utilities are incurring annual EM&V expenses in excess of those necessary to sufficiently validate the benefits of their conservation and energy efficiency measures and that greater reliance should be placed on accepted industry estimates for measure savings and methods for further verifying such estimates, where appropriate.

EM&V should strive to confidently identify the savings achieved from energy efficiency measures installed. However, the specific EM&V approaches used should balance accuracy with costs to optimize the value of information obtained from EM&V efforts. In other words, it is not always appropriate, or feasible, to directly measure the impacts, or even directly measure all input variables used, to determine savings impacts through engineering calculations. Industry standard EM&V approaches outlined in IPMVP and other guidance documents offer the ability to customize the approach to a particular situation or circumstance. Based on the foregoing, the Gas Utilities recommend that their annual EM&V budgets, as a percentage of total program costs, be brought closer in line with national average expenditures by permitting the Gas Utilities to incorporate accepted industry standards and measures into their annual evaluations.

Guiding principles in determining appropriate EM&V for a particular program or measure should reflect a value of information framework that includes: prioritizing the M&V budget; assessing the relative uncertainty of savings impacts; use of industry-standard approaches; and an appropriate balance of the rigor and cost of EM&V activities.

---

[52] See American Gas Association, Natural Gas Efficiency Programs Brief: Investments and Savings – 2014 Program Year; AGA Report Appendix D – 2014 Natural Gas Efficiency Program Expenditures by Activity and Region (Annual EM&V expenditures as a percentage of total program costs were 1.83% for the Northeast, 2.34% for the Midwest, 1.92% for the South and 1.42% for the West).

- ***Prioritizing the EM&V budget.*** Properly allocating EM&V resources requires an assessment of the relative contributions of individual measures and program contributions to the overall portfolio savings. Measures with higher contributions typically should receive a greater portion of EM&V efforts. This will allow for more robust EM&V approaches for these measures, but also may necessitate that measures with smaller savings contributions be evaluated by different means, such as desk reviews of project applications, deemed savings, and engineering calculations rather than site visits and direct metering.

- ***Assessing the relative uncertainty of savings impacts.*** Some measures may have impacts that are well understood and not likely to deviate from the current value, while others may be newer or be more dependent on a particular installation or facility characteristics. In the case of measures that have extensive prior evaluation data, either conducted locally or performed elsewhere but determined to be applicable in the local market, EM&V may focus on the verification of measure installation or on key input parameters that inform the deemed savings algorithms.

- ***The use of industry-standard approaches.*** EM&V approaches should align with industry-standard approaches for each measure being evaluated. This alignment may include different EM&V techniques for different measures in the portfolio, and should be done in the context of the available budget, magnitude of savings, and level of uncertainty of measure impacts. Industry-standard approaches range from verification of installed measures coupled with the use of deemed savings, to the collection of key input parameters for savings algorithms through surveys or site visits, to direct metering or billing analysis of installed equipment or the entire facility.

- ***Appropriate balance of rigor and cost.*** Depending on the EM&V approach selected, it may be appropriate to prioritize primary data collection, recognizing that in some scenarios, direct measurement is not feasible or cost-effective. Where direct measurement is not feasible or cost-effective, secondary data may be available and relevant, and acceptable EM&V practices could include a review and validation of this secondary data to verify applicability to the measure being evaluated. The balance of rigor and cost may also influence the timing of EM&V activities. In some situations, annual EM&V is required or advisable; however, often EM&V activities can be aligned with the regulatory approval cycle to ensure that programs are evaluated prior to the development of new program offerings, but not evaluated so frequently as to unduly burden the overall portfolio budget.

The establishment of EM&V protocols that adhere to these four principles will create an EM&V framework that provides the optimal value of information while allowing for a variety of industry-accepted EM&V approaches.

IV. The statutory prohibition against eliminating a program or portfolio based on the results of a single test should be extended to preclude the elimination of a measure based on the results of a single test, which will increase opportunities for participation and reduce the potential number of non-participating customers.

The CARE Act definition of "cost-effective conservation and energy efficiency program" is based on the application of four standard cost-effectiveness tests.[53] Moreover, the CARE Act provides that neither a program nor a portfolio may be eliminated based on the results of a single test.[54] The Gas Utilities recommend that the statutory prohibition against eliminating a program or portfolio based on the results of a single test be clarified to also preclude the elimination of a measure based on the results of a single test.

The CARE Act does not contemplate the application of the four tests to individual measures or the elimination of a measure that is cost-effective under three or four of the cost-effectiveness tests. Similarly, Rule 20 VAC 5-304-20 prescribes that an application for approval of a portfolio of conservation and energy efficiency programs include an analysis of the costs and benefits of each individual **program**. The Rule does not require or even contemplate the application of the four cost-effectiveness tests to a measure, much less the elimination of a measure based on such an analysis.

An individual measure may further the purposes of the Virginia Energy Policy generally, and the CARE Act specifically, for a variety reasons specified in the CARE Act such as: providing customers with long-term, meaningful opportunities to more efficiently consume natural gas; educating customers as to the economic and environmental benefits of efficient use of natural gas; facilitating a utility's ability to work with customers to decrease the average customer's annual average weather-normalized consumption of natural gas; or the preservation or enhancement of utility bill savings that customers receive when they reduce their natural gas use.

[53] Virginia Code §56-600.
[54] *Id.*

Moreover, the retention of cost-effective conservation and energy efficiency measures will often increase the realistically possible number of participants in such measures and help reduce the potential number of non-participating customers that will be required to pay for a CARE Plan, as directed by the Commission.[55]

IV. Recommendations

The CARE Act prescribes the cost/benefit analysis to be performed in determining whether an energy efficiency program or portfolio is cost-effective. Consistent application of the requirements of the CARE Act and transparency in the manner in which energy efficiency programs and portfolios will be measured, verified and validated are critical to the development of cost-effective energy efficiency programs that further the objectives of the CARE Act as well as the Virginia Energy Policy. In furtherance of those objectives, the Gas Utilities recommend the following:

(1) Cost-effectiveness tests and the associated standard of review applied by the Staff and Commission to natural gas conservation and energy efficiency programs and measures should be applied consistently across natural gas utilities in order to facilitate the development, approval and implementation of cost-effective conservation and energy efficiency programs, consistent with the statutory objectives of the Virginia Energy Policy and the CARE Act. Moreover, the standard of review should be refined to eliminate obstacles to the implementation of cost-effective conservation and energy efficiency programs.

(2) The application of the cost/benefit tests should be enhanced through better defined evaluation and verification protocols for estimating savings actually realized. Moreover, the scope and magnitude of evaluation and verification protocols should be balanced against the incremental costs and benefits of any such enhanced evaluation and verification activities, with the objective of bringing the Gas Utilities'

[55] 2008 VNG Case, *supra* at 13.

annual EM&V budgets, as a percentage of total program costs, closer in line with national average expenditures.

(3) Guiding principles should be adopted for determining appropriate EM&V for a particular program or measure and should include: prioritizing the M&V budget, assessing the relative uncertainty of savings impacts, use of industry-standard approaches, and an appropriate balance of the rigor and cost of EM&V activities.

(4) The statutory prohibition against eliminating a program or portfolio based on the results of a single test be clarified to also preclude the elimination of a measure based on the results of a single test.

WHEREFORE, CGV respectfully requests that the Commission: (i) consider the Gas Utilities Comments and recommendations; and (ii) incorporate the foregoing Comments and recommendations into its Report to the Governor and the General Assembly pursuant to Senate Bill 395.

Respectfully submitted,

By: _____

James S. Copenhaver
Senior Counsel
NiSource Corporate Services Company
1809 Coyote Drive
Chester, Virginia 23836
(804) 768-6408 (phone)
(804) 768-6413 (fax)
jcopenhaver@nisource.com

Counsel for Columbia Gas of Virginia, Inc.

By: Jennifer D. Valaika

Jennifer D. Valaika
McGuireWoods LLP
Gateway Plaza
800 East Canal Street
Richmond, VA 23219-3916
(804) 775-1051
jvalaika@mcguirewoods.com

Counsel for Virginia Natural Gas, Inc.

By: _____

Meera Ahamed
Associate General Counsel
Office of the General Counsel
Washington Gas Light Company
101 Constitution Ave., NW
Washington, DC 20080
202-624-6622
mahamed@washgas.com

Counsel for Washington Gas Light Company

May 25, 2016

Respectfully submitted,

By: _____

James S. Copenhaver
Senior Counsel
NiSource Corporate Services Company
1809 Coyote Drive
Chester, Virginia 23836
(804) 768-6408 (phone)
(804) 768-6413 (fax)
jcopenhaver@nisource.com

Counsel for Columbia Gas of Virginia, Inc.

By: _____

Jennifer D. Valaika
McGuireWoods LLP
Gateway Plaza
800 East Canal Street
Richmond, VA 23219-3916
(804) 775-1051
jvalaika@mcguirewoods.com

Counsel for Virginia Natural Gas, Inc.

By: _____

Meera Ahamed
Associate General Counsel
Office of the General Counsel
Washington Gas Light Company
101 Constitution Ave., NW
Washington, DC 20080
202-624-6622
mahamed@washgas.com

Counsel for Washington Gas Light Company

May 25, 2016

Dominion Resources Services, Inc.
Law Department
120 Tredegar St. Richmond, VA 23219
dom.com

William H. Baxter II
Senior Counsel
Direct: (804) 819-2458; Facsimile: (804) 819-2183
Email: william.h.baxter@dom.com

VIA ELECTRONIC DELIVERY

May 25, 2016

Mr. Joel H. Peck, Clerk
c/o Document Control Center
State Corporation Commission
Tyler Building – First Floor
1300 East Main Street
Richmond, Virginia 23219

Commonwealth of Virginia, *ex rel.*
State Corporation Commission
***Ex Parte*: In the matter of receiving input for evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures**
Case No. PUE-2016-00022

Dear Mr. Peck:

Enclosed are the Comments of Virginia Electric and Power Company for filing in the above-referenced matter.

Should you have any questions, please contact me.

Sincerely,

William H. Baxter II
Senior Counsel

Enclosure

cc: Ashley B. Macko, Esq.
K. B. Clowers, Esq.
Service List

COMMONWEALTH OF VIRGINIA

STATE CORPORATION COMMISSION

Commonwealth of Virginia, *ex rel.*

State Corporation Commission

Case No. PUE-2016-00022

Ex Parte: In the matter of receiving input
for evaluating the establishment of protocols,
a methodology, and a formula to measure
the impact of energy efficiency measures

CASE NO. PUE-2016-00022

COMMENTS
OF
VIRGINIA ELECTRIC AND POWER COMPANY
TO
THE STATE CORPORATION COMMISSION OF VIRGINIA
PURSUANT TO ORDERING PARAGRAPH (5) OF THE
COMMISSION'S SCHEDULING ORDER DATED MARCH 30, 2016

MAY 25, 2016

TABLE OF CONTENTS

Executive Summary

The purpose of these Comments ("Comments") is to present information and detail on (i) existing State Corporation Commission of Virginia ("Commission") demand-side management ("DSM") approval requirements; (ii) Virginia Electric and Power Company's ("Dominion Virginia Power" or the "Company") current DSM cost/benefit and evaluation, measurement and verification ("EM&V") processes; and (iii) responses to the "Objectives" and "Cost/Benefit Questions" posed by the Commission in its March 30, 2016 Scheduling Order in Case No. PUE-2016-00022 (the "Scheduling Order").

Specifically, the Company is filing these Comments pursuant to Ordering Paragraph (5) in the Commission's Scheduling Order directing interested parties or entities to prepare and file comments with the Clerk of the Commission on or before May 25, 2016. Comments are to address the Objectives and/or Cost/Benefit Questions outlined in the Scheduling Order.

The Company's Comments focus on the following positions:

- The cost/benefit tests as currently defined provide a standardized and acceptable method for determining cost-effectiveness of DSM programs;
- The California Standard Practice Manual definitions of the cost/benefit tests are industry standard;
- Levelized Cost of Energy Saved can be calculated from the cost/benefit results using standard financial techniques;
- Using the net present value ("NPV") from cost/benefit results to determine Levelized Cost of Energy Saved for both program benefits and program costs provides a consistent way to evaluate DSM programs;
- A technical resource manual ("TRM") generally accepted in Virginia would be the best way to standardize an approach to DSM program evaluation and compare ongoing program performance to plans;
- Use of an existing TRM, which is applicable to Virginia and/or has precedent for use in Virginia would be preferable;
- Existing southeastern U.S. and Mid-Atlantic region TRM documents would serve as a good primary reference for DSM program evaluation, have precedent for use in Virginia, and have been developed through a stakeholder process;
- In cases where no TRM or secondary source is available, case-specific approaches would

need to be developed;

- EM&V should follow industry standard approaches in the U.S. Department of Energy's Uniform Methods Project ("UMP") and the International Performance Measurement and Verification Protocol ("IPMVP"); and
- Deemed savings calculations, to the extent available and practical, should provide the basis for comparing actual program results to projected results.

Introduction

These Comments are submitted by Dominion Virginia Power in response to the Commission's March 30, 2016 Scheduling Order in Case No. PUE-2016-00022. The Comments address the existing Commission DSM approval requirements, a description of current Dominion Virginia Power cost/benefit and EM&V processes, and responses to the Objectives and Cost/Benefit Questions noted in the Scheduling Order. As stated therein on page 2:

> The Commission finds that an evaluation ("Evaluation") should be conducted to consider the establishment of: (i) uniform protocols for measuring, verifying, validating, and reporting the impacts of energy efficiency measures; (ii) a methodology for estimating annual kilowatt savings for such energy efficiency measures; and (iii) a formula to calculate the levelized cost of saved energy for such energy efficiency measures (collectively, "Objectives").
>
> . . . .
>
> Further, since evaluation and verification of energy savings of energy efficiency programs typically are measured against the projected savings included in the cost/benefit analyses, the Commission is of the opinion that the Evaluation also should encompass the methodologies by which utilities calculate the components of the cost/benefit tests in proceedings requesting approval to implement energy efficiency programs. In particular, the Evaluation should consider: (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; and (iii) whether the application of the cost/benefit tests can be improved by enhanced evaluation and verification protocols for estimating savings actually realized (collectively, "Cost/Benefit Questions") (internal footnote omitted).

The Commission also noted, on page 4 of the Scheduling Order, that it seeks input concerning existing measurement and verification protocols and their applicability for Virginia; and appropriate formulae for developing the cost of saved energy resulting from energy efficiency programs and appropriate inputs for such formulae.

As requested by this directive, the Company has prepared these Comments covering the above topics.

Background

The Commission issued the Scheduling Order to address requirements set out in House Bill 1053 and Senate Bill 395 from the 2016 session of the Virginia General Assembly. The bills addressed:

- The establishment of uniform protocols for measuring, verifying, validating and reporting the impacts of energy efficiency measures; and
- A methodology for estimating annual kilowatt savings and a formula to calculate the levelized cost of saved energy for such energy efficiency measures.

The Commission scheduled a public hearing on July 12, 2016 to receive comments on the issues and included additional requirements as part of the Scheduling Order. The Commission characterized the requirements as follows:

I. The first set of requirements was characterized as the **"Objectives."** They include:

(i) Uniform protocols for measuring, verifying, validating, and reporting the impacts of energy efficiency measures;
(ii) A methodology for estimating annual kilowatt savings for such energy efficiency measures; and
(iii) A formula to calculate the levelized cost of saved energy for such energy efficiency measures.

II. The second set of requirements was characterized as the **"Cost/Benefit Questions."** They include:

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

Existing Commission DSM Approval Requirements

The current body of law governing DSM in Virginia is comprised of a variety of statutes and rules, including § 56-585.1 A 5 ("Subsection A 5") of the Code of Virginia ("Va. Code" or "Code"); Rules 10 (20 VAC 5-201-10) and 60 (20 VAC 5-201-60) of the Commission's Rules Governing Utility Rate Case Applications and Annual Informational Filings (20 VAC 5-201-10, *et seq.*); the Commission's Rules Governing Utility Promotional Allowances (20 VAC 5-303-10, *et seq.*); the Commission's Rules Governing Cost/Benefit Measures Required for Demand-Side Management Programs (20 VAC 5-304-10, *et seq.*) ("Cost/Benefit Rules"); and directives contained in the Commission's Orders.

In addition, Va. Code § 56-576 provides the relevant definitions, including in pertinent part:

> "*Energy efficiency program*" means a program that reduces the total amount of electricity that is required for the same process or activity implemented after the expiration of capped rates. Energy efficiency programs include equipment, physical, or program change designed to produce measured and verified reductions in the amount of electricity required to perform the same function and produce the same or a similar outcome. Energy efficiency programs may include, but are not limited to, (i) programs that result in improvements in lighting design, heating, ventilation, and air conditioning systems, appliances, building envelopes, and industrial and commercial processes; (ii) measures, such as but not limited to the installation of advanced meters, implemented or installed by utilities, that reduce fuel use or losses of electricity and otherwise improve internal operating efficiency in generation, transmission, and distribution systems; and (iii) customer engagement programs that result in measurable and verifiable energy savings that lead to efficient use patterns and practices. Energy efficiency programs include demand response, combined heat and power and waste heat recovery, curtailment, or other programs that are designed to reduce electricity consumption so long as they reduce the total amount of electricity that is required for the same process or activity . . . .
>
> "*Peak-shaving*" means measures aimed solely at shifting time of use of electricity from peak-use periods to times of lower demand by inducing retail customers to curtail electricity usage during periods of congestion and higher prices in the electrical grid . . . .
>
> "*In the public interest*" for purposes of assessing energy efficiency programs, describes an energy efficiency program if, among other factors, the net present value of the benefits exceeds the net present value of the costs as determined by the Commission upon consideration of the following four tests: (i) the Total Resource Cost Test; (ii) the Utility Cost Test (also referred to as the Program Administrator Test); (iii) the Participant Test; and (iv) the Ratepayer Impact Measure Test. Such determination shall include an analysis of all four tests, and a program or portfolio of programs shall not be rejected based solely on the results of a single test. In addition, an energy efficiency program may be deemed to be "in the public interest" if the program provides measurable and verifiable energy savings to low-income customers or elderly customers.

> "*Measured and verified*" means a process determined pursuant to methods accepted for use by utilities and industries to measure, verify, and validate energy savings and peak demand savings. This may include the protocol established by the United States Department of Energy, Office of Federal Energy Management Programs, Measurement and Verification Guidance for Federal Energy Projects, measurement and verification standards developed by the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), or engineering-based estimates of energy and demand savings associated with specific energy efficiency measures, as determined by the Commission.

In its April 30, 2012 Order in Dominion Virginia Power's 2011 DSM proceeding (Case No. PUE-2011-00093), the Commission explained that:

> In evaluating Dominion's Application to determine whether its proposals are "in the public interest" under § 56-585.1 A 5 of the Code, we have considered all four tests (Utility Cost, Participant, Ratepayer Impact Measure ("RIM") and Total Resource Cost) discussed by the participants in this case, as well as other relevant factors. We have not used any of the four tests as a sole determining factor in our analysis . . . . In addition, we find that the impact on customers' bills, especially the impact on the bills of customers not participating in these programs, is a relevant factor in our determination of the public interest.[1]

The Commission also noted that "[t]he magnitude of the potential recovery of lost revenues, and the bill increases attendant thereto are among the other relevant factors we consider in evaluating the public interest"[2] and "[w]e find that a program's impact on customer rates in both the near and long term is particularly relevant to our evaluation of the public interest."[3]

Previously, the Commission had indicated that it would "give greatest weight to the RIM test, closely followed by the TRC test and rounded out by consideration of the Participant and Utility Cost tests."[4] Legislation passed in 2012 added a definition of "in the public interest" to Va. Code § 56-576 (as seen above), which directs consideration of all four cost/benefit tests and that "a program or portfolio of programs shall not be rejected based solely on the results of a single test."

---

[1] *Application of Virginia Electric and Power Company, For approval to implement new demand-side management programs and for approval of two updated rate adjustment clauses pursuant to § 56-585.1 A 5 of the Code of Virginia*, Case No. PUE-2011-00093, Order, 2012 S.C.C. Ann. Rept. 298, 300 (Apr. 30, 2012).

[2] *Id.* (internal footnote omitted).

[3] *Id.*, 2012 S.C.C. Ann. Rept. at 301.

[4] *Commonwealth of Virginia, State Corporation Commission, Report to the Governor of the Commonwealth of Virginia and the Virginia General Assembly*, "Report: Study to Determine Achievable and Cost-effective Demand-side Management Portfolios Administered by Generating Utilities in the Commonwealth Pursuant to Chapters 752 and 855 of the 2009 Acts of the Virginia General Assembly" (Nov. 15, 2009), at 32, 35.

While this amendment to Va. Code § 56-576 means the Commission cannot solely rely on the results of any one test, the RIM test is the cost/benefit test that most closely tracks the impact of proposed DSM programs on the bills of non-participating customers, and the Commission has repeatedly stressed that the RIM test would be a significant factor in determination of the public interest[5].

Description of Current Dominion Virginia Power DSM Cost/Benefit and EM&V Processes

Cost/Benefit Evaluation

As mentioned above, the Commission's Cost/Benefit Rules also play an important role in the current DSM landscape. Like the Code, these Rules stress that utility applicants filing for approval of a DSM program must "analyze a proposed program from a multi-perspective approach using, at a minimum, the Participants Test, the Utility Cost Test, the Ratepayer Impact Measure Test, and the Total Resource Cost Test."[6] Further, the Cost/Benefit Rules outline "[m]inimum guidelines to provide direction to electric and natural gas utilities in developing applications for approval of DSM programs . . . ."[7] Those guidelines, set forth at 20 VAC 5-304-30 (1) through (7), and the Company's current processes for adherence thereto are as follows:

1. *That the assumptions used in developing projected input data and the models used in the integrated resource planning process should be identified and well-documented. Utility-specific data should be used whenever possible (e.g., unit performance data, end-use load research data, market research data, etc.). In cases where utility-specific data are not available, the assumptions must be clearly defined;*

   The Company uses the Strategist model which is a fully integrated electric utility resource planning model that was developed to aid utilities in performing resource planning analysis. It relies on least-cost planning techniques to perform optimized utility resource assessments. It also integrates DSM evaluation into the resource planning process so that assumptions of cost and benefits are consistent with assumptions for the supply-side resources. The assumptions that the Company uses in the resource planning process are well documented in the annual integrated resource plan ("IRP") that is filed with the Commission, as well as in the applications that the Company files with the Commission for approval of DSM programs and supply-side resources. Using the same model to conduct utility supply-side planning and demand-side analysis facilitates the process of documenting assumptions used in the applications for DSM program approval. The Company's process relies on Company-specific data in the modeling process and in

---

[5] *See, e.g., Petition of Virginia Electric and Power Company For approval to implement new demand-side management programs and for approval of two updated rate adjustment clauses pursuant to § 56-585.1 A 5 of the Code of Virginia*, Case No. PUE-2014-00072, Final Order, at 6 n.16 (Apr. 24, 2015) ("The Commission's consideration of the public interest was not based solely on the results of a single factor or a single test.").
[6] 20 VAC 5-304-20.
[7] 20 VAC 5-304-30.

cases where the Company uses external resources for specific model input, the Company strives to document such inputs in the integrated resource plan or DSM filings.

2. *That historic data, if available, should be assessed in developing projected data. Significant departures from historic trends should be explained*;

   The Company's planning process relies heavily on historical trends. The forecasts are produced by running an econometric model using actual load and weather data from the past 20 years along with projected economic data. Expected weather values are developed and then used to produce a weather-normalized forecast. Commodity forecasts for fuel and market prices are generated using both fundamental forecasts that incorporate supply and demand economics as well as shorter term market forecasts that take into account prices from fully functioning and transparent commodity markets. The Company also relies on economic forecasts of key financial drivers which affect the capital markets and return components of the Company's operations. Volatility in recent years in financial markets and in key drivers like fuel prices, market prices for capacity and energy and load growth have increased the level of uncertainty in utility planning assumptions. The Company forecasts and evaluates all of these parameters in great detail each year as part of the Company's IRP process and describes in detail the global assumptions that it uses in its planning process. These same assumptions are used when developing the Company's long-term resource plans, which include the portfolio of DSM resources.

3. *That each projected data series should represent the Company's most current forecast*;

   The Company develops an integrated resource plan on an annual basis. This process includes updating all key assumptions that drive the results of the plan. When developing load forecast adjustments due to DSM programs as well as developing cost/benefit analysis for the DSM programs, the Company uses the most recent IRP data as the basis for its resource planning analysis.

4. *That computer modeling techniques should be used in the development of an integrated resource plan*;

   As referenced above, the Company uses the Strategist computer model to perform integrated resource planning. This model allows the evaluation of supply-side and demand-side programs in an integrated fashion which takes into account the specific attributes of each type of resource and provides output that optimizes the net benefit of all types of resource options.

5. *That estimates of the capital and O&M (operation and maintenance) costs of supply-side options should include realistic projections of the costs of compliance with all promulgated environmental regulations or enacted legislation from which environmental regulations will be promulgated*;

Environmental constraints placed on utility resources plans have been steadily increasing over the recent past. The most recent U.S. Environmental Protection Agency final requirements with respect to carbon dioxide (CO_2) abatement, although currently subject to a stay by the Supreme Court of the United States, have placed unique restrictions on future utility resources and have limited the types of supply-side resources that will meet future environmental requirements. The Company is factoring in these new requirements as well as modifying modeling approaches to account for these new regulations. The Company uses the best data available to develop capital cost as well as operating cost for supply-side options.

6. *That each assumption and/or projected data series should be consistent with all other assumptions and/or projections. Consistency of data should be maintained between all models used within the integrated resource planning process; and*

   Developing annual integrated resource plans allows the Company to maintain consistent assumptions and data series within all of the modules used in the long term resource planning process.

7. *That alternative projections to determine sensitivity to input assumptions should be developed. These alternative projections should be used to perform cost/benefit analysis.*

   The Company runs sensitivity analysis on key parameters that affect the DSM portfolio of programs. These sensitivities include high and low load projections, high and low fuel price projections, and high and low transmission and distribution cost sensitivities.

In more general terms, the DSM program design process begins by soliciting proposals from vendors who have demonstrated their ability to perform DSM program design. Program design includes the development of all of the parameters that are needed to prepare the cost/benefit scores for the program. They include parameters such as:

- Measures to be included in the program,
- Kilowatt (KW) and kilowatt hour (KWh) reductions for each measure,
- Weighted average load shape for all of the measures in a program,
- Cost to implement the measures including marketing, administrative cost and customer incentives, and
- Net-to-gross ratios.

The Company's process to analyze, propose, implement and verify its DSM activities begins with the annual IRP process. DSM programs are viewed as a resource for meeting current and future load imposed on the Company's electrical system by its customers. The Company is responsible for planning and operating an electrical grid that provides electricity at the lowest reasonable cost and in an environmentally acceptable manner.

Utility resource planning is based on least-cost planning concepts that require the utility to forecast the future to decide on the set of resources that will meet future utility load requirements

while also minimizing the cost that the utility must collect from its customers. The objective is to minimize revenue requirements over an appropriate planning horizon while meeting all environmental constraints placed on utility supply-side resources.

Demand-side resources are evaluated by first determining the benefits that a particular DSM program or measure can provide. Benefits are derived from the fact that customers, if provided the right incentive, will alter their normal energy usage patterns in a manner that will lower utility cost and ultimately lower the total amount of dollars the Company must collect from all of its customers.

DSM benefits come primarily from three categories. The first category of benefits comes from reducing the amount of energy customers consume, which lowers the amount of energy the utility has to produce. The benefits come primarily from lower fuel costs. The other two categories are capacity-related and come in the form of avoided capacity cost that results when a DSM program reduces the Company's peak load requirements. Lower peak load requirements allow the utility to defer building new generating capacity to meet future load growth. Lower peak loads will also result in lower expenditures on transmission and distribution facilities to meet expected future customer load growth.

The second part of performing DSM evaluations is to look at the cost of designing and implementing the DSM programs. The benefits from the programs are then used to fund the DSM program. If the benefits of the program outweigh the costs, then the program can be implemented without being subsidized by customers.

The DSM cost/benefit evaluations are accomplished by performing cost/benefit tests. The cost/benefit tests that are currently required in Virginia are derived from the California Standards Practice Manual. They are the Participant Test, Utility Cost Test ("UCT"), Total Resource Cost Test ("TRC Test"), and the Ratepayer Impact Measure Test ("RIM Test"). A version of this manual was first introduced in February 1983 and has been modified over the years to guide California utilities in the development of cost/benefit tests to evaluate DSM programs. The tests are high-level resource planning tests that have been accepted by many jurisdictions in the United States and are recognized in the industry as relevant indicators of cost-effectiveness, although the weightings and interpretations of the tests vary across different jurisdictions. There are four tests; each has a specific purpose and evaluates the benefits and cost for a DSM program from different perspectives. The tests can also viewed as representing the objectives of four different stakeholders in the DSM process. Below is a description of each of the four tests and the stakeholder perspective the test represents.

Participant Test

The Participant test is the measure of the quantifiable benefits and costs to Program participants due to enrollment in a DSM Program. This test indicates whether the Program or measure is economically attractive to the customer. Benefits include the participant's retail bill savings over time plus any incentives offered by the utility. Costs include only the participant's costs. The Participant test is calculated by the following

formula:

$$= \frac{\text{Participant Bill Reduction + Incentives}}{\text{Participant's Cost}}$$

A result of 1.0 or higher indicates that a Program passes the Participant test.

Utility Cost Test

The UCT compares the cost to the utility to implement a Program to the cost that should be avoided as a result of the Program. The UCT measures the net costs and benefits of a Program as a resource option, based on the costs and benefits incurred by the utility, including incentive costs and excluding any net costs incurred by the participant. The UCT is calculated by the following formula:

$$= \frac{\text{Avoided Capacity Benefit + Avoided Energy Benefit}}{\text{Utility Administrative Cost + Utility Incentive Payments}}$$

A result of 1.0 or higher indicates that a Program passes the UCT.

Total Resource Cost Test

The TRC test compares the total costs and benefits to the utility and participants, relative to the costs to the utility and participants. It can also be seen as a combination of the Participant and Utility Cost tests, measuring the impacts to the utility and all program participants as if they were treated as one group. Additionally, this test considers customer incentives as a pass-through benefit to customers and, therefore, does not include customer incentives. The TRC test measures the net costs and benefits of a Program as a resource option based on the total costs and benefits of the Program, including both the participants' and the utility's costs and benefits. The TRC test is calculated by the following formula:

$$= \frac{\text{Avoided Capacity Benefit + Avoided Energy Benefit}}{\text{Utility Administrative Cost + Customer Costs}}$$

A result of 1.0 or higher indicates that a Program passes the TRC test.

The Ratepayer Impact Measure Test

The RIM test considers equity issues related to Programs. This test determines the impact a given DSM Program will have on non-participants and directionally assesses the

impact on customer bills or rates due to changes in utility revenues and operating costs attributed to the Program. A score on the RIM test of greater than 1.0 indicates the Program is beneficial for both participants and non-participants, because it should have the effect of lowering bills or rates even for customers not participating in the Program. Conversely, a score on the RIM test of less than 1.0 indicates the Program is not as beneficial because the costs to implement the Program exceed the benefits shared by all customers, including non-participants. In other words, a RIM score of less than 1.0 indicates that rates or bills of non-participants may rise. The RIM test is calculated by the following formula:

$$= \frac{\text{Avoided Capacity Benefit + Avoided Energy Benefits}}{\text{Utility Administrative Cost + Utility Incentive Payments + Utility Revenue Reductions}}$$

DSM program approval starts with a rigorous cost/benefit evaluation to determine whether a DSM program is in the public interest. The cost/benefit scores evaluate the program design assumptions for a given DSM program on a going-forward basis. That is, projections are made for the cost of the program, the load impacts that might result from the program and the associated cost savings that the utility will see if it implements the program. From the program assumptions, cost/benefit scores for all of the four stakeholder populations are determined. If the cost/benefit score is positive (above 1.0) then it is assumed, if the programs can be implemented as planned, that the program would be beneficial for the particular stakeholder that the test represents.

The Company has developed criteria for determining if the Company will bring a DSM program before the Commission for approval. Specifically, the Company examines the cost/benefit analysis for a given program design; if the cost-effectiveness analysis indicates that the program would be cost beneficial (three of the four tests, Participant, Utility and TRC above 1.0), the program moves to the next step. The Company then reviews the program design in detail and determines whether the program can be practically presented to customers. If the Company has reason to believe that the program design is both cost-effective and viable, then it is included in a petition for approval before the Commission. If a given program does not pass the RIM test, but passes the other tests and has a viable design that demonstrates system benefits, the Company will still consider bringing the program before the Commission for approval. A RIM test below 1.0 indicates that there are potential equity issues with the program. Specifically, a RIM test score below 1.0 indicates that there will be upward pressure on rates if the program is implemented. In this case, participants in the program will see lower bills because of the energy savings provided by the more efficient measure that was adopted by the participant. In these instances, non-participants will see higher bills because their rates will be higher if the program is implemented.

The Company has presented the results of these four cost/benefit tests in all of its DSM

applications before the Commission, starting with the Company's initial DSM proceeding, Case No. PUE-2009-00081.[8] The tests are performed using the Strategist model which uses the California Standard Practice Manual as its basis for defining the test.

The Company believes the Commission is in the best position to hear arguments from all viewpoints represented in a DSM proceeding about the pros and cons of implementing a program with a RIM score below 1.0. The Company evaluates the DSM programs based on all four tests and presents the cost/benefit scores on an individual and portfolio basis for Commission consideration. The Commission, upon hearing from all of the interested participants in a DSM approval case, ultimately determines whether approving a program that has RIM score below 1.0 is in the public interest.

Levelized Cost Calculation

The Senate and House Bills (1053 and 395, respectively) require the Commission to evaluate the establishment of a methodology for calculating levelized cost of energy saved. The Bills and the Commission's Scheduling Order do not specifically state how the calculation of levelized cost of energy saved would be used. The Commission in the past has ordered Dominion Virginia Power to calculate levelized cost of DSM programs and supply-side options, and to include the results in the annual IRP filings. The Company has developed a methodology for computing levelized cost that is internally consistent with the method of determining cost/benefit scores for the individual DSM programs. This is appealing if there are plans to use the levelized cost numbers in a similar fashion as the cost/benefit scores to assess the relative merits of individual DSM programs, although the Company does not advocate for this change.

The DSM cost/benefit scores utilize a discounted cash flow methodology to determine the NPV of both a benefit stream of dollars and a cost stream of dollars due to the DSM program over a specific time period. The Company has used the planning period for its IRP resource planning efforts, which is 25 years, to calculate the NPVs of both cost and benefits of the DSM programs. To determine the cost/benefit ratio of a program, the NPV of the benefits is used as the numerator and NPV of the costs as the denominator:

Benefit/Cost Ratio = Net Present Value of the Program Benefits / Net Present Value of the Program Costs

NPVs can easily be turned into a level stream of costs or benefits over the same time period. A capital cost recovery factor utilizing the same discount factor used when developing the NPVs of the benefit and cost streams will produce a level stream of dollars that produces the same NPV over the study period. Therefore, the first step in developing levelized cost of energy saved is to apply a capital cost recovery factor to the NPV of the benefit stream of dollars and the cost

[8] *Application of Virginia Electric and Power Company For approval to implement new demand-side management programs and for approval of two rate adjustment clauses pursuant to § 56-585.1 A 5 of the Code of Virginia*, Case No. PUE-2009-00081, Order Approving Demand-Side Management Programs, 2010 S.C.C. Ann. Rept. 362-67 (Mar. 24, 2010).

stream of dollars for the program. The next step is to represent the levelized stream of benefits and costs as a benefit and cost per megawatt hour ("MWh") by dividing the NPV by the appropriate MWh reduction for the program. Because the discounting process takes into account the time value of money, so should the MWh reductions which occur over time. The MWh reductions from the programs should be discounted to take into account the fact that the value of a MWh reduction would be less in future years, just as a dollar would be worth less in future years. The discounted stream of MWh reductions should also be levelized over the study period, and is what is used to determine the levelized cost of saved energy.

"Levelized Cost of Energy Saved" is calculated through the following formula:

Levelized Cost of Energy Saved = (C x (Capital Recovery Factor))/(D)
Capital Recovery Factor[9] = [A* (1 +A)^B]/[(1 +A)^B – 1]

Where:

A = Utility specific discount rate[10]
B = Program Evaluation period in years
C = Net Present value of total program costs in base year dollars for the review period[11]
D = Levelized kilowatt hours saved over the evaluation period[12]

The appeal of using this method to calculate levelized cost of energy saved is that it produces the same result for the cost/benefit ratios as the NPV method that is currently used for calculating cost/benefit ratios for the cost/benefit tests. The two methods are internally consistent and will produce the same results as long as both cost and benefits are used when evaluating DSM cost/benefit scores.

Below is an example of the cost/benefit scores from the Company's 2015 integrated resource plan for the Residential High Efficiency Heat Pump Upgrade Program, as well as the levelized cost and benefits for the program. The Net Present Values of the benefit and cost streams follow the formula in the California Standard Practice Manual and are the industry standard approach to performing cost/benefit analysis. The cost/benefit ratios for the levelized benefit and cost streams are derived from the formula above. As shown below, the cost/benefit ratios using the NPV for the benefits and costs are the same as the levelized cost/benefit ratio using the levelized cost and benefits for the program.

---

[9] Capital Cost Recovery Factor is the classic definition of a compound interest calculation to calculate equivalent annual net disbursements.
[10] Utility discount rate should be the utility's weighted average cost of capital and equivalent to the discount rate used in the supply-side evaluation.
[11] NPV based on end of year cash flows.
[12] KWh saved is levelized over study period.

Cost/Benefit ratio using Net Present Value of benefit and cost streams

	UCT	TRC	RIM
NPV Benefits	$ 53,917	$ 53,917	53,917
NPV Cost	$ 16,049	$ 21,677	108,036
C/B Ratio	3.36	2.49	0.50

Cost/Benefit ratios using the levelized benefit and cost streams on a per MWh basis

Levelized Benefit per MWH	$76.72	$76.72	$76.72
Levelized Cost per MWH	$22.84	$30.85	$153.74
C/B Ratio	3.36	2.49	0.50

Evaluation Measurement and Verification (EM&V)

Once a program is approved, the Company's EM&V contractor is engaged to establish data requirements for the program using industry standard approaches for measurement and verification.

For each program, the Company's EM&V contractor develops a plan for the general methodology that will be used to evaluate each program against energy and capacity projections and reviews available data associated with energy and/or capacity savings expected to result from specific application of the program measures. The contractor prepares a Standard Tracking and Engineering Protocols Manual ("STEP manual") – similar to a TRM document – with information specific to the program based on the available data and on the contractor's professional experience and judgment. For example, the Company's 2016 EM&V Report, filed on April 1, 2016 in Case No. PUE-2014-00071, provided the following savings estimation approach for an air source heat pump upgrade under Dominion Virginia Power's Residential Heat Pump Upgrade Program:

Savings Estimation Approach

Gross annual electric energy savings for **time of sale** and **early replacement** units are calculated according to the following equation. The calculation for early replacement units in this manual deviates from that in the Mid-Atlantic TRM 2015, which has two separate approaches to calculate the initial phase savings (existing to efficient savings) and remain phase savings (new baseline to efficient savings). DNV GL conducts a single calculation at the time of the measure installation to determine the measure's annualized savings. That savings is then aggregated with other measure savings and the aggregated value is tracked over time. We do not keep records of that individual participant's savings over time, to discount it at the appropriate time for the new baseline. In the case of early replacement units, DNV GL assumes the baseline to be at the new Federal minimum requirement to be conservative with the savings that are reported.

$$\Delta kWh/year = \frac{FLH_{cool} \times BtuH \times \left(\frac{1}{SEER_{base}} - \frac{1}{SEER_{ee}}\right)}{1{,}000\ W/kW} + \frac{FLH_{heat} \times BtuH \times \left(\frac{1}{HSPF_{base}} - \frac{1}{HSPF_{ee}}\right)}{1{,}000\ W/kW}$$

Gross coincident demand reductions savings for **time of sale** and **early replacement** units are calculated according to the following equation:

[71] Residential Heat Pump Upgrade Program website. https://www.dom.com/library/domcom/pdfs/virginia-power/ways-to-save/residential-heat-pump-upgrade-rebate-form.pdf. Accessed 6/29/2015

[72] Ibid

$$\Delta kW = \frac{BtuH \times \left(\frac{1}{EER_{base}} - \frac{1}{EER_{ee}}\right) \times CF}{1{,}000\ W/kW}$$

Where:

ΔkWh/year = gross annual electric energy savings

ΔkW = gross coincident demand reductions. The above equation is for estimating the summer peak demand reduction. At present, both VA and NC do not consider the winter peak demand in their utility tariff structure. However, when needed, this reference manual can be updated with algorithm on winter peak demand reduction calculation.

FLH_{cool} = annual cooling full load hours (FLH)

FLH_{heat} = annual heating FLH

BtuH = capacity of air source heat pump (1 ton = 12,000 Btu/h). BtuH appearing in energy savings and peak demand reduction equations above refers to the cooling nameplate rated capacity, converted to Btu.

$SEER_{base}$ = seasonal energy efficiency ratio (SEER) of baseline (pre-retrofit) air source heat pump

$SEER_{ee}$ = SEER of efficient (post-retrofit) air source heat pump

$HSPF_{base}$ = heating seasonal performance factor (HSPF) of baseline air source heat pump

$HSPF_{ee}$ = HSPF of efficient air source heat pump

EER_{base} = energy efficiency ratio (EER) of baseline unit

EER_{ee} = EER of efficient unit

CF = summer peak coincidence factor

Input Variables

Table 26: Input Values for Air Source Heat Pump Upgrade Savings Calculations

Component	Type	Value	Unit	Source(s)
FLH_{cool}	Fixed	Richmond, VA = 842; Charlotte, NC = 939; See Table 90	hours/year	Mid-Atlantic TRM 2015, p. 115; ENERGY STAR® calculator[74]
FLH_{heat}	Fixed	Richmond, VA = 789; Charlotte, NC = 744; See Table 90	hours/year	Mid-Atlantic TRM 2015, p. 116
BtuH	Variable	See customer application	Btu/hour	Customer application
		Richmond, VA default = 28,720 Charlotte, NC default = 30,889		Dominion's portfolio of residential energy efficiency programs program[75]
$SEER_{base}$	Fixed	See Table 91 for federal minimum baseline	Btu/watt-hour	Mid-Atlantic TRM 2015, p. 115[76]
$SEER_{ee}$	Variable	See customer application	Btu/watt-hour	Customer application
		Default = 14.5		Dominion program requirements[77]
$HSPF_{base}$	Fixed	See Table 91for federal minimum baseline	Btu/watt-hour	Mid-Atlantic TRM 2015, p. 116[78]
$HSPF_{ee}$	Variable	See customer application	Btu/watt-hour	Customer application
		Default = 8.2		Dominion program requirements[79]

[74] ENERGY STAR®. Heat Pumps "Savings Calculator," Heating Usage, http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=EP. Accessed June 30, 2015.

[75] DNV GL reviewed the customer application data on heat pump size of participants in the Residential AC Cycling Program, Residential Duct Testing Program, Residential Heat Pump Upgrade Program and Residential Heat Pump Tune-Up Programs from program start dates through the end of 2015 (12/31/2015). The average heat pump capacity in VA (2.39 tons or 28,720 BtuH) was calculated using data from 85,412 air source heat pump units enrolled in these programs in Virginia. The average capacity in NC (2.57 tons or 30,889 BtuH) was calculated using data from 5,292 air source heat pump units enrolled in these programs in North Carolina. The average capacity was converted to BtuH using the conversion factor of 12,000 BtuH per ton.

[76] Mid-Atlantic TRM 2015, p. 115. Minimum Federal Standard

[77] https://www.dom.com/heatpumpupgrade. Accessed June 30, 2015.

[78] Mid-Atlantic TRM 2015, p. 115. Minimum Federal Standard

[79] https://www.dom.com/heatpumpupgrade. Accessed June 30, 2015.

EER_{base}	Variable	See Table 91 for federal minimum baseline	Btu/watt-hour	Mid-Atlantic TRM 2015, p. 118[80]
EER_{ee}	Variable	See customer application	Btu/watt-hour	Customer application
		Default value 12.0.		Dominion program requirements[81]
CF	Fixed	0.69	-	Mid-Atlantic TRM 2015, p. 119[82]

[80] The federal Standard does not currently include an EER component. The value is approximated based on the SEER standard (14) and equals EER 11.8. To perform this calculation we are using this formula: (-0.02 * SEER2) + (1.12 * SEER) (from Wassmer, M. (2003). A Component-Based Model for Residential Air Conditioner and Heat Pump Energy Calculations. Masters Thesis, University of Colorado at Boulder).

[81] Estimated from SEER = 15.0 with the help of the following algorithm: $EER = (-0.02 * SEER^2) + (1.12 * SEER)$

[82] Mid-Atlantic TRM 2015, p. 119. Based on BG&E's "Development of Residential Load Profiler for Central Air Conditioners and Heat Pumps" research, the Maryland Peak Definition coincidence factor is 0.69.

Energy savings values and computation approaches in the Company's STEP manual are generally referencing the Mid-Atlantic TRM where possible. Where regional statewide TRM values and approaches are not available, values from other accepted TRMs or methods consistent with the standard EM&V protocols mentioned above should be used. In the example above, for variables such as system size (BtuH) and efficiencies (SEERee and HSPFee) where customer-specific details are not available, the STEP manual indicates that the input value is based on (i) information from customer applications in the Company's portfolio of energy efficiency programs, and (ii) the Mid-Atlantic TRM, p. 115. Development of EM&V plans and STEP manuals are important components of an effective EM&V program.

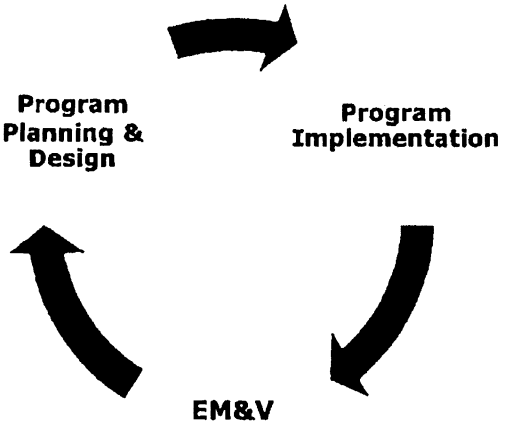
Virginia does not have a state-specific TRM. While such a resource would provide pre-approved methodologies for calculating demand and energy reductions for individual DSM measures, the Company believes that the existing approaches in its STEP manual from accepted sources is sufficiently effective and consistent with industry practice. This approach relies primarily on other regional or state TRMs, the U.S. Department of Energy ("DOE") UMP, IPMVP standards or case-specific approaches as necessary. This approach:

- Establishes a common resource for Dominion Virginia Power's energy and demand savings estimates;
- Ensures all internal parties (*e.g.*, Program Managers, resource planners and implementation vendors) are using the same protocols, input values assumptions and algorithms; and
- Serves as a basis for assessing performance of program implementation progress.

While this approach and the resulting STEP manuals are specific to Company programs, the process behind developing the STEP manual is sound. It follows regionally recognized standard approaches, which should also be a requirement for other utilities in the state that are required to

track program performance toward goals and perform EM&V on Commission-approved DSM programs. It should also be recognized that for the most part, EM&V efforts will be provided by external vendors. While the EM&V standards provide direction for performing EM&V evaluations, different vendors will have specific techniques and processes for compiling and reporting EM&V reports. This need for flexibility among vendors should be recognized if the Commission sets uniform standards for this important part of the DSM process in Virginia.

The DSM program development, approval and evaluation process is designed to provide feedback that can be used to improve the process over time. Best available industry standards are used to perform each of the outlined steps. The following diagram depicts the steps discussed above and provides some insight into the need for standardization in approach across the Virginia utilities.



The process starts with Program Planning and Design. This step includes the development of program parameters that will form the basis of the cost/benefit calculations discussed above. Deemed savings approaches such as those contained in the STEP manual can play an important role in documenting the initial objectives of a DSM program as well as the economic evaluation that determines whether a DSM program is in the public interest. The second step is the implementation of the DSM program. Implementation vendors who have submitted proposals to implement the DSM program according to the program assumptions that were approved by the Commission work with the Company and an EM&V vendor to track the programs' performance through the implementation process. The final step, EM&V, helps determine if a program is delivering the benefits that were part of the original cost/benefit evaluation used when the program was approved. The process is ongoing. Information about customer response, changes in the market for individual DSM measures, and utility operating and energy savings assumptions change over time. The DSM program cycle will make the proper adjustments to keep the DSM program on track or make changes to the future status of the program.

The Company reports on EM&V evaluation on an annual basis. The information that is provided in the EM&V report can be used to update DSM assumptions on a going-forward basis. The Company uses the data to update DSM program assumptions and provides updated going-forward cost/benefit scores for each of the approved programs that have sufficient EM&V data or where program assumptions have significantly changed. Although annual data on program performance are generated, it should be recognized that sufficient time needs to elapse in order to ensure that trends in the data are valid predictors of a DSM program's future benefits and costs. The Company's experience indicates that at least three years of program implementation data may be required for trends to become sufficiently stable to allow the information to be used to update program design assumptions. Relying on data reflective of shorter periods of time may result in adjustments in program assumptions that do not accurately reflect longer-term trends.

Responses to Objectives and Cost/Benefit Questions

"Objectives"

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

Utilities should follow industry standard practice when developing and implementing EM&V plans. The two prevalent standards are the Uniform Methods Project ("UMP") sponsored by DOE and the International Performance Measurement & Verification Protocol ("IPMVP") standard. The EM&V plan should rely on a Technical Resource Manual that clearly defines the parameters associated with forecasting DSM energy and demand reduction projections as well as forms the basis on how the individual measures of a program are measured and reported. The Company believes its STEP Manual can serve as an effective starting point for developing deemed savings approaches for electric energy efficiency measures.

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

The Company recommends that utilities rely primarily on other regional TRMs to the extent that they address the measures in question. For those measures not adequately addressed by a regional TRM, a utility should identify the deemed savings approach that it plans to follow for all measures that are brought to the Commission for approval.

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

Levelized cost of saved energy is a valid metric in considering DSM programs as long as it is used in conjunction with the levelized benefit of the DSM program. The Company

suggests using the formula presented herein, on page 14, if levelized cost of energy saved is used to evaluate the cost-effectiveness of DSM programs. The formula is internally consistent with the standard cost/benefit ratios produced by following the California Standard Practice Manual and will yield the same results as the standard cost/benefit tests when evaluating DSM programs.

"Cost/Benefit Questions"

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

The cost/benefit methodology for DSM programs is outlined in the California Standard Practice Manual. If utilities follow this guideline, then there will be consistency in application of the tests. Dominion Virginia Power uses the Strategist implementation of the cost/benefit tests, which follows the California Standard Practice Manual. The Commission Staff ("Staff") can help inform the Commission as to whether the Virginia utilities consistently follow the California Standard Practice Manual.

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

The cost/benefit approach using the California Standard Practice Manual guidance would provide a consistent way to evaluate DSM programs for electric utilities as well as facilitate comparison of program assumptions and benefits. Consistent application of the California Standard Practice Manual would facilitate compiling data on the cost-effectiveness of DSM programs within the state, as well as forming a basis for setting statewide targets and reporting requirements for meeting state objectives like the Virginia Energy Plan.

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

The DSM process described above lays out a feedback loop process with steps that are interdependent. The steps complement each other and result in a DSM proposal, implementation and evaluation process that ensures that DSM program projections are sound and produce benefits for a utility's customer base. The program cycle starts with Program Planning and Design where the assumptions of a DSM program are identified. The second step is Program Implementation where DSM programs are set up with the administrative and project management functions to deliver the DSM programs as planned. Finally, there is the EM&V step where the benefits as well as the costs of the programs are monitored and reported to ensure programs produce the benefits that were originally projected. This process as described above represents a process that follows industry standard practice and provides for the best application of the cost/benefit scores. The Company does not propose enhancements to the EM&V process other than the process that is currently followed by the Company. However, the Company is open to

enhancements to its individual EM&V methods for specific programs should that be beneficial to the Commission or the Staff.

Conclusion

In conclusion, the Company has undertaken significant efforts to develop processes and procedures that allow it to continue to develop and grow a cost-effective DSM portfolio. The Company's customers, both residential and non-residential, regularly express interest in increased choices among energy efficiency and peak-shaving offerings. The Company diligently works to identify and develop new ideas and program concepts to study and ultimately bring those programs that are likely to provide viable benefits before the Commission for approval to initiate in the Commonwealth.

The Company proposes that the cost/benefit tests as currently defined by the California Standard Practice Manual provide a standardized and acceptable method for determining cost-effectiveness of DSM programs and are generally accepted as the industry standard. The Company does not currently evaluate the cost-effectiveness of DSM programs using a levelized cost analysis. However, should the Commission move in that direction, Levelized Cost of Energy Saved should be calculated from the cost/benefit NPV results using the formula and assumptions outlined above.

With respect to data inputs for projected savings, a deemed savings approach that is generally accepted in Virginia would be the best way to standardize an approach to DSM program evaluation, and provide the basis for comparing ongoing program performance to plans. The Company has developed a comprehensive document of deemed savings approaches for its programs based on southeast and Mid-Atlantic region TRMs. The Company does not advocate the creation of a new, Virginia-specific TRM due to cost and other considerations and believes its STEP manual can be used as a starting point for developing standardized deemed savings approaches for electric efficiency measures in Virginia. The Company further notes that for those electric efficiency measures not addressed in relevant regional TRM documents, a case-specific approach using EM&V standards discussed above should be used.

Finally, EM&V to determine actual savings should follow industry standard protocols from UMP and IPMVP standards.

Dominion Virginia Power thanks the Commission for the opportunity to submit comments on these important topics and looks forward to further dialogue as appropriate.

Respectfully submitted,

VIRGINIA ELECTRIC AND POWER COMPANY

By: William H. Baxter II
Counsel

William H. Baxter II
Dominion Resources Services, Inc.
Law Department, Riverside 2
120 Tredegar Street
Richmond, Virginia 23219
Telephone: (804) 819-2458
Facsimile: (804) 819-2183
william.h.baxter@dom.com

Vishwa B. Link
Lisa R. Crabtree
McGuireWoods LLP
Gateway Plaza
800 East Canal Street
Richmond, Virginia 23219-3916
Telephone: (804) 775-4330 (VBL)
Telephone: (804) 775-1327 (LRC)
Facsimile: (804) 698-2151
vlink@mcguirewoods.com
lcrabtree@mcguirewoods.com

Counsel for Virginia Electric and Power Company

May 25, 2016

CERTIFICATE OF SERVICE

I hereby certify that a true copy of the *Comments of Virginia Electric and Power* Company was sent by first-class mail, postage prepaid this 25th day of May, 2016 to the following:

Rodney Dickens, President
Allegheny Power
800 Cabin Hill Drive
Greensburg, Pennsylvania 15601

William K. Castle
Director Regulatory Services
American Electric Power
3 James Center
1051 East Cary Street, Suite 1100
Richmond, Virginia 23219

John Ebert, President
Appalachian Natural Gas
P.O. Box 2543
220 West Valley Street
Abingdon, Virginia 24210

Kevin Akers, President
Atmos Energy Corporation
801 Crescent Center Drive, Suite 600
Franklin, Tennessee 37067-6226

C. Meade Browder, Jr., Esq.
Office of the Attorney General
Division of Consumer Counsel
202 North Ninth Street
Richmond, Virginia 23219

James S. Copenhaver, Esq.
Columbia Gas of Virginia Inc.
1809 Coyote Drive
Chester, Virginia 23836-2400

Department of Mines, Minerals
1100 Bank Street
Richmond, Virginia 23219

Rick Lovekamp
Manager Regulatory Policy & Strategy
Kentucky Utilities
P.O. Box 32030
Louisville, Kentucky 40232

Lonnie Bellar
Vice President Regulation
LG&E Energy Corporation
220 West Main Street
Louisville, Kentucky 40202

John S. D'Orazio
President and CEO
Roanoke Gas Company
519 Kimball Ave., NE
Roanoke, Virginia 24016

Southeastern Virginia Gas Company
Lance G. Heater
President and CEO
208 Lester Street
Martinsville, Virginia 24112

Robert Duvall, President
Virginia Natural Gas, Inc.
544 South Independence Blvd.
Virginia Beach, Virginia 23452-1104

Adrian Chapman
President and COO
Washington Gas Light Company
6801 Industrial Road
Springfield, Virginia 22151

William H. Baxter, II
Counsel

Before the Commonwealth of Virginia State Corporation Commission

Case No. PUE-2016-00022

In the matter of receiving input for evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures

Date Opened: March 30, 2016

Comments of EnergySavvy on Evaluation, Measurement and Verification for Energy Efficiency Programs in Virginia

EnergySavvy appreciates the opportunity to offer comments in response to the Commission's inquiry into methods, protocols and standards for the measurement and verification of energy efficiency savings estimates. The measurement of energy efficiency is a critically important exercise to ensure that savings are accurate, verified and appropriately valued. EnergySavvy, as provider of EM&V 2.0 tools, has expertise in the measurement and verification of mass-market programs (residential and small-medium business). As such, the following comments are intended to only reflect on methods for measuring savings from programs serving those sectors.

Background:

EnergySavvy is a software-as-a-service company that serves utility and government administered demand-side management energy efficiency programs. EnergySavvy provides software to improve customer engagement, manage program data and quantify savings. EnergySavvy is a provider of EM&V 2.0 software, a technology designed to enhance the evaluation, measurement and verification (EM&V) of demand side management energy

efficiency programs. EnergySavvy's EM&V 2.0 tools combine cloud based software with industry best practices (IMPVP Option C and ASHRAE 2002.14) to identify, analyze and measure energy efficiency savings thoroughly and continuously while complementing existing EM&V approaches. By analyzing data from weather stations, program tracking (what measures installed, where and when) and energy usage (monthly or interval) from meters, EnergySavvy's EM&V 2.0 conducts a billing analysis to account for normalized metered energy consumption in an ongoing fashion. EM&V 2.0 tools are embedded into energy efficiency programs to measure savings, uncover program indicators and provide a data collection and analysis tool that benefits utilities and evaluators, and speeds up program evaluation.

Existing measurement and verification protocols and their applicability for Virginia

- Deemed Savings

Deemed savings are a common approach for measuring energy savings in mass-market programs. EnergySavvy encourages the Commission to limit the use of deemed savings to a minimal number of programs for which deemed saving are necessary (e.g. retail rebates or single measure installations). Deemed savings are not representative of the customer experience, can be expensive and time consuming to update and can slow the introduction of innovative energy efficiency measures into the market. Furthermore, deemed savings present challenges for utilities seeking to introduce smart devices, such as home energy management systems or smart thermostats, that cannot easily be deemed because each measure is uniquely custom. While deemed savings are appropriate tools for program planning, technology is now allowing utilities to measure savings at the meter quickly, easily and cost effectively.

In addition to limiting the use of deemed savings, EnergySavvy also encourage the Commission to apply strong technical rigor to the development of deemed savings estimates in Virginia. Too often, deemed savings are borrowed across state lines, are woefully out of date or are negotiated in closed processes. EnergySavvy encourages the Commission to develop deemed savings that are based on studies completed with Virginia data, develop an update schedule for deemed savings values and to make updates a public process that is open to stakeholder input.

➤ Billing analysis

EnergySavvy encourages the Commission to develop guidelines for EM&V that rely heavily on the use of billing analysis (also referred to as consumption data analysis) methods for mass-market energy efficiency programs. A billing analysis, with controls for normalization and exogenous change, is a robust and accurate method for measuring energy savings. Billing analysis methods for quasi-experimental design programs are a valuable and rigorous method for estimating savings from mass-market programs.[1]

Billing analysis data also provides for robust primary source information that can inform Virginia's deemed savings updates. Billing analysis performed on single measure programs, or multi-measure programs where measure impacts are disaggregated are able to provide the Commission that deemed savings data are accurate and reflective of the impacts being experienced by most ratepayers participating in energy efficiency programs. In fact, the state of Missouri recently began a process to develop a statewide technical resource manual (TRM) to catalog deemed savings for the state. As part of this project, the state is studying how EM&V 2.0 approaches can inform the development and updating of the TRM.[2]

➤ EM&V 2.0

EnergySavvy's strong encouragement for billing analysis is based on the availability of EM&V 2.0 software and hardware tools. Two traditional critiques of billing analysis are (1) that billing analysis methods are too expensive to be used widely and (2) that billing analysis methods can only measure savings for programs that achieve deep savings (>10%) are no longer true with EM&V 2.0 tools. EM&V 2.0 tools are not encumbered by the incremental costs of analyzing additional data as a result of software automating the analysis process. And EM&V 2.0 tools that measure every project and refine savings estimates using robust comparison groups are able to measure savings from programs in the 2-3% range.

---

[1] Agnew, Ken and Mimi Goldberg. 2013. Uniform Methods Project Chapter 8: Whole-Building Retrofit with Consumption Data Analysis Evaluation Protocol.

[2] https://energy.mo.gov/energy/about/missouri-technical-reference-manual-work-plan

- Rigor of EM&V 2.0

As stated above, EM&V 2.0 knocks down many of the cost barriers associated with traditional EM&V methods. The use of cloud software, dual processing and big-data analytics allows for computers to automate many tasks that were previously completed manually. Without the traditional cost barriers, EM&V 2.0 approaches are capable of measuring savings from every project in a program (census), rather than a sampling approach. EM&V 2.0 is also capable of developing comparison groups that are based on similar premises across the entire service territory. This allows for comparison group ratios of no less than 1:25 (participants to non-participants), and up towards 1:100 and greater (based on the number of meters in a utility's service territory). These large comparison groups enable EM&V 2.0 to refine savings estimates to normalize for non-correlated effects that impact usage across a service territory (rate or commodity price changes, non-degree weather changes, or macroeconomic changes). While these instances may seem rare, in EnergySavvy's experience controlling for these effects are critically important and these instances of fluctuations in usage occur more often than expected. The benefit of enhanced comparison groups enabled by EMV& 2.0 tools has also been noted by leading EE organizations. As noted by ACEEE, "one important advance [of EM&V 2.0 tools] is the use of comparison groups of customers that are not participating in a program but are similar in their energy use to those that are. Automated and advanced analysis of comparison groups with program participants improves the accuracy and timeliness of energy savings reports...".[3]

- Cost Reductions

In additional to analyzing large amount of data without adding additional incremental costs, EM&V 2.0 tools offer great potential to reduce costs associated with EM&V. As noted by ACEEE in a recent research paper on modern tools for EM&V, " [EM&V 2.0] enables [utilities, evaluators and implementers] to perform more accurate and timely EM&V at a lower cost. For

[3] Kiker, P. 2015, December 16. Independent Reports Reach Same Conclusions on the Future of Energy Efficiency, Evaluation, Measurement and Verification. Message posted to http://aceee.org/press/2015/12/independent-reports-reach-same

one thing, remote automated data gathering is likely to be less expensive than traditional onsite inspection. This means that either the overall cost of EM&V can be reduced or higher-quality EM&V can be accomplished within a given budget. For example, information can be collected over longer periods of time to track the persistence as well as the volume of savings. And since [EM&V 2.0] can be scaled quickly, it can evaluate more projects and more programs with marginal incremental costs."[4]

Nationally, it is estimated that between 2-6% of energy efficiency budgets are dedicated to EM&V.[5] Those estimates account for budgets dedicated to EM&V but they do not recognize the utility staff hours that are committed to evaluation preparation, data collection, or involvement with EM&V related tasks. EM&V 2.0 tools cannot also reduce cost burdens associated with many of these activities. For example, data collection is often a timely and costly effort for program administrators to prepare for evaluations. Because EM&V 2.0 tools are automatically collecting this data continuously, data for evaluation is already prepared and ready for analysis by third-party evaluators. Research by ACEEE recognizes this value, "The use of [EM&V 2.0] to track customer energy use can help make residential programs scalable, as the effort and cost involved in expanding a program can be quite small. As more customers are added to the program, the administrative cost per customer goes down, which in turn improves the program's cost effectiveness.[6]

- Performance feedback

The greatest value of EM&V 2.0 tools is performance feedback. Traditional EM&V reports are ex-post documents that provide utilities and regulators feedback months, or sometimes years, after programs are concluded. These reports inform utilities of missed opportunities, or process improvements long after the following year of programs have already been deployed. EM&V

---

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

[5] Consortium for Energy Efficiency, Annual Industry Report; 2015 State of the Efficiency Program Industry: Budgets, Expenditures, Impacts. pg 46.

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

2.0 tools provide utilities with continuous feedback throughout the course of the program year. This allows utilities to make mid-course correction. The Northeast Energy Efficiency Partnership's EM&V Forum's research in this area recently concluded that "Estimated savings reductions from automated consumption data analysis can provide rapid feedback to programs whether or not this analysis is used as the final evaluated savings."[7]

EM&V 2.0 tools for mass-market programs run billing analysis continuously. That means that with each new data point, a billing analysis is run on the projects in the program. This translates to fresh data every time the meter is read. That can be every 15 minutes, every hour, every day, every month or every other month. Continuous analysis allows program administrators to see how projects and programs are performing. It also allows program administrators to uncover leading and lagging indicators that impact program performance. For example, many residential and small business programs utilize trade allies to install measures in home or buildings. Evaluation reports do not measure savings at the contractor level and therefore fail to capture trade ally performance. EM&V 2.0 approaches are capable of measuring savings from individual trade allies and can show program administrators which contractors are best serving customers and which trade allies need additional training.[8]

Conclusion

EnergySavvy appreciates the opportunity to offer these comments to the Virginia State Corporation Commission. Energy efficiency is of great value to Virginia utilities, ratepayers and the environment. Developing a standardized modern EM&V protocol will help foster robust energy efficiency programs for Virginia. EnergySavvy looks forward to working with the Commission and other stakeholders to establish a rigorous, sustainable and forward looking

---

[7] DNV-GL for the Northeast Energy Efficiency Partnership Regional Evaluation Measurement and Verification Forum. 2015. The Changing EM&V Paradigm: A Review of Key Trends and New Industry Developments, and Their Implications on Current and Future EM&V Practices. http://www.neep.org/sites/default/files/resources/NEEPJ DNV%20GL%20EMV%202.0.pdf

[8] ACEEE Intelligent Efficiency Conference; Presentation by Greg Lovett of Ameren of Missouri; Unique Insights from Usage Data: Leveraging Savings Measurement Software; December 7, 2015, Boston MA. http://aceee.org/sites/default/files/pdf/conferences/ie/2015/Session3C-Lovett-IE15-12.7.15.pdf

EM&V framework for energy efficiency programs in Virginia.

If you have any questions, please contact:

Jake Oster
Senior Director of Regulatory Affairs
EnergySavvy
Email: jake@energysavvy.com
Mobile: 802-598-1175

Dated: May 25, 2016

Good for the Economy.
Good for the Environment.

May 25, 2016

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

Re: SCC Case No. PUE-2016-00022 - Evaluating the Establishment of Protocols, a Methodology, and a Formula to Measure the Impact of Energy Efficiency Measures - Objective and Cost-Effectiveness - Evaluation, Measurement and Verification (EM&V)

Dear Mr. Peck:

Thank you for the opportunity to comment on the important matter of evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures. In brief, we encourage the adoption of a rigorous Evaluation, Measurement and Verification (EM&V) framework, which will (1) ensure that savings from energy efficiency are quantifiable and verifiable; (2) balance the accuracy and reliability of results with the associated costs of EM&V; (3) avoid excessive interference with existing practices that are already robust, transparent and effective; and (4) recognize that EM&V is routinely evolving to reflect changes in markets, technologies and data availability.

E2 is a national, nonpartisan group of business leaders, investors and others who advocate for smart policies that are good for the economy and good for the environment. Our members come from a broad business base, ranging from clean energy and clean tech, to real estate and finance and beyond.

Our members have been involved in the financing, founding or development of more than 1,700 companies that have created more than 600,000 jobs, and manage more than $100 billion in venture and private equity capital. Accordingly, our members' take keen interest in the questions under consideration, which are critical to ensuring a cost-effective clean energy economy in Virginia.

The policies under consideration can let Virginia take its rightful share of the exponential growth in clean energy jobs in recent years. In E2's recent report "Clean Jobs America", analysis found that more than *2.5 million Americans* work in the clean energy industry across all 50 states.

Further, the report found energy efficiency to be the nation's largest clean energy sector

employer, with nearly 1.9 million Americans working in areas such as high-efficiency lighting, Energy Star appliance manufacturing and high-efficiency HVAC services to reduce wasted energy in homes, schools and businesses.

E2 recognizes that energy efficiency provides cost savings for ratepayers, enhances grid reliability, and is generally the least-cost resource for meeting new energy demand.

Energy Efficiency Benefits Virginia and its Ratepayers

Energy efficiency is generally the least-cost option for meeting electricity demand today. One independent financial advisory firm estimated a levelized cost of energy (LCOE) for energy efficiency between zero and $50/MWh.[1] Similarly, the Lawrence Berkeley National Laboratory (LBNL), based on an analysis of programs in 20 states from 2009-2013, recently estimated that the U.S. average "total cost of saved energy" from utility energy efficiency programs at $46/MWh (or $0.046/kWh).[2] In comparison, the average price of electricity in Virginia is $93/MWh (or $0.093/kWh).[3]

Because of its relatively modest existing efficiency programs, Virginia currently ranks higher than other Southeastern states for energy efficiency potential. Virginia is also well-positioned to tap into the large and growing energy efficiency industry due to its relatively older building stock, and a conventional regulatory structure which can undervalue efficiency programs and fail to provide full recognition of the potential of this resource.[4]

Evaluation, Measurement and Verification (EM&V)

SCC should adopt procedures that accurately and consistently reflect the contributions to cost-effective, reliable operation of the electricity system of all resources--including energy efficiency. A transparent measurement of these contributions is essential to providing a reliable basis for SCC decision-making.

Evaluation, Measurement and Verification (EM&V) for demand side energy efficiency is a well-established field of analysis, that has demonstrated itself to be a reliable basis for decision-making in myriad jurisdictions since the 1980s.

---

[1] Lazard, *Levelized Cost of Energy Analysis 9.0* (November 2015). Available at https://www.lazard.com/media/2390/lazards-levelized-cost-of-energy-analysis-90.pdf

[2] Lawrence Berkeley National Laboratory, *The Total Cost of Saving Electricity through Utility Customer-Funded Energy Efficiency Programs*, p. 11 (April 2015), *available at* https://emp.lbl.gov/sites/all/files/total-cost-of-saved-energy.pdf; Advanced Energy Economy Institute, *Competitiveness or Renewable Energy and Energy Efficiency in U.S. Markets*, p. 13.

[3] Energy Information Administration

[4] Synapse Energy Economics, *Regulatory Policies to Support Energy Efficiency in Virginia* (October 2014). Available at http://www.synapse-energy.com/sites/default/files/Regulatory%20Policies%20to%20Support%20Energy%20Efficiency%20in%20Virginia%2014-110.pdf

EM&V industry best practices are based in a well-developed field of analysis, consisting of many firms, private companies, and hundreds of practitioners; supported by a rich pool of technical resources, professional organizations, training, and certification programs; and is based on 30 years of experience. Numerous government entities and private customers rely on EM&V results and best practices to verify cost and energy savings; and to meet a variety of statutory, regulatory, and legal requirements, including prudent use of ratepayer dollars.[5]

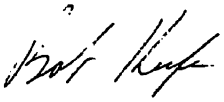
The EM&V industry has demonstrated that these best practices are a reliable basis for decision making, guiding the investment of billions of dollars annually in both public and private funds. These energy-efficiency investments support clean, local jobs here in Virginia.

Comments on Uniform Protocols

As the SCC strives to identify best practices throughout the industry, the best existing resource is the Department of Energy's Uniform Methods Project (UMP), which offers a solid and consistent foundation to account for a variety of efficiency technologies for EM&V measures. The UMP protocols are based on best practices in use today, and are aligned with other government efforts that require accurate EM&V, such as the Clean Power Plan. These protocols are well-understood by industry and professionals, allowing for easier compliance. Additionally, the UMP protocols can be adopted for the Virginia-specific market that can work for all stakeholders.

We will continue to following this important issue with great interest.

Sincerely,



Bob Keefe
Executive Director
Environmental Entrepreneurs (E2)

[5] For example, in 2009, ten Northeastern and Mid-Atlantic states began the Regional Greenhouse Gas Initiative (known as RGGI), the country's first market-based program to reduce emissions of carbon dioxide (CO2) from power plants. RGGI states account for one-sixth of the population in the US and one-fifth of the nation's gross domestic product. See: Hibbard, Paul et al., "The Economic Impacts of the Regional Greenhouse Gas Initiative on Ten Northeast and Mid- Atlantic States: Review of the Use of RGGI Auction Proceeds from the First Three-Year Compliance Period," (Nov,15, 2011), Analysis Group. http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/economic_impact_rggi_report.pdf, and Hibbard, Paul et al., "The Economic Impacts of the Regional Greenhouse Gas Initiative on Nine Northeast and Mid-Atlantic States: Review of RGGIS's Second Three-Year Compliance Period (2012-2014)," (July 14, 2015), Analysis Group .http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis_group_rggi_report_july_2015.pdf

COMMONWEALTH OF VIRGINIA

Department of Mines, Minerals and Energy
DIVISION OF ENERGY
Washington Building / 8th Floor
1100 Bank Street
Richmond, Virginia 23219-3638
(804) 692-3200 FAX (804) 692-3238
www.dmme.virginia.gov

Joel H. Peck, Clerk
State Corporation Commission
Document Control Center
P.O. Box 2118
Richmond, Virginia 23218

May 25, 2016

RE: PUE-2016-00022, Ex Parte: In the matter of receiving input for evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures

Dear Mr. Peck:

The Virginia Department of Mines, Minerals and Energy (DMME) respectfully submits the following Comments in regards to the Commission's March 30, 2016 Scheduling Order (Case No. PUE-2016-00022). These comments are organized into the following sections:

Introduction and Overview:

DMME is an executive branch agency charged with advancing the Commonwealth of Virginia's energy objectives and energy policy in order to enhance the health, welfare, and safety of its residents.

Chapter 255 of the 2016 Acts of Assembly directs the State Corporation Commission to "evaluate the establishment of uniform protocols for measuring, verifying, validating, and reporting the impacts of energy efficiency measures implemented by investor-owned electric utilities providing retail electric utility service in the Commonwealth and the establishment of a methodology for estimating annual kilowatt savings and a formula to calculate the levelized cost of saved energy for such energy efficiency measures."[1] A provision of the Act stipulates that the SCC "shall receive input from interested parties and the Department of Mines, Minerals and Energy."[2] Accordingly, we are pleased to provide the following comments.

In 2007, the Virginia General Assembly passed the Virginia Electric Utility Restructuring Act and established a ten percent energy consumption reduction goal in the Commonwealth, to be achieved by 2022.[3] This goal was reflected in the 2007 Virginia Energy Plan[4] and accelerated by Governor McAuliffe in the 2014 Virginia Energy Plan, which set 2020 as the new target date for this ten percent reduction goal.[5]

The SCC has itself agreed that the goal is attainable within the prescribed timeframe.[6] It is clear, however, that it will be very difficult to reach this goal without significant involvement of utilities in energy efficiency programs.[7] So far, the projects currently planned by Virginia's two major utilities will only get the Commonwealth 24% of the way towards meeting this ten percent goal.

---

[1] 2016 Va. Acts, Ch. 255. *Available at* https://lis.virginia.gov/cgi-bin/legp604.exe?161+ful+CHAP0255+pdf.

[2] See *id.*

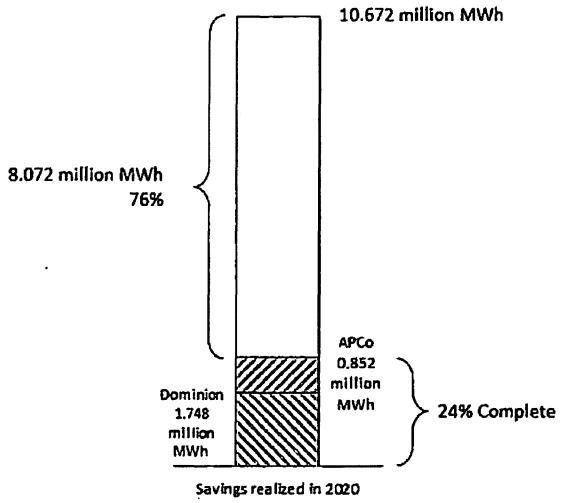
[3] 2007 Va. Acts 2614, 2636 (codified as amended at VA. CODE ANN. §§ 56-576 to -594 (Repl. Vol. 2012 & Cum. Supp. 2014)).

[4] *See* 2007 VIRGINIA ENERGY PLAN, Chapter 7, Recommendation 7.1: Energy Efficiency and Conservation [hereinafter 2007 VEP], *available at* http://dls.virginia.gov/groups/energy/VEP.pdf.

[5] *See* 2014 VIRGINIA ENERGY PLAN, Section 12, Recommendation 2A [hereinafter 2014 VEP], *available at* https://www.dmme.virginia.gov/DE/LinkDocuments/2014_VirginiaEnergyPlan/18Recommendations.pdf.

[6] VA. STATE CORP. COMM'N, STAFF'S REPORT TO THE STATE CORPORATION COMMISSION IN PREPARATION FOR THE COMMISSION'S REPORT TO THE GOVERNOR AND THE GENERAL ASSEMBLY 10 (2007), available at http://www.scc.virginia.gov/pue/conserve/staff/ staf_rept111607.pdf

[7] *See* 2007 VEP, *supra* note 4 ("Analysis completed for this Plan shows that Virginia electric utilities would have to invest in the range of $100 to $120 million per year between 2008 and 2022 to meet the 10 percent electric savings goal.").



Recommendations:

1. **Performance Incentives:** DMME considers it critical to develop performance incentives for utility investments in demand-side energy efficiency measures (DSM) that are (a) fair to both the ratepayers and the regulated utilities; (b) reasonable to administer; and (c) effective in their measureable impact. We submit two recommendations regarding performance incentives whose impacts can be measured, verified, validated, and reported unambiguously:

   A) Authorization of investor-owned electric utilities to recover, as a part of cost recovery permitted for energy efficiency programs, a performance incentive. This performance incentive would replace a provision authorized by the SCC to allow an electric utility to recover revenue reductions related to energy efficiency programs to the extent that the SCC determines such revenue has not been recovered through margins from incremental off-system sales directly attributable to energy efficiency programs.

   B) To ensure that performance incentives work in practice, the resulting "performance" must be evaluated, measured and verified with respect to its impact, its relationship to the incentives, and its cost-effectiveness. Therefore DMME considers a review of best practices on performance incentives to be relevant to the Order.

   In February of this year, DMME commissioned Synapse Energy Economics, Inc. ("Synapse") to draft a brief memorandum on performance incentives that have successfully promoted the scale and cost-effectiveness of energy efficiency programs designed and managed by investor-owned utilities.[8] From these findings, DMME considers the following recommendations relevant to these Comments:

[8] *See* Attachment A: Alice Napoleon and Tim Woolf, *Policies to Provide Performance Incentives for Energy Efficiency Programs*, February 25, 2016 [hereinafter Synapse Memo].

1. Many states have found it appropriate to allow utilities a reasonable amount of performance incentives for aggressive, well-designed EE programs.[9] The primary rationale for the incentive is to encourage utility upper management to provide the institutional support necessary for proposing and implementing aggressive efficiency programs, to the extent they achieve regulatory approval.

2. The following principles should be applied in designing any performance incentive policy:

    a. Design incentives to encourage energy efficiency programs that will best achieve the state's energy goals.

    b. Base incentives on desired outcomes (e.g., energy savings), not just expenditures.

    c. Provide incentives only for activities where the utility company plays a distinct, clear, and necessary role in bringing about the desired outcome.

    d. Base incentives on clearly defined outcomes that can be sufficiently monitored, quantified, and verified.

    e. Cap incentives at a predetermined not-to-exceed portion of program budgets.

    f. Provide incentives only for programs that have been subject to proper monitoring and evaluation studies, and base the incentive amount on post-evaluation estimates of actual efficiency measure installations.

    g. Avoid creating perverse incentives, such as the incentive to increase costs without comparable increases in savings, or the incentive to cream-skim (i.e., targeting the least expensive efficiency resources, while leaving other viable and cost-effective opportunities behind).

We recommend that the Virginia utilities be provided with comprehensive, thoughtful energy efficiency performance incentives. The American Council for an Energy-Efficient Economy (ACEEE) found increasing evidence of a relationship between performance incentives and achievement of efficiency savings goals. ACEEE also reported that states with energy efficiency performance incentives averaged higher levels of energy efficiency savings and higher levels of energy efficiency spending as a portion of utility revenue, relative to states without energy efficiency performance incentives.

---

[9] Nowak, S., B. Baatz, A. Gilleo, M. Kushler, M. Molina & D. York. 2015. *Beyond Carrots for Utilities: A National Review of Performance Incentives for Energy Efficiency.* American Council for an Energy-Efficient Economy

We recommend a mechanism that specifies the potential incentive based upon a portion of efficiency program budgets, and the earned incentive based upon a combination of energy savings, capacity savings, and net benefits. For example, the threshold could start at 80 percent of the targets, and the cap could be at 140 percent of the targets. A sliding scale could be used to determine the earned incentive between these two points.

2. **EM&V Protocols:** Energy conservation and efficiency improvements constitute an important resource, as acknowledged by all parties. Means must be established for the evaluation, measurement, and verification (EM&V) of its impacts to the satisfaction of those charged with regulation in the public interest. The EM&V must ensure the savings are real, so that comparisons and weighing of costs and benefits of supply side and demand side resources are reliable, transparent, and data-driven. We offer several recommendations to that end:

   A. **Technical Resource Manual:** A Virginia-based Technical Resource Manual (TRM) should be developed and periodically updated through a formal, broad-based stakeholder process. The purpose of a TRM is to provide stakeholders and program administrators with a single, transparent source of deemed savings values, source data, and other relevant materials to support the calculation of measure and program savings. DMME recommends that an independent organization manage TRM development, upgrading, and application. This organization should ensure that deemed savings data in the TRM are based on reliable, transparent, and documented sources of information and that assumptions are applicable to the situation being evaluated. This organization should also identify the need for modifications to the TRM, propose updates, lead the stakeholder feedback process, and assist in the development of final recommendations to the regulators. Coordination with the Mid-Atlantic TRM efforts would bring in experience from peer states and agencies.

   B. **Consistent Protocols:** For programs that call for large-scale consumption analysis and project-specific M&V, the Commission should provide guidelines consistent with the best practices described in the 2012 State and Local Energy Efficiency (SEE) Action Network report, *Energy Efficiency Program Impact Evaluation Guide.*[10] Where applicable, the Commission should adopt DOE's Uniform Methods Project (UMP) protocols, which aims to establish protocols based on commonly accepted engineering and statistical methods (e.g. the International Performance Measurement and Verification Protocol) for determining gross savings for a core set of commonly deployed energy efficiency measures

   C. **Independent Oversight and Documentation:** The Commission should establish procedures for independent oversight of EM&V protocols and require its electric utilities to document their EM&V processes. Further, the SCC should develop guidance on the timing of EM&V studies. An inclusive collaborative process should be established.

---

[10] State and Local Energy Efficiency Action Network, *Energy Efficiency Program Impact Evaluation Guide* (2012), *available at* https://www4.eere.energy.gov/seeaction/system/files/documents/emv_ee_program_impact_guide_0.pdf

Membership should include a range of stakeholders, including representation by the SCC; DMME; the Virginia Energy Efficiency Council; program administrators, including investor-owned utilities and cooperatives; and EM&V technical consultants. Invitations could be extended to the Attorney General's Office, environmental stakeholders in the energy efficiency proceedings (e.g., Chesapeake Climate Action Network and Appalachian Voices) and consumer groups (e.g. the Virginia Committee for Fair Utility Rates).

D. **Transparent Reporting:** The Commission should adopt a transparent reporting framework and require EM&V contractors to use them. The Northeast Energy Efficiency Partnership (NEEP) standardized reporting forms developed by the Cadmus Group in consultation with the representatives of the states of Connecticut, Delaware, Massachusetts, Maryland, New Hampshire, New York, Rhode Island, and Vermont, as well as DOE and the U.S. Environmental Protection Agency (EPA) are one such example.[11] While some modifications to the current version NEEP EM&V reporting forms are needed to fully align them with EPA's proposed EM&V reporting requirements, new versions of the forms are anticipated in 2016.[12] The NEEP forms have the advantage of being supported by a number of Virginia's neighboring states. Furthermore, the NEEP forms will likely be incorporated into or consistent with the National Energy Efficiency Registry (NEER), a U.S. DOE sponsored project led by the state of Tennessee to advance the reporting, crediting, and potential sale and trading of energy savings achieved through efficiency programs.

E. **Advanced EM&V Practices:** The Commission should also consider developing approaches to "EM&V 2.0," which relies on the increasing capacity of technology to perform EM&V functions. Virginia utilities should work together to pilot "automated M&V" projects for the residential and commercial sector. Virginia agencies and utilities should also collaborate with surrounding states and regional organizations such as the Southeast Energy Efficiency Alliance and the Northeast Energy Efficiency Partnership to exchange knowledge and experience on automated M&V projects and programs.

F. Lastly, The SCC should consider whether adherence to common EM&V protocols should be a condition of large general service customer's[13] exemption from energy efficiency charges under § 56-585.1(A)(5)(c) of the Code of Virginia.[14]

---

[11] National Energy Efficiency Partnership, *Model EM&V Methods Standardized Reporting Forms* (2014), http://www.neep.org/initiatives/emv-forum/model-emv-methods-standardized-reporting-forms

[12] *See id.*

[13] Code of Virginia § 56-585.1(A)(5)(c) (defining a large general service customer as a "customer that has a verifiable history of having used more than 500 kilowatts of demand from a single meter of delivery"), *available at* http://law.lis.virginia.gov/vacode/title56/chapter23/section56-585.1.

[14] *See id.* (stipulating that "[n]on-participation in energy efficiency programs shall be allowed by the Commission if the large general service customer has, at the customer's own expense, implemented energy efficiency programs that have produced or will produce measured and verifiable results consistent with industry standards and other regulatory criteria stated in this section).

3. **Levelized Cost of Energy Savings (LCOSE)**: The Commission seeks specific input on "Appropriate formulae for developing the cost of saved energy resulting from energy efficiency programs and appropriate inputs for such formulae." The following discussion and recommendations are excerpted from the Synapse Memo commissioned by DMME. [15]

Arriving at a levelized cost requires much standardization of some key variables such as discount rate and energy savings types (e.g., gross vs. net, line loss included or not) to ensure that comparisons are valid. Whenever possible, all program administrators within a single state should use common definitions and practices to enable comparisons of energy efficiency programs. Program comparisons can enable a better understanding of the range of costs of certain program categories and the drivers of cost differences, identify best practices that deliver robust services at a relatively low cost, and inform program design improvements. [16]

The following are some common standardization problems, as well as recommendations for standards that states should use for the data inputs into the levelized cost of saved energy calculation. The standards should be consistent across program administrators, and over time. Thus, it is important that the Commission provide guidance on how this metric should be presented.

A. **Consistent definitions of savings:** Annual and lifetime energy savings can be gross, rather than net, and claimed, rather than evaluated. While net, evaluated savings are more accurate, gross, claimed savings are more frequently and consistently reported by program administrators. Program administrators should work towards a more consistent definition, and reporting, of net savings. When greater consistency is achieved, net savings should be used instead of gross savings.

   Annual and lifetime energy savings should represent savings at the end-use or site instead of at the busbar or power plant level (i.e., accounting for transmission and distribution losses), as this is what most program administrators report.

B. **Consistent definitions of costs**: Program administrator costs should explicitly include all of the costs required to implement the programs . . . When calculating the LCOSE for individual energy efficiency programs, the program administrator costs should not include any utility performance incentives. However, when calculating the LCOSE for an entire portfolio of energy efficiency resources, any utility shareholder incentives should be included in the program administrator costs.

C. **Consistent units**: To be consistent with data previously collected and reported by the Lawrence Berkeley National Laboratory (LBNL 2014), the levelized cost of saved energy should be reported in dollars per kWh of energy saved.

---

[15] *See generally* Synapse Memo, *supra* note 8.

[16] Further, PJM Interconnection, ISO-New England, and New York ISO require consistent, rigorous reporting of the values used as inputs to the LCOSE in order to account for demand-side resources, including energy efficiency, in load forecasting.

D. **Consistent discount rates:** All program administrators should use the same discount rate or the same guidance for developing an assumed discount rate. As mentioned above, the discount rate can have a substantial impact on the calculated levelized cost of saved energy. It is also noteworthy that the discount rate is the only input that is assumed and not calculated directly from program administrator data. As a result, the approach for developing an assumed discount rate is of particular importance. A 2014 NEEP report entitled *Cost-Effectiveness Screening Principles and Guidelines: For Alignment with Policy Goals, Non-Energy Impacts, Discount Rates and Environmental Compliance Costs*, is a good reference for guidance on discount rate assumption.[17]

The following are some improvements to reporting transparency that Virginia can put into practice immediately:

- Report the calculation of LCOSE, all inputs used in calculating the LCOSE for each program and sector, and the source of inputs in reporting.

- Report program cost and savings data using common definitions and terminology for key inputs into the calculation of the levelized cost of saved energy. Please see LBNL's 2013 report.[18] This memo provides common definitions and terminology for these key inputs. LBNL also released a policy brief and reporting template to assist jurisdictions in further improving reporting consistency.[19]

- Categorize and report using common naming conventions for program sectors and categories.[20,21] This may require program administrators to add new fields to their reporting databases. Common program sectors and categories can be used to group programs and enable optimization of the LCOSE for programs in the same sector or category.

---

[17] Regional Evaluation, Measurement and Verification Forum, *Cost-Effectiveness Screening Principles and Guidelines: For Alignment with Policy Goals, Non-Energy Impacts, Discount Rates and Environmental Compliance Costs, available at* http://www.synapse-energy.com/sites/default/files/CostEffectiveness%20Screening%20Principles%20and%20Guidelines%2014-059.pdf.

[18] Hoffman, I.M., M.A. Billingsley, S.R. Schiller, C.A. Goldman and E. Stuart, *Energy Efficiency Program Typology and Data Metrics: Enabling Multi-State Analyses Through the Use of Common Terminology*, LBNL-6370E (2013), *available at* https://emp.lbl.gov/sites/all/files/lbnl-6370e.pdf.

[19] Rybka, G.M., I.M. Hoffman, C.A. Goldman & L.C. Schwartz, *Flexible and Consistent Reporting for Energy Efficiency Programs: Introducing a New Tool for Reporting Spending and Savings for Programs Funded by Utility Customers,* LBNL-1003879 (2015), *available at*: https://emp.lbl.gov/publications/flexible-and-consistent-reporting

[20] Megan A. Billingsley, Ian M. Hoffman, Elizabeth Stuart, Steven R. Schiller, Charles A. Goldman & Kristina LaCommare, *The Program Administrator Cost of Saved Energy for Utility Customer-Funded Energy Efficiency Programs*, LBNL-6595E (2014), *available at* https://emp.lbl.gov/sites/all/files/lbnl-6595e.pdf

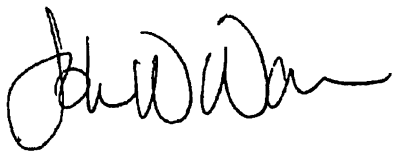
[21] Barbose, G. L., C.A. Goldman, I. M. Hoffman & M. A. Billingsley. 2013. *The Future of Utility Customer-Funded Energy Efficiency Programs in the United States: Projected Spending and Savings to 2025*. LBNL-5803E, *available at* https://emp.lbl.gov/sites/all/files/lbnl-5803e.pdf

Legislative Impediments:

There are challenges to the control and monitoring of the costs of electricity conservation programs that are beyond the purview of EM&V practices, and which might not be within the sole authority of the SCC to address. In its Final Order in Dominion's 2015 Biennial Review rate case, a 2-1 majority of the Commission applied Senate Bill 1349's amendments to the Virginia Electric Utility Regulation Act for the first time and declined to adjust Dominion's base rates or set a new rate of return on equity for the company. In a partial dissent one Commissioner wrote about Senate Bill 1349: "Under this law, major categories of rising costs can be passed along to customers, but lower costs or savings cannot. That is, for virtually any significant infrastructure or related costs (such as new power plants, demand-side management investment, or transmission lines), separate rate increases are mandated through rider provisions in Code § 56-585.1, which effectively guarantee recovery of those costs to the utility, plus a profit and, in some cases, a rate of return bonus. Conversely, Senate Bill 1349 fixes base rates (and any excess revenues currently built therein) at existing levels; base rates cannot be lowered by the Commission." [22]

It is hard not to surmise reluctance by the SCC to approve large investments in demand side management programs when commissioners might be unable to act over the next few years to recover for the ratepayers any excess revenues that utilities may have earned or will earn from base rates. DMME believes that this might be a significant impediment to the advancement of utility energy efficiency programs in Virginia. It is important that the SCC be confident that it has the tools to monitor and evaluate DMS programs, control costs, ensure that ratepayers are served and that utility earnings are regulated and transparent. Refining the rate freeze legislation may be the most appropriate mechanism to correct the unintended consequence and ensure the SCC has the necessary tools to implement meaningful energy efficiency programs. Revisiting some of the provisions of this law also might be justified by recent changes in the federal regulatory environment, including the Supreme Court stay of enforcement of the Environmental Protection Agency's Clean Power Plan.

Signed:



John Warren, Director
Department of Mines, Minerals and Energy
Commonwealth of Virginia

[22] SCC Final Order, Dominion 2015 Biennial Review rate case, SCC Case No. PUE-2015-00027. Pages 29-30 *available at* http://www.scc.virginia.gov/newsrel/e_dvpbien_15.pdf

Attachment A:

Synapse Energy Economics Memorandum
"Policies to Provide Performance Incentives for Energy Efficiency Programs"
Prepared by Alice Napoleon & Tim Woolf

Memorandum

TO: DAVE DAYTON

FROM: ALICE NAPOLEON, TIM WOOLF

DATE: FEBRUARY 25, 2016

RE: POLICIES TO PROVIDE PERFORMANCE INCENTIVES FOR ENERGY EFFICIENCY PROGRAMS

Introduction and Purpose

Many states have adopted performance or shareholder incentive policies to provide rewards for investing in and successfully implementing energy efficiency programs. In the sections that follow, we describe these policies and make recommendations for using them to increase utility implementation of energy efficiency in the Commonwealth of Virginia.

Rationale and Principles

Utilities frequently seek some form of performance incentive to help offset the financial disincentives associated with efficiency programs, arguing that they should be able to earn as much profit from efficiency as they do from investments in supply-side facilities.

If efficiency programs are implemented by a third-party administrator, there is no need to provide the program administrator or the local utilities with performance incentives. Nevertheless, it may be effective to provide some form of performance incentive to the third-party administrator in order to encourage them to implement successful efficiency programs.

If the efficiency programs are implemented by a utility, it may be appropriate to allow utilities a reasonable amount of performance incentives for aggressive, well-designed programs. The primary rationale for the incentive is to encourage utility upper management to provide the institutional support necessary for aggressive efficiency programs.

Performance incentives should only be provided for well-designed and well-executed efficiency programs. It is important that performance incentives be properly designed, because the specific designs can have significant implications regarding utility energy efficiency activities and achievements. The following principles should be applied in designing any performance incentive policy:

- Design incentives to encourage energy efficiency programs that will best achieve the state's energy goals.
- Base incentives on desired outcomes (e.g., energy savings), not just expenditures.

- Provide incentives only for activities where the utility company plays a distinct, clear, and necessary role in bringing about the desired outcome.
- Base incentives on clearly defined outcomes that can be sufficiently monitored, quantified, and verified.
- Minimize the magnitude of performance incentives, in order to avoid unnecessary increases in electric and gas customer costs.
- Cap incentives at a predetermined not-to-exceed portion of program budgets.
- Provide incentives only for programs that have been subject to proper monitoring and evaluation studies, and base the incentive amount on post-evaluation estimates of actual efficiency measure installations.
- Provide incentives only for utility programs that receive sufficient regulatory oversight and stakeholder input.
- Avoid creating perverse incentives, such as the incentive to increase costs without comparable increases in savings, or the incentive to cream-skim (i.e., targeting the least expensive efficiency resources, while leaving other viable and cost-effective opportunities behind).

Design of Performance Incentive Mechanism

Overall Structure

Energy efficiency performance incentives are relatively common in the United States.[23] Often, these structures are defined in terms of a threshold requirement, a target, and a cap.

- The "threshold" level of performance is the point below which no incentives are earned. If utilities cannot meet this threshold level, they do not earn any reward.
- The "target" level of performance is based on the achievement of efficiency program goals (e.g., megawatt-hour [MWh] savings or net benefits) in the most recent energy efficiency plan approved by the public service commission.
- Incentives are provided up to a "cap," which limits rate impacts associated with the performance incentive, and may act as a check against utilities understating savings opportunities in order to reap large incentives later.

The amount of money made available for performance incentives can be determined in several ways. The most common ways include: as a percentage of program costs, as a share of total net benefits, or as a rate of return on efficiency expenditures. These options are discussed briefly below.

---

[23] Nowak, S., B. Baatz, A. Gilleo, M. Kushler, M. Molina, and D. York. 2015. *Beyond Carrots for Utilities: A National Review of Performance Incentives for Energy Efficiency*. American Council for an Energy-Efficient Economy.

Incentives Based on Efficiency Program Cost

Several states base performance incentives on program spending, coupled with achievement of energy or capacity savings targets.[24] For example, Connecticut has a sliding scale incentive starting at 2 percent of spending, when savings exceed 75 percent of the target. The maximum incentive is set at 8 percent of program spending, when savings reach 135 percent of the goal.[25] Where program spending is the basis of the incentive, it is explicitly tied to attainment of established energy savings targets; without this link, incentives may encourage spending without a corresponding increase in savings.

The magnitude of the performance incentives should be large enough to capture utility management attention but small enough to ensure that customers do not pay more than necessary for successful efficiency programs. In our view, a target shareholder incentive of roughly 5 percent of demand-side management program budgets should provide a reasonable balance between utility management incentives and customer protection. Performance incentive caps that exceed 10 percent are likely to be unnecessarily high.

Incentives Based on Share of Net Benefits

Performance incentives are often based on shared net benefits, where the utility is allowed to keep a portion of the difference between program benefits and program costs.[26] This approach is appealing to many because it provides the utility with an incentive to both reduce program costs and increase program benefits.

However, this approach suffers from a significant problem. The efficiency program benefits are based on avoided costs—typically avoided energy, capacity, transmission, and distribution costs. These avoided costs can swing significantly over time, especially the avoided energy costs that are often driven by fossil fuel prices. When avoided costs increase dramatically, then the utility will earn significantly higher incentives, and vice versa. This can be a problem because (a) the utility incentive is driven by an external event that the utility has no control over, and (b) the utility incentive can ultimately be way too high or too low.

For this reason we do not recommend performance incentives that are based on a share of net benefits alone.

Incentives Based on Rate of Return

Another frequently considered approach is to allow utilities to earn a rate of return on some or all of the efficiency expenditures, either by placing the efficiency expenditures in the utility's rate base or by making a comparable calculation to determine the size of the shareholder incentive. This approach is appealing to many because it creates an incentive for energy efficiency investments that is comparable to, or equal to, the incentive for investments in supply-side alternatives. It is also appealing because it is based on the investment/return model that is familiar to utility management and shareholders.

---

[24] Nowak et al., 2015, p. 7.

[25] Ibid., p. 12.

[26] Ibid., p. 7.

Unfortunately, this approach also suffers from significant problems. First, it rewards the utility for simply spending energy efficiency funds, without necessarily implementing successful programs or achieving significant efficiency savings. Second, it is inconsistent with general ratemaking practices to allow a return on expenses that are recovered immediately from customers. Third, placing a cost into rate base without a corresponding asset that can act as collateral can cause the utility problems with regard to accounting and financing requirements.

For these reasons we do not recommend performance incentives that are based on the utility's rate of return.

Setting Potential and Earned Incentives

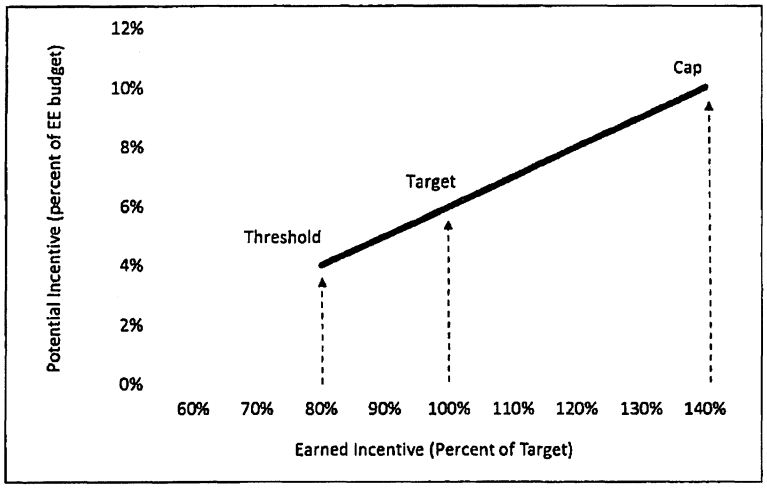
It is possible to combine some of the concepts above to design a performance incentive that achieves several key goals at once. In our view, the magnitude of the potential incentives (i.e., the total amount of incentives that the utility could potentially earn), should be based on a portion of efficiency program budgets. In this way, the amount of incentive that the utility actually earns will always be in proportion to the magnitude of the efficiency program themselves. This will ensure that (a) the utility incentive is proportional to its level of activity; and (b) customer payments will also be proportional to the level of efficiency activities. In other words, the energy efficiency program budgets provide very useful benchmarks to ensure that the amount of the incentive remains reasonable.

Furthermore, the magnitude of the earned incentives (i.e., the amount of incentives that the utility actually earns) should be based on utility performance. Utility performance can be defined in several different ways, including achieved energy savings (in MWh), achieved capacity savings (in MW), achieved net benefits, or more specific outcomes that are determined to warrant performance incentives.

Figure 1 provides a relatively simple example of the relationship between potential and earned incentives. The y-axis indicates the amount of incentive that the utility could potentially earn. In this example, the potential incentive ranges from 4 percent of the efficiency program budget to a maximum of 10 percent of the program budget.

The x-axis indicates the amount of the incentive that the utility actually earns, based on performance relative to efficiency targets. The efficiency targets can be based on energy savings, capacity savings, net benefits, or a combination of these. In this case, if the utility achieves 100 percent of the efficiency targets, it will earn an incentive equal to 6 percent of the efficiency program budget. If the utility achieves results between 80 percent and 140 percent of the target, it will earn an incentive based on the line between these two points. This is referred to as a sliding scale incentive.

Figure 1. Example of a Sliding Scale Performance Incentive



Existing Performance Incentive Policy in Virginia

Under Virginia Code (Section 56-585.1) utilities may earn a rate of return—equal to the general rate of return on common equity—on the operating expenses component of total energy efficiency costs.[27] However, the amount of the incentive in Virginia may not to be sufficient to capture utility management's attention. Based on a review of Dominion's proposed revenue requirements in Case No. PUE-2014-00071, it appears that the incentive (called a "margin on operations and maintenance") was on the order of 0.5 percent of total program costs in 2013.[28] We have not reviewed incentives for other Virginia utilities; however based on the structure of the law, it seems likely that they are of a similar magnitude.

If this estimate is accurate, the efficiency performance incentives that Virginia utilities receive are very small relative to what other utilities receive (ranging from a low of 2 to 8 percent of program costs in Connecticut, to a high of 5 to 15 percent of program spending in Michigan).[29]

VA House Bill No. 1053

VA House Bill No. 1053 would allow an investor-owned utility to recover an energy efficiency performance incentive that is based on the levelized cost of saved energy associated with the utility's energy efficiency programs.

---

[27] The Code of Virginia, § 56-585.1. http://law.lis.virginia.gov/vacode/title56/chapter23/section56-585.1/

[28] In Case No. PUE-2014-00071, the Corporation Commission approved Dominion Virginia Power's proposed Income and Age Qualifying Home Improvement and Appliance Recycling programs, subject to a cost cap. This cost cap includes an incentive; however the Commission did not specify the proportion of each cost component relative to the total cap in the order. (April 24 2015 Final Order.)

[29] Nowak et al., 2015.

We are not aware of any state that uses the cost of saved energy to determine the amount of the incentive in this way. Some states instead account for cost effectiveness in determining whether the energy savings or net benefits qualify the utility to earn an incentive (e.g., South Carolina's requirement that the programs as a whole must pass the Utility Cost Test), or as a cap on incentives (e.g., Minnesota's cap on incentives at $0.0875 per first-year kWh saved).[30]

Using the cost of saved energy to determine the earned performance incentive suffers from a significant flaw. It encourages utilities to focus on the least expensive efficiency resources, while leaving other viable and cost-effective opportunities behind. This results in "cream-skimming" that will lead to lost opportunities, as revisiting a customer to install the remaining measures may involve prohibitive transaction costs.

For this reason, we do not support the utility efficiency incentive mechanism proposed in House Bill No. 1053.

Recommendations

We recommend that the Virginia utilities be provided with comprehensive, thoughtful energy efficiency performance incentives. The American Council for an Energy-Efficient Economy (ACEEE) found increasing evidence of a relationship between performance incentives and achievement of efficiency savings goals.[31] ACEEE also reported that states with energy efficiency performance incentives averaged higher levels of energy efficiency savings and higher levels of energy efficiency spending as a portion of utility revenue, relative to states without energy efficiency performance incentives.[32]

While the incentive mechanism proposed in VA House Bill 1053 is a step in the right direction, we recommend against an incentive that is based solely on the cost of saved energy. As noted above, this will certainly result in cream-skimming and lost opportunities.

Instead, we recommend a mechanism that specifies the potential incentive based upon a portion of efficiency program budgets, and the earned incentive based upon a combination of energy savings, capacity savings, and net benefits. The threshold could start at 80 percent of the targets, and the cap could be at 140 percent of the targets. A sliding scale could be used to determine the earned incentive between these two points. **Figure 1** above provides an illustration of how such a mechanism could work.

---

[30] Ibid., p. 11.

[31] Ibid., p. 22-23.

[32] Ibid., p. 24.

Madria Barnes

From: wshepherd@nrdc.org
Sent: Wednesday, May 25, 2016 4:30 PM
To: PUE_Comments
Subject: Case Comments Submission for Case # PUE-2016-00022

Importance: High

Follow Up Flag: Follow up
Flag Status: Flagged

The following case comments were submitted online Wednesday, May 25, 2016 **at** 4:29:50 PM

Full Name: Walton C Shepherd
Group or Organization: NRDC
Address Line One: 1152 15th Street NW
Address Line Two:
City, State, Zip: Washington, DC 20005
Email: wshepherd@nrdc.org
Case Number: PUE-2016-00022
Comments: RE: PUE-2016-00022 NRDC commends the Virginia SCC and Staff for conducting this crucial and timely Study. We first and foremost recommend that the SCC Commission, using this Study as a foundation, open a formal proceeding to properly place and value energy efficiency as a fundamental component of Virginia's least-cost energy mix. The significant dollar value of energy efficiency is everywhere to be seen, most recently in yesterday's PJM capacity auction that delivered a $4 billion savings, largely due to decreased demand amid record-breaking efficiency delivery. A formal proceeding would help unlock that high value of demand-side resources inside the Commonwealth, so that Virginia can 1). lower electricity bills, 2). increase Virginia's energy independence, 3). obviate excess supply-side generation and related fuel imports that subject ratepayers to price increases, and 4). meet federal or state pollution regulations to protect human health. The ultimate goal of this study and subsequent formal proceeding should be a framework for ensuring that energy efficiency investments provide reliable and cost-effective savings. That framework should include a range of guidance, from planning through implementation to post-program evaluation. The study and formal proceeding should of course recognize Virginia's unique characteristics and opportunities to reduce total costs, but also tap the deep experience of other states. Indeed, because many other states have already successfully unlocked energy efficiency as a cost-effective resource, Virginia should not force itself to "reinvent the wheel." Thus, to craft a Virginia-specific cost-effectiveness regime, the SCC should join in substantive and fruitful multi-state efforts already underway. Specifically, NRDC recommends that the SCC and Staff: • make use of the resources and technical assistance provided through the State and Local Energy Efficiency Action (SEE Action) network supported by the U.S. DOE, and • take part in the Regional Evaluation, Measurement and Verification Forum (EM&V Forum) developed by the Northeast Energy Efficiency Partnerships (NEEP), including use of consistent assumptions, definitions, and common reporting tools. NRDC looks forward to lending its efforts to create a more durable and clean energy mix.

Madria Barnes

From:	richard.caperton@opower.com
Sent:	Wednesday, May 25, 2016 3:18 PM
To:	PUE_Comments
Subject:	Case Comments Submission for Case # PUE-2016-00022
Importance:	High
Follow Up Flag:	Follow up
Flag Status:	Flagged

The following case comments were submitted online Wednesday, May 25, 2016 **at** 3:17:45 PM

Full Name: Mr. Richard Caperton
Group or Organization: Opower
Address Line One: 1515 N. Courthouse Road
Address Line Two:
City, State, Zip: Arlington, VA 22201
Email: richard.caperton@opower.com
Case Number: PUE-2016-00022
Comments: May 25, 2015 State Corporation Commission P.O. Box 1197 Richmond, Virginia 23218 RE: PUE-2016-00022 - SCC Ex Parte: In the matter of receiving input for evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures To whom it may concern: Thank you for the opportunity to comment on the possible establishment of protocols to measure the impact of energy efficiency measures in Virginia. Opower believes that the creation of such a protocol would be valuable for the Commonwealth, and that existing protocols provide ample guidance for Virginia. Opower is a publicly-traded enterprise software company that helps utilities elevate the customer experience. Energy providers use Opower's customer engagement platform to deliver proactive, digital communications that raise customer satisfaction, manage energy demand, and lower service costs. Opower's software is deployed to 100 utilities worldwide and reaches more than 60 million homes and businesses. The Commission has requested comment on several questions. In this response, Opower specifically makes three points: An evaluation, measurement, and verification (EM&V) protocol would provide certainty for utilities and efficiency providers, and help deliver more efficiency to Virginia consumers. If it decides to proceed with a protocol, the Commission should adopt existing protocols for behavioral energy efficiency. Cost effectiveness tests should include a comprehensive set of benefits, including avoided infrastructure costs. An EM&V protocol would provide certainty A protocol would provide certainty that results derived from measures included in the EM&V protocol would be accepted as accurate results by the Commission. The Commission often demands that efficiency programs demonstrate the ability to deliver results in pilot programs in Virginia before being deployed at scale. However, utilities and vendors sometimes struggle to understand exactly what results the Commission will deem valid. For example, consider the Commission's final order in Case PUE-2015-00138. In Washington Gas Light Company's Response to the Staff Report, the utility provided an independent evaluation, which followed a common EM&V protocol used across the country, showing efficiency savings from a pilot of the Opower Home Energy Report Program. However the Commission states in their final order, "We remain concerned by the lack of data available for this program based on actual experience by either WGL or by a Commission-regulated Virginia utility." (see page 8 at http://www.scc.virginia.gov/docketsearch/DOCS/38%24z01!.PDF) Absent a discussion of why the independent evaluator's findings are not valid, one possible explanation is that the Commission disagreed with the process employed by the evaluator. There are several benefits to avoiding similar misunderstandings in the future. First, utilities spend significant resources in conducting evaluations,

without the guarantee that the resources are being spent effectively. A protocol would eliminate this uncertainty and help ensure that resources devoted to EM&V are spent most effectively. Second, utilities may reasonably avoid running pilots if they are not assured that the results from the pilot will be viewed as legitimate. This would almost certainly result in innovative and effective programs not moving forward. The Commission should adopt existing protocols for behavioral energy efficiency If the Commission does decide to create a protocol, they should embrace the significant body of knowledge that already exists in EM&V. This is especially true for residential behavioral energy efficiency. Both the State and Local Energy Efficiency Action Network and the United States Department of Energy's Uniform Methods Project have recommended a best practice for EM&V for behavioral programs. In both cases, they recommend a "randomized control trial." Randomized control trials are the gold standard for scientific experiments, and should be used as much as possible in measuring energy efficiency results. The concept is straightforward. A population of utility consumers is split into two statistically equivalent groups. One group is provided with personalized energy usage information, while the other group is not. Throughout the program, the energy usage for the two groups is measured using billing or meter data. The difference in usage between the two groups is attributed to the personalized energy usage information. This EM&V method has been used in more than 80 independent evaluations, in addition to being recommended by the Department of Energy. The Commission should simply adopt the residential behavioral protocol from the DOE's Uniform Methods Project. Adopting the best practice that is already in common use across the country will provide the most rigorous results. Evaluators, utilities, and vendors will also appreciate the cost savings that come from not having to develop new measurement methods. Cost-effectiveness tests should include a comprehensive set of benefits If the Commission decides to create a protocol, it should include guidelines on cost-effectiveness calculations. Importantly, the Commission should incorporate best practices from across the country. This will make sure that Virginia is using the most up-to-date understanding of the benefits of energy efficiency, and will streamline processes for utilities and vendors that operate in multiple states. One important element that the Commission should consider is incorporating avoided transmission and distribution infrastructure costs into the benefits of energy efficiency. This is recommended practice in California and New England. In California, the New California PUC Avoided Costs for Energy Efficiency Evaluation (http://aceee.org/files/proceedings/2004/data/papers/SS04_Panel5_Paper20.pdf) says that the benefits of energy efficiency for natural gas include, "Transmission and distribution (T&D) capacity, which captures the reduced demand related capital expenditures, line capacity losses and maintenance costs associated with energy savings." In New England, the Avoided Energy Supply Costs in New England: 2015 Report (http://www.ripuc.ri.gov/eventsactions/docket/4580-NGrid-TRM4-AESC_report.pdf) says that natural gas avoided costs include, "Avoided local distribution infrastructure costs due to delays in the timing and/or reductions in the size of new projects that have to be built resulting from the reduction in gas that has to be delivered." Conclusion The decision to adopt a protocol for measuring the impacts of energy efficiency programs is an important opportunity for the Commission. The Commission could increase the amount of energy efficiency in Virginia by adopting a protocol, especially if the protocol includes best practices from across the country. Thank you for the opportunity to submit these comments. We would welcome the opportunity to discuss these comments with you at any point. Sincerely, Richard W. Caperton Director of National Policy and Partnerships Opower

Madria Barnes

From:	jbooe@naesb.org
Sent:	Wednesday, May 25, 2016 5:26 PM
To:	PUE_Comments
Subject:	Case Comments Submission for Case # PUE-2016-00022
Importance:	High
Follow Up Flag:	Follow up
Flag Status:	Flagged

The following case comments were submitted online Wednesday, May 25, 2016 **at** 5:26:01 PM

Full Name: Jonathan Booe
Group or Organization: North American Energy Standards Board
Address Line One: 801 Travis Street
Address Line Two: Suite 1675
City, State, Zip: Houston, Texas 77002
Email: jbooe@naesb.org
Case Number: PUE-2016-00022
Comments: RE: In the matter of receiving input for evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures, PUE-2016-00022 Dear Mr. Peck, The North American Energy Standards Board (NAESB) appreciates the opportunity to offer the attached comments in response to the State Corporation Commission's efforts to address House Bill 1053 and Senate Bill 395. The NAESB REQ.19 Measurement & Verification of Energy Efficiency Programs Model Business Practices were adopted by NAESB and provided to the National Association of Regulatory Utility Commissioners (NARUC) in 2013 and may be supportive of the Commission's analysis of energy efficiency measures. Similar standards that support the wholesale market have been adopted by the Federal Energy Regulatory Commission and have been incorporated by reference into federal regulation. If you have any questions or need additional information, please feel free to contact the NAESB office at any time ((713) 356-0060; www.naesb.org) Respectfully submitted, Jonathan Booe, Executive Vice President and Chief Administrative Officer, North American Energy Standards Board Cc via email: Rae McQuade, President & COO, NAESB Cade Burks, Chairman & CEO, NAESB William P. Bowell, General Counsel, NAESB NAESB is an American National Standards Institute (ANSI) accredited, non-profit 501(c)(6) corporation formed with the support of the Department of Energy (DoE) for the purpose of developing voluntary standards and model business practices designed to promote more competitive and efficient natural gas and electric services that streamline the transactional processes of the natural gas and electric industries. NAESB and its predecessor organization, the Gas Industry Standards Board (GISB), have developed voluntary consensus based standards in these industries for over twenty years with the support of the Federal Energy Regulatory Commission (FERC), the DoE, the North American Electric Reliability Corporation (NERC), NARUC and state utility commissions among other governmental and industry agencies. With the intent of creating uniformity in implementation and acceptance of energy reduction measures and practices, the NAESB REQ.19 Measurement & Verification (M &V) of Energy Efficiency (EE) Programs Model Business Practices (NAESB REQ.19) contain 51 definitions and Model Business Practices that provide standard methods to measure and verify energy reductions for energy efficiency measures. NAESB REQ.19 is applicable to the M&V of electrical energy (kWh) and demand (kW) impacts, referred to as reductions or savings in EE programs offered to retail customers. Developed to be implementable within a regulated or unregulated retail market, the M&V Standards for EE can simplify how the programs are planned, implemented and evaluated by having more uniform metrics. NAESB REQ.19 defines several

different M&V methodologies that are commonly applied to analyzing measure-level or project-level savings. The acceptable methodologies described include, but are not limited to: Partially Measured Retrofit Isolation/Stipulated Measurement, Retrofit Isolation/Metered Equipment, Whole Facility/Regression Analysis, and Calibrated Simulation. Additionally, alternative methodologies were identified and included in NAESB REQ.19 to measure the type and sensitivity of the estimation techniques. Those supplemental methodologies may include Deemed Savings and Large-Scale Billing Analysis. The NAESB REQ.19 also covers verification components for projects that verify EE baseline conditions, EE baselines, statistical significance, EE value savings calculations, measurement and monitoring parameters, and measurement equipment specification, and data validation. NAESB has also developed M&V EE business practice standards for the wholesale electric market. The NAESB WEQ-021 M&V of Energy Efficiency Products are business practice standards complementary to the NAESB REQ.19 and were incorporated by reference into the Federal Energy Regulatory Commission (FERC) regulations through FERC Order No. 676-G issued in February of 2012. In the order, the Commission explained that the standards "facilitate the ability of demand response and energy efficiency providers to participate in organized wholesale electric markets, reducing transaction costs and providing an opportunity for more customers to participate in these programs, especially for customers that operate in more than one organized market." Together, the REQ.19 Model Business Practices for Energy Efficiency and the WEQ-021 Business Practice Standards for Energy Efficiency form the foundation of the NAESB Certification Program for Demand Response (DR) and Energy Efficiency Measurement and Verification Services or Products. The certification program supports the NAESB WEQ and REQ Demand Response and Energy Efficiency Measurement and Verification Standards and provides guidance to the utilities and Independent System Operators (ISOs) and Regional Transmission Organizations (RTOs) in evaluation of demand response and energy efficiency services, or products. Similar to other NAESB certification programs, the DR and EE M&V Certification Program is supported by the NAESB Business Practice Standards and Model Business Practices, specification requirements and process requirements that must be met for certification. The NAESB certification provides an additional assurance to those evaluating and purchasing services and products and assists the customer in making an informed decision. NAESB appreciates the opportunity to submit these informational comments and support the SCC efforts. If you have any questions about these model business practices, or any other NAESB standards, or need additional information, please feel free to contact the NAESB office at any time ((713) 356-0060; www.naesb.org).

North American Energy Standards Board
Retail Gas Quadrant
Retail Electric Quadrant
Model Business Practices

Measurement & Verification (M&V) of Energy Efficiency Programs

Version 3.1
March 31, 2016

The Model Business Practices follow a numbering convention which is q.x.y.z.a, where:

q	REQ	Applicable only to REQ
	RGQ	Applicable only to RGQ
	RMQ	Applicable to both REQ and RGQ
	RXQ	Applicable to both REQ and RGQ
x	0	Overview of Model Business Practices and Master List of Defined Business Terms
	1	Market Participant Interactions
	2	Creditworthiness
	3	Billing and Payments in Competitive Energy Markets
	4	Dispute Resolution
	5	Quadrant-Specific Electronic Delivery Mechanism
	6	Contracts
	7	Internet Electronic Transport
	8	Retail Customer Information
	9	Retail Customer Billing and Payment Notification via Uniform Electronic Transactions
	10	Retail Customer Enrollment, Drop, and Account Information Change
	11	Retail Customer Enrollment, Drop, and Account Information Change Using a Registration Agent
	12	Inquiries
	13	Measurement & Verification (M&V) of Demand Response Programs
	14	Service Request, Disconnection and Reconnection in the Registration Agent Model
	15	Specifications for Common Electricity Product and Pricing Definition
	16	Specifications for Common Schedule Communication Mechanism for Energy Transactions
	17	Specifications for Retail Standard Demand Response Signals
	18	Retail Customer Energy Usage Information Communication
	19	Measurement & Verification (M&V) of Energy Efficiency Programs
	20	Smart Grid Standards Data Elements Table
	21	Energy Services Provider Interface
	22	Third Party Access to Smart Meter-based Information
	23	Supplier Marketing Practices
	24	Enrollment, Drop, and Account Information Change in Demand Response Programs
	25	Supplier Certification
	26	Open Field Message Bus (OpenFMB)

y	1	Principles
	2	Definitions
		A – Business Definitions
		B – Technical Definitions
		C – Abbreviations and Acronyms
	3	Model Business Practices
	4	Models
	5	Related Model Business Practices
	6	Technical Implementation

z Functional Grouping

a Sequentially assigned number

Terms used:

MBP	Model Business Practice
NAESB	North American Energy Standards Board
REQ	Retail Electric Quadrant
RGQ	Retail Gas Quadrant
RMQ	Retail Markets Quadrant

For additional explanation of the Model Business Practices' organization see Book 0.

MEASUREMENT & VERIFICATION (M&V) OF ENERGY EFFICIENCY PROGRAMS

Table of Contents

Executive Summary

This document contains the Model Business Practices for the Measurement & Verification ("M&V") of Energy Efficiency programs. These Model Business Practices are applicable to the M&V of electrical Energy (kWh) and Demand (kW) impacts, also referred to as reductions or savings, of Energy Efficiency programs offered to Retail Customers.

These Model Business Practices may be applied within the context of regulatory or other market requirements and agreements. The information contained in these Model Business Practices does not replace the Governing Documents or the requirements of the Applicable Regulatory Authority. In the event of a conflict, the Governing Documents and the requirements of the Applicable Regulatory Authority should have precedence over these Model Business Practices.

Model Business Practices for M&V of Energy Efficiency programs have the potential to broaden implementation and acceptance of energy reduction measures and practices in both retail and wholesale markets. Retail Energy Efficiency in retail electricity markets should provide consistent and reliable evidence of reductions in electrical usage for qualification and performance. Methodologies for qualifying and demonstrating energy and demand reductions should be specified in the Governing Documents. These Model Business Practices are not intended to replace the existing rules and tariffs stipulated within each market or to establish or support any policy.

Introduction

The North American Energy Standards Board (NAESB) is a voluntary non-profit organization comprised of members from all aspects of the natural gas and electric industries. Within NAESB, the Retail Electric Quadrant (REQ) and the Retail Gas Quadrant (RGQ) focus on issues impacting the retail sale of energy to Retail Customers. REQ / RGQ Model Business Practices are intended to provide guidance to Distribution Companies, other Market Participants, and Applicable Regulatory Authorities involved in providing energy service to Retail Customers. The focus of these Model Business Practices is the Measurement & Verification of Energy Efficiency programs.

These Model Business Practices are voluntary and do not address policy issues that are the subject of state legislation or regulatory decisions. These voluntary Model Business Practices have been adopted by NAESB with the realization that as the industry evolves, additional and amended voluntary Model Business Practices may be necessary. Any industry participant seeking additional or amended voluntary Model Business Practices (including principles, definitions, data elements, process descriptions, and technical implementation instructions) should submit a request to the NAESB office, detailing the change, so that the appropriate process may take place to amend the voluntary Model Business Practices.

Business Processes and Practices

REQ.19 Overview

REQ.19.1 Principles

REQ.19.1.1 These Model Business Practices pertain to M&V of retail Energy Efficiency projects and programs. These Model Business Practices are intended to be applicable in any regulated or unregulated retail arena. The information contained within these Model Business Practices is not intended to replace the Governing Documents or the requirements of the Applicable Regulatory Authority. In the event of a conflict between these Model Business Practices and the Governing Documents or the requirements of the Applicable Regulatory Authority, the latter two should have precedence.

REQ.19.1.2 This document is intended to provide general M&V guidance, and is intended to create consistency across retail and wholesale markets, where appropriate and applicable. These Model Business Practices do not establish practices or provide guidance related to the compensation, design, operation, or use of Energy Efficiency. These Model Business Practices do not establish practices or provide guidance related to how the results are used. They do not establish practices or provide guidance related to the evaluation of program design, cost effectiveness (cost-benefit analysis), implementation (process evaluation) or market assessments (market evaluations).

REQ.19.1.3 These Model Business Practices include recognition that Energy Efficiency is an evolving practice within the energy service industry with increased penetration across wholesale and retail markets. As such, terminology used in the energy service industry to define approaches to quantifying energy savings and Demand reductions from Energy Efficiency investments vary. For the purposes of these Model Business Practices, the term M&V refers to a range of activities that are used to estimate savings from Energy Efficiency projects or programs. Such activities not only include M&V of site-specific project savings, but also include statistical sampling and analysis to estimate program level savings, measure life and persistence, and use of deemed savings and large scale billing analysis. In these Model Business Practices, the term M&V covers this range of activities which are sometimes

referred to as "impact evaluation" activities in the retail industry and relevant guidance documents.

REQ.19.2 Definitions, Abbreviations and Acronyms

REQ.19.2.A Business Definitions

RXQ.0.2.1 **Applicable Regulatory Authority**: The state regulatory agency or other local governing body that provides oversight, policy guidance, and direction to any parties involved in the process of providing energy to Retail Customers through regulation and orders.

REQ.0.2.153 **Demand**: The rate at which electric energy is delivered to or by a system or part of a system, generally expressed in kilowatts or megawatts, at a given instant or averaged over any designated interval of time; and the rate at which energy is being used by the Retail Customer.

REQ.0.2.154 **Demand Reduction Value**: Measurement of reduced electricity usage by a Demand Resource during a Demand Response Event or Energy Efficiency performance hours, generally expressed in kilowatts or megawatts.

REQ.0.2.234 **Energy Efficiency**: Installed measures (e.g. products, equipment, systems, services, practices and/or strategies) on end-use customer facilities that reduce the total amount of electrical energy needed, while delivering a comparable or improved level of end-use service. Such measures include, but are not limited to, the installation of more energy efficient lighting, motors, refrigeration, HVAC equipment and control systems, envelope measures, operations and maintenance procedures, and industrial process equipment.

RXQ.0.2.22 **Governing Documents**: Documents that determine the interactions among parties, including but not limited to: applicable law, regulatory documents (e.g., tariffs, rules, regulations), contractual agreements, Distribution Company Operational Manuals, and other relevant models and operational procedures.

REQ.0.2.168 **Load**: An end-use device or Retail Customer that receives power from the electric system.

REQ.0.2.235 **Measurement & Verification (M&V)**: The process of determining reductions in usage and/or Demand resulting from Demand Response or Energy Efficiency.

RXQ.0.2.208 **Model Business Practices**: Electric and gas industry processes and procedures developed by interested parties representing the NAESB Retail Gas and Electric Quadrants' segments and ratified by the NAESB Retail Gas and Electric Quadrants' members.

RXQ.0.2.207 **Retail Customer**: Any Entity that takes or is applying to take gas and/or electric service for its own consumption.

REQ.0.2.192 **Validating, Editing and Estimation (VEE)**: The process of confirming the accuracy of raw meter data and, if necessary, replacing corrupt or missing data. VEE guidelines are published in the Edison Electric Institute's Uniform Business Practices for Unbundled Electricity Metering.

REQ.19.2.B Technical Definitions – *(Reserved)*

REQ.19.2.C Abbreviations and Acronyms

Abbreviation / Acronym	Meaning
ANSI	American National Standards Institute
HVAC	Heating, Ventilation & Air Conditioning
M&V	Measurement & Verification
NIST	National Institute of Standards & Technology
VEE	Validating, Editing and Estimation

REQ.19.3 Model Business Practices

REQ.19.3.1 Measurement and Verification Methodologies

REQ.19.3.1.1 M&V Methodologies: M&V methodologies should be appropriate to the measure type and sensitivity of the measurement techniques. These methods are commonly applied to analyzing measure or project level savings. A representative sample of projects in the program can be selected and the savings from those selected projects are determined and may be applied to the entire population of projects.

Acceptable methods can include, but are not limited to, the following options.

REQ.19.3.1.1.1 Option A: Partially Measured Retrofit Isolation/Stipulated Measurement: Option A may involve an equipment specific retrofit or replacement, new installation or a system level M&V assessment. The approach is intended for measures where either performance factors (such as lighting wattage) or operational factors (such as operating hours) can be measured on a spot or short-term, or for measures for which a measured proxy variable and/or stipulated factors, can provide an accurate estimate of energy and demand savings.

REQ.19.3.1.1.2 Option B: Retrofit Isolation/Metered Equipment: Option B involves a retrofit or system-level M&V assessment. The approach is intended for retrofits with performance factors and operational factors that can be measured at the component or system level using interval electrical Demand meters installed on the affected end-use.

REQ.19.3.1.1.3 Option C: Whole Facility/Regression Analysis: Option C estimates energy and Demand by analyzing the overall energy use in a facility and identifying the impact of the implemented measures on the total building or facility energy use patterns. The analysis of whole-building or facility level metered data may be completed using techniques ranging, for example, from billing comparisons to multivariate regression analysis.

REQ.19.3.1.1.4 Option D: Calibrated Simulation: Option D involves calibrated computer simulation models of component or whole-building Demand and energy usage to measure Demand and energy savings.

REQ.19.3.1.2 Alternative M&V Methodologies: Alternative or supplemental methodologies should be appropriate to the measure type and sensitivity of the estimation techniques. These alternative methodologies are commonly applied to program level savings, and may include, but are not limited to:

REQ.19.3.1.2.1 Deemed savings: Deemed savings are stipulated values based on historical savings values of like measures directly or indirectly measured, determined through engineering calculations or based on previous studies. As with the M&V options described in REQ.19.3.1.1, the savings determined for a sample of projects may be applied to all the measures or projects in the program. This approach is best suited for projects with predictable operating conditions and documented stipulated values such as energy-efficient appliances.

REQ.19.3.1.2.2 Large-scale billing analysis: Statistical analyses are conducted on the energy usage data collected from revenue meters or equivalent for all or most of the participants in an Energy Efficiency program and either non-participants (a control group) or a baseline condition. This approach is primarily used for residential programs with homogeneous participants, load characteristics and measures. Billing analysis may be appropriate when project-specific analyses are not practical. Billing analysis may only be useful for quantification of energy use rather than Demand use, unless interval meter data is available.

REQ.19.3.1.3 Verification: For projects or programs involving installation of measures, methodologies should include a verification component for each project or a sample of projects that verifies Energy Efficiency Baseline conditions, measures were actually installed, and/or measures were installed and are operating correctly.

REQ.19.3.1.4 Measure Life and Persistence: Methodologies should include mechanisms for estimating measure life and persistence of measures.

REQ.19.3.2 Energy Efficiency Baselines

REQ.19.3.2.1 **Underlying Assumptions**: Energy Efficiency baseline definitions should include a description of underlying assumptions used for establishing the Energy Efficiency baseline conditions that would have occurred in the absence of the program (i.e., the counterfactual).

REQ.19.3.2.2 **Energy Efficiency Baseline Conditions**: The Energy Efficiency baseline should reflect the conditions under which new energy efficient equipment or processes are installed to provide a service function. The four primary conditions are as follows:

(a) Replacement or retrofit of functional equipment still within its current useful life or process improvements.

(b) Replacement of functional equipment beyond its current useful life.

(c) Unplanned replacement for (of) failed equipment.

(d) New construction.

REQ.19.3.2.3 **Standard Energy Efficiency Baseline**: The standard Energy Efficiency baseline should be the nameplate rating of the equipment meeting the more stringent level of Energy Efficiency required by applicable state code, the federal or state (as applicable) product Energy Efficiency standard, or standard practice. The standard Energy Efficiency baseline should be determined at the time of installation or as set forth in the Governing Documents or as established by the Applicable Regulatory Authority.

REQ.19.3.2.4 **Current Load Energy Efficiency Baseline**: The current Load Energy Efficiency baseline should be the current Load of the existing operating equipment or facility. The current Load Energy Efficiency baseline should be determined at the time of installation or as set forth in the Governing Documents or as established by the Applicable Regulatory Authority.

REQ.19.3.2.5 The application of the Energy Efficiency baseline conditions described in REQ.19.3.2.2 applicable to the two Energy Efficiency baselines in REQ.19.3.2.3 and REQ.19.3.2.4 is summarized below in Table REQ.19.3.2.6.

REQ.19.3.2.6 Table

	Primary Condition	Standard EE Baseline	Current Load EE Baseline
A	Replacement or retrofit of functional equipment still within its current useful life or process improvements		X
B	Replacement of functional equipment beyond its current useful life	Depends on Governing Documents or Applicable Regulatory Authority	Depends on Governing Documents or Applicable Regulatory Authority
C	Unplanned replacement for (of) failed equipment	X	
D	New construction	X	

REQ.19.3.3 Statistical Sampling

REQ.19.3.3.1 General: M&V of Energy Efficiency programs may include measurement methodologies utilizing statistical estimation techniques for estimating energy and Demand savings. In the event that statistical methods are used, the following expectations for statistical significance should be met:

REQ.19.3.3.1.1 Specification for Statistical Error and Precision when Sampling is Used: Sample error and precision used should be suited to the provisions of the program (e.g. at least 80/10 using a two-tailed test or 90/10 using a one-tailed test), subject to the Governing Documents and the requirements of the Applicable Regulatory Authority.

REQ.19.3.3.1.2 Sample Size Calculation: The sample size should reflect a population coefficient of variation (c.v.), which may not be known at the time of sample design. The desired error and precision level are also inputs into sample size calculation. The sample size may be established using an estimate of the c.v. For example, the estimated c.v. should

REQ.19.3.4 Energy Efficiency Value Savings Calculations: Energy Savings and Demand Reductions Calculations

REQ.19.3.4.1 Energy Efficiency Savings Value Calculation Variables: Calculation of energy and Demand Reduction Values for equipment, measures and practices should be performed using energy (kWh) or Demand (kW) values calculated according to M&V methodologies provided herein. Calculation of Demand Reduction Values for equipment, measures and practices, including weather sensitive Loads, may include estimated modifiers or proxy variables. Estimated modifiers and proxy variables used in the calculation of the Demand Reduction Value should include, but are not limited to the following: coincidence factor, realization rate, equipment failure rate, weather normalization for weather sensitive loads, temperature, humidity, flow, concentration, volts, amps, lumens, and quantity.

REQ.19.3.5 Measurement and Monitoring

REQ.19.3.5.1 Measurement and Monitoring Parameters and Variables Requirements: Measurement and monitoring involve the collection of data of various types from equipment, measures and practices. Monitoring parameters and variables should be used in the calculation of the energy savings and Demand reductions.

REQ.19.3.5.1.1 All measured monitoring parameters and variables used in calculation of the energy savings and Demand reductions should be documented.

REQ.19.3.5.1.2 All measured monitoring parameters and variables used in the calculation of the energy savings and Demand reductions should be applicable to the category of equipment, measure or practice, including but not limited to: heating ventilating and air conditioning (HVAC) equipment, HVAC controls, building envelope, interior/exterior lighting, major electric consuming equipment and weather sensitive loads.

For information on membership in the
North American Energy Standards Board
contact the NAESB office at:
801 Travis, Suite 1675
Houston, Texas 77002
(713) 356-0060
(713) 356-0067 Fax
E-mail: naesb@naesb.org
www.naesb.org

Additional copies may be obtained from NAESB.

ISBN 978-1-935525-22-6

May 21, 2016

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

Case No. PUE-2016-00022 and shall

To Whom It May Concern:

The staff and Commissioners of the SCC are incredibly bright and dedicated people and I am befuddled as to why there seems to be such hostility toward energy efficiency. Many states, including those that are more conservative in their attitudes than Virginia have invested in EE and found real and measurable savings across the customer base (see attached charts).

I believe the argument that EE provides "cross class subsidization" is specious for it also provides "cross class benefits". Additionally, the whole economic concept behind a utility being granted a monopoly is because some customers must be necessity subsidize others for the common good of the Commonwealth (think rural residential vs urban residential or rural industrial vs urban residential)... If real benefits can be derived by all than it is a worthy investment.

By having robust EM&V, Virginia can invest in energy efficiency and fight the "bill creep" that is shown in the SCC's September 1, 2015 "Report to the Commission on Electric Utility Regulation of the Virginia General Assembly and the Governor of the Commonwealth of Virginia".

Since 2006, Dominion Virginia Power's average residential rates and bills have both increased relative to Dominion's peers. In 2006 Dominion had the 7th lowest residential rates among its peer group.[1] By 2014, Dominion had dropped to 10th in the same grouping.[2] Likewise, and more importantly from a consumer angle, in 2015, Dominion's typical residential bills also increased relative to its peers:

Dominion's residential bill ranking[3]		
	2006	**2015**
Monthly usage of 500 kWh	9	11
Monthly usage of 750 kWh	9	12
Monthly usage of 1,000 kWh	8	12

[1] SCC Report at Appendix 2.
[2] *Id.*
[3] *Id.* at Appendix 3.

Therefore, please add my voice to others' for a robust EM&V procedures in Virginia that fairly and accurately measure the real customer and system savings for energy efficiency in Virginia.

In particular, I believe that the SCC should adopt procedures that accurately reflect the contributions to cost-effective, reliable operation of the electricity system of all resources, including energy efficiency. Energy efficiency provides cost savings for ratepayers, enhances grid reliability, and is generally the least-cost resource for meeting new energy demand. An accurate and transparent measurement of these contributions is essential to providing a reliable basis for SCC decision-making.

SCC should rely on well-established industry best practices. EM&V for demand side energy efficiency is a well-established field of analysis that has demonstrated itself to be a reliable basis for decision-making in myriad jurisdictions since the 1980s.

As the SCC identifies best practices throughout the industry, I have been told the best existing resource is the Department of Energy's Uniform Methods Project (UMP), which offers a solid foundation to account for a variety of efficiency technologies for EM&V measures. The UMP protocols are based on best practices that are in use today, and are aligned with other government efforts that require accurate EM&V, such as the Clean Power Plan. These protocols are well-understood by industry and professionals allowing for easier compliance. Additionally, the UMP protocols can be adopted for a Virginia-specific market that can work for all stakeholders.

Technology means that the EM&V should be less of the total program cost than it was 10 or 20 years ago yet provide increased certainty. I urge the SCC to move forward with measurements to provide the certainty so that these programs can move forward.

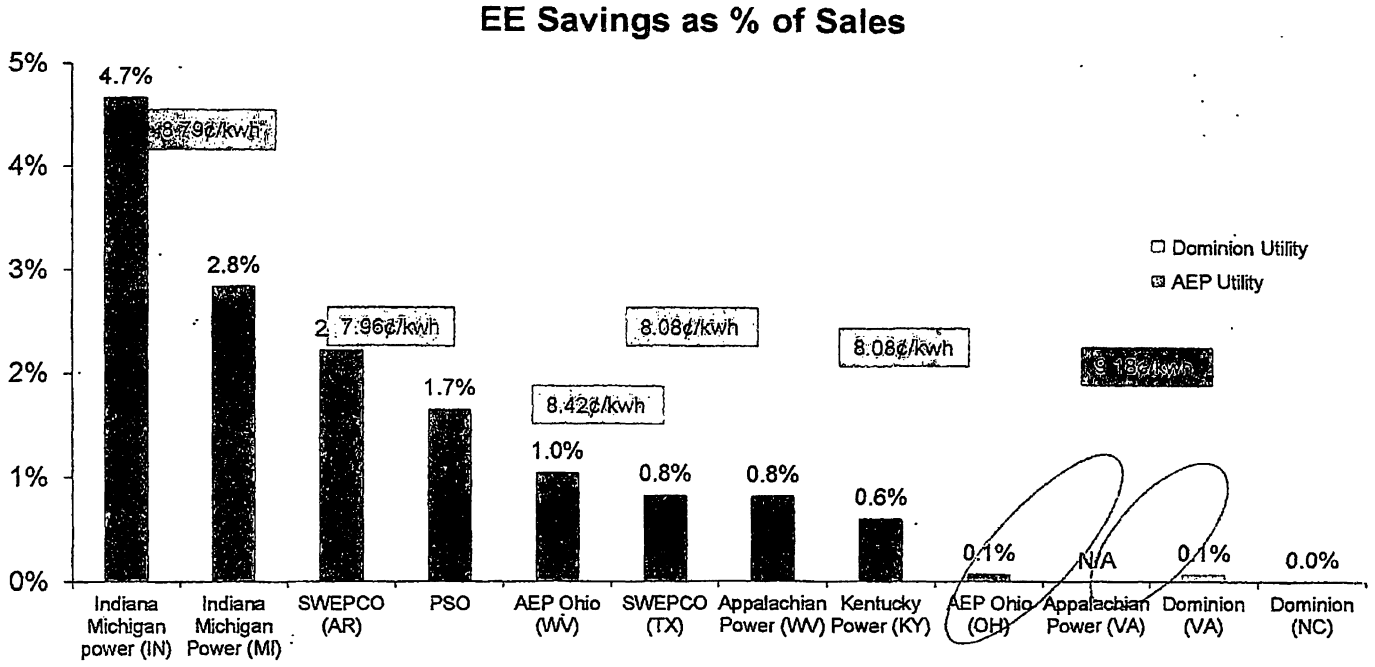
Lastly, I have attached two slides that show that other utilities with lower rates in Virginia's peer group have more investment in EE. I understand that correlation is not causation but....

With thanks for your consideration of my input.

The Honorable Albert C. Pollard, Jr

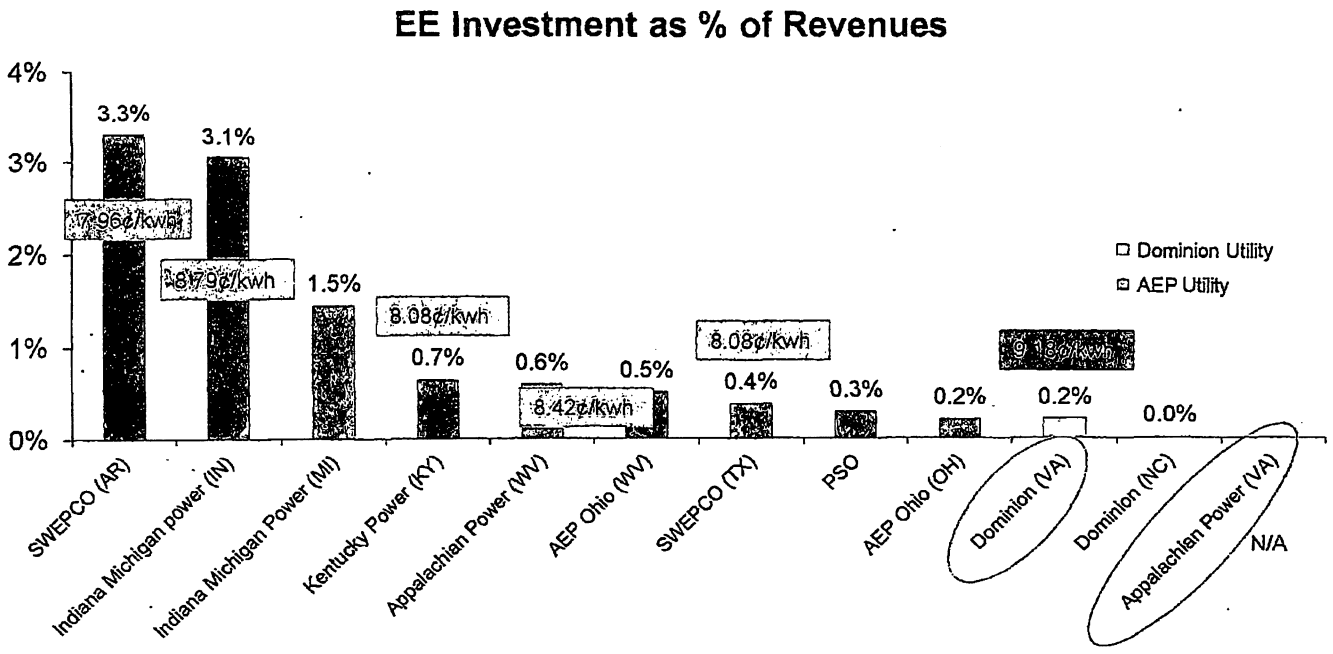
48 Steamboat Rd
Irvington, VA 22480
Pollard.albert@gmail.com

EE SAVINGS FROM VIRGINIA UTILITIES LAG BEHIND SISTER UTILITIES



Source: EIA Form 861 (2013); Electric rates found on AEE Powersuite.
Note: Appalachian Power (VA) was not approved to run EE programs in 2013. An application to run a portfolio of EE programs is currently before the VA SCC (PUE-2014-00039)

VIRGINIA UTILITIES UNDERINVESTING IN EE RELATIVE TO SISTER UTILITIES AT EXPENSE TO RATEPAYERS



Source: EIA Form 861 (2013); Electric rates found on AEE Powersuite.
Note: Appalachian Power (VA) was not approved to run EE programs in 2013. An application to run a portfolio of EE programs is currently before the VA SCC (PUE-2014-00039)

Southern Environmental Law Center

201 West Main Street, Suite 14
Charlottesville, VA 22902-5065
434-977-4090
Fax 434-977-1483
SouthernEnvironment.org

May 25, 2016

VIA ELECTRONIC FILING

Mr. Joel H. Peck, Clerk
c/o Document Control Center
State Corporation Commission
Tyler Building – First Floor
1300 East Main Street
Richmond, Virginia 23219

RE: ***Ex Parte: In the matter of receiving input for evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures***

Case No. PUE-2016-00022

Dear Mr. Peck:

Enclosed for filing in the above-captioned proceeding are the Comments of the Southern Environmental Law Center, Appalachian Voices and the Chesapeake Climate Action Network ("Environmental Respondents"). This filing is being completed electronically, pursuant to the Commission's electronic document filing system.

If you should have any questions regarding this filing, please call me at (434) 977-4090.

Sincerely,

Cale Jaffe

cc: Parties on Service List
Commission Staff

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION

COMMONWEALTH OF VIRGINIA, *ex rel.*	)	
	)	
STATE CORPORATION COMMISSION	)	
	)	
	)	Case No. PUE-2016-00022
Ex Parte: In the matter of receiving input	)	
for evaluating the establishment of protocols,	)	
a methodology, and a formula to measure	)	
the impact of energy efficiency measures	)	

COMMENTS OF SOUTHERN ENVIRONMENTAL LAW CENTER, APPALACHIAN VOICES, AND CHESAPEAKE CLIMATE ACTION NETWORK

Pursuant to the Commission's Scheduling Order of March 30, 2016, the Southern Environmental Law Center ("SELC"), Appalachian Voices, and the Chesapeake Climate Action Network, by counsel, (hereinafter "Environmental Respondents") file these comments in the above-captioned proceeding. Environmental Respondents consulted with Optimal Energy, Inc. ("Optimal") in the preparation of these comments. Optimal is a full-range energy efficiency consulting firm that has provided services to investor-owned and municipally-owned utilities, program administrators, state and federal energy offices, regulatory commissions, and advocacy groups. Environmental Respondents and Optimal Energy have worked together to present expert testimony to the Virginia State Corporation Commission ("SCC" or the "Commission") in more than a dozen dockets in recent years, with an emphasis on improving efficiency programs in the Commonwealth to address the needs of all stakeholders in a cost-effective and balanced fashion. Building on that experience and mindful of lessons learned from prior DSM dockets, Environmental Respondents offer the following comments to help the Commission establish and implement evaluation, measurement, and verification ("EM&V") protocols in Virginia.

I. INTRODUCTION

EM&V protocols are vital for ensuring that demand-side management ("DSM") programs are cost-effective and provide value. A well-designed EM&V process will guide cost recovery and planning, protect ratepayers from fraud, inefficient, or ineffective programs, and identify opportunities to improve programs and maximize their benefit to customers. EM&V protocols can also create an objective evaluation process, allowing regulators to determine savings from DSM programs and calculate costs and benefits. While specific EM&V protocols may vary between states, uniformity and consistency within a given jurisdiction is essential.

The comments below identify ways in which clearer EM&V protocols and expectations can address many of the concerns that the Commission has articulated in recent dockets concerning utility-sponsored DSM programs. These comments also address: (1) the objectives and scope of uniform EM&V protocols to determine the savings from energy efficiency measures and the costs of these savings; (2) appropriate levels of independence, stakeholder input, oversight, and management of EM&V planning and implementation; and (3) consistency in cost/benefit tests and calculations and how these may be improved by better EM&V protocols. Taken together, these comments chart a path towards maximizing the overall ratepayer value of EM&V efforts.

II. REVIEW OF RECENT VIRGINIA DSM CASES

Establishing a clear procedure for EM&V protocols is necessary to provide consistency in terms of predicting and measuring savings and cost-effectiveness. Through Final Orders issued in recent DSM dockets, the Commission has identified concerns with proposed efficiency

programs and the anticipated benefits to ratepayers. As shown below, clearly established EM&V protocols would remedy many of these concerns.

For example, in the docket for Dominion Virginia Power's 2011 energy efficiency portfolio, PUE-2011-00093, the Commission questioned the reasonableness of the Company's assumptions related to the "actual usage conditions for CFL bulbs, baseline technology assumptions, and overall cost effectiveness for the Residential Lighting Program."[1] Without confidence in the cost-effectiveness results, the Commission could not find the proposed programs in the public interest. Accordingly, the Commission rejected "the continuation and expansion of the Residential Lighting Program."[2] In a subsequent DSM docket two years later, PUE-2013-00072, baseline assumptions underlying the use of Standard T12 (115 W) fluorescent lighting fixtures led the Commission to find that the Company could have overestimated the proposed DSM program's projected energy savings.[3] Here the Commission addressed this concern by reducing the proposed programs' five-year cost cap "by an amount equal to 50 percent of the Company's planned O&M expenses for the Non-Residential Lighting Systems & Controls Program."[4]

In both of these cases, clear baselines (derived either from EM&V protocols or Technical Reference Manuals) would have alleviated the identified failings and would have allowed for expansion of the programs. This, in turn, would have produced greater savings for customers. Going forward, the Commission's EM&V protocols could specify these requirements and the

---

[1] Order, Application of Va. Elec. & Power Co. For Approval to Implement New Demand-Side Management Programs and for Approval of Two Updated Rate Adjustment Clauses, PUE-2011-00093, at 11 (Apr. 30, 2012).

[2] *Id.*

[3] Final Order, Petition of Virginia Elec. & Power Co. For Approval to Implement New Demand-Side Management Programs and for Approval of Two Updated Rate Adjustment Clauses, PUE-2013-00072, at 9-10 (Apr. 29, 2014).

[4] *Id.* at 11.

timing of EM&V plans—at the time when a DSM docket is first pending before the Commission— to guarantee that EM&V planning is adequate and will support program goals.

Moreover, protocols should establish that in future cases, utilities must incorporate EM&V results when planning new, expanded, or continued programs. For example, in PUE-2015-00089, the Commission found that Dominion failed to reference EM&V results from prior dockets when using the average coincident and non-coincident peak savings per participant for continuation of the AC Cycling Program.[5] Instead, the Company reused savings estimates from when it originally modelled the program. Establishing protocols that identify appropriate use of EM&V results and sources will provide the Commission and ratepayers with additional, supplementary evidence to support a utility's planning assumptions.

The above examples document discrete instances where uniform EM&V protocols would have ensured that utilities performed all assumptions and analyses in a consistent, transparent, and credible manner. Looking ahead, an adequately independent EM&V process will produce more reliable DSM portfolios in Virginia. That reliability, in turn, will allow utility-sponsored DSM programs to expand, which in turn can delay the need for more capital-intensive generation projects, provide a hedge against volatile fuel prices, and deliver bill savings to all customers.

III. SCOPE OF EM&V UNIFORM PROTOCOLS

A consistent and transparent approach to establishing EM&V protocols should include an independent EM&V process, the accuracy of the results, and the consistent reliability of results from docket to docket. Accordingly, this section of our comments focuses on the broad subject areas that a future docket to establish EM&V guidelines or regulations should consider:

[5] Final Order, Petition of Virginia Elec. & Power Co. For Approval to Implement New Demand-Side Management Programs, for Approval to Continue a Demand-Side Management Program, and for Approval of Two Updated Rate Adjustment Clauses, at 9-10 (Apr. 19, 2016).

1. Establishing an organizational framework that ensures appropriate evaluator independence and stakeholder input, and supports efficient decision-making and engagement in EM&V planning, implementation, review, approval, and reporting;

2. Defining and ensuring appropriate levels of accuracy, consistency, and transparency in all EM&V activities;

3. Maximizing the ratepayer value of EM&V efforts and resources; and

4. Establishing procedures for important regulatory issues such as savings claims verification, cost recovery, and cost-effectiveness analysis.

A. Establishing a Framework to Ensure Appropriate Independence and Stakeholder Input

Any EM&V protocols must address structural organization and decision-making issues to clarify the roles and responsibilities of all appropriate parties. Proper EM&V requires an appropriate level of independence from the utilities proposing to implement the programs, so that all stakeholders have a role in EM&V planning. Giving all stakeholders "skin in the game" in the EM&V process helps guarantee credible final results. Equally important, an independent EM&V process increases the likelihood that all stakeholders will support the findings, both positive and negative.

There is significant, nationwide precedent for independent EM&V evaluations. In fact, approximately 80% of states use independent consultants and contractors to conduct energy-efficiency evaluations.[6] Further, a number of models throughout the U.S. address levels of independence and third party oversight. For example, in many states, while the program administrators directly contract with independent evaluation firms and pay for EM&V with

[6] *See* State and Local Energy Efficiency Action Network (2016). SEE Action Guide for States: Energy Efficiency as a Least-Cost Strategy to Reduce Greenhouse Gases and Air Pollution and Meet Energy Needs in the Power Sector. Prepared by: Lisa Schwartz, Greg Leventis, Steven R. Schiller, and Emily Martin Fadrhonc of Lawrence Berkeley National Laboratory, with assistance by John Shenot, Ken Colburn and Chris James of the Regulatory Assistance Project and Johanna Zetterberg and Molly Roy of U.S. Department of Energy. *Available at:* http://www4.eere.energy.gov/seeaction/system/files/documents/pathways-guide-states-final0415.pdf.

ratepayer funds, there are third party processes to oversee and/or audit the EM&V work. This ensures appropriate levels of independence and participation in the EM&V planning process to allow for consensus among stakeholders.

In some cases, stakeholder bodies or other third parties directly contract for and retain all oversight and management of evaluators. For example, in some states the staff of the public utility commission or another regulatory body directly is responsible for EM&V.[7] In other states, the program administrators contract and provide day-to-day management of EM&V, but the public utility commission's staff hires an independent EM&V auditor to both participate in all EM&V planning and performance and render final decisions and approval of all work products.[8] Other jurisdictions rely on a collaborative body of stakeholders to directly plan, oversee, and manage EM&V efforts, while program administrators act as the fiscal agent to contract and pay for the EM&V.[9] This collaborative model, of course, has a significant advantage over other approaches in that it brings all stakeholders to the table and increases the likelihood that final EM&V results will be broadly accepted as legitimate.

Regardless of which model Virginia adopts, issues that should be addressed in establishing EM&V protocols include, but are not limited to:

1. Roles and responsibilities of all key players, including program administrators, evaluators, regulators, Commission Staff, and non-program administrator stakeholders;

2. Definition and organization of any formal body (or bodies) to solicit and hire an independent EM&V contractor, guide and develop EM&V plans, oversee and manage all EM&V activities, and appropriate roles and procedures to resolve disputes or make final decisions around draft and final EM&V products; and

[7] Pennsylvania, Vermont and the District of Columbia Sustainable Energy Utility use this model. Much of California's EM&V is managed by the California Energy Commission.

[8] Examples of this model include Maryland, Missouri, Ontario, and to some extent, Arkansas.

[9] Examples of this model include Connecticut, Massachusetts and Rhode Island, where various energy advisory councils directly select and oversee all EM&V efforts. These councils effectively represent formal stakeholder collaboratives and include numerous non-utility parties.

3. Guidelines around transparency and distribution of all key draft and final work products and reports, and appropriate opportunities for comment and revisions.

Regardless of the final model, Virginia must address these structural issues in an EM&V framework in an efficient, clear way that produces an appropriate level of quality assurance, independence, and oversight. Ultimately, an EM&V framework should yield widespread trust and support of EM&V efforts.

B. Ensuring Accuracy, Consistency, and Transparency

EM&V protocols must create a framework to ensure appropriate levels of accuracy, consistency, and transparency. To achieve these results, state regulatory guidelines must establish appropriate methodologies, standards of statistical precision, and reporting requirements. That said, protocols must be flexible and should not mandate explicit methods for specific types of evaluations. Rather, protocols should offer general policy and procedural guidance that encourages the use of best practices while allowing for flexibility to maximize the benefits of EM&V efforts, considering the necessary trade-offs between precision and level of resources and effort. Protocols should also take advantage of regional, national, and international resources, such as the Northeast Energy Efficiency Partnerships ("NEEP") EM&V Forum and the International Protocols for Measurement, Verification and Performance ("IPMVP"). These well-established standards will allow Virginia to move forward quickly on EM&V without reinventing the proverbial wheel.

To ensure accuracy in EM&V reports, Virginia's regulatory guidance on EM&V should address the following factors:

1. Definitions of key terms and guidelines about how those terms are used, *e.g.*, distinctions between evaluation, measurement, and verification functions;

2. Establishment of procedures and policies to guide selection of baselines from which to estimate efficiency savings;

3. Definition of cost-effectiveness procedures and major inputs, such as which tests to use and what costs and benefits to include in analyses;

4. Establishment of statistically precise targets, where reasonable, balancing available resources and the levels of impact and uncertainty;

5. Guidance around use of joint evaluations and services across territories or markets, and the leveraging and use of appropriate secondary data from outside Virginia, when appropriate;

6. Application and use of load shapes, definitions of peak coincidence periods, and other issues related to the level of granularity desired in EM&V activities, across sectors, programs, market segments, and measures;

7. Guidance around key methodologies to create a common understanding of the types of methods and studies appropriate for different programs or markets (*e.g.*, when to rely on things like billing analysis vs. engineering estimates, use of consistent weather zones and normalization, etc.); and

8. Reporting procedures and timing, including distribution and/or filing of all draft and final work products that ensures appropriate transparency of methods and findings.

Importantly, Virginia's regulatory guidelines must also establish minimum standards that will support participation in the PJM capacity market (Reliability Pricing Model, or RPM). PJM specifically allows demand response and energy-efficiency resources in the RPM auction. Virginia's EM&V protocols should help Virginia ratepayers maximize any available market revenue streams.

C. *Maximizing Ratepayer Value*

A nearly infinite amount of data can be collected to assess the impacts of DSM programs. Requiring more detailed, granular evaluations and increasing the frequency of studies are always possible. But the additional data collected comes at a cost. EM&V protocols must balance the

inherent trade-offs between the benefits of ever-more-precise EM&V results and the cost (often to ratepayers) to develop those results. The focus, as always, should be maximizing overall ratepayer value while protecting the ratepayer's investment in efficiency. Flexibility is necessary to accommodate unique circumstances and to allow stakeholder input on EM&V planning and investment decisions.

In addition to understanding a program's savings impacts and cost-effectiveness, another important aspect of EM&V is "process evaluation," which attempts to assess the overall effectiveness of program designs and implementation procedures. A related but somewhat distinct aspect of process evaluation is market research and assessment. This research most often focuses on customers and should improve understanding of barriers to DSM participation by customers. Overcoming these barriers, of course, will help all stakeholders identify opportunities for DSM program improvements. The EM&V protocols must include regulatory guidance on the need and manner of incorporating process and market evaluations. Again, the focus here is on using EM&V to protect ratepayers' investments in the DSM programs.

Key issues that should be addressed include, but are not limited to:

1. Guidelines around overall EM&V budgets (typically expressed as a percentage of program spending);

2. Guidance regarding allocation of EM&V funding across functional areas (impact/process/market) as well as by sector and program;

3. Guidance around timing of EM&V studies that addresses trade-offs between available resources and the desire for impact precision and appropriate investment in process and market assessment. For example, should impact evaluations be conducted every year for every program, once per program plan cycle, only for the largest and/or most uncertain impact areas?

4. Guidance to capture economies of scale in EM&V. For example, guidelines should address issues of statewide versus utility-specific evaluations, opportunities to look at

programs and markets across territories that may result in cost savings or improved accuracy, appropriate use and leveraging of secondary data that may be available from neighboring states or regions, etc.

5. Procedures that ensure consistency and compliance with PJM capacity market requirements, the Clean Power Plan, or other markets and regulations outside Virginia that will directly or indirectly benefit ratepayers.

In sum, a vitally important function of EM&V is to create an objective and structured feedback loop to program planners, designers, and implementers that will result in ongoing improvements to DSM programs. That is, EM&V creates an iterative process, where each generation of DSM programs leads to greater long-term benefits and ever-increasing efficiency gains.

D. Establish Procedures to Guide Savings Claims Verification and Cost Recovery

In addition to establishing an appropriate structure and EM&V planning and decision-making process, and ensuring that ratepayers get the maximum value and benefit from EM&V resources, the protocols should directly address key regulatory issues around policies for applying EM&V results. The issues on how to *apply* the EM&V results include: 1) how to claim and verify savings; 2) how to calculate cost-effectiveness; and 3) how to consider cost recovery factors such as savings goals and net loss revenue calculations.

Issues that should be addressed in this portion of the protocols include, but are not limited to:

1. Reliance on net-versus-gross savings impacts and the policy, planning and regulatory use of EM&V net and gross findings;

2. Policies on prospective deeming of savings impacts, assumptions, or algorithms versus the retroactive application of EM&V findings[10];

[10] Whether or when it is appropriate to use EM&V findings retroactively may vary depending on the specific use of the findings.

3. Development and use of a Technical Reference Manual ("TRM") to estimate, track, and verify annual energy savings from energy efficiency measures, and procedures for updates and modifications to the TRM to incorporate new EM&V findings. If a TRM is developed and maintained for purposes of defining how annual energy savings are estimated, policy issues around its application and modifications must be established; and

4. Clear definitions of all key variables or terms to guide impact evaluation and cost-effectiveness analysis. For example, the protocols should identify energy savings and costing periods, define peak or critical peak demand periods and how these should be applied, use of measure lives, etc.

These final aspects of EM&V are essential for developing a common framework on how to use EM&V results. Establishing this framework in advance will help avoid potential future disagreements about what the results mean, which will also reduce end-of-program litigation over net loss revenue calculations. An agreed-upon framework will also ensure that adequate data is collected from the outset to support all necessary regulatory findings and decisions in a timely and cost-efficient manner.

IV. ESTABLISH A FORMULA TO CALCULATE LEVELIZED COST OF SAVED ENERGY ("LCSE") FOR ENERGY EFFICIENCY MEASURES

House Bill 1053 and Senate Bill 305 require the Commission to evaluate the establishment of uniform EM&V protocols that, among other things, provide "a formula to calculate the levelized cost of saved energy" for efficiency measures. Further, the Commission's Scheduling Order in this docket requests specific input concerning "appropriate formulae for developing the cost of saved energy resulting from energy efficiency programs and appropriate inputs for such formulae." While the comments above focus on the appropriateness and benefits of development of EM&V protocols, we also provide some more specific comments in response to this request from Commission.

We caution the Commission that over-reliance on Levelized Cost of Saved Energy ("LCSE") as a primary metric for efficiency programs is problematic for a number of reasons.

While LCSE can provide some useful information, it is an incomplete representation of the value of efficiency investments and, accordingly, is subject to misuse. We recommend that the primary cost-effectiveness test should be the Total Resource Cost ("TRC") test, which more comprehensively considers the entire costs and benefits to all Virginia ratepayers from investment in efficiency. We also recommend close consideration of the Utility Cost test, which puts the precise question facing a utility before the Commission: whether it is cheaper to roll out a portfolio of DSM programs or to select an alternative option, such as accelerated construction of new company-owned generation resources or increased purchases from merchant power providers.

The primary reason that the LCSE can be misleading is that efficiency programs provide a variety of economically quantifiable benefits to the Virginia economy that are not captured in the LCSE metric. Typically, LCSE calculations simply compare the entire costs of efficiency programs against only a single benefit—kWh savings—while ignoring all other benefits. As a result, a program that may be very cost-effective in aggregate can still have a high LCSE, above current electricity market prices and/or retail rates. An efficiency program with an LCSE greater than the cost of electricity might nevertheless be a cost-effective investment, as explained below.

Consider a program that addresses residential cooling and building shell improvements. This program will provide some electric energy (kWh) savings and benefits. However, because cooling is highly coincident with system peak loads, it will also provide substantial peak demand (kW) capacity benefits to ratepayers. In addition, if the home is heated by gas, then the shell improvements (and perhaps controls as well such as a smart thermostat) will also provide substantial gas avoided-cost benefits. A traditional LCSE analysis does not reflect these peak capacity and natural-gas savings.

A possible solution to this problem would be to calculate a "net LCSE" that compares the net investment costs after subtracting other non-kWh benefits. This approach provides a net LCSE that can be directly compared against kWh supply costs to provide an understanding of whether the program or measure is cost-effective. In the event that a measure offers large electric capacity or gas benefits—or potentially other quantified benefits—these savings should be captured in any comparison between cost per kWh and LCSE. At a minimum, we recommend that any LCSE metrics be reported along with TRC test or Utility Cost test cost/benefit ratios.

The table below provides an illustrative example of net and gross LCSE calculations for a typical home energy services program, which would provide single-family residential customers with: 1) a home energy assessment; 2) rebates for installing recommended measures for lighting, appliances, and heating/cooling equipment; and 3) rebates for shell measures such as air sealing and insulation. For the purposes of preparing this table, a fifteen-year measure life was assumed.

Table 1. Example Gross vs. Net Levelized Cost of Saved Energy Calculation

		Inputs for Gross LCSE	Inputs for Net LCSE
	Total Program Costs	$87,000,000	$87,000,000
Savings	**Energy (kWh)**	44,400,000	44,400,000
	Capacity (kW)	7,800	7,800
	Gas (MMBTU)	140,800	140,800
Benefits	**Total Program Benefits**	$109,000,000	$109,000,000
	Energy Benefits	$36,800,000	$36,800,000
	Capacity Benefits	$20,000,000	-$20,000,000
	Gas Benefits	$52,200,000	-$52,200,000
	Net Program Costs	$87,000,000	$14,800,000
	TRC Benefit-Cost Ratio	1.25	1.25
	LCSE	$0.19	$0.03

As can be seen in Table 1, this DSM program overall is cost-effective based on a TRC test benefit-cost ratio of 1.25. Nonetheless, under a traditional LCSE metric ("Gross LCSE") it has a levelized cost of saved energy of 19 cents/kWh. This is substantially higher than current market supply costs, and would lead many readers to think this program is a poor investment despite it passing the TRC test. The second column, however, shows the "net LCSE" calculation, which takes into account the additional benefits that accrue from this program. Specifically, it credits the electric capacity benefits and the gas benefits against the program cost, to show the net cost of only the kWh savings. Under this approach, the cost of 3 cents/kWh is more directly comparable to traditional electric supply costs, and readers are less likely to misinterpret the program as being too costly. By acknowledging the real-world, tangible benefits that accrue from this DSM program, the net LCSE analysis recognizes that the true cost would be less than one-sixth of the gross LCSE value.

V. CONCLUSION

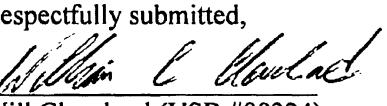
We thank the Commission for the opportunity to provide these comments. As explained above, the most important factor is to establish an objective and independent process to oversee and guide EM&V planning and implementation. Utilities sponsoring DSM programs should not have undue control and management of EM&V planning, implementation, or final outcomes. To give the Commission and all stakeholders confidence in the final EM&V results, independence is crucial.

Moreover, developing a robust EM&V program is absolutely vital for expanding DSM resources in Virginia. As highlighted by the specific examples from DSM cases in Virginia (PUE-2011-00093, PUE-2013-00073, and PUE-2015-00089), strong EM&V protocols can address concerns that the Commission has identified and allow for the approval of more cost-effective programs. EM&V requirements can also supplant cost caps as a primary mechanism for

protecting ratepayers. After all, cost caps might limit the amount of ratepayer dollars spent on a given efficiency program, but they do not necessarily ensure that ratepayer money is well-spent. Effective EM&V requirements, on, the other hand, do ensure that the money is well-spent. EM&V helps judiciously target program dollars to where they can deliver the best results.

If done right, EM&V can deliver on the greatest promise of energy efficiency programs—the ability to meet customer needs at a far lower cost than *any* generation-side resource.

Respectfully submitted,



Will Cleveland (VSB #88324)
Caleb Jaffe (VSB #65581)
Southern Environmental Law Center
201 West Main St., Suite 14
Charlottesville, VA 22902-5065
Tel: (434) 977-4090
Fax (434) 977-1483

ON BEHALF OF
ENVIRONMENTAL RESPONDENTS

DATED: May 25, 2016

CERTIFICATE OF SERVICE

I hereby certify that the following have been served with a true and accurate copy of the foregoing via first-class mail, postage pre-paid:

Rodney Dickens
Allegheny Power
800 Cabin Hill Drive
Greensburg, PA 15601

William K. Castle
American Electric Power
3 James Center
1051 E. Cary Street, Suite 1100
Richmond, VA 23219

John Ebert
Appalachian Natural Gas
P.O. Box 2543 (24212)
220 W. Valley Street
Abingdon, VA 24210

Kevin Akers
Atmos Energy Corporation
801 Crescent Center Drive, Suite 600
Franklin TN, 37067-6226

C. Meade Browder, Jr.
Division of Consumer Counsel
Office of Attorney General
202 North Ninth Street
Richmond, VA 23219

James S. Copenhaver
Columbia Gas of Virginia Inc.
1809 Coyote Drive
Chester, VA 23836-2400

Paul Koonce
Dominion Virginia Power
120 Tredegar Street
Richmond, VA 23219

Department of Mines, Minerals and Energy
1100 Bank Street
Richmond, VA 23219

Rick Lovekamp
Kentucky Utilities
P.O. Box 32030
Louisville, KY 40232

Lonnie Bellar
LG&E Energy Corporation
220 W. Main Street
Louisville, KY 40202

John D'Orazio
Roanoke Gas Company
519 Kimball Avenue NE
Roanoke, VA 24016

Lance G. Heater
Southwestern Virginia Gas Company
208 Lester Street
Martinsville, VA 24112

Robert Duvall
Virginia Natural Gas, Inc.
544 South Independence Boulevard
Virginia Beach, VA 23452-1104

Adrian Chapman
Washington Gas Light Company
6801 Industrial Road
Springfield, VA 22151

DATED: May 25, 2016

Cale Jaffe, Southern Environmental Law Center

COMMONWEALTH OF VIRGINIA

STATE CORPORATION COMMISSION

EX PARTE: **IN THE MATTER OF RECEIVING INPUT FOR EVALUATING THE ESTABLISHMENT OF PROTOCOLS, A METHODOLOGY, AND A FORMULA TO MEASURE THE IMPACT OF ENERGY EFFICIENCY MEASURES**

STAFF REPORT

CASE NO. PUE-2016-00022

June 24, 2016

STAFF REPORT

EX PARTE: **IN THE MATTER OF RECEIVING INPUT FOR EVALUATING THE ESTABLISHMENT OF PROTOCOLS, A METHODOLOGY, AND A FORMULA TO MEASURE THE IMPACT OF ENERGY EFFICIENCY MEASURES**

CASE NO. PUE-2016-00022

EXECUTIVE SUMMARY

The Objectives

The Establishment of Uniform Protocols

Uniform protocols are procedures for reliably and consistently estimating the energy savings and related service-territory impacts resulting from demand-side management programs and measures sponsored by investor-owned utilities and electric cooperatives. There are a number of existing protocols of varying degrees of complexity, as well as several sets of guidelines to aid in the development of uniform protocols.

The Commission could adopt a set of uniform protocols from the extant group of general protocols or it could decide to develop uniform protocols for investor-owned utilities and electric cooperatives to follow when measuring the energy savings and impacts resulting from demand-side management programs. Establishing uniform protocols or a technical resource manual ("TRM") would be an elaborate and detailed process, but with either option, there are a number of considerations with which the Commission will be faced. Among these are whether to institute a separate proceeding with stakeholder involvement, the breadth and level of specificity incorporated into the protocols, and the appropriate balance between the cost of measuring and validating energy savings and impacts and the accuracy of the measurements derived from the protocols and TRMs.

The balance between accuracy and the costs of measurement will be a particularly important consideration. Measurements or estimates derived from protocols or a TRM will involve deemed values to some degree. Deemed values are those which are based on judgment, engineering calculations, availability, etc. rather than measurement, and introduce considerable inaccuracy or uncertainty into the estimation of energy savings and impacts. The inaccuracy or uncertainty of deemed values may be mitigated by greater efforts to measure relevant inputs to energy savings calculations, but such efforts will entail greater cost.

The options available to the Commission do not have to be limited simply whether or not to adopt uniform protocols or a TRM. One option could be to adopt general guidelines which could be tailored on a case-by-case basis to suit the specific energy efficiency measure or program under consideration.

Establishment of a Methodology for Estimating Annual Kilowatt Savings

Several responding entities recommend a TRM for estimating annual kilowatt ("kW") savings; however, a TRM, given the potential for inaccuracy is not likely to be suitable for reliable measurement of kW savings.

A method of estimating annual kW savings is a related component of the evaluation, measurement, and verification ("EM&V") of energy efficiency programs and measures and could, therefore, be developed in the context of EM&V of these programs on a program- or measure-specific basis.

Establishment of a Formula to Calculate the Levelized Cost of Saved Energy

A calculated levelized cost of saved energy can be used to compare costs of an energy efficiency measure or program; however, this has limited usefulness and should not be used as a substitute for more detailed costs and benefits studies.

There are two basic formulas for calculating the levelized cost of energy, the main difference being the omission or inclusion of participant costs. If the Commission finds that a formula for the levelized cost of saved energy should be developed, the Commission will need to determine the appropriate formulation of the equation and formalize the definitions of the inputs of the formula, such as the appropriate interest rate to employ in the calculation.

The Cost/Benefit Questions

Whether Application of Costs and Benefits is Consistent Across Utilities

The application of costs and benefits is generally consistent across utilities. While Staff believes that the cost/benefit methodologies are applied consistently, inputs for the calculation of the components of the cost/benefit tests are not always calculated consistently among utilities.

While there may be perceived inconsistencies in the application of costs and benefits across utilities, this perception arises largely from changes in energy prices over time, differences in appropriate assumptions for the respective utilities, and differences related to the respective utilities' EM&V.

Whether Consistent Application of Costs and Benefits Across Utilities Is Necessary or Reasonable

The general principles of cost/benefit analysis are broadly applicable, and the California Standard Practice Manual is a consistent guideline. Therefore, in the interest of fairness and economic efficiency, the application of costs and benefits across utilities should be consistent.

To the extent that issues may arise that would appear to justify disparate treatment, Staff believes that the Commission could decide such issues on a case-by-case basis.

Whether the Application of the Cost/Benefit Tests Can Be Improved by Enhanced Evaluation and Verification Protocols for Estimating Savings Actually Realized

Accurate and comprehensive EM&V can improve the application of the cost/benefit tests. EM&V should be credible and appropriate to the measures and programs being evaluated. A given measure or program proposed by an investor-owned utility or electric cooperative should be credibly and accurately (within reason) evaluated. Credible estimates of savings will lead to more credible cost/benefit tests results.

Accuracy of measurement of estimated savings must be balanced against the cost of achieving a given level of accuracy; however, the validity of the cost/benefit test results for a given measure or program is undermined if the estimated savings of that measure or program is not credible.

STAFF REPORT

***EX PARTE:* IN THE MATTER OR RECEIVING INPUT FOR EVALUATING THE ESTABLISHMENT OF PROTOCOLS, A METHODOLOGY, AND A FORMULA TO MEASURE THE IMPACT OF ENERGY EFFICIENCY MEASURES**

CASE NO. PUE-2016-00022

Introduction

On March 30, 2016, the Virginia State Corporation Commission ("Commission") established Case No. PUE-2016-00022 pursuant to Senate Bill 395 and House Bill 1053 for the purpose of conducting an evaluation ("Evaluation") to consider the establishment of (i) uniform protocols for measuring, verifying, validating, and reporting the impacts of energy efficiency measures; (ii) a methodology for estimating annual kilowatt savings for such energy efficiency measures; and (iii) a formula to calculate the levelized cost of saved energy for such energy efficiency measures (collectively, "Objectives").[1] The Scheduling Order stated that the Commission will conduct the Evaluation and consider the Objectives as they concern energy efficiency measures implemented by both investor-owned electric utilities and investor-owned natural gas utilities.

In the Scheduling Order, the Commission ordered that the Evaluation should also encompass the methodologies by which investor-owned electric and natural gas utilities calculate the components of the cost/benefit tests in proceedings requesting approval to implement energy efficiency programs. The Commission also found that, "[i]n particular, the

[1] *Ex Parte: In the matter of receiving input for evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures,* Case No. PUE-2016-00022, Doc. Con. Cen. No. 160340071, Scheduling Order, (Mar. 30, 2016).

Evaluation should consider: (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; and (iii) whether the application of the cost/benefit tests can be improved by enhanced evaluation and verification protocols for estimating savings actually realized" (collectively, "Cost/Benefit Questions").

Through the Scheduling Order, the Commission also sought input from the Virginia Department of Mines, Mineral, and Energy, from investor-owned electric and natural gas utilities, and other interested parties.

The Scheduling Order established May 25, 2016 as the deadline for interested persons and entities to file comments and directed Staff to file a report on or before June 24, 2016 containing Staff's evaluation of the issues under consideration in this matter. The Scheduling Order also established July 12, 2016 as the date for a public session to receive comments from interested persons and entities regarding the Objectives and the Cost/Benefit Questions under consideration in this matter.

Discussion of the Objectives

The Establishment of Uniform Protocols

Background

Uniform protocols for measuring, verifying, validating, and reporting the impacts of energy efficiency measures are standardized procedures for investor-owned utilities and electric cooperatives to follow when developing and implementing evaluation, measurement, and verification ("EM&V") plans related to demand-side management ("DSM") programs and energy efficiency programs. Uniform protocols are meant to provide predetermined procedures

for utilities to follow and to provide consistent, reliable energy saving measurements that could be employed in further evaluations.

The term "protocol" can have several meanings in the context of the EM&V of utility-sponsored energy efficiency programs. Established protocols may be general methodological guidelines to measuring energy efficiency savings, or they may extend to detailed measurement methods for specific energy efficiency programs ranging from high-efficiency heat pumps to high-efficiency room air purifiers.

A given set of uniform protocols is meant to serve as a guide to evaluators in designing and conducting EM&V and to ensure that estimates of energy savings and program impacts are transparent and reliable. It may also provide guidance to utilities in planning and offering DSM programs for approval in that it will provide a transparent basis for assessing the cost-effectiveness of proposed programs. More specifically, however, uniform protocols potentially will provide a predetermined methodology to estimate energy savings that can be used to determine "revenue reductions related to energy efficiency programs"[2] (hereinafter referred to as "lost revenues") associated with DSM programs and to evaluate ongoing DSM programs.

<u>Existing Protocols</u>

A number of organizations have developed existing protocols that satisfy objectives similar to those specified in the Scheduling Order. There are also existing protocols developed by various regulatory commissions, independent system operators, or other entities. The most well-known protocol developed for general application is the <u>International Performance</u>

[2] Pursuant to § 56-576 of the Code of Virginia ("Code"), revenue reductions related to energy efficiency programs "means reductions in the collection of total non-fuel revenues, previously authorized by the Commission to be recovered from customers by a utility, that occur due to measured and verified decreased consumption of electricity caused by energy efficiency programs approved by the Commission and implemented by the utility, less the amount by which such non-fuel reduction in total revenues have been mitigated through other program-related factors, including reduction in variable operating expenses."

Measurement and Verification Protocol[3] ("IPMVP") issued by the Efficiency Valuation Organization ("EVO").[4] The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures[5] ("UMP") developed by the U.S. Department of Energy ("DOE")[6] is also applicable on a general level. In the UMP, DOE designed a more detailed approach that is based in part upon the IPMVP. Another protocol developed for general application is Measurement & Verification (M&V) of Energy Efficiency Programs by the North American Energy Standards Board ("NAESB"). NAESB's protocols also draw upon the IPMVP protocols. Examples of protocols developed for applications in specific regions or jurisdictions include: the California Energy Efficiency Protocols ("California Protocols"),[7] Energy Efficiency Measurement & Verification,[8] developed by the PJM LLC ("PJM"), and M&V Guidelines: Measurement and Verification for Performance-Based Contracts,[9] developed through the Federal Energy Management Program. In general, these protocols build upon, or are consistent with, the IPMVP protocols.

---

[3] International Performance Measurement and Verification Protocol, Efficiency Valuation Organization, January 2012.

[4] According to the organization's website, the Efficiency Valuation Organization began as "a committee of volunteers who came together under a U.S. Department of Energy initiative to develop an international monitoring and verification protocol that would help determine energy savings from energy efficiency projects in a consistent and reliable manner." EVO dates its origin to 1994.

[5] The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures, National Renewable Energy Laboratory, January 2012-March 2013.

[6] According to the Energy.gov website, "[u]nder the Uniform Methods Project, DOE is developing a set of protocols for determining savings from energy efficiency measures and programs. The protocols provide a straightforward method for evaluating gross energy savings for residential, commercial, and industrial measures commonly offered in ratepayer-funded programs in the United S[t]ates [*sic*]. The measure protocols are based on a particular International Performance Measurement and Verification Protocol . . . option, but provide a more detailed approach to implementing that option. Each chapter has been written by technical experts in collaboration with their peers, reviewed by industry experts, and subject to public review and comment." The protocols are published by the National Renewable Energy Laboratory.

[7] California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals, California Public Utilities Commission, April 2006.

[8] Energy Efficiency Measurement & Verification, PJM Manual 18B, Revision 2, December 17, 2015.

[9] M&V Guidelines: Measurement and Verification for Performance-Based Contracts, Version 4.0, Federal Energy Management Program, November 2015.

In addition to protocols developed to provide guidance in EM&V and the measurement of the impacts of energy efficiency measures, a number of regulatory entities and advisory groups have issued guidelines to facilitate the development of specific protocols. These include Evaluation[,] Measurement and Verification Guidance for Demand-Side Energy Efficiency[10] (Draft) issued by the U.S. Environmental Protection Agency ("EPA"); Model Energy Efficiency Program Impact Evaluation Guide[11] developed by the National Action Plan for Energy Efficiency, and Regional EM&V Methods and Savings Assumptions Guidelines, published by the Northeast Energy Efficiency Partnerships ("NEEP").[12] (A list of protocols and guidance documents compiled by Staff may be found in Attachment No. Staff-1.)

The level of scope and complexity varies among existing published protocols. The IPMVP, which is incorporated generally into many other protocols, is primarily a framework for developing detailed EM&V methods and plans. On the other hand, the UMP, which incorporates the guidance provided in the IPMVP, is a set of detailed protocols designed for the EM&V of specific energy efficiency measures. The UMP offers options and recommendations for specific methods and savings calculations for specific energy efficiency measures that are included in the UMP.

The IPMVP provides general guidelines to measurement and other relevant considerations, such as the roles of uncertainty and weather. It is probably most well-known for its four methodological options, each based upon the characteristics of a specific energy efficiency measure, for the measurement of energy savings. (It is these four options, known as

[10] Evaluation[,] Measurement and Verification Guidance for Demand-Side Energy Efficiency , Draft for Public Input, EPA, August 3, 2015.
[11] Model Energy Efficiency Program Impact Evaluation Guide, National Action Plan for Energy Efficiency Leadership Group ("NAPEEL"), November 2007. The report reflects the views of the NAPEEL, an independent advocacy group, but DOE and EPA facilitated its development.
[12] Regional EM&V Methods and Savings Assumptions Guidelines, Northeast Energy Efficiency Partnerships, May 2010.

Options A, B, C, and D, that are generally incorporated into other protocols.) In total, the IPMVP is comprised of ten chapters and four appendices (approximately 122 pages). The UMP, on the other hand, expands upon the IPMVP options and offers additional details and specific procedures for commonly-implemented measures such as furnaces and lighting. The UMP contains thirteen chapters (approximately 373 pages). By way of contrast, the California Protocols, which also incorporate the IPMVP options, provide the primary framework for the design and conduct of energy-efficiency measure evaluations. The California Protocols are composed of eleven separate protocols and five appendices (approximately 274 pages). There are shorter, more general versions of uniform protocols, such as the NAESB and PJM protocols. Both of these protocols base their evaluation and measurement protocols upon the IPMVP and include other protocols related to statistical sampling, establishment of electricity usage baselines, etc., but provide less detail than the aforementioned protocols. The NAESB and PJM protocols consist of 18 and 40 pages, respectively.

Developing a Protocol

The appropriate content of a set of uniform protocols depends upon the aim of the issuing authority. Existing protocols mentioned above include individual sub-protocols specifying not only procedures for calculating energy efficiency savings and service territory-wide impacts related to utilities' DSM programs, but also sub-protocols establishing, among other things, procedures specifying the contents of EM&V plans; how to balance uncertainty and cost of measurement; the development of effective useful life ("EUL")[13] assumptions; sampling and uncertainty methodologies; survey design; and process evaluations.[14] An

[13] EUL is a parameter used in impact analysis of utilities' DSM programs.
[14] Process evaluations are those intended to assess the effectiveness of program designs and implementation.

evaluaton to consider the establishment of uniform protocols should, therefore, consider the desired breadth and level of specificity for those protocols. Other considerations may include flexibility in application and the extent to which the Commission might wish to cede the review of utilities' energy savings and impact estimates and, instead, rely upon a standardized methodology of estimation and measurement.

If the Commission desires to establish Virginia-specific uniform protocols, rather than adopting a general guideline, such as the IPMVP, it may be appropriate for the development process to incorporate a separate proceeding involving interested stakeholders.[15]

As noted above, uniform protocols for EM&V may be used in an effort to provide reliable and transparent estimates of energy savings and the energy impacts attributed to DSM programs, as well as the standardization of these measurements. While reliable and transparent estimates of these values may aid in assessing the cost-effectiveness of existing and proposed DSM programs, and standardize the calculation of lost revenues, uniform protocols may also aid in the efficiency of EM&V procedures by clarifying issues such as the trade-off between cost and accuracy in the measurement of energy savings and impacts. In addition, at least one interested entity responding to the Commission's Scheduling Order represents that uniform protocols, by establishing clear baselines, will also aid in the expansion of DSM programs by utilities in the Commonwealth.[16]

While these attributes may be considered positive, it is important to consider other potentially off-setting attributes of uniform protocols when evaluating their establishment. For

[15] Several respondents in this proceeding have noted the need for a stakeholder process to establish either uniform protocols or a technical reference manual ("TRM").
[16] Comments of the Environmental Respondents at 2-3.

example, the IPMVP prescribes some methods in which deemed values[17] based on historical data, manufacturers' estimates, engineering judgment, or measurement of suitable proxies are utilized in estimating energy saving impacts of DSM programs and measures. Such methods produce deemed savings[18] values as measurements of energy savings impacts of utilities' and electric cooperatives' DSM programs. Deemed savings estimates are, thus, subject to questionable or inaccurate data assumptions and judgments. If these estimates, derived from pre-approved uniform protocols, are then relied upon as the basis for energy saving impacts to be used in calculations of lost revenue or ongoing evaluation of utilities' DSM programs, the Commission may lose flexibility in its evaluation of these estimate and the underlying programs.

When evaluating the establishment of uniform protocols, the Commission should be aware of the competing or offsetting characteristics of uniform protocols, including not only the trade-offs described in the previous two paragraphs, but also the degree of specificity that the Commission would find appropriate. As described above, the level of complexity can range from that of the IPMVP, which provides a general approach to the EM&V of specific measures, to that of UMP which includes engineering formulas for each specific measure considered. An important consideration here is that in the most complex and detailed format, numerous engineering calculations would have to be developed and specified for each measure and possibly updated periodically.

[17] Deemed values are those which are not determined by measurement, but rather, are based on judgment, availability, or general determinations of suitability.

[18] Deemed savings is usually an estimate of energy savings or energy demand savings based on an estimate that has been developed from data sources or widely-accepted analytical or engineering methods.

Technical Resource Manuals

Several responding entities suggest the development of a TRM specific to Virginia.[19] TRMs are reference documents, more detailed than most uniform protocols that are designed to provide common assumptions for specific energy efficiency measures. A TRM utilizes deemed savings assumptions in conjunction with energy efficiency measure-specific information and assumptions to calculate deemed savings for a specific measure. As the name implies, TRMs are technical documents, specifying engineering equations (generally referred to as algorithms), deemed savings values, representative residential and commercial building sizes and load characteristics, etc.

A TRM is usually intended to be a "flexible" document that is periodically updated to reflect new or revised assumptions. For example, NEEP issued the sixth version of the Mid-Atlantic TRM, a TRM which has been referenced in several proceedings before the Commission. According to the NEEP website, the Mid-Atlantic TRM, Version 6[20] "documents common savings assumptions for ninety-four prescriptive[21] residential and commercial/industrial electric and gas energy measures."[22]

Establishing a TRM may entail several drawbacks. A principle concern lies in the reliance of these documents on deemed values, even though these values may be periodically updated. The Commission previously has determined that "purely secondary sources of formulae and data gathered from outside of Virginia [is] less rigorous at measuring and

[19] A partial list of interested entities includes, Virginia Department of Mines, Minerals and Energy; Appalachian Power Company ("APCo"), Virginia Energy Efficiency Council, and the American Council for an Energy Efficient Economy ("ACEEE").
[20] http://www.neep.org/mid-atlantic-technical-reference-manual-v6.
[21] Prescriptive energy efficiency measures are those measures in which a specific technology offered with a pre-established incentive structure, such as a high-efficiency heat pump or duct sealing. Prescriptive measures are in contrast to custom measures whereby a participant proposes energy efficiency measures that the participant wishes to undertake.
[22] http://www.neep.org/mid-atlantic-technical-reference-manual-v6.

verifying decreased consumption of electricity . . . than Virginia-specific data would be," and that using such data to estimate electricity savings did not meet the statutory standard of measured and verified.[23] The Commission has reiterated its concerns with non-Virginia-specific data in other cases.[24] Without Virginia-specific data, a TRM for Virginia would have to rely, at least initially, on measured or deemed assumptions from other jurisdictions. For example, the 94 prescriptive measures detailed in the Mid-Atlantic TRM incorporate assumptions based on data or surveys from, *inter alia,* the New England states, Illinois, New Jersey, California, and Ontario, Canada. The vintage of the data supporting these assumptions dates from the early 2000s to as far in the past as 1986 in one case found by Staff.

The potential scope of a TRM may present an additional difficulty. Engineering algorithms must be determined for each measure and, more significantly, hundreds of requisite underlying assumptions must be determined. Examples of such data include full load heating and full load cooling hours which would have to be developed to determine the savings resulting from a high-efficiency heat pump, and incoming water temperature and number of persons per household, among other inputs, which would have to be developed to determine the savings resulting from a high-efficiency gas water heater, etc.

The general nature of TRMs allows them to be useful, but not necessarily authoritative, in a context of the initial assessment of proposed DSM measures; however, accuracy may be

[23] *Application of Virginia Electric and Power Company, For approval to continue two rate adjustment clauses, Riders C1 and C2, as required by the Order Approving Demand-Side Management Programs of the State Corporation Commission in Case No. PUE-2009-00081*, Case No. PUE-2010-00084, 2011 S.C.C. Ann. Rept. 342, Order Approving Rate Adjustment Clauses, (Mar. 27, 2011).

[24] *See, e.g., Application of Columbia Gas of Virginia, Inc., For authorization to amend and extend its conservation and ratemaking efficiency plan pursuant to Virginia Code § 56-602*, Case No. PUE-2015-00072, 2015 S.C.C. Ann. Rept. 354, Final Order (Oct. 29, 2015); *Application of Washington Gas Light Company, for authority to amend its natural gas conservation and ratemaking efficiency plan,* Case No. PUE-2010-00079, 2010 S.C.C. Ann. Rept. 573, Order on Application to Amend Conservation and Ratemaking Efficiency Plan (Nov. 18, 2010).

questionable when calculating energy savings and impacts for lost revenue calculations or for an assessment of cost-effectiveness of ongoing programs.

For example, the 2016 Mid-Atlantic TRM includes an algorithm to calculate the energy savings achieved through the use of a low-flow showerhead. This algorithm requires, *inter alia,* a measurement of gallons per day per person for showering. In lieu of an actual measurement, the Mid-Atlantic TRM, citing a U.S. Environmental Protection Agency ("EPA") document,[25] provides an assumed value of 11.6 gallons per day per person for showering. If one accesses the EPA document, one finds that the source of the assumed value of 11.6 gallons per day is a 1998 study sponsored by the American Water Works Association ("AWWA") entitled Residential End Uses of Water. If one accesses the AWWA study, one finds that the study was conducted in twelve localities, ten of which were in the far western United States, one in Florida, and one in Ontario, Canada.[26] Moreover, the authors state in the Executive Summary of the AWWA study that, "Creating national water use 'averages' was not an objective of this study. The pooled results are presented for summary and comparative purposes alone."[27]

Another example, although not directly taken from a TRM, illustrating the potential inaccuracy of deemed savings values may be drawn from Case No. PUE-2015-00089.[28] This example reveals the difference that may arise from deemed and measured kilowatt ("kW")

---

[25] http://www.epa.gov/watersense/docs/home_suppstat508.pdf.

[26] The specific localities in the AWWA study were: Boulder and Denver, Colorado; Eugene, Oregon; Seattle, Washington; San Diego and Lompoc, California; Phoenix and Tempe/Scottsdale, Arizona; Tampa, Florida; Waterloo, Ontario, Canada; and the Walnut Valley Water District and the Las Virgenes Municipal Water District in California. Residential End Uses of Water, AWWA Research Foundation, 1999 at xxiii.

[27] *Id.* at xxii.

[28] *Petition of Virginia Electric and Power Company, For approval to implement new demand-side management programs, for approval to continue a demand-side management program, and for approval of two updated rate adjustment clauses pursuant to § 56-585.1 A 5 of the Code of Virginia*, PUE-2015-00089, Doc. Cen. Con. No. 160420196, Final Order (April 19, 2016).

savings and the regulatory inertia that can be present in updating deemed values. At issue was a discrepancy between the assumed kW savings of participants in Dominion Virginia Power's ("Dominion") Air Conditioner Cycling Program and the actual kW savings measured by Dominion's EM&V for that program. For purposes of the cost/benefit analysis for this program, Dominion assumed that the annual per participant kW savings related to the program was 1.0 kW, the same assumed annual per participant kW savings utilized in the Dominion's initial petition seeking approval for the program.[29] Dominion conceded that .69 kW was a more appropriate assumption based on the current EM&V results, but requested additional time to thoroughly analyze the kW savings of this program in order to "characterize the impact of exogenous market changes on the [p]rogram, assess the [p]rogram's implementation approach, and mitigate any potential biases in the modeling approach."[30] Staff does not make this illustration as a criticism of Dominion's EM&V, but rather to point out that more than six years after the Air Conditioning Cycling Program was first implemented,[31] it is questionable that an appropriate updated value of annual per participant savings is available.

There is also some question as to whether a TRM would contain sufficient flexibility to adequately represent, within a sufficient degree of accuracy, the Virginia utilities, as well as the electric cooperatives give the diversity of their respective service territories. One entity, the Association of Electric Cooperatives, commented, "The Cooperatives may need to depart from a uniform TRM for various reasons—demographic, geographic, topographic, etc." One of the more appealing properties of TRMs is their general application. If certain utilities or electric

[29] Exh. 15, Pre-filed Testimony of Mark K. Carsley, PUE-2015-00089 at 19.
[30] Exh. 17, Rebuttal Testimony of Timothy J. Pettit, PUE-2015-00089 at 4, 6-7.
[31] *Application of Virginia Electric and Power Company, For approval to implement new demand-side management programs and for approval of two rate adjustment clauses pursuant to § 56-585.1 A 5 of the Code of Virginia*, PUE-2009-00081. S.C.C. Ann. Rept. 362, Order Approving Demand-Side Management Programs (Mar. 24, 2010) ("2010 Order").

cooperatives would seek to depart from the use of any TRM that is developed, then the development of a TRM may be a wasted exercise.

In summary, a TRM may be suitable as a generalized, streamlined process for determining potential savings from energy efficiency programs; however, they are not suitable for the calculation of actual savings unless the Commission wishes to apply a general, streamlined approach with the recognition that such an approach is more likely to produce less accurate results.

Commission Options

Given the considerations discussed above, the Commission could pursue several options with respect to the establishment of a uniform protocol:

- Establish a proceeding to develop Virginia-specific set of uniform protocols;
- Establish a proceeding to adopt an existing protocol or an appropriate combination of existing protocols;
- Endorse a general guideline or set of general protocols that would allow the establishment of individual, company-specific guidelines on a case-by-case basis. Under this approach, the Commission would follow generally accepted protocols, but tailor specific aspects of the protocols to the case at hand.
- decline to adopt or endorse a uniform protocol.

Staff believes careful consideration must be given to any adoption, creation, or alteration of a set of uniform protocols by the Commonwealth. As has been previously mentioned, an inherent compromise must be struck between accuracy and reliability of gathered or estimated data and the cost and effort expended to gather or estimate the necessary data. The more rigorous the requirements for accuracy in the protocols, the greater the cost and

expended effort to generate such data; easier-to-implement protocols may result in less accurate or less reliable estimates of savings.

Establishment of a Methodology for Estimating Annual Kilowatt Savings

The purpose of a methodology for estimating annual kW savings is a significant consideration in an evaluation of its establishment. Several entities support the use or development of a TRM or other deemed savings methodology for estimating annual kW savings[32] As discussed above, while a TRM or deemed savings approach may be sufficient for a cost/benefit assessment of a new, proposed DSM measure or program, such approaches are likely to be insufficiently accurate for purposes of cost/benefit assessments of ongoing programs. A deemed savings or TRM methodology is also not likely to be suitable for comparison of kW savings of DSM programs and measures with generation options or for the purposes of incentivizing utilities and electric cooperatives to establish DSM measures and programs. This lack of suitability is directly related to the potential inaccuracy of TRMs that is discussed above.

A method for estimating annual kW savings is a related component of EM&V and could be developed in that context, whereby the appropriate parameters to determine utility-specific data could be specified and subsequently measured.

Establishment of a Formula to Calculate the Levelized Cost of Saved Energy

A levelized cost of saved energy ("LCSE") is a metric that can be used to compare the costs of particular DSM programs and measures to one another by type or over time. LCSE can also be used to compare costs among program administrators. As noted by several

[32] Comments of Virginia Electric and Power Company at 20; Comments of APCo at 3.

respondents, this calculation is of somewhat-limited use as it is not a direct evaluation of the costs and benefits of any proposed program.

The basic formulas for the LCSE are relatively straightforward, but important practical distinctions can be made depending on the costs that are included. The most basic distinction is whether only utility program costs are included or both utility program costs and incremental participant costs, *i.e.*, total costs, are included. When incremental participant costs are excluded, the LCSE is a measure of the program administrator's (or utility's) cost of saved energy.

This distinction is important because without the inclusion of participant costs, the LCSE calculation does not include all of the costs of saved energy. Thus, when one attempts, for example, to draw comparisons between the LCSE and the levelized cost of electricity generation, if one does not include participant costs, the comparison is between one alternative (electricity generation) that includes all costs borne by ratepayers and the second alternative (saved energy) that does not include all out-of-pocket expenses that participants must pay. Further, saved energy is not a dispatchable commodity, and the lack of dispatchability introduces another significant difference between the value of saved energy and the value of generated electricity at any particular point in time.

Equations and definitions for the calculation of LCSE can be found in Attachment No. Staff-2.

Should the Commission select either equation for implementation, Staff encourages due consideration be given to which interest rate to use as an input. Both equations presented utilize a real interest rate for calculation of the capital recovery factor. Staff believes that a nominal interest rate is more appropriate. If the LCSE is to be a proxy for a true, levelized cost

of a utility, a nominal interest rate should be included in the capital recovery formula because a nominal interest rate approximates the actual interest rate that a utility faces in financial markets.[33] (If a comparison between the LCSE and the levelized cost of electricity generation is drawn, the use of a real interest rate in the LCSE equation will introduce a downward bias in the cost of saved energy with respect to the levelized cost of electricity generation which usually includes a nominal interest rate.) Staff also believes that the nominal interest (discount) rate should be specific to a given utility's weighted-average cost of capital because the LCSE is appropriately the cost of saved energy to a given utility.

In evaluating the establishment of a formula to calculate the LCSE of DSM programs and measures, the Commission must decide which equation, either Equation (1) or Equation (2), appropriately represents the cost of saved energy. The Commission must also decide whether a real discount (interest) rate or a nominal discount (interest) rate is appropriate to determine the LCSE. Staff believes that Equation (2), which includes utility program costs and incremental participant costs, is the appropriate equation, and that a nominal discount (interest) rate should be incorporated into the capital recovery factor. The Commission may also wish to formalize the definitions of the components in any chosen LCSE equation in order to ensure fairness and standardization in the calculations of the LCSE among utilities.

In evaluating the establishment of a methodology to calculate the LCSE, the Commission may wish to consider the use to which the measure of the LCSE would be put. As discussed above, the LCSE is an inappropriate comparison to the levelized cost of electricity generation and provides no useful information with respect to the cost-effectiveness of DSM measures and programs given that LCSE calculations do not incorporate the value of electric

[33] The use of a nominal interest rate will yield a higher LCSE than a real interest rate which does not account for expected inflation.

generating capacity or the value of other components that are included in the cost/benefit tests required by § 56-576 of the Code.

If the Commission decides to establish a methodology to calculate the LCSE, Staff recommends that measurement of the components of the LCSE equation be made through a utility's EM&V rather than through a deemed savings approach or a TRM. As discussed above, a deemed savings approach to the calculation of the LCSE would be an approximation at best and could prove to be inaccurate.

Discussion of the Cost/Benefit Questions

Background

In responding to the Scheduling Order, several entities commented on how the Commission evaluates the cost/benefit tests specified in §§ 56-576 and 56-600 of the Code.[34] In particular, these comments, some of which are misguided and others of which are incorrect, are directed at the Commission's perceived reliance solely on the Ratepayer Impact Measure ("RIM") Test in approving or rejecting energy efficiency programs proposed in the Commonwealth.

The joint comments of Columbia Gas of Virginia, Inc., Virginia Natural Gas, Inc. and Washington Gas Light Company ("Gas Utilities") proffered as an obstacle to the approval of "cost-effective conservation and energy efficiency programs:"

> The principle that an energy efficiency measure is not cost-effective if the measure reflects a negative net present value ("NPV") under the [RIM] Test, unless that negative RIM NPV is offset by an equivalent or greater positive NPV for the measure under the Total Resource Cost ("TRC") Test,

[34] *E.g.*, Comments of the Virginia Energy Efficiency Council and Comments of Columbia Gas of Virginia, Inc., Virginia Natural Gas, Inc. and Washington Gas Light Company.

> inappropriately eliminates measures based on the results of a single cost-effectiveness test, where the measure passes the remaining three tests.[35]

Notwithstanding the mathematical fact that considering the *level* of the NPV of one cost/benefit test relative to the *level* of the NPV of another test takes into account at least two tests, the principle stated in the Gas Utilities' comments has never been a principle endorsed by the Commission.

Another example which is often cited is the Commission's 2010 Order, in which the Commission rejected several residential energy efficiency programs proposed by Dominion. Contrary to statements that the Commission rejected these programs simply because they did not pass the "RIM" Test, the Commission's 2010 Order stated:

> In this regard, we find that the programs not approved, under the current circumstances, have not been proven to be in the public interest as required by § 56-585.1 A 5 of the Code. For example, Consumer Counsel and Staff note the low RIM scores of these programs, which also do not have significant offsetting and reliable TRC scores. . . . Moreover, the Company's proffered test results tend to be inflated in certain instances. As explained by Consumer Counsel, certain deficiencies in the Company's cost/benefit analyses 'tend to overstate projected benefits of DSM programs, deemphasize potential downside risk associated with such programs, or introduce uncertainty regarding the costs and benefits for proposed programs.[36]

The 2010 Order clearly shows that the Commission did not simply base its decision on low RIM Test scores.

With respect to the RIM Test, many specious criticisms have been offered as to the nature of the test. For example, one criticism is that, "The RIM [T]est . . . does not provide

[35] Comments of Columbia Gas of Virginia, Inc., Virginia Natural Gas, Inc. and Washington Gas Light Company ("Gas Utilities Comments") at 3.
[36] *Id.*, at 365.

regulators and other stakeholders with information necessary to assess rate impact or distributional equity issues that go along with them."[37] This assertion is incorrect. According to the California Standard Practice Manual ("CSPM") the seminal source of the cost/benefit tests, the RIM Test "indicates the direction and magnitude of the expected change in customer bills or rate levels."[38] The RIM Test also specifically shows the distributional effect of energy efficiency programs on non-participants. According to the CSPM, "The [RIM] Test has previously been described under what was called the "Non-Participant Test."[39]

Another criticism of the RIM Test is that the test does not take into account the potential for energy efficiency measures to defer new capital investment in capacity or distribution. This criticism is incorrect. "The benefits calculated in the RIM test are the savings from avoided supply costs. These avoided costs include the reduction in transmission, distribution, generation, and capacity costs for periods when load has been reduced . . . ."[40]

Finally, it has been claimed that the RIM Test "assesses the benefit/costs for one group (non-participants) over the short-term" and "ignores impact on bills, savings to participants, and avoided costs of new generation."[41] The discussion in the previous two paragraphs shows that this claim as to the impact on bills and the avoided costs of generation is incorrect. As to the claim that the RIM Test ignores savings to participants, that is true, because participant savings are explicitly measured in a separate test, the Participant Test, and subsumed in another test, the TRC Test.

---

[37] "Regulatory Policies to Support Energy Efficiency in Virginia: A Discussion of Issues for the 2014 Virginia Energy Efficiency Workshop," Prepared for the Virginia Energy Efficiency Council, October 1, 2014 at 14.
[38] California Standard Practice Manual, July 2002 at 13.
[39] *Id.* at fn 5.
[40] 2010 Order at 365 (internal footnotes omitted).
[41] Opower Presentaton to the Energy Advisory Committee of the Joint Committee on Science and Technology, 2011.

Concentrating criticism on the RIM Test ignores that the RIM Test is but one of four *interrelated* cost/benefit tests that are not intended to be used independently. The four tests are mathematically structured to be used in conjunction with one another. As noted in the CSPM:

> The tests set forth in this manual are not intended to be used individually or in isolation. The results of tests that measure efficiency, such as the Total Resource Cost Test, the Societal Test, and the Program Administrator Cost Test, must be compared not only to each other[,] but also to the Ratepayer Impact Measure Test. This multi-perspective approach will require program administrators and state agencies to consider tradeoffs between the various tests.[42]

Criticism of the RIM Test has prompted many comments, both in the instant case and outside of it, regarding overly-rigorous analysis of proposed DSM measures and programs, resulting, in part due to failure to pass one or more of the cost/benefit tests, in the rejection of worthwhile proposals. This, it is argued, has resulted in higher electric bills for customers in the Commonwealth relative to national averages, the inference being that these rejected DSM programs and measures would have reduced average customer bills. Staff is not aware of any empirical analysis that demonstrates that lower average electric bills for a given State is solely attributable to the efficacy of that State's utility sponsored energy efficiency initiatives or vice versa. Average electrical bills are impacted by numerous drivers, the majority of which are not impacted by a State's energy efficiency policies.

Staff has performed a study of Virginia residential electricity consumption which found that, overwhelmingly, a higher percentage of Virginian residential energy consumers use electricity for end uses than the national average.[43] In particular, Virginians use electricity for heating and cooling to a much greater extent than the national average. Staff's research also

[42] California Standard Practice Manual at 6.
[43] Based on information available in *Residential Energy Consumption Survey, 2009*, United States Energy Information Administration, August, 2013.

found that, despite this, Virginia residential customers consume approximately 4 percent less total energy[44] than the national average.[45]

Staff's research also found that, compared to other States ranked highly by the ACEEE for their efforts in energy efficiency, Virginia consumes less total energy than many highly-ranked States.[46] It could be argued that the energy efficiency measures in these highly-ranked States are preventing them from consuming even higher above the national average of total energy consumption; however, it could also be argued that despite attempts by these States to increase energy efficiency, the return on such investments in energy efficiency are not resulting in expected values.

Responses to the Cost/Benefit Questions

(i) Whether the Application of Costs and Benefits is Consistent Across Utilities;

The application of costs and benefits is generally consistent across utilities in that the cost/benefit tests required by §§ 56-576 and 56-600 of the Code are defined and discussed in the CSPM.[47] Staff generally adheres to the CSPM when reviewing the cost/benefit tests results of proposed in programs and measures and attempts to apply the tests uniformly across utilities.

Although Staff interprets the cost/benefit tests consistently, the inputs of each test are not always calculated consistently among utilities. For example, in determining a price forecast

[44] "Total energy" is defined as all fuels used in residential customers' homes, to include electricity, natural gas, propane, wood, fuel oil, and kerosene.

[45] "Virginia households consume an average of 86 million [British thermal units] per year, about 4% less than the U.S. average." *Residential Energy Consumption Survey, 2009 State Fact Sheet, Virginia*, United States Energy Information Administration, August, 2013.

[46] Massachusetts residences consume approximately 109 MMBtu per year (approximately 22 percent more than national average) while being ranked second for energy efficiency measures by the ACEEE in 2009. New York residences, ranked fifth for energy efficiency measures by the ACEEE in 2009, consumed 103 MMBtu (approximately 15 percent more than national average). *Residential Energy Consumption Survey, 2009, State Fact Sheet, Massachusetts*, and *Residential Energy Consumption Survey, 2009, State Fact Sheet, New York*, United States Energy Information Administration, August, 2013.

for electrical energy for purposes of the cost/benefit tests, Dominion generally relies upon a private consulting firm. In contrast, APCo relied upon an in-house price forecast to support its application for approval of certain DSM programs filed in Case No. PUE-2014-00039.[48] Similarly, when calculating avoided supply cost, a key component in several of the cost/benefit tests, Dominion utilizes the Strategist planning model. In Case No. PUE-2014-00039, APCo utilized an in-house model to determine avoided supply costs. While a uniform method for calculating all components may be desirable, such a uniform calculation may not be practicable.

The Gas Utilities commented in this proceeding that, "The cost-effectiveness tests and the associated standard of review of the Gas Utilities' respective CARE measures and programs do not appear to be consistently applied across natural gas utilities."[49] The Gas Utilities note that some measures have been approved for some natural gas companies, but rejected for other companies, and that some measures have been approved in a company's CARE Plan application at one point in time and subsequently disapproved in a subsequent CARE Plan application.

There are three general reasons for these apparent discrepancies: 1) natural gas prices, and the associated forecasts, have fallen significantly over the past several years; 2) assumptions utilized in a respective company's cost/benefit analysis have not been credible; and

[47] The four cost/benefit tests required by §§ 56-576 and 56-600 of the Code are the Participant Test, the Utility/Program Administrator Cost Test, the RIM Test, and the TRC Test.
[48] *Petition of Appalachian Power Company, For approval to implement a portfolio of energy efficiency programs and for approval of a rate adjustment clause pursuant to § 56-585.1 A 5 c of the Code of Virginia*, Case No. PUE-2014-00039, 2015 S.C.C. Ann. Rept. 215, Final Order (June 24, 2015).
[49] Gas Utilities Comments at 6-8.

3) a respective company's EM&V has indicated that actual measured savings may differ from those assumed in another Company's cost/benefit analyses.[50]

The Gas Utilities point out that in 2013, the Commission rejected a proposed Storage Water Heater measure by Washington Gas Light Company ("WGL")[51] while approving a proposed Storage Water Heater measure by Virginia Natural Gas Inc. ("VNG").[52] The predominant reason related to the approval of VNG's Storage Water Heater Measure was a higher level of assumed annual dekatherm ("dth") savings per high-efficiency water heater (which was validated by VNG's EM&V) relative to the assumed annual dth savings per high-efficiency water heater for WGL's high-efficiency water heater measure.[53] This resulted in higher cost/benefit test results initially for VNG's program. WGL's cost/benefit model assumptions also were not as well-substantiated, and the associated lower cost/benefit tests indicated the WGL's program was not as cost-effective.

The Gas Utilities also commented that the Commission approved a High-efficiency Tankless Water Heater measure proposed by Columbia Gas of Virginia, Inc. ("CGV") in April 2012,[54] but rejected a similar measure proposed by WGL in December 2012.[55] Irrespective of

---

[50] Moreover, there a several other reasons why one would not expect a given measure in one company's service territory may be cost-effective, but might not be cost-effective in other company's service territory. For example, the respective companies may have differing levels of avoided costs; the program costs that a given natural gas company builds into its CARE Plan may differ; weighted average cost of capital assumptions (used to discount future costs and benefits) may differ; and given the wide geographic range of the natural gas companies in the Commonwealth, measures that are cost-effective in one natural gas companies service territory may not be cost-effective in another companies service territory.

[51] *Application of Washington Gas Light Company, For authority to amend its natural gas conservation and ratemaking efficiency plan*, Case No. PUE-2012-00138, 2013 S.C.C. Ann. Rept. 335, Order Approving Amended Natural Gas Conservation and Ratemaking Efficiency Plan (Apr. 2, 2013) ("2012 WGL Case").

[52] *Application of Virginia Natural Gas, Inc., For approval of a natural gas conservation and ratemaking efficiency plan and rider*, Case No. PUE-2012-00118, 2013 S.C.C. Ann. Rept. 298, Order Approving Natural Gas Conservation and Ratemaking Efficiency Plan (May 30, 2013).

[53] The same outside consultant performed the cost/benefit analysis for WGL and VNG, respectively, in Case No. PUE-2012-00138 and Case No. PUE-2012-00118.

[54] *Application of Columbia Gas of Virginia, Inc., For approval to implement a natural gas conservation and ratemaking efficiency plan*, Case No. PUE-2012-00013, 2013 S.C.C. Ann. Rept. 395, Final Order (Aug. 6, 2012) ("2012 CGV Case").

[55] 2012 WGL Case.

any changes in the price of natural gas over the relevant period, CGV entered into a settlement with Staff in the 2012 CGV Case, whereas the Commission decided the 2012 WGL Case subsequent to Staff's settlement with CGV. The tradeoffs involved in the negotiation of the settlement resulted in the inclusion of the Tankless Water Heater in CGV's CARE Plan, whereas subsequent to Staff's settlement with CGV, the Commission disapproved the Tankless Water Heater measure proposed by WGL.

The Gas Utilities also question the Commission's seemingly incongruous approval of Attic and Floor Insulation measures proposed by CGV in 2009,[56] 2012,[57] 2014,[58] and 2016,[59] while rejecting WGL's proposed residential Attic and Floor Insulation measures in 2015.[60] As noted in the Staff Report in the 2015 WGL Case, WGL assumed annual combined savings for these two measures of 76 dth when WGL's most recent estimate of residential weather-normalized usage was78.1 dth.[61] In other words, WGL's cost/benefit analysis of the proposed residential Attic and Floor Insulation measures assumed that a residential customer undertaking both measures would reduce, on average, approximately 97 percent of that customer's annual gas usage. Staff challenged this assumption and recommended that the Commission not approve the Attic and Floor Insulation measures.

---

[56] *Application of Columbia Gas of Virginia, Inc., For approval to implement a natural gas conservation and ratemaking efficiency plan including a decoupling mechanism*, Case No. PUE-2009-00051, 2009 S.C.C. Ann. Rept. 484, Final Order (Dec. 4, 2009).

[57] 2012 CGV Case.

[58] *Application of Columbia Gas of Virginia, Inc., For authority to amend its natural gas conservation and ratemaking efficiency plan pursuant to Chapter 25 of Title 56 of the Code of Virginia*, Case No. PUE-2013-00114, 2014 S.C.C. Ann. Rept. 326, Final Order (Apr. 10, 2014).

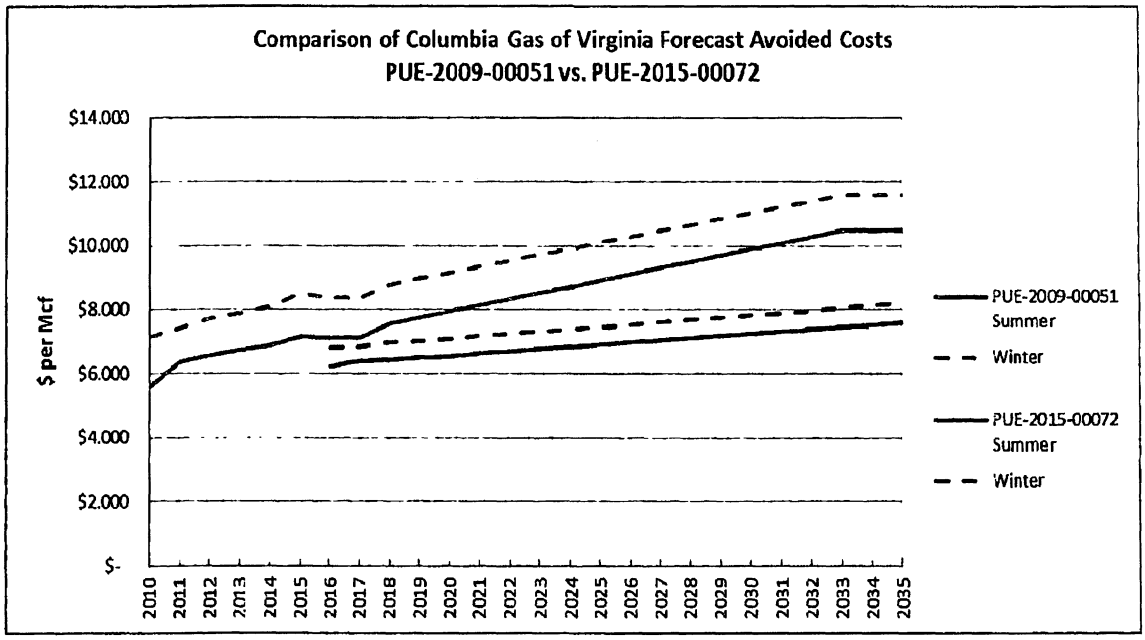
[59] *Application of Columbia Gas of Virginia, Inc., For authorization to amend and extend its conservation and ratemaking efficiency plan pursuant to Virginia Code § 56-602*, Doc. Cen. Con. No. 160240141, Order Approving Amended Natural Gas Conservation and Ratemaking Efficiency Plan (Feb. 23, 2016).

[60] *Application of Washington Gas Light Company, For authority to amend its natural gas conservation and ratemaking efficiency plan*, Case No. PUE-2015-000138, Doc. Cen. Con. No. 160440058, Final Order (April 29, 2016) ("2015 WGL Case").

[61] Staff Report, Part I, PUE-2015-00138 at 18-19.

Finally, Staff notes that over the past approximately eight years, natural gas commodity prices have declined dramatically. The impact of this price decline on the approval of proposed CARE Plan measures and programs cannot be avoided. As a point of reference, Staff presents Chart 1 which illustrates the forecasted avoided cost of natural gas assumed by CGV in the cost/benefit analysis of proposed programs in Case No. PUE-2009-00051 compared to that in Case No. PUE-2015-00072. The chart shows the forecasted summer and winter avoided costs for each CARE Plan proposal.

Chart 1



(ii) Whether Consistent Application of Costs and Benefits Across Utilities Is Necessary or Reasonable;

In general, Staff believes that the consistent application of costs and benefits across utilities is necessary and reasonable. The general principles of cost/benefit analysis are broadly

applicable; for example, all costs associated with a program should be included in the cost/benefit analysis of that program in order to accurately measure a program's cost-effectiveness. The CSPM is also a consistent set of guidelines that can be applied to all utilities.

To the extent that issues may arise that would appear to justify disparate treatment, Staff believes that such issues could be decided by the Commission on a case-by-case basis, but, in general, in the interests of economic efficiency and fairness, the application of costs and benefits should be consistent.

(iii) Whether the Application of the Cost/Benefit Tests Can Be Improved by Enhanced Evaluation and Verification Protocols for Estimating Savings Actually Realized.

Staff believes that the accurate and comprehensive EM&V can improve the application of the cost/benefit tests. EM&V of specific measures or programs should be appropriate to those measures and programs, and the respective EM&V should be credible. Simply establishing a Virginia-specific TRM will not meet this criteria for the reasons discussed above.

The extent and detail of EM&V must be weighed against the costs to conduct a specific EM&V methodology or program; however, if utilities propose measures and programs for which EM&V may be difficult, those utilities should not be averse to devoting the resources EM&V that produces credible estimates of savings. To state this in an alternative manner, if a utility proposes a specific measure or program, that utility should have a plan to credibly and accurately (within reason) measure the effect of that program.

Several entities commented on the balancing of costs with accuracy in EM&V efforts. For example, the Gas Utilities state, "[I]t is not always appropriate, or feasible, to directly measure the impacts, or even directly measure all input variables used[ ] to determine savings

impacts through engineering calculations."[62] However, when engineering calculations are used to measure energy reductions associated with measures such as low-flow showerheads (as discussed above), the use of dated and inappropriate assumptions is inconsistent with the concept of reliable and credible EM&V.

Appropriateness and credibility could be ensured by consideration of EM&V plans at the time that measures and programs are proposed.

Conclusion

The Objectives

The Establishment of Uniform Protocols

Uniform protocols are procedures for reliably and consistently estimating the energy savings and related service-territory impacts resulting from demand-side management programs and measures sponsored by investor-owned utilities and electric cooperatives. There are a number of existing protocols of varying degrees of complexity, as well as several sets of guidelines to aid in the development of uniform protocols.

The Commission could adopt a set of uniform protocols from the extant group of general protocols or it could decide to develop uniform protocols for investor-owned utilities and electric cooperatives to follow when measuring the energy savings and impacts resulting from demand-side management programs. Establishing uniform protocols or a TRM would be an elaborate and detailed process, but with either option, there are a number of considerations with which the Commission will be faced. Among these are whether to institute a separate proceeding with stakeholder involvement, the breadth and level of specificity incorporated into the protocols, and the appropriate balance between the cost of measuring and validating energy

[62] Comments of the Gas Utilities at 24.

savings and impacts and the accuracy of the measurements derived from the protocols and TRMs. The balance between accuracy and the costs of measurement will be a particularly important consideration; however, measurements or estimates derived from protocols or a TRM will involve deemed values to some degree.

The options available to the Commission do not have to be limited simply whether or not to adopt uniform protocols or a TRM. One option could be to adopt general guidelines which could be tailored on a case-by-case basis to suit the specific energy efficiency measure or program under consideration.

Establishment of a Methodology for Estimating Annual Kilowatt Savings

Several responding entities recommend a TRM for estimating annual kW savings; however, a TRM, given the potential for inaccuracy is not likely to be suitable for reliable measurement of kW savings.

A method of estimating annual kW savings is a related component of the EM&V of energy efficiency programs and measures and could, therefore, be developed in the context of EM&V of these programs on a program- or measure-specific basis.

Establishment of a Formula to Calculate the Levelized Cost of Saved Energy

A calculated levelized cost of saved energy can be used to compare costs of an energy efficiency measure or program; however, this has limited usefulness and should not be used as a substitute for more detailed costs and benefits studies.

There are two basic formulas for calculating the levelized cost of energy, the main difference being the omission or inclusion of participant costs. If the Commission finds that a formula for the levelized cost of saved energy should be developed, the Commission will need

to determine the appropriate formulation of the equation and formalize the definitions of the inputs of the formula, such as the appropriate interest rate to employ in the calculation.

The Cost/Benefit Questions

Whether Application of Costs and Benefits is Consistent Across Utilities

The application of costs and benefits is generally consistent across utilities. While Staff believes that the cost/benefit methodologies are applied consistently, inputs for the calculation of the components of the cost/benefit tests are not always calculated consistently among utilities.

While there may be perceived inconsistencies in the application of costs and benefits across utilities, this perception arises largely from changes in energy prices over time, differences in appropriate assumptions for the respective utilities, and differences related to the respective utilities' EM&V.

Whether Consistent Application of Costs and Benefits Across Utilities Is Necessary or Reasonable

The general principles of cost/benefit analysis are broadly applicable, and the California Standard Practice Manual is a consistent guideline. Therefore, in the interest of fairness and economic efficiency, the application of costs and benefits across utilities should be consistent.

To the extent that issues may arise that would appear to justify disparate treatment, Staff believes that the Commission could decide such issues on a case-by-case basis.

Whether the Application of the Cost/Benefit Tests Can Be Improved by Enhanced Evaluation and Verification Protocols for Estimating Savings Actually Realized

Accurate and comprehensive EM&V can improve the application of the cost/benefit tests. EM&V should be credible and appropriate to the measures and programs being evaluated. A given measure or program proposed by an investor-owned utility or electric cooperative should be credibly and accurately (within reason) evaluated. Credible estimates of savings will lead to more credible cost/benefit tests results.

Accuracy of measurement of estimated savings must be balanced against the cost of achieving a given level of accuracy; however, the validity of the cost/benefit test results for a given measure or program is undermined if the estimated savings of that measure or program is not credible.

Selected Evaluation, Measurement & Verification Protocols

Uniform Methods Project (2015); U.S. Department of Energy.

California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals (2006); California Public Utility Commission.

International Performance Measurement and Verification Protocol (2012); Efficiency Valuation Organization.

Federal Energy Management Program M & V Guidelines: Measurement and Verification for Performance-Based Contracts, Version 4.0 (2015); U.S. Department of Energy.

ASHRAE Guideline 14, Measurement of Energy, Demand, and Water Savings (2014); American Society of Heating, Refrigeration, and Air Conditioning Engineers.

Measurement and Verification of Demand Reduction Value from Demand Resources (Manual M-MVDR, 2014); ISO-New England.

Energy Efficiency Measurement & Verification (PJM Manual 18B, 2015); PJM Interconnection.

Measurement & Verification of Energy Efficiency Program (2016); North American Energy Standards Board

Guidance Documents for Evaluation, Measurement & Verification Protocols

Energy Efficiency Program Impact Evaluation Guide (2012); State and Local energy Efficiency Action Network (SEE)

Evaluation Measurement and Verification Guidance for Demand-Side Energy Efficiency -Draft (2015); U.S. Environmental Protection Agency

NEEP Regional-Common EM&V Methods and Savings Assumptions Guidelines (2010); Northeast Energy Efficiency Partnership

Guidance Documents for Evaluation, Measurement & Verification Protocols (cont.)

State Plan Considerations (2014); U.S. Environment Protection Agency.

Measurement & Verification Protocol Selection Guide and Example M & V Plan (2012); Bonneville Power Administration.

LEVELIZED COST OF SAVED ENERGY

EQUATIONS

Equation (1)

LCSE ($/kWh or therm) = (C * Capital Recovery Factor) / D

Where:

C = Total annual program administrator costs;

D = Incremental net annual energy (kWh or therms) saved by energy efficiency programs;

Capital Recovery Factor = (A * (1 + A) ^ B) / (((1 + A) ^ B) – 1)

A = Real discount (interest) rate;

B = Estimated program measure life in years

Equation (2)

LCSE[63] ($/kWh or therm) = (Capital Recovery Factor * (Program Administrator Costs + Participant Costs)) / Net Annual Energy Savings

Where:

Program Administrator Costs = Total program administrator costs;

Participant Costs = Incremental participant costs exclusive of incentives;

Net Annual Energy Savings = Incremental net annual energy (kWh or therms) saved by energy efficiency programs;

Capital Recover Factor = defined as above in Eq. (1)

[63] Staff made one substantive alteration in Eq. (2) by changing the denominator of the equation from Gross Annual Energy Savings to Net Annual Energy Savings. The LBNL authors note that Net Savings could be used, but that sufficient data for the calculation of Net Savings was not available at the time of their study. Staff believes that net energy savings is the appropriate measurement. Staff also has modified slightly the nomenclature of Eq. (2).

USGBC
2101 L STREET, NW
SUITE 500
WASHINGTON DC 20037
202 828-7422
USGBC.ORG

May 25, 2016

Joel H. Peck
Clerk, State Corporation Commission
Commonwealth of Virginia
Document Control Center
P.O. Box 2118
Richmond, Virginia 23218

Subject: Case No. PUE-2016-00022 re. Guidelines Implemented by Investor-Owned Electric Utilities Providing Retail Electric Utility Service in the Commonwealth

Dear Mr. Peck:

The U.S. Green Building Council (USGBC), a 501(c)(3) nonprofit organization, is committed to transforming the design, composition, and operation of the places where we live, learn and work to improve the quality of life for all.[1] USGBC advances leadership in energy conservation and efficiency through building design, construction and operations through the widespread use of our flagship rating system, Leadership in Energy and Environmental Design (LEED). Private sector and public sector leaders around the world have made LEED the most widely used third-party verification for green buildings, with around 1.85 million square feet being certified daily. LEED continues to be the leading benchmark in green building because LEED-certified buildings are resource efficient; they use less water and energy; and save money in the process.

As HB1053 and SB395 have directed, the State Corporation Commission (SCC) will evaluate the establishment of protocols for measuring, verifying, validating, and reporting the impacts of energy efficiency measures implemented by investor-owned electric utilities. As we are dedicated to implementing market-based strategies for cost-effective sustainability in the built environment, we are pleased to offer comments for the SCC's consideration.

The Importance of Energy Efficient Building to Virginia

Virginia is home to over 1,000 LEED certified projects encompassing 132 million square feet of commercial, residential, manufacturing, educational, health care and other facility space. LEED is applied as a tool to achieve energy efficiency gains throughout the state with projects in southern Appalachia, the Tidewater region, Northern Virginia and many more. These buildings are good for residents

[1] USGBC's mission to transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life. http://www.usgbc.org/about

and businesses– such as in saving money on utility bills and helping establish a healthy and productive indoor environment. They are good for government, too – by reducing burdens on local and regional infrastructure and utility systems and supporting resiliency.

Moreover, green building is good for Virginia's economy. The 2015 Green Building Economic Impact Study finds the green building sector of the U.S. construction industry is outpacing overall construction growth in the U.S., accounting for more than 2.3 million American jobs this year. From 2015-2018, Booz Allen projects that LEED certified construction will account for 107,000 total jobs and contribute $9.39 billion in gross domestic product in Virginia alone. [2]

Taking advantage of this market, targeted incentives for whole building energy efficiency are important means for utilities to cost-effectively make efficiency gains. At present, Virginia's utilities generally lack whole building efficiency incentives and thus are missing out on a key source of cost-effective, verified efficiency.

Whole Building Energy Efficiency Incentives and EM&V

Whole building approaches offer maximum benefit to both Virginia building owners as well as the Commonwealth and its utility providers. EM&V protocols need to ensure that savings from energy efficiency are quantifiable and verifiable while employing realistic compliance pathways for building owners.

Fortunately, there are well-established EM&V protocols for whole building energy efficiency. Notably, the International Performance Measurement & Verification Protocol (IPMVP) Volume III, Option D: Calibrated Simulation (Savings Estimation Method 2) and Option C: Whole Building M&V,[3] have been widely endorsed.[4] Attachment 1 provides a description of these methods. State utility regulatory commissions across the country recognize IPMVP protocols for new construction and deep retrofit projects.

Numerous utility incentives employ effective whole building EM&V programs throughout the U.S. In North Carolina, for example, Duke Energy provides a custom whole building incentive for energy efficiency in commercial new construction and retrofits based on annual kilowatt-hours saved. The custom whole building incentive for new construction modeled 10% beyond applicable building code can receive $0.09 per annual kWh saved up to $0.14 per annual kWh saved for designs exceeding 20% beyond code.[5] The program incorporates

---

[2] Booz Allen Hamilton, 2015 Green Building Economic Impact Study, prepared for U.S. Green Building Council, available at http://go.usgbc.org/2015-Green-Building-Economic-Impact-Study.html. See also http://www.usgbc.org/articles/new-study-finds-green-construction-major-us-economic-driver

[3] See resources at http://mnv.lbl.gov/keyMnVDocs/ipmvp.

[4] See, e.g., Pacific Northwest National Laboratory and PECI, Advanced Energy Retrofit Guide: Practical Ways to Improve Energy Performance, Office Buildings, at ch. 6 (2011), available at http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-20761.pdf.

[5] Duke Energy Progress – Energy Efficiency for Business; see http://www.duke-energy.com/pdfs/EEB-custom-incentive-payment-rate-summary.pdf; http://www.duke-energy.com/pdfs/DEP-EEB-custom-customer-guide.pdf; http://www.duke-energy.com/pdfs/EEB-PP-Manual.pdf

EM&V and has been approved repeatedly by the North Carolina Utility Commission.

Whole building incentives and EM&V stand up to scrutiny. One utility's whole building incentive has undergone significant analysis and found to be highly effective. The analysis closely examined the new construction energy-efficiency incentive program, focusing on LEED buildings. The evaluation found the projects achieved an average gross square-foot-weighted savings of 23% over baseline building energy consumption and a gross square-foot-weighted realization rate of 90%.[6]

Many states and utilities also use whole building approaches in their residential efficiency programs, such as incentivizing single and multifamily new construction achieving ENERGY STAR certification, whose buildings are designed and built to deliver energy efficiency savings of up to 30 percent when compared to typical construction.[7] Utilities typically offer rebates to the builder for ENERGY STAR certification. For example, Pennsylvania Energy offers builders who meet ENERGY STAR v3.0 certification requirements $400 per home plus 10¢ per kWh saved for homes that perform 15 percent better than the referenced building code.[8] Again, these incentives are subject to program level EM&V and have been shown to be cost-effective.

In conclusion, as the SCC considers energy efficiency EM&V guidelines to be implemented by investor-owned electric utilities providing retail electric utility service in the Commonwealth, we urge inclusion of proven EM&V methods for assessing savings from whole building approaches to energy efficiency, in new construction, major rehabs, and energy retrofits.

Thank you for your consideration of these comments. Please do not hesitate to contact Nick Brousse at (202) 609-7163 if there are any questions or if we may provide additional information.

Sincerely,

Elizabeth Beardsley, P.E.
Senior Policy Counsel
U.S. Green Building Council

---

[6] Evaluating Results for LEED Buildings in an Energy Efficiency Program. http://aceee.org/files/proceedings/2014/data/papers/3-368.pdf The study also found a statistically significant positive correlation between LEED points awarded for the optimizing energy performance credit, and the evaluated energy savings.

[7] The ENERGY STAR for Homes systems developed by EPA in collaboration with the U.S. DOE, https://www.energystar.gov/index.cfm?c=new_homes.hm_index For incentives, see https://www.energystar.gov/index.cfm?fuseaction=new_homes_partners.locator&s=mega

[8] See http://www.energysavepa-newhomes.com/

Attachment 1: Overview of IPMVP Whole Building EM&V Approaches

Option D, Calibrated Simulation, Method 2

IPMVP Option D, Calibrated Simulation, Method 2 compares the calibrated baseline model to actual consumption Whole Building Energy Simulation, which requires the development of a pair of energy models. One model represents the pre-construction design case, and the other model represents the pre-construction budget case, which is the design case model "crippled" to follow the Building Performance Rating Method defined in Appendix G of ASHRAE Standard 90.1 (building energy model code).

Once all performance data collected as part of this M&V effort have been analyzed, inputs to the pre-construction design case energy model will be revised to reflect the true operation of the building (based on the interval data collected). The energy performance of this model will also be calibrated using one year of utility billing information. The same modifications (such as correcting the building operating hours and setpoints) will be made to the baseline model.

The energy savings for the building are calculated by comparing the actual utility consumption to the calibrated baseline model. The calibrated and the original design models are also compared to shed light on the true energy performance of the building's various energy saving measures and building end-uses.

Option C, Whole Building M&V

For major renovation (where the building type is the same or similar), as well as existing building operation and maintenance, Option C may be appropriate, utilizing pre- and post-project metered data rather than a model. Whole building M&V determines savings by measuring energy use at the facility level on a short-term or continuous basis, used in conjunction with a billing analysis regression model to calibrate the savings estimates resulting from program participation. The regression model may be used to account for weather and usage variations.

Madria Barnes

From:	Trieste@vcnva.org
Sent:	Tuesday, May 24, 2016 2:06 PM
To:	PUE_Comments
Subject:	Case Comments Submission for Case # PUE-2016-00022
Importance:	High
Follow Up Flag:	Follow up
Flag Status:	Flagged

The following case comments were submitted online Tuesday, May 24, 2016 **at** 2:06:24 PM

Full Name: Ms. Trieste Lockwood
Group or Organization: Virginia Conservation Network
Address Line One: 409 E. Main St.
Address Line Two: Suite 201
City, State, Zip: Richmond, VA 23220
Email: Trieste@vcnva.org
Case Number: PUE-2016-00022
Comments: Joel H. Peck, Clerk May 24, 2016 State Corporation Commission Document Control Center P.O. Box 2118 Richmond, Virginia 23218 RE: VCN Comments on Case No. PUE-2016-00022 - SCC Ex Parte: In the matter of receiving input for evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures Dear Mr. Peck, On behalf of the Virginia Conservation Network (VCN) we are submit comments on Case No. PUE-2016-00022 Scheduling Order. Thank you for your time and consideration. Energy efficiency is one of the lowest-cost energy mechanisms in place to meet current energy needs in Virginia. The energy efficiency industry is growing and the Commonwealth is positioned to take advantage of its growth by investing in energy efficiency programs. The State Corporation Commission (SCC) could establish 1) standard energy savings methodologies for Evaluation, Measurement and Verification (EM&V) practices; and 2) a sensibly defined formula to calculate energy efficiency measures. First, industry best practices indicate that the Evaluation, Measurement and Verification (EM&V) method on the demand side of energy efficiency is a reliable and valuable way to show assessment measures and performance (American Council for an Energy Efficiency Economy, available at: http://aceee.org/topics/evaluation-measurement-and-verification-emv). Establishing uniform methodologies for EM&V practices to be included in the SCC energy efficiency plans would benefit Virginia. We support EM&V practices to measure, verify, validate, and report the impact of energy efficiency measures through a stakeholder process. The EM&V impact would be greater through the implementation of a state cost/benefit test that focused on the amount of energy saved. Also, the cost/benefit tests would be more effective through the employment of EM&V measures because the most updated data would be used in the tests. The Department of Energy's (DOE) Uniform Methods Project provides a variety of EM&V measures and can be adopted in the Virginia marketplace (Department of Energy, Office of Energy Efficiency and Renewable Energy, Uniform Methods Project for Determining Energy Efficiency Program Savings, available at: http://energy.gov/eere/about-us/ump-home). The DOE's uniform protocols allow for savings guidance and more efficient compliance. These protocols have a strong background and are understood by industry and other stakeholders while aligning with other government programs like the Clean Power Plan. A National Renewable Energy Laboratory report states that adopting standard EM&V methods ensures that: (1) they are consistent with accepted practices; and (2) they have been vetted by technical experts in the field of energy efficiency program evaluation (National Renewable Energy Laboratory, Hossein Haeri (September 2011-December 2014) http://energy.gov/sites/prod/files/2015/02/f19/UMPIntro1.pdf). EM&V

practices can include a variety of benefits such as carbon reduction, lower ratepayer costs lower greenhouse gas emissions, job creation, and cost reduction for utilities' construction projects. Second, we also encourage the establishment of a standard formula to calculate each energy efficiency measure's levelized cost of saved energy through input from a stakeholder group. The levelized cost of energy references the economic lifetime of savings through energy efficiency programs. The helpful formula cited in Virginia House Bill 1053 and Senate Bill 395 is an effective way to compute and compare program impacts. The formula is composed by the annual kWh saved, year that savings are claimed, average measure of lifetimes, total cost of program, and any applicable discount. Best practices should be used to define the input in the formula, and a transparent stakeholder group would be beneficial to this formula development. Cost-effective tests should be used when determining the implementation of energy efficiency programs. Thank you for accepting comments on this issue.

Joel H. Peck, Clerk
State Corporation Commission
Document Control Center
P.O. Box 2118
Richmond, Virginia 23218

May 25, 2016

RE: PUE-2016-00022, Ex Parte: In the matter of receiving input for evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures

Dear Mr. Peck:

The Virginia Energy Efficiency Council ("VAEEC") respectfully submits the following Comments in regards to the Commission's March 30, 2016 Scheduling Order (Case No. PUE-2016-00022).

The VAEEC is a nonprofit organization composed of a broad coalition of businesses, academics, local governments, utilities, and advocates in the energy efficiency industry, working to assess and support programs, innovation, best practices, and policies that advance energy efficiency in Virginia while providing a forum for stakeholder interaction. We convened a broadly representative coalition of stakeholders interested in submitting comments and appreciate the opportunity the Commission has provided to engage on this important issue regarding EM+V protocols for utility programs in Virginia.

In preparation to submitting comments, the VAEEC also worked with DMME and other partners on a Department of Energy State Energy Program grant to commission a paper from the well-known and respected Synapse Energy, a consulting firm that provides data driven analysis of the electric power sector for public interest and governmental organizations. Their *"Evaluation, Measurement, and Verification in Virginia"* (Attachment A) informs aspects of our recommendations and response.

The VAEEC is especially sensitive to our stakeholders' and members' concerns about energy efficiency program cost and the impact that has on rates and regulatory approval. Accordingly, our recommendations identify ways to *lower* costs through a transparent and standard process; by leveraging both lessons learned and best practices from other states' programs; and where applicable and cost effective, by incorporating EM&V methodologies enabled by new technology and innovation.

The Commission's Scheduling Order included the following Objectives and Cost/Benefit Questions:

> *The Commission will conduct an evaluation to consider the establishment of: (i) uniform protocols for measuring, verifying, validating, and reporting the impacts of energy efficiency measures; (ii) a methodology for estimating annual kilowatt savings for such energy efficiency measures; and (iii) a formula to calculate the levelized cost of saved energy for such energy efficiency measures (collectively, "Objectives").*

The Commission also believes that the Evaluation also should encompass the methodologies by which utilities calculate the components of the cost/benefit tests in proceedings requesting approval to implement energy efficiency programs. In particular, the Evaluation should consider: (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; and (iii) whether the application of the cost/benefit tests can be improved by enhanced evaluation and verification protocols for estimating savings actually realized (collectively, "Cost/Benefit Questions").

The Commission also seeks specific input concerning:

- *Existing measurement and verification protocols and their applicability for Virginia; and*
- *Appropriate formulae for developing the cost of saved energy resulting from energy efficiency programs and appropriate inputs for such formulae*

VAEEC Comments/Recommendations

I. Establishment of uniform protocols for measuring, verifying, validating, and reporting the impacts of energy efficiency measures; including information existing protocols and their applicability for Virginia

Establishing a uniform EM&V protocol across utilities and their programs would contribute greatly to the quantification, validation, transparency, and level of confidence assignable to the quantitative impacts of EE measures and programs sponsored by regulated utilities in Virginia. First, these protocols would provide certainty that results derived from M&V measures included in the protocols would be accepted as accurate results by the SCC. Second, it would provide certainty for utilities about how lost revenue is calculated, to the extent that lost revenue is derived from efficiency programs with results measured using these M&V protocols. Also, the VAEEC supports the Synapse report recommendation for the SCC to adopt a transparent reporting framework, such as the new version of the NEEP reporting forms, and require EM&V contractors to use them.

The VAEEC has examined such protocols in "peer" states with comparable resources, legislative frameworks, EE histories and cultures, to determine what elements might be most applicable in Virginia. A summary of preliminary findings is given in Attachment B. After consulting with several stakeholders (full list of resources can be found in Attachment C), we have concluded that Arkansas is a useful "peer" state for the SCC to consider. Arkansas' utilities are regulated, have a robust energy efficiency portfolio, and importantly have used a well-defined stakeholder forum to develop a state Technical Resource Manual (TRM), EM&V protocols, net-to-gross savings adjustments, and approaches for quantifying non-energy benefits.

The VAEEC supports the establishment of uniform protocols for measuring, verifying, validating, and reporting the impacts of energy efficiency measures *through a stakeholder process*, similar to the successful one developed by Arkansas (more details can be found in Synapse Attachment). One additional topic which should be explored is the creation or identification of a third party to review the EM&V process. This review should not be duplicative of the utilities' own evaluations, nor a cost burden. The review by a third party EM&V consultant could concentrate on the utility's EM&V practices and reports assuring consistent execution with the "approved EM&V" plan and the specific EE program requirements. Such a third party consultant would be part of an overall process improvement and

program feedback team. Best practices across the country have shown this can be an important step and requirement to lowering overall cost of the entire DSM program.

II. Establishment of a methodology for estimating annual kilowatt savings for such energy efficiency measures

In mass-market programs (residential and small business), one of the most common methodologies for EM&V relies on deemed savings, whose calculations are documented in a TRM. As billing analysis methods were time consuming and expensive, deemed savings were created to enable energy efficiency to scale. A deemed savings approach is relatively inexpensive, and the TRM provides the single, definitive source program administrators rely on for savings values. While deemed savings have been beneficial to the industry, they do not always represent the actual impact of energy efficiency measures and can vary significantly from the customer experience. As explained in the Synapse Attachment A, a deemed approach runs the risk of being more or less applicable to the jurisdiction based on a number of factors. Currently, Virginia utilities rely on the Mid-Atlantic TRM for deemed savings, but there is no common evaluation protocol or stakeholder input with respect to the EM&V process .

With respect to EM&V protocols, "enhanced EM&V" methods provide opportunities for utilities and regulators to gain program insights in near real-time, speeding up the evaluation process and reducing the associated costs. As was recently stated by Tom Eckman, the Power Division Director of the Northwest Power and Conservation Council, at a presentation on the evolution of evaluation, "Why deem it when you can measure it."[1] Depending on the methodology, enhanced EM&V (also referred to as "automated EM&V" or "EM&V 2.0") does not require a smart meter or in home energy monitoring device to be effective:

> These technologies extract granular energy consumption data in different ways in a timely manner, and allow new data analytics software to store, track, and analyze the data in near real time using cloud-based software. This capability allows program administrators to implement automated M&V, which takes advantage of automated data processing to produce building energy profiles, estimate savings potential, or estimate whole-building energy savings in near real time.[2] The way automated M&V estimates savings is similar to traditional billing analysis. Billing analysis uses an adjusted baseline, modeled using actual metered consumption data in the pre-program period, to estimate what future building energy use would be absent the energy efficiency measure. The advantage of automated M&V over traditional methods such as billing analysis is that automated M&V estimates data in real time without needing a site visit. Thus, it can more easily develop baseline consumption and estimate savings in numerous buildings. (Synapse Attachment A, p.16)

The emergence of these new EM&V tools allows for a resurgence of billing analysis methods to be completed for utility programs inexpensively through cloud computing software with just monthly

---

[1] NEEA Efficiency Exchange, The Evolution of Evaluation: Revolution or Resolution? EM&V 2.0 New Approaches vs. Traditional Methods; Presentation by Tom Eckman; Impact Evaluation: A Very Short History; April 26, 2016, Coeur d'Alene, ID. https://conduitnw.org/Pages/File.aspx?rid=3436

[2] DNV GL. 2015c. The Changing EM&V Paradigm – A Review of Key Trends and New Industry Developments, and Their Implications on Current and Future EM&V Practices, p. 34.

energy use data and without a requirement for smart meters. Some EM&V 2.0 tools that employ a continuous, automated billing analysis can detect savings in buildings in the range of 2-3% and are no longer hindered by the costs associated with manual billing analysis. Standardizing these approaches will enable Virginia energy efficiency programs to develop a strong, data-driven footing from which to expand programs and offerings to customers. Enhanced EM&V that results in lower costs to ratepayers and shortens the program performance feedback cycle, will enable better long term program performance and greater customer satisfaction. A report issued by ACEEE last year on the topic of EM&V 2.0 noted these two important benefits. First, the ability for utilities to understand program performance continuously supports better outcomes for utilities and customers; "Automated program analysis provides timely key performance information to implementers and administrators on an ongoing basis." Second, the ability for automation to reduce costs associated with evaluation; "[3]

Many of the elements of EM&V 2.0 are already in use throughout the country, including in Virginia. For example, there are efficiency programs in use today in which the savings are measured with statistical analysis of meter data on a frequent basis. Residential behavioral energy efficiency (BEE) is one type of a program that includes these elements, and is measured with a process called a "randomized control trial." With residential BEE, a utility population is divided into treatment and control groups. These groups are statistically equivalent, based on previous energy usage, as well as characteristics like participation in other utility programs or parcel data (such as house size and age). Energy efficiency communications are sent to just the treatment group. The usage of each group is measured with meter data, and any difference in the usage of the two groups is credited to the behavioral energy efficiency program. These impacts are typically measured every month, but there's no reason they couldn't be measured over a shorter time frame, given sufficient metering technology. This randomized control trial approach has been endorsed as a best practice by the US Department of Energy, as part of the DOE's Uniform Methods Project (see Appendix D).

III. Establishment of a formula to calculate the levelized cost of saved energy for such energy efficiency measures

As succinctly explained in the Synapse Attachment: the levelized cost of energy (LCOE) is a metric used by utilities to make an apples-to-apples comparison of the cost of electric generating resources such as natural gas plants, nuclear plants, and renewables. The levelized cost of saved energy (LCOSE) refers to the cost of acquiring energy savings which result from economic lifetime of efficiency programs. The classic formula cited in HB 1053/ SB 395 is a useful means of computing and comparing program impacts.

The inputs to this formula—annual kWh saved, the year(s) in which such savings are claimed, the weighted average of measure lifetimes, total program costs, and applicable discount rate(s)—require careful definition and agreement on their sources and would benefit from a transparent, stakeholder-informed process. Best practices for these inputs are described in the Synapse Attachment, and the VAEEC supports standardizing key variables such as the discount rate and energy savings types (e.g., net vs. gross). The VAEEC also recommends the SCC be specific about how the LCOSE estimates will be used.

[3] Rogers, Ethan, et al. 2015. *How Information and Communications Technologies Will Change the Evaluation, Measurement, and Verification of Energy Efficiency Programs.* ACEEE. http://aceee.org/research-report/ie1503, pg 21

In a vacuum, it's difficult to conclude anything about the value of an efficiency program with LCOSE alone, and LCOSE is not the appropriate metric for determining if an efficiency investment should be pursued. For this purpose, the SCC should continue to use cost-effectiveness tests.

IV. Consistency of application of cost/benefits tests across utilities

Cost/benefit (cost-effectiveness) tests vary widely from state to state and from utility to utility; even states and utilities that use what is nominally the same California Standard Practice Manual test each typically use their own assumptions and inputs, with the result that there is wide variation in the way that each test is implemented. Because the California Standard Practice Manual does not provide explicit guidance on many issues related to cost/benefit test implementation, tests such as the Utility Cost Test, the Total Resource Cost Test, and the Societal test are widely misinterpreted and/or misapplied. Frequent problems include failure to account for the full range of utility system costs and benefits, and asymmetrical approaches that incorporate all costs without adequately accounting for corresponding benefits. To ensure that regulators and policy-makers receive the best information possible as the basis for decisions about demand-side programs, a statewide cost/benefit test framework should be designed with reference to best practices, such as those developed by SEE Action, the Regulatory Assistance Project, and the National Efficiency Screening Project. We note that a standardized approach to developing accurate tests that address a state's specific policy needs and goals has been developed by the National Efficiency Screening Project, and would be the ideal basis for the development of a consistent statewide cost/benefit test framework.

One of the best practice principles that should be adopted in a statewide cost/benefit test framework is transparency. It is important that all stakeholders have a clear understanding of the inputs that go into the tests, and how the inputs are derived or calculated. A consistent statewide cost/benefit test has the following benefits:

- The cost/benefit test framework could incorporate best practices to ensure the most accurate results;
- Firms offering demand-side programs and services would have a broadly consistent market across the state.

While the Ratepayer Impact Measure (RIM) test is one test used to evaluate cost/benefit of a program, a statewide cost/benefit test framework should not rely solely on the RIM test, as it provides only limited information about a demand-side program: specifically, it looks only at rate impacts, rather than total costs, and does not provide an indication of the magnitude of the rate impacts (which, for small programs, are likely to be negligible). Also, the Total Resource Cost test should constructed symmetrically, so that the full range of corresponding costs and benefits are accounted for. This is particularly an issue with participant costs, because participants incur costs to obtain a range of benefits, including comfort and improved health, with energy savings typically being a secondary consideration at best. Other costs, including avoided water and other fuel costs, should also be incorporated into these tests to ensure that they are provide an accurate comparison of "total" costs and benefits.

The VAEEC respectfully requests that the Commission initiate a stakeholder process to develop guidance for the purpose of adopting a consistent, transparent state-wide framework for cost/benefit testing.

V. Enhanced EM&V impact on cost/benefit testing

A statewide Cost/Benefit Test framework (or any cost/benefit test) would benefit from enhanced EM&V (often referred to as EM&V 2.0). Enhanced EM&V increases the accuracy of the cost/benefit tests by quantifying more accurately one of the crucial test inputs: energy saved. Enhanced EM&V has particular potential for determining when energy is saved, therefore providing a much more accurate quantification of reduction in peak demand, as well as reduction in total energy consumption. Finally, enhanced EM&V can reduce the time necessary to quantify energy savings, thus allowing the cost/benefit tests to be based on more recent and relevant data.

Enhanced EM&V or EM&V 2.0 can be especially useful in establishing deemed savings for creating or updating a state TRM This area of study is quickly emerging, and other states are taking advantage of it: Missouri is in the process of creating its first statewide Technical Resource Manual. As part of the project, the state will be studying the use of EM&V 2.0 technologies for this process.[4] A recent case study completed by Ameren, Missouri demonstrated that an EM&V 2.0 tool using an automated billing analysis could locate deemed saving values that were both under and over-estimated.[5]

While automated EM&V tools measure savings at the meter, they also provide robust, local primary data sources for parties studying, creating and calibrating deemed savings. Ideally, Virginia deemed savings referenced in cost/benefit tests and subsequent EM&V should be standardized to a single TRM: the state could adopt one which has already been written; it could adopt *and* amend a TRM with "trued-up" Virginia data; or it could create its own. Certainly data drawn from a state TRM would provide more accurate projections for cost/benefit testing, as well as future EM&V. ***The Virginia Energy Efficiency Council recommends a stakeholder process for the adoption and/or potential development of a state TRM, overseen by an independent party and informed by results from past and current Virginia utility programs.***

Thank you for your thoughtful consideration of our comments. We look forward to continuing to engage with the commission on this important issue as you decide next steps in the process. Please do not hesitate to contact me at 804.457.8619 or chelsea@vaeec.org if VAEEC can further assist with this process.

Sincerely,

Chelsea Harnish

Chelsea Harnish, VAEEC Executive Director

Board of Directors vote
Approved:
Cynthia Adams, Pearl Certification, VAEEC Chair
David Steiner, D+R International, VAEEC Vice Chair
Bill Greenleaf, VAEEC Treasurer
Andrew Grigsby, Local Energy Alliance Program, VAEEC Secretary

---

[4] https://energy.mo.gov/energy/about/missouri-technical-reference-manual-work-plan

[5] ACEEE Intelligent Efficiency Conference; Presentation by Greg Lovett of Ameren of Missouri; Unique Insights from Usage Data: Leveraging Savings Measurement Software; December 7, 2015, Boston MA. http://aceee.org/sites/default/files/pdf/conferences/ie/2015/Session3C-Lovett-IE15-12.7.15.pdf

Bill Beachy, Community Housing Partners
Larry Cummins, Trane
John Morrill, Arlington County
Saifur Rahman
Marisa Uchin, Opower

Abstained:
David Koogler, Rappahannock Electric Cooperative
Tom Jewell, Dominion Virginia Power

Attachment A

Memorandum

TO: CLEAN ENERGY SOLUTIONS INC., VIRGINIA ENERGY EFFICIENCY COUNCIL, AND VIRGINIA DEPARTMENT OF MINES, MINERALS AND ENERGY

FROM: ALICE NAPOLEON, KENJI TAKAHASHI, JENNIFER KALLAY, AND TIM WOOLF

DATE: MAY 24, 2016

RE: EVALUATION, MEASUREMENT, AND VERIFICATION IN VIRGINIA

Synapse drafted this memo to respond to the questions on evaluation, measurement, and verification (EM&V) raised by the Virginia State Corporation Commission (SCC or Commission) in the March 30, 2016 order in Case PUE-2016-00022. This memo is organized into the following sections:

- Overview of Current EM&V Practices in Virginia
- Best Practices and Common Frameworks for EM&V
- Emerging EM&V Approach - EM&V 2.0
- Levelized Cost of Saved Energy

Overview of Current EM&V Practices in Virginia

For this memo, Synapse briefly researched and reviewed EM&V guidelines and practices for the largest investor-owned utilities in the Commonwealth, including Virginia Electric and Power Company d/b/a Dominion Virginia Power (DVP) and Appalachian Power Company (APCo).[1] In addition, Synapse sought information on EM&V practices of cooperative utilities and businesses who elect to "opt-out" of efficiency programming.[2] A summary of our findings is provided in the sections that follow.

Investor-Owned Utilities

DVP

Since 2010, DVP has implemented a range of demand-side management (DSM) programs.[3] For residential customers, these programs continue to provide services or other incentives for heat pump upgrades and tune ups, duct sealing, audits, appliance recycling, and air conditioning cycling. For non-

[1] Based on 2014 EIA 861 data on utility sales to ultimate customers.

[2] §56-585.1.A.5.c of the Code of Virginia.

[3] Virginia State Corporation Commission. 2015. *Report to the Commission on Electric Utility Regulation of the Virginia General Assembly*, Status Report: Implementation of the Virginia Electric Utility Regulation Act Pursuant to §56-596 B of the Code of Virginia.

residential customers, DVP's programs provide audits and financial incentives for duct sealing, lighting systems and controls, window film, and heating and cooling measures.[4] Per 2010 and 2012 Commission orders, DVP is required to provide a detailed EM&V report on its DSM programs on an annual basis.[5] DNV GL released an impact evaluation study of DVP's programs in 2015.[6] The 2015 DNV GL study reported gross and net savings,[7] gross participation, and expenditures (which were redacted in the public version), based on a variety of methods specific to each program (shown below). In the study, these actual values were compared with planned values. DNV GL conducts data quality review and deemed savings estimates on a monthly basis.[8] Oversight of the evaluation process was not addressed in the evaluation report. A summary of evaluation activities by program is provided in the table below.

Sector	Program(s)	Savings focus	Activities
Residential	Home Energy Check-Up Heat Pump Tune-Up	Energy	Billing analysis Participant satisfaction survey
Residential	Heat Pump Upgrade	Energy	Metering analysis Participant satisfaction survey
Residential	Duct Sealing	Energy	On-site blower door tests Participant satisfaction survey
Residential	AC Cycling	Demand	Analysis of event season
Non-Residential	Energy Audit Duct Sealing	Energy	On-site verification of tracking data Participant net-to-gross survey[9]
Non-Residential	Distributed Generation	Demand	Analysis of event season
All	All	Energy and demand	Review and assessment of program tracking data Updated EM&V plans

[4] Virginia Electric and Power Company. 2015. *Annual Report to the Division of Energy of the Virginia Department of Mines, Minerals and Energy*.

[5] Virginia State Corporation Commission. Order Approving Demand Side Management Programs, Case PUE-2009-00081, March 24, 2010; Order, Case PUE-2011-00093, April 30, 2012.

[6] DNV GL. 2015a. *Evaluation, Measurement, and Verification Report for Dominion Virginia Power*, Case PUE-2013-00072.

[7] Gross savings are "the change in energy consumption and/or demand that results directly from program-related actions taken by participants in an efficiency program, regardless of why they participated and unadjusted by any factors." Net savings are "the total change in load that is attributable to an energy efficiency program" which may take into account the effects of free drivers, free riders, energy efficiency standards, changes in the level of energy service, and other causes of changes in energy consumption or demand. (NEEP 2014. Model EM&V Methods: Standardized Reporting Forms for Energy Efficiency, Version 1.0.)

[8] DNV GL. 2015a, p. 3-19.

[9] A net-to-gross ratio equals net program savings divided by gross program savings (NEEP 2014). See footnote 7.

In the evaluation, DNV GL suggested that the results of its evaluation can be used for improvement of the programs, as well as in future Integrated Resource Plan (IRP) modeling.[10] The most recent IRP for DVP was filed with the Commission on April 29, 2016.[11] According to the SCC Order for Notice and Hearing, the IRP is based on the Company's current assumptions regarding load growth, demand-side management programs, and other factors.[12] Per SCC guidance, utilities are to provide overall assessment of existing and potential DSM options in their IRPs.[13]

DNV GL uses the Standard Tracking and Engineering Protocols (STEP) Manual Version 5.0.0 for estimation of deemed energy and demand reductions for tracking, monitoring, and reporting on DSM programs in Virginia and North Carolina. Under contract with Dominion, DNV GL developed the STEP Manual "using industry-standard approaches for estimating energy and demand reductions." This manual makes reference to Technical Resource Manuals (TRMs) issued by regulatory agencies in other states, primarily the Mid-Atlantic TRM version 2014 managed by the Northeast Energy Efficiency Partnerships (NEEP) for Maryland, Delaware, and the District of Columbia. In addition, the STEP manual refers to various other TRMs (from Connecticut, Maine, Massachusetts, New Jersey, New York, Ohio, Pennsylvania, the Tennessee Valley Authority, and Vermont) and other engineering resources such as the American Society of Heating, Refrigeration & Air Conditioner Engineers (ASHRAE) and the 2012 International Energy Conservation Code.[14] The STEP manual calculates energy savings at the level of the customer meter.[15]

DNV GL also performed a potential study for DVP released in 2015, which likewise used the STEP manual for savings estimates.[16]

---

[10] DNV GL. 2015a, page 1-9.

[11] Dominion. 2016. Dominion Virginia Power's and Dominion North Carolina Power's Report of Its Integrated Resource Plan, Case No. PUE-2016-00049, filed on April 29, 2016. https://www.dom.com/library/domcom/pdfs/electric-generation/2016-irp.pdf?la=en.

[12] Virginia State Corporation Commission. Order for Notice and Hearing in Case No. PUE-2016-00049. May 12, 2016. http://www.scc.virginia.gov/docketsearch/DOCS/38%25_011.PDF.

[13] Virginia State Corporation Commission. *Integrated Resource Planning Guidelines*, p. 8. http://www.scc.virginia.gov/pue/docs/irp.pdf.

[14] DNV GL. 2015a. Appendix E: *Standard Tracking and Engineering Protocols Manual.*

[15] Ibid. p. 1-8.

[16] DNV GL. 2015b. *Dominion Energy Efficiency Potential Study: Dominion Virginia Power*. P. 78.

APCo

In the order approving APCo's current suite of energy efficiency programs, the Commission required annual filing of EM&V reports.[17] In April 2016, APCo filed reports compiled by its evaluation contractor, ADM Associates, Inc., with assistance from Johnson Consulting Group.[18]

Two of APCo's programs, the Residential Low Income Weatherization Program (RLIWP) and Peak Reduction Program (PRP), have been in operation for more than a year. For these programs, the April 2016 reports provided impact and process evaluation methodologies and results. These reports included comparisons between realized values and expected values but did not provide net savings, as it was assumed that both programs have no free ridership. The study authors used the Mid-Atlantic TRM for the food bank lighting component of the RLIWP (which provides CFL bulbs to local food banks for distribution to APCo customers for no cost), while for the weatherization component of the RLIWP they drew on the Weatherization Assistant National Energy Audit Tool software, also used by providers of the U.S. Department of Energy's Weatherization Assistance Program.[19] For estimating savings from the PRP, Pennsylvania residential air conditioning data are used.[20] The reports do not indicate whether savings are estimated at the generator or at the customer meter.

Most of APCo's programs, including the Appliance Recycling, Efficient Products, Home Performance, Manufactured Housing, and Commercial and Industrial programs, have only been in operation since early 2016. The April 2016 reports included "launch reports" with early feedback on these programs and their initial operations, as well as planned methodology for future EM&V efforts. For assessing program impacts, the authors primarily proposed to use the Mid-Atlantic TRM Version 5.0 wherever possible, to be supplemented with other resources as needed. Surveys were proposed to verify measure installation or recycling of old products, measure customer satisfaction, and assess program attribution (i.e. net-to-gross). Methodologies for estimating net-to-gross ratios were provided, suggesting that future reports will provide both net and gross savings estimates.

Per SCC guidance, utilities are to provide overall assessment of existing and potential DSM options in their IRPs.[21] The most recent IRP for APCo was filed with the Commission on April 29, 2016.[22] According to the SCC Order for Notice and Hearing, the IRP is based on the Company's current assumptions

---

[17] Virginia State Corporation Commission. Final Order in Case No. PUE-2014-00039. June 24, 2015.

[18] American Electric Power. April 29, 2016 filing in Case No. PUE-2014-00039.

[19] ADM Associates, Inc. and Johnson Consulting Group. 2016. *Evaluation of Residential Low Income Weatherization Program.*

[20] ADM Associates, Inc. and Johnson Consulting Group. 2016. *Evaluation of Residential Peak reduction Program.*

[21] Virginia State Corporation Commission. *Integrated Resource Planning Guidelines*, p. 8. http://www.scc.virginia.gov/pue/docs/irp.pdf.

[22] Appalachian Power. 2016. Integrated Resource Planning Report to the Commonwealth of Virginia State Corporation Commission Case No. PUE-2016-00050, filed on April 29, 2016. http://www.scc.virginia.gov/docketsearch#caseDocs/135883.

regarding customer load requirements, demand-side management program costs and analysis, and the effect of environmental rules and guidelines, among other things.[23]

Cooperative Electric Utilities

Cooperative electric utilities have limited energy efficiency programming. Starting in 2011, several of the electric cooperatives implemented load management programs that provide incentives to customers who retain load-cycling switches on their central air conditioning systems.[24] Rappahannock Electric Cooperative also offers free energy assessments and energy-efficiency measure rebates to high-use residential members.[25] However, we were unable to find documentation of EM&V on the programs offered by the cooperative utilities.

Opt-out Electors

Per statute, a general service customer with historical peak demand in excess of 500 kW is allowed to provide a notice of non-participation in order to avoid its electric utility's energy efficiency charges ("opt-out"). Customers who have opted-out must implement energy efficiency that has produced or will produce "measured and verified results consistent with industry standards" at their own expense. The Commission may take steps to verify that these customers have achieved energy efficiency, but only if it possesses evidence that the customer knowingly misrepresented energy efficiency achievements.[26] Pursuant to the rules on opt-out, non-participating customers must provide the utility with a measurement and verification plan.[27] Furthermore, non-participants are required to provide the Division of Energy Regulation with annual reports on their energy efficiency savings, for as long as the exemption is sought.[28]

---

[23] Virginia State Corporation Commission. Order for Notice and Hearing in Case No. PUE-2016-00050. May 12, 2016. http://www.scc.virginia.gov/docketsearch/DOCS/38%25p01!.PDF.

[24] Virginia State Corporation Commission. 2015. *Report to the Commission on Electric Utility Regulation of the Virginia General Assembly*, Status Report: Implementation of the Virginia Electric Utility Regulation Act Pursuant to §56-596 B of the Code of Virginia.

[25] Cadmus. 2014. *Multi-State Residential Retrofit Project Process Evaluation: Final*. P. 107.

[26] 56-585.1.A.5.c of the Code of Virginia.

[27] Such a plan must conform to "methods accepted for use by utilities and industries to measure, verify, and validate energy savings and peak demand savings. This may include the protocol established by the United States Department of Energy, Office of Federal Energy Management Programs, Measurement and Verification Guidance for Federal Energy Projects, measurement and verification standards developed by the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), or engineering-based estimates of energy and demand savings associated with specific energy efficiency measures, as determined by the Commission." (§56-576 of the Code of Virginia).

[28] Chapter 316: Rules Governing Exemptions for Large General Services Customers Under §56-585.1 A 5 c of the Code of Virginia. Available at https://www.dom.com/library/domcom/pdfs/virginia-power/scc-rules-lgs-cust-a5-rider.pdf.

Best Practices and Common Frameworks for EM&V

This section discusses common approaches to EM&V, including use of deemed savings values, large scale consumption analysis, and project-specific M&V. This section also describes best practices and recommendations for developing and updating common EM&V frameworks. Common frameworks and protocols allow consistency, transparency, and stream-lined processes, and should be adopted or developed across all areas discussed below. For example, DOE's Uniform Methods Project (UMP) for project-specific M&V approaches provides useful guidelines for program administrators and M&V practitioners. This resource is detailed in the M&V Approach section below.

Uniform M&V Protocol

Deemed Savings

According to the State Energy Efficiency Action Network (SEE Action Network),[29] "[d]eemed savings values, also called stipulated savings values, are estimates of energy or demand savings for a single unit of an installed energy efficiency measure that (1) has been developed from data sources (such as prior metering studies) and analytical methods that are widely considered acceptable for the measure and purpose, and (2) is applicable to the situation being evaluated."[30] A variant of deemed savings values is deemed savings calculations where a stipulated set of engineering algorithms are used to calculate energy savings. This deemed savings approach is one of the most common approaches to evaluate energy savings for ratepayer-funded energy efficiency programs. According to a 2012 report by SEE Action, 36 states rely on some type of deemed savings in the evaluation framework.

Deemed savings and deemed savings calculations are usually documented in a TRM, which can take different formats depending on jurisdiction and range from reports and spreadsheets to online searchable databases. It can also include impact factors to be applied to calculated savings (e.g., net-to-gross ratio values), documentation of the sources of savings values and calculations, and other relevant material to support the calculation of measure and program savings.[31] The intent of a TRM is to provide stakeholders with a single, transparent source of savings values and source data for all program administrators in the jurisdiction. Thus, the document should include all measures, whether implemented by all program administrators or unique to one program administrator. While many jurisdictions use values, methods, and sources developed in other jurisdictions, it is expected that such "borrowed" deemed values be updated based on each jurisdiction's own evaluation study results. Although it is unclear how regularly and thoroughly states update their TRMs, a 2012 ACEEE report

---

[29] The State and Local Energy Efficiency Action Network (SEE Action) is a state- and local-led effort facilitated by the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA) to take energy efficiency to scale and achieve all cost-effective energy efficiency by 2020. SEE Action offers knowledge resources and technical assistance to state and local decision makers as they seek to advance energy efficiency policies and programs in their jurisdictions.

[30] SEE Action Network. 2012. *Energy Efficiency Program Impact Evaluation Guide.* Prepared by Steven R. Schiller Consulting, Inc. Available at www.seeaction.energy.gov, p. 4-7.

[31] SEE Action Network. 2012, p. 4-8.

found that most U.S. states with TRMs (28 states out of 35 states) generally modify and update deemed values over time.[32]

The deemed savings approach is a relatively easy and inexpensive way to estimate savings from energy efficiency measures.[33] If properly used, this approach "can be very useful for program planning purposes and can reduce M&V costs, create certainty, and simplify evaluation procedures."[34] However, this approach always runs the risk of producing results that are irrelevant, obsolete, or not useful. This is largely because deemed values are based on various factors (e.g., wattage savings, efficiency ratings, operating hours, measure life), assuming average consumption and typical conditions. Thus, there is a risk that some of these factors are not appropriate for the measure(s) or program(s) to which they are applied, unless these factors were recently examined in evaluation studies that are relevant to the jurisdiction. Also, even if evaluated values are used, they become outdated over time. Further, when key variables are borrowed from another state, there is a possibility that conditions underlying the variable (such as operating hours of equipment) are not adjusted to conditions in the borrowing state. An additional issue is that average savings values can vary widely from actual metered savings.[35]

To avoid these pitfalls, entities responsible for developing and updating a TRM (e.g., TRM managers and stakeholders) need to ensure (a) that deemed savings data in a TRM are based on reliable, traceable, and documented sources of information and (b) the assumptions that went into determining a value are applicable to the situation (e.g., measures, measure delivery mechanism, facility types) being evaluated.[36] A TRM is only as good as its source data, and should be coupled with an EM&V plan. EM&V plans should correspond to and complement the TRM, addressing any gaps identified through the TRM development process. States need to ensure that a TRM be a flexible and living document that is updated periodically (e.g., annually) based on best available information and reviews by stakeholders and energy efficiency experts. For this to happen, it is important to develop a formal process to update the TRM and to establish the roles of different parties.

An example of the TRM update process from NEEP's Mid-Atlantic TRM is presented below. The figure shows at least one round of feedback from the program administrators, independent reviewers, and other stakeholders. To address any disagreement on proposed changes, it is also beneficial to establish a Technical Advisory Group (TAG) to provide a more formal venue for resolution of technical disputes prior to submission to the regulators.[37]

---

[32] ACEEE. 2012. *A National Survey of State Policies and Practices for the Evaluation of Ratepayer-Funded Energy Efficiency Programs.*

[33] ACEEE. 2015. *How Information and Communications Technologies Will Change the Evaluation, Measurement, and Verification of Energy Efficiency Programs*, P. 9.

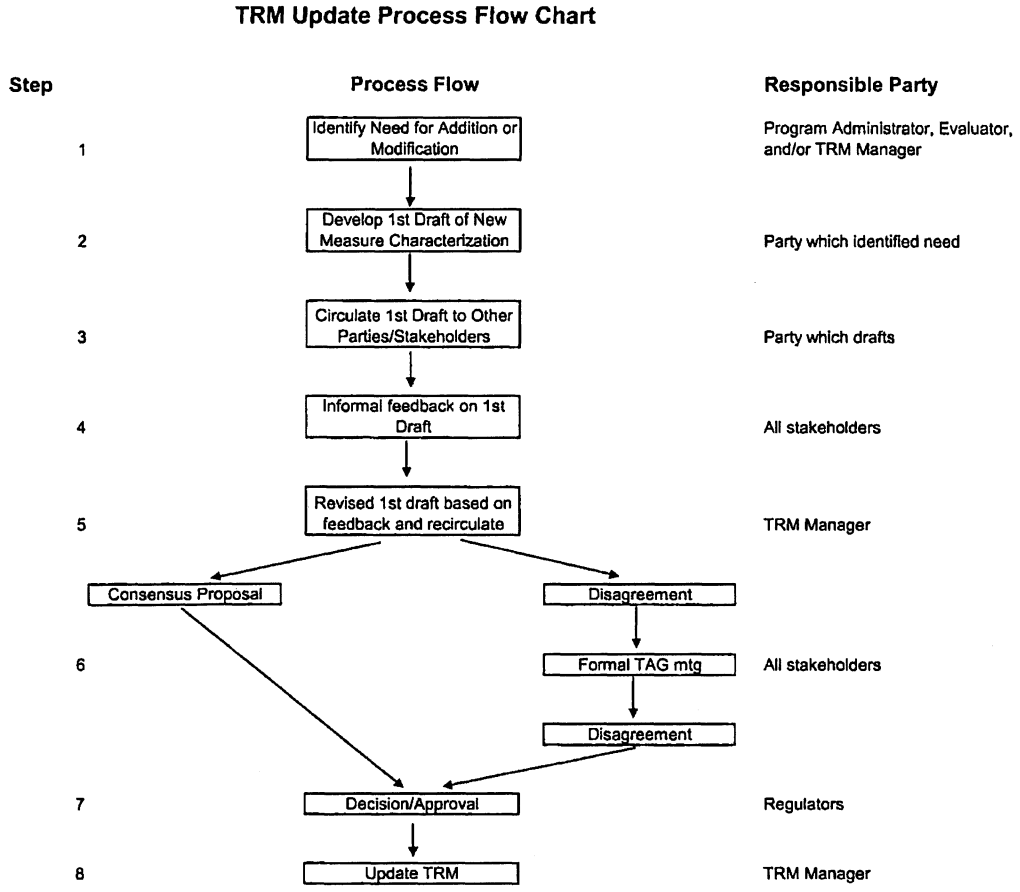
[34] SEE Action Network. 2012, p. 4-9.

[35] EnergySavvy. 2015a. *Transforming Energy Efficiency through Modern Measurement.*

[36] SEE Action Network. 2012, p. 4-8.

[37] NEEP 2016. *Mid-Atlantic Technical Reference Manual*, Appendix B.

Figure 1. Technical Reference Manual update process



Source: NEEP 2016 Mid-Atlantic Technical Reference Manual

Another key to an effective TRM update is establishing an independent entity that is responsible for managing the TRM update process. The TRM manager should identify the need for modifications to the TRM, propose updates, lead the stakeholder feedback process, and assist in the development of final recommendations to the regulators. Alternatively, if the TRM is managed by program administrators, an independent entity should have the role of (a) reviewing and (b) either agreeing with proposed additions or challenging such changes—with the regulators having final say regarding any disputes.[38]

Arkansas provides a good example of a well-managed TRM process with its highly effective stakeholder group/process called the Parties Working Collaboratively (PWC), established in 2006. One of the primary tasks of this PWC is to update a TRM with a jointly funded independent entity called the Independent

[38] NEEP 2016. Appendix B, p. 497.

Evaluation Monitor (IEM).[39] Arkansas also has a TRM update process very similar to the Mid-Atlantic TRM. Since the development of the first TRM in 2011, Arkansas has updated its TRM every year by following the established TRM process. For more discussion of energy efficiency collaboratives see page 13.

Our review of deemed savings/TRM approaches in Virginia (presented in the first section of this memo) revealed that Virginia is using a patch-work approach, in which every utility uses slightly different methods and sources. There is also no independent entity or expert that oversees utilities' evaluation study design and results. Further, there are no common evaluation protocols, e.g. for deemed savings. While it is likely that evaluation vendors such as DNV GL are doing decent evaluation work, and two of the utilities are using the same resource for some deemed values—the Mid-Atlantic TRM—there is no stakeholder process to vet any of these work products and determine whether the selected approaches and assumptions are appropriate for the Commonwealth of Virginia and the specific programs and measures being considered.

Large-Scale Consumption Data Analysis

Large-scale consumption data analyses are conducted for programs that have many participants sharing common characteristics, such as single-family detached homes in a particular community with residents of similar economic demographics.[40] This approach is often used for evaluating behavior programs with peer comparison feedback mechanisms. This type of analysis can take two different approaches: (1) a randomized controlled trials approach or (2) a quasi-experimental approach where the control group is not randomly assigned. The most common quasi-experimental method is a pre-post method in which energy consumption of the treatment group after enrollment in the program is compared with the same sites' historical energy consumption before program enrollment.[41] SEE Action recommends the randomized controlled trials approach over the quasi-experimental approach because randomized controlled trials will result in robust, unbiased estimates of program energy savings; however, SEE Action suggests using the quasi-experimental approach when the randomized controlled trials approach is not feasible.[42]

M&V Approach

The project-specific Measurement and Verification (M&V) approach is used for various types of programs. These programs involve relatively complex retrofits or new construction projects that are subject to more variation in savings than the type of projects or measures suitable for deemed savings or large-scale consumption analyses. It is generally applied to only a sample of projects in a program or

[39] Johnson, K. and M. Klucher. 2014. "All Together Now! How Collaboration Works in Arkansas," proceedings of the 2014 International Energy Policy & Programme Evaluation Conference in Berlin.

[40] SEE Action Network. 2012, p. 4-13

[41] SEE Action Network. 2012, p. 4-10

[42] SEE Action Network. 2012, p. 7-24

when project-level savings are needed.[43] This approach uses one or more methods that can involve measurement, engineering calculations, billing regression analyses, and/or computer simulation modeling. These different methods are described in the International Performance Measurement and Verification Protocols (IPMVP). The verification part of the M&V typically accompanies field activities dedicated to collecting site information, including equipment counts, observations of field conditions, building occupant or operator interviews, measurements of parameters, and metering and monitoring.[44]

While the M&V approach largely relies on the IPMVP, actual applications of the IPMVP are likely to differ by jurisdiction, utility, or evaluation practitioner. Coupled with the trend of increasing investment in energy efficiency and greater reliance on energy efficiency as a means of meeting future energy resource requirements, there is a growing demand for publicly available, national M&V protocols that describe how energy savings are determined and reported.[45] In response, the U.S. Department of Energy (DOE) initiated the Uniform Methods Project (UMP), a collaborative effort to develop national M&V protocols for commonly implemented program measures.

The goal of the UMP is to help reduce the uncertainty associated with determining energy efficiency savings, and offer guidance for implementing the techniques and interpreting results. More specifically, DOE has the following goals for UMP:

- Offer guidelines that help strengthen the credibility of energy efficiency program savings calculations
- Provide clear, accessible, step-by-step protocols to determine savings for the most common energy efficiency measures
- Support consistency and transparency in how savings are calculated
- Reduce the development and management costs of EM&V for energy efficiency programs offered by public utility commissions, utilities, and program administrators
- Allow for comparison of savings across similar efficiency programs and measures in different jurisdictions
- Increase the acceptance of reported energy savings by financial and regulatory communities[46]

[43] SEE Action Network. 2012, p. 4-12

[44] Ibid.

[45] Haeri, H. 2015. *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures*. Prepared for the National Renewable Energy Laboratory (NREL), p. 3.

[46] Haeri, H. 2015, p. 3.

To achieve these goals, the UMP documents aim to establish easy-to-follow protocols based on commonly accepted engineering and statistical methods (e.g., IPMVP) for determining gross savings for a core set of commonly deployed energy efficiency measures. The protocols also include:

A description of measure and application conditions

An algorithm for estimating savings

An example of a typical program offering and alternative delivery strategies

Considerations for the measurement and verification process, including an IPMVP option

Data requirements for verification and recommended data collection methods

Recommended program evaluation elements

Alternatives for lower-cost EM&V approaches

Currently, UMP protocols are available for several residential and commercial projects or programs.[47]

Recommendations

Virginia should develop a statewide TRM. To this end, the Commission should:

- Develop a process to develop and update a statewide TRM that all utilities in Virginia can use, and pair it with an EM&V plan;
- Develop and regularly update a statewide TRM using a thorough stakeholder process;
- Establish an independent entity that will manage the TRM update process; and
- Consider coordination with the Mid-Atlantic TRM efforts.

For programs that call for large-scale consumption analysis and project-specific M&V, the Commission should provide guidelines consistent with the best practices described in the 2012 SEE Action Network report *Energy Efficiency Program Impact Evaluation Guide.* Where applicable, the Commission should adopt DOE's UMP protocols.

These recommendations apply to electric utilities, as well as to cooperatives. Further, the SCC should consider whether adherence to common EM&V protocols should be a condition of exemption from energy efficiency charges under § 56-585.1A.5.C of the Code of Virginia.

[47] U.S. DOE. "Uniform Methods Project: Determining Energy Efficiency Savings for Specific Measures." Available at http://energy.gov/eere/about-us/ump-protocols.

Evaluation planning and process

Evaluation oversight

Transparency, independence, and proper oversight by regulators are necessary for selecting evaluation vendors, and for reviewing and applying study results. This will ensure that study results are unbiased and robust. Responsibility for the selection and management of evaluation contractors can be placed with regulators alone, or it can be shared between regulators and program administrators. As an example of the joint management approach, a group of expert consultants working for the Massachusetts Energy Efficiency Advisory Council (EEAC) work corroboratively with program administrators to hire contractors, plan and implement the evaluations, and determine how results are applied to energy savings, incentive payments, and future program assumptions.[48] As discussed above, the need for independent oversight also applies to the updating process of a TRM.

Timing of Evaluation Studies

Program evaluation timeframes are often determined by the funding and contracting schedules for a program portfolio cycle (e.g., 1–3 years). The best time to plan for evaluations is in the program design stage, the reason being that the program budget, schedule, and resources can properly take into account evaluation requirements and opportunities. In addition, when evaluation is an integral part of the program portfolio process, evaluation can enhance the portfolio's success through a timely assessment of actual program savings impacts. This type of integral assessment can also provide a useful comparison to gauge the success of the program's approach to achieving savings and reinforce the pivotal role that evaluation plays in energy efficiency planning. Finally, early consideration of the evaluation process—prior to program implementation—helps ensure that the necessary data will start to be collected once implementation begins.[49]

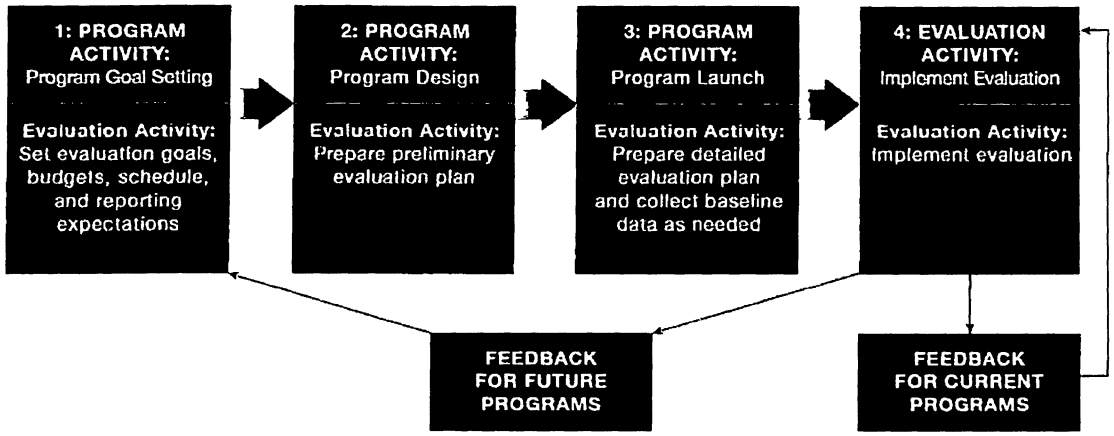
According to the SEE Action Network, there are various crucial evaluation activities that should start prior to, and continue during, program implementation. These activities are presented in Figure 2 below along with the four program implementation activities: (1) program goal setting, (2) program design, (3) program launch, and (4) evaluation activity. Evaluation activities required prior to program launch include setting evaluation goals, budgets, schedule and reporting expectations, and preparing preliminary evaluation plans.

---

[48] Energy Futures Group, Cx Associates, and Wirtshafter Associates. 2016. Review of Efficiency Maine Trust's 2017 – 2019 Third Triennial Plan, p. 55

[49] SEE Action Network. 2012, Figure 8.1, p. 8–1.

Figure 2. Program implementation cycle with high-level evaluation activities



Source: Reproduced from State and Local Energy Efficiency Action Network. 2012. Energy Efficiency Program Impact Evaluation Guide, Figure 8.1, prepared by Steven R. Schiller.

SEE Action recommends that evaluation activities be carried out and results be produced in a timely manner as follows:

> Evaluations should be produced within a portfolio cycle or very soon after the completion of a cycle. This is so evaluation results can document the operations and effects of the programs in a timely manner and provide feedback for ongoing program improvement, provide information to support energy efficiency portfolio assessments (including market assessments and potential studies), and help support the planning of future portfolio cycles, load forecasts, and energy resource plans.[50]

Although the SCC's requirement that DVP and APCo file annual EM&V reports probably indicates that some EM&V planning is happening at the early stages of program design and implementation, it is unclear what is actually being done, and when. Virginia should require its electric utilities to document this process, and encourage cooperatives to provide such documentation as well.

Collaborative Process on EM&V Framework and TRM

Collaboratives and other stakeholder groups (such as advisory councils and boards) have proven effective for gathering stakeholder input and feedback, and for implementing successful energy efficiency programs. Some collaboratives are tasked with developing evaluation-related guidance and supporting materials, including development of a TRM or specific EM&V protocols.[51] In doing so, the

[50] SEE Action Network. 2012, p. 8-1.

[51] SEE Action Network. 2015. *Energy Efficiency Collaboratives: Driving Ratepayer-Funded Efficiency through Regulatory Policies Working Group*. Available at https://www4.eere.energy.gov/seeaction/publication/energy-efficiency-collaboratives.

collaboratives serve to provide consistency among jurisdiction-wide efficiency EM&V by bringing all program administrators and interested parties together at one table. There are a few overarching principles to observe when establishing a collaborative.[52]

- **Clear objective.** The objective should clarify the duration of the collaborative (i.e., short or long term) and scope (e.g., evaluation planning, development of M&V protocols).
- **Ground rules.** Processes should be clear and transparent. Members should work towards consensus but there should also be a clearly defined process to resolve disputes. Meetings and meeting materials should be freely accessible to the public. Technical reference manuals and other technical EM&V material should be written as to be transparent and understandable by a broad audience.
- **Evaluation of efforts.** A periodic assessment of the collaborative helps to validate its continuation, refine its mission and operating practices, and assess its progress toward objectives.
- **Strong, experienced facilitator**. An experienced, independent facilitator can ensure all attendees have a chance to express their views.
- **Influence with commission.** A collaborative is most useful if the commission gives weight to the findings and conclusions of the collaborative.
- **Membership.** Participants should:
    - represent a range of stakeholders (energy office and utility commission staff, program administrators, EM&V technical consultants, consumer groups/advocates and environmental stakeholders),
    - have expertise in EM&V issues and methodologies,
    - be consistently engaged over a period of time,
    - be representative of a group of customers (rather than just one entity), and
    - have the ability to intervene in the proceeding if consensus is not reached.[53]

Several states have used collaboratives to develop statewide EM&V materials, including Arkansas, Illinois and California. Also, South Carolina Electric & Gas Company (SCE&G) has a board to advise them on EM&V matters.[54]

When it started in 2006, the first tasks assigned the collaborative in Arkansas, referred to as the Parties Working Collaboratively (PWC), were related to EM&V. To date, the collaborative has developed

[52] SEE Action Network. 2015.

[53] Based on a discussion at a Rhode Island Energy Efficiency Collaborative meeting on January 14, 2016. The Collaborative is a subcommittee of the Energy Efficiency and Resource Management Council (EERMC).

[54] SEE Action Network. 2015.

Technical Reference Manuals, EM&V Protocols, and net-to-gross savings adjustments. Since 2013, the PWC role has expanded beyond EM&V issues to provide on broader energy policy issues.

The PWC is composed of 20 different organization and entities, including the seven utilities, Commission staff, the Attorney General and its expert consultants, the State Energy Office, EM&V contractors, program implementers, expert consultants, the industrial customer group, commercial customer representatives, community action agencies with its expert consultants, low-income advocates, and colleges and technical schools. The collaborative is facilitated by an Independent Evaluation Monitor. The PWC debates and resolve issues in working group-style meetings that occur outside of a formal commission proceeding. In this more casual setting, stakeholders can exchange information and debate freely with one another, be more transparent about their positions, and let their positions evolve over the course of the working group process. The group is encouraged to reach consensus, and when it does a group settlement or position paper can replace briefs filed by each party in a docket. An important aspect of the PWC is that consensus is not required. There is a process for dispute resolution in which minority parties may petition the Commission directly to appeal any majority decision.[55]

The Illinois Energy Efficiency Stakeholder Advisory Group (SAG) has met monthly since it was formed in 2008. The SAG is tasked with helping program administrators modify and improve energy efficiency programs to achieve their energy efficiency and demand response goals. SAG EM&V responsibilities include developing the TRM and TRM Policy Document and resolving any other EM&V issues.

South Carolina Electric & Gas Company (SCE&G) has a utility-specific advisory group established by Commission order. Among other things, the group is tasked with reviewing and improving SCE&G's EM&V plans.

Evaluation Process Recommendations

The Commission should establish procedures for independent oversight of evaluation and require its electric utilities to document the evaluation process. Further, the SCC should develop guidance on the timing of evaluation studies. An inclusive collaborative process should be established following the principles laid out above. Membership should include a range of stakeholders, including representation by the Virginia Energy Efficiency Council; the SCC; the Department of Mines, Minerals and Energy; program administrators, including investor-owned utilities and cooperatives; and EM&V technical consultants. Invitations should be extended to the Attorney General's Office, environmental stakeholders in the energy efficiency proceedings (e.g., Chesapeake Climate Action Network and Appalachian Voices) and consumer groups (e.g. the Virginia Committee for Fair Utility Rates).

Reporting of EM&V Study Results

Consistent EM&V reporting has a multitude of benefits. It allows for more meaningful comparisons with other utility energy efficiency programs within and across jurisdictions, in order to identify best practices and improve program performance. It increases transparency and supports more informed participation

[55] Johnson, K. and M. Klucher. 2014.

and feedback by stakeholders in resource planning decisions. It allows results to be aggregated in order to inform state, regional, and national policy impacts, system planning, and forecasting. It can help support the claim of savings for air quality plans.[56] Further, it can help to streamline EM&V efforts.

A common framework for reporting EM&V methods, assumptions, and results can help Virginia realize these benefits. A number of reporting guidelines are currently available or are under development. As an example, the NEEP standardized reporting forms were developed by the Cadmus Group in consultation with the representatives of the states of Connecticut, Delaware, Massachusetts, Maryland, New Hampshire, New York, Rhode Island, and Vermont, as well as DOE and the U.S. Environmental Protection Agency (EPA).[57] While some modifications to the current version NEEP EM&V reporting forms are needed to fully align them with EPA's proposed EM&V reporting requirements, new versions of the forms are anticipated in 2016.[58] The NEEP forms have the advantage of being supported by a number of Virginia's neighboring states. Furthermore, the NEEP forms will likely be incorporated into or consistent with the National Energy Efficiency Registry.

We recommend that the Virginia SCC adopt a transparent reporting framework, such as the new version of the NEEP reporting forms, and require EM&V contractors to use them.

Emerging EM&V Approach - EM&V 2.0

Review of Literature

New information and communications technologies (ICT) are changing the way energy efficiency program administrators implement their programs and conduct EM&V on their efficiency measures, projects, and programs. Examples of relevant ICT include, but are not limited to, smart meters, smart thermostats and devices, and non-intrusive load metering (NILM) devices.[59] These technologies extract granular energy consumption data in different ways in a timely manner, and allow new data analytics software to store, track, and analyze the data in near real time using cloud-based software. This capability allows program administrators to implement automated M&V, which takes advantage of automated data processing to produce building energy profiles, estimate savings potential, or estimate whole-building energy savings in near real time.[60] This new approach for evaluating measures, projects, and programs based on emerging ICT is called EM&V 2.0.

---

[56] Wallace, P. *The Value of Consistent, Transparent Energy Efficiency Reporting Across the Country: Current and Future Uses*. Northeast Energy Efficiency Partnerships. (Undated) Available at http://www.neep.org/sites/default/files/resources/SEE%20Action%20REED-Methods%20Presentation.pdf.

[57] Available at http://www.neep.org/initiatives/emv-forum/model-emv-methods-standardized-reporting-forms

[58] Wallace (Undated).

[59] Details of these ICTs are described in: DNV GL 2015, *The Changing EM&V Paradigm*; and, ACEEE 2015, *How Information and Communications Technologies Will Change the Evaluation, Measurement, and Verification of Energy Efficiency Programs*.

[60] DNV GL. 2015c. The Changing EM&V Paradigm – A Review of Key Trends and New Industry Developments, and Their Implications on Current and Future EM&V Practices, p. 34.

The way EM&V 2.0 estimates savings has similarity to traditional billing analysis. Billing analysis uses an adjusted baseline, modeled using actual metered consumption data in the pre-program period, to estimate what future building energy use would be absent the energy efficiency measure. The advantage of EM&V 2.0 over traditional methods such as billing analysis is that EM&V 2.0 estimates data in real time without needing a site visit. Thus, it can more easily develop baseline consumption and estimate savings in numerous buildings in near real time.

There are a number of potential benefits for EM&V 2.0 approaches:

Potential cost reduction: EM&V 2.0 can potentially cut costs associated with M&V practices in several different ways:

(a) Traditional M&V approaches involve site visits to verify installations and measure consumption or other operational parameters. EM&V 2.0 can reduce the need for these onsite visits and measurement by implementers and evaluators.[61] EM&V 2.0 is more difficult for complex buildings and industrial facilities, and for certain projects that are likely to have new baselines (e.g., new construction, natural replacement, and early replacement).[62] While EM&V 2.0 is not likely to eliminate the need for onsite measurement and analysis for complex premises—such as a large industrial facility with unique processes and operating patterns—combining smart meter data with additional information from a customer's energy management system will enable much more sophisticated modeling of heterogeneous building baselines and widen the field of prospects for business sector energy efficiency.[63]

(b) EM&V 2.0 can be scaled quickly and easily. It can also evaluate more projects and more programs with marginal incremental cost.[64] Further, the value of additional data is not likely to decrease with EM&V 2.0 as the more timely data available for analysis, the more accurate the analysis is likely to be.[65]

Improvements to TRM: EM&V 2.0 tools can collect more accurate and granular energy data in a timely manner. The results of EM&V 2.0 can be used to refine, calibrate, and assess the accuracy of deemed savings values in a TRM.[66]

Net to gross calculations: Given the large volume of data that could be obtained through automated M&V, evaluators can develop statistical models to detect naturally occurring trends that affect energy

[61] ACEEE. 2015. p. vi, p. 27.

[62] DNV GL. 2015c, p. 34, p. 37.

[63] ACEEE. 2015, p, 26.

[64] ACEEE. 2015, p. 29.

[65] ACEEE. 2015, p. 28; EnergySavvy 2015a, p. 8.

[66] EnergySavvy. 2015b. Comments of EnergySavvy to the EPA on the EM&V Provisions in the Proposed Model Trading Rule and Draft EM&V Guidance for the Clean Power Plan.

consumption both in the treated group and in an untreated group (or a comparison group). They can then estimate net energy savings adjusted for the naturally occurring trends.[67]

Market assessment and program delivery: Virtual audits, remote audits, and virtual assessment—subsets of automated M&V/EM&V2.0 functionality—can identify and engage potential customers as they assess investments in energy conservation measures or are pursuing maintenance and operational changes to improve energy efficiency. These remote assessments of potential customers allow program administrators to use customer-specific data in targeted marketing and customer engagement campaigns. Examples of this application would be to engage the largest potential energy savers or potential savers in highly specific geographical areas (geo-targeting) to reduce loads on constrained distribution grids. Con Edison has a geo-targeting program that adopted the latter approach.[68]

Process evaluation: EM&V 2.0 provides deep, granular insights that empower utilities to optimize the program through the year and address issues prior to the start of the next program year.[69] For example, if measured savings are not as expected, utilities and implementers can try to identify why measures are not performing as predicted. They can then attempt to fix them on the fly or come up with further measures to meet the target.[70] Some examples of factors influencing project performance include an individual measure, specific contractor, zip code, or building type.[71]

Program planning: As EM&V 2.0 can provide a prediction of the expected end-of-year savings data, utilities can know whether their programs are on track to meet annual goals.[72] Further, this ongoing learning of energy savings performance and targeted market assessment discussed above will allow utilities to improve their program designs for the new program year.

While EM&V 2.0 could provide these benefits discussed above, it also faces a number of potential limitations or challenges. Two of these challenges are discussed above: (a) EM&V 2.0 is difficult to apply to certain projects with new baselines that are different from the existing baseline; and (b) it is more difficult to apply to complex buildings with heterogeneous energy profiles. Some of the additional limitations and challenges include: (c) additional costs for collecting, storing, and validating a much

[67] EnergySavvy. 2015a, p. 8; ACEEE 2015, p. 28.

[68] DNV GL. 2015c, p. 39.

[69] EnergySavvy. 2015a. p. 10.

[70] ACEEE. 2015, p. 27.

[71] EnergySavvy. 2015a. p. 10.

[72] EnergySavvy. 2015a. p. 9.

larger amount of energy consumption data;[73] (d) transparency and standardization of automated M&V protocols;[74] (e) data ownership, access, privacy, and security.[75]

To date, many utilities and program administrators have launched pilot programs to test the data analytics of EM&V 2.0 services with a focus on identifying and engaging program participants, and providing rapid and continuous feedback to customers on the changes in energy consumption.[76] One interesting example is the "On Ramp Pilot" project conducted by the Maryland Energy Administration (MEA) on behalf of PEPCO. This pilot used Retroficiency's data analytics software called "Virtual Energy Assessment" (VEA) which uses meter data to disaggregate end uses to identify candidate buildings and systems for efficiency improvements. The pilot focused only on energy savings measures related to operational improvements and provided both remote and on-site assessments to three Montgomery Country Maryland schools.[77,78]

The pilot began analyzing energy data using VEA for eight schools and identified three schools with the best no-cost operational improvement opportunities. The selected schools were further assessed through phone conversations with building management and on-site audits in order to identify specific operational recommendations. An example of savings opportunities is that after one-off night events, school operations were not always quickly set back to their optimal control setting for typical usages. After the schools implemented some of the recommendations, Retroficiency began estimating realized savings with its "Efficiency Track" automated M&V software. This software uses proprietary algorithms based on IPMVP Option C to automatically generate a weather- and occupant-normalized consumption baseline, and estimate savings by comparing the metered consumption against the baseline. Interestingly, measured savings were 23 percent, 15 percent, and 1 percent respectively for the three schools, despite the fact that the buildings implemented the same measures. One of the potential reasons for this difference is a construction event for one building during the measurement period that may have increased energy consumption. This pilot is a good example of where automated M&V/EM&V 2.0 is effective in finding problems, and also underscores the need for standardized methods for documenting and accounting for observed events, such as baseline adjustments when using interval data.[79]

[73] DNV GL. 2015c, p. 63; ACEEE 2015, p. 32.

[74] DNV GL. 2015c, p. 60; ACEEE 2015, p. 33.

[75] ACEEE. 2015, p. 36.

[76] ACEEE. 2015, p. 27. DNV GL 2015c, p. 58.

[77] Operational improvements present a substantial opportunity to save energy in the commercial sector; but MEA considered attaining savings in this area to be difficult, partly due to a lack of standardized programmatic EMV protocol.

[78] DNV GL. 2015c, p. 66-67.

[79] DNV GL. 2015c, p. 66-67.

Recommendations

Virginia utilities should work together to develop EM&V 2.0 pilot projects for the residential and commercial sector to assess various potential benefits discussed above for EM&V, market assessment, program delivery, process evaluation, and program planning. Virginia should also collaborate with surrounding states and regional organizations such as the Southeast Energy Efficiency Alliance and the Northeast Energy Efficiency Partnership to exchange knowledge and experience on EM&V 2.0 projects and programs.

Levelized Cost of Saved Energy

Definition and Application

Energy efficiency program costs can be presented in a useful standardized metric called the levelized cost of saved energy (LCOSE). LCOSE is "the cost of acquiring energy savings that accrue over the economic lifetime of the energy efficiency effort program/sector/portfolio, amortized over that lifetime and discounted back to the year in which the costs are paid and the actions are taken."[80,81]

There are several ways in which the LCOSE can be applied:

- It can be used to compare the levelized cost of energy efficiency resources with the levelized cost of supply-side resources.
- It can be used to compare energy efficiency programs within a program administrator's portfolio.
- It can be used to compare energy efficiency programs and portfolios across program administrators, and across states and regions.

While the LCOSE is a useful metric to compare efficiency resources with each other and with supply-sided resources, it should not be used to screen efficiency resources, i.e., to determine which resources are cost-effective. Energy efficiency cost-effectiveness should be evaluated using net present values of the stream of annual costs and benefits, and should conform to best practices for energy efficiency screening.[82]

---

[80] LBNL. 2014. *The Program Administrator Cost of Saved Energy for Utility Customer-Funded Energy Efficiency Programs.* Available at https://emp.lbl.gov/sites/all/files/lbnl-6595e.pdf.

[81] This calculation should not be confused with two other cost calculations often made by program administrators: the cost of lifetime saved energy ($/lifetime kWh saved) and cost of first-year saved energy ($/annual kWh saved). While these calculations can also be useful, they do not enable apples-to-apples comparisons of programs implemented in different years as the costs are not discounted back to the same year dollars. Also, the cost of first-year saved energy does not enable apples-to-apples comparisons of programs with different measure lifetimes as the levelized costs are spread evenly across the period over which savings are accruing (LBNL 2014).

[82] See, for example: *The Resource Value Framework: Reforming Energy Efficiency Cost-Effectiveness Screening*, National Efficiency Screening Project, August 2014.

The LCOSE can be calculated for natural gas or electric energy efficiency programs. In this section, we discuss the calculation for electric energy efficiency programs.

Inputs

The key inputs for calculating the LCOSE include: (1) an assumed real or nominal discount rate,[83] (2) the total program administrator costs, (3) the annual energy saved, and (4) the lifetime energy saved. Definitions for each of these key inputs follow.

> Discount rate: an interest rate applied to a stream of future costs to convert those values to a common period, typically the current or previous year.[84]
>
> Total program administrator cost: all of the costs to the program administrator to design, market, administer, and evaluate an energy efficiency portfolio, sector, program, or program category,[85] as well as any technical support, incentives, or rebates offered to program participants, retailers, distributors, and contractors.
>
> Annual energy saved: the reduction in energy consumption due to actions taken by participants in an energy efficiency program in a given program year. These energy savings are annualized to represent a full year of savings, regardless of when the measure was implemented within the program year. Annual energy saved includes only incremental savings, representing new savings realized over that year (as opposed to cumulative savings, which include savings realized from the installation of an energy efficiency measure in a previous program year). The savings can be presented on a gross or net, claimed (pre-evaluation) or evaluated basis, as program administrator reporting is not consistent. [86]
>
> Lifetime energy saved: the reduction in energy consumption due to actions taken by participants in an energy efficiency program over the expected lifetime of the measure.

Total program administrator costs, annual energy saved, and lifetime energy saved are obtained from program administrators, often via energy efficiency plans and reports. There is a vast pool of literature on appropriate discount rates for policies that involve resource investment. The U.S. Bureau of

---

[83] It is important to apply a nominal discount rate when the values are in current or nominal dollars and a real discount rate when the values are in constant dollars, as the discount rate can have a significant impact on the levelized cost of saved energy. The real discount rate can be approximated by subtracting expected inflation from the nominal discount rate.

[84] SEE Action Network. 2012.

[85] Some program administrators do not allocate costs for marketing, education, and evaluation to programs.

[86] SEE Action Network. 2012.

Economic Analysis's Implicit Price Deflator is a useful source for converting nominal values to real values.

Calculation

A 2014 report by the Lawrence Berkeley National Laboratory provides the formula for the LCOSE, shown below.[87] We view this report as one of the best resources for information on how to best calculate the cost of saved energy.

> LCOSE = (Program administrator cost x Capital recovery factor) / (Annual energy saved)
>
> Where:
>
> Capital recovery factor = [Discount rate x (1 + Discount rate) ^ Weighted average measure life]/[(1 + Discount rate) ^ Weighted average measure life – 1]
>
> Weighted average measure life = Lifetime energy saved[88]/Annual energy saved

Discussion and Recommendations

Arriving at a levelized cost requires much standardization of some key variables such as discount rate and energy savings types (e.g., gross vs. net, line loss included or not) to ensure that comparisons are valid. Whenever possible, all program administrators within a single state should use common definitions and practices to enable comparisons of energy efficiency programs. Program comparisons can enable a better understanding of the range of costs of certain program categories and the drivers of cost differences, identify best practices that deliver robust services at a relatively low cost, and inform program design improvements. [89]

The following are some common standardization problems, as well as recommendations for standards that states should use for the data inputs into the levelized cost of saved energy calculation. The standards should be consistent across program administrators, and over time. Thus, it is important that the Commission provide guidance on how this metric should be presented.

- Consistent definitions of savings.
    - Annual and lifetime energy savings can be gross, rather than net, and claimed, rather than evaluated. While net, evaluated savings are more accurate, gross, claimed savings are more frequently and consistently reported by program administrators. Program administrators should work towards a more consistent

[87] LBNL. 2014.

[88] Lifetime energy savings are not consistently provided in program administrator plans and reports. If this input is not provided, a weighted average measure life can be estimated using a measure life from like programs in other jurisdictions.

[89] Further, PJM Interconnection, ISO-New England, and New York ISO require consistent, rigorous reporting of the values used as inputs to the LCOSE in order to account for demand-side resources, including energy efficiency, in load forecasting.

definition, and reporting, of net savings. When greater consistency is achieved, net savings should be used instead of gross savings.

  - Annual and lifetime energy savings should represent savings at the end-use or site instead of at the busbar or power plant level (i.e., accounting for transmission and distribution losses), as this is what most program administrators report.

- Consistent definitions of costs.

  - Program administrator costs should explicitly include all of the costs required to implement the programs, as defined above. When calculating the LCOSE for individual energy efficiency programs, the program administrator costs should not include any utility performance incentives. However, when calculating the LCOSE for an entire portfolio of energy efficiency resources, any utility shareholder incentives should be included in the program administrator costs.

- Consistent units. To be consistent with data previously collected and reported by the Lawrence Berkeley National Laboratory (LBNL 2014), the levelized cost of saved energy should be reported in dollars per kWh of energy saved.

- Consistent discount rates. All program administrators should use the same discount rate or the same guidance for developing an assumed discount rate. As mentioned above, the discount rate can have a substantial impact on the calculated levelized cost of saved energy. It is also noteworthy that the discount rate is the only input that is assumed and not calculated directly from program administrator data. As a result, the approach for developing an assumed discount rate is of particular importance. A 2014 NEEP report entitled *Cost-Effectiveness Screening Principles and Guidelines: For Alignment with Policy Goals, Non-Energy Impacts, Discount Rates and Environmental Compliance Costs*, is a good reference for guidance on discount rate assumption. [90]

The following are some improvements to reporting transparency that Virginia can put into practice immediately.

- Report the calculation of LCOSE, all inputs used in calculating the LCOSE for each program and sector, and the source of inputs in reporting.

- Report program cost and savings data using common definitions and terminology for key inputs into the calculation of the levelized cost of saved energy. Please see LBNL's 2013 report.[91] This memo provides common definitions and terminology for these key

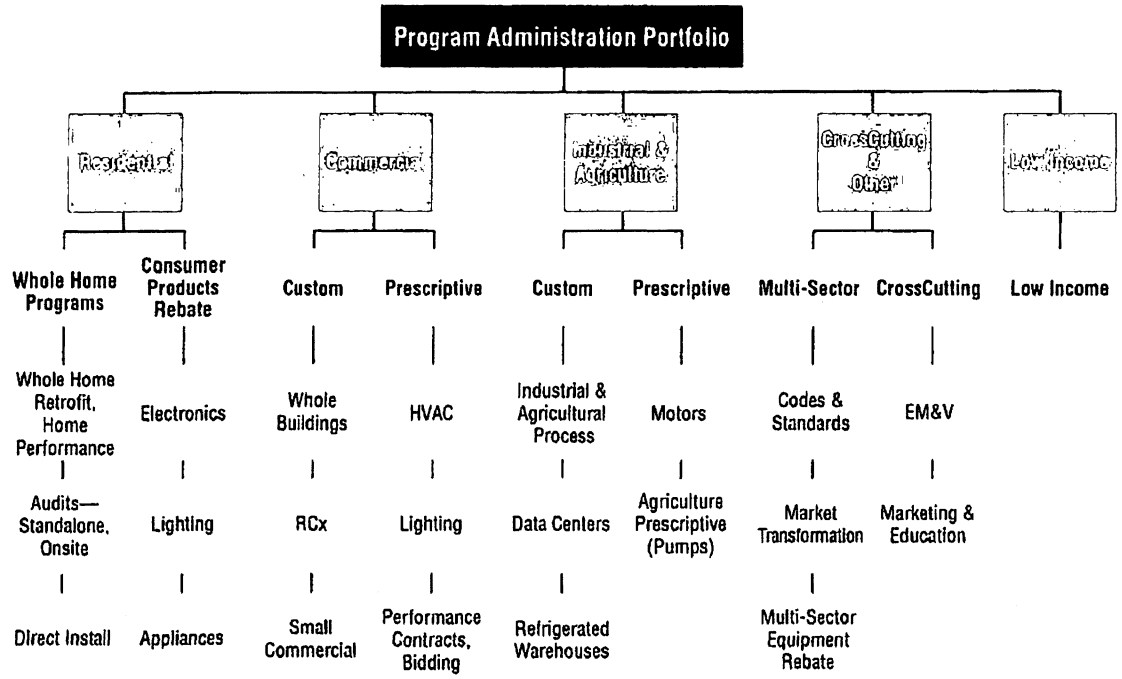
[90] NEEP. 2014. Cost-Effectiveness Screening Principles and Guidelines: For Alignment with Policy Goals, Non-Energy Impacts, Discount Rates and Environmental Compliance Costs. Available at http://www.synapse-energy.com/sites/default/files/Cost-Effectiveness%20Screening%20Principles%20and%20Guidelines%2014-059.pdf.

[91] Hoffman, I.M., M.A. Billingsley, S.R. Schiller, C.A. Goldman and E. Stuart. 2013. Energy Efficiency Program Typology and Data Metrics: Enabling Multi-State Analyses Through the Use of Common Terminology. LBNL-6370E. Available at: https://emp.lbl.gov/sites/all/files/lbnl-6370e.pdf.

inputs. LBNL also released a policy brief and reporting template to assist jurisdictions in further improving reporting consistency.[92]

- Categorize and report using common naming conventions for program sectors and categories.[93,94] This may require program administrators to add new fields to their reporting databases. Common program sectors and categories can be used to group programs and enable optimization of the LCOSE for programs in the same sector or category. One way to group program sectors and categories is presented in Figure 3 below from LBNL's 2013 report.[95]

Figure 3. Ratepayer-funded energy efficiency program grouping conventions



Source: LBNL. 2013. Energy Efficiency Program Typology and Data Metrics: Enabling Multi-State Analyses Through the Use of Common Terminology.

[92] Rybka, G.M., I.M. Hoffman, C.A. Goldman, and L.C. Schwartz. 2015. Flexible and Consistent Reporting for Energy Efficiency Programs: Introducing a New Tool for Reporting Spending and Savings for Programs Funded by Utility Customers. LBNL-1003879. Available at: https://emp.lbl.gov/publications/flexible-and-consistent-reporting

[93] LBNL. 2014.

[94] Barbose, G. L., C.A. Goldman, I. M. Hoffman, and M. A. Billingsley. 2013. *The Future of Utility Customer-Funded Energy Efficiency Programs in the United States: Projected Spending and Savings to 2025*. LBNL-5803E.

[95] Hoffman, I.M., et al. 2013.

Attachment B
Peer State EM&V Protocols
EM&V Overview: Arkansas and Georgia
Completed by the Southeast Energy Efficiency Alliance
Arkansas
Framework
Many key issues in Arkansas' efficiency decision-making are developed through a longstanding utility stakeholder collaborative, known as the Parties Working Collaboratively (PWC). Among the issues that have been resolved through this process are the development and usage of a state technical reference manual, specific EM&V protocols, net-to-gross savings adjustments, approaches for quantifying non-energy benefits and carbon cost assumptions. The PWC operates based on a set of procedural guidelines, which chart a path toward, in many cases, a consensus recommendation.
Evaluation Approaches

Each year, the PWC updates the Arkansas Technical Reference Manual (TRM), which describes EM&V protocols for the EERS programs. The TRM includes deemed savings and the associated underlying assumptions.

Utilities subject to Arkansas' energy efficiency resource standard (EERS) have a two-tiered EM&V process, where each utility program is evaluated individually by a third-party contractor through both process and impact evaluations. These results, in turn, are evaluated at an aggregate level by a Commission-hired independent evaluation monitor (IEM). While we are concerned that having multiple evaluators can be costly, we do see value in the role a commission-hired IEM could provide.

The IEM ensures a level of consistency among the electric and gas utilities delivering programming under the EERS. The IEM's duties are as follows:

- "Assures compliance with national Evaluation, Measurement, and Verification ('EM&V') best practices, and Commission approved protocols and the Arkansas TRM.
- Manages timely updates and/or expansion of deemed savings and the TRM are pursued.
- Oversees and coordinates the activities of the TRM Technical Manager.
- Gives feedback on draft measure characterizations from other parties.
- Coordinates with Staff on recommendation for TRM revision to the Commission.
- Manages and updates TRM manuals (after Commission approval of changes).
- Ensures proper use of TRM in annual savings verification process."[6]

The standardization and oversight provided by the IEM allows for leverage of resources throughout the evaluation process, as well as the ability to distill key improvements and lessons learned from across the programs. The IEM submits an annual summary report to the Commission evaluating the work of the utilities' EM&V contractors over the program year.

Collaborative Forums
Arkansas utilities report net savings. In Program Year 2015, Arkansas' three investor-owned electric utilities currently covered by the EERS spent an average of 3.13 percent of their budgets on EM&V activities.

[6] http://www.johnsonconsults.com/presentations/IEPPEC%202014%20All%20Together%20Now%20AR.pdf

Reporting
Each covered IOU files process and impact reports annually on May 1st. Utilities file a narrative report, as well as a standardized Excel workbook articulating key cost, participation and savings metrics.
References
Arkansas PSC Docket No. 10-100-R Evaluation, Measurement & Verification Protocol Rules for EM&V.
Arkansas PSC Docket No. 10-010-U Notice of Inquiry into Energy Efficiency (http://www.apscservices.info/pdf/10/10-010- u_150_1.pdf).
Arkansas PSC Docket No. 06-004-R Rules for Conservation and EE Programs Order (http://www.apscservices.info/Rules/energy_co nservation_rules_06-004-R.pdf.
Arkansas Technical Reference Manual, Version 5 (http://www.apscservices.info/EEInfo/TRM5.pdf).
PWC procedural guidelines (http://www.apscservices.info/pdf/13/13-002-u_153_1.pdf).

Georgia
Framework
The Georgia Public Service regulates Georgia Power – the only electric, investor-owned utility in the state of Georgia. Georgia Power evaluations of its programs via a third-party evaluator. Georgia Power conducts both process and impact evaluations.
Collaborative Forums
Since 2004, the Georgia Public Service Commission has regularly convened a Demand Side Management Working Group (DSM Working Group). The DSM Working Group is a stakeholder collaborative charged with implementing a DSM Program Planning Approach to develop and manage Georgia Power's energy efficiency programs.
Evaluation Approaches
According to the terms of Georgia's IRP rules, evaluators may calculate savings through a variety of approaches, including a "comparison of demand patterns of similar participant and nonparticipant groups, and/or use of customer bill analysis, engineering estimates, end-use meter data, or other methods to identify the gross and net impacts of program participation on customers' usage and demand patterns."[7]
Georgia Power typically reports gross savings, and in the past, has allocated 5 percent of their program budget to EM&V activities.
Reporting
Georgia Power files quarterly and semi-annual progress reports, including key metrics like participation, program costs and marketing information. Semi-annual reports provide more detailed information. As a general rule, program impact evaluations are conducted on a two-year cycle.
Resources
Georgia PSC Docket No. 31082 final order (http://facts.psc.state.ga.us/Public/GetDocument.aspx?ID=129660).
Georgia IRP Rules (http://rules.sos.state. ga.us/cgi-bin/page.cgi?g=GEORGIA_PUBLIC_SERVICE_COMMISSION%2FGENERAL_RULES%2FINTEG).

[7] Georgia IRP Rules.

Attachment C
List of EM&V Resources
Compiled by the American Council for an Energy Efficient Economy

Program and Portfolio-Level EM&V

[ACEEE] American Council for an Energy-Efficient Economy. *State and Local Policy Database.* http://database.aceee.org/state/evaluation-measurement-verification

[EIA] US Energy Information Administration. 2013. *State Energy Efficiency Program Evaluation Inventory.* https://www.eia.gov/efficiency/programs/inventory/

[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

[DOE] Department of Energy. Uniform Methods Project. http://energy.gov/eere/about-us/ump-protocols

Joint Comments on Energy Efficiency in the Environmental Protection Agency's Proposed Rate-Based Federal Plan. 2016. http://aceee.org/regulatory-filing/joint-comments-rate-based-012116

State and Local Energy Efficiency Action Network. 2012. *Energy Efficiency Program Impact Evaluation Guide.* Prepared by Steve R. Schiller, Schiller Consulting, Inc. http://www4.eere.energy.gov/seeaction/publication/energy-efficiency-program-impact-evaluation-guide

Kushler, M. et al. 2012. *A National Survey of State Policies and Practices for the Evaluation of Ratepayer-Funded Energy Efficiency Programs.* Washington, DC: ACEEE. http://aceee.org/research-report/u122

Kushler, M. et al. 2014. *Examining the Net Savings Issue: A National Survey of State Policies and Practices in the Evaluation of Ratepayer-Funded Energy Efficiency Programs.* Washington, DC: ACEEE. http://aceee.org/research-report/u1401

[NEEP] Northeast Energy Efficiency Partnerships. *The Changing EM&V Paradigm.* Lexington, Mass.: NEEP. http://www.neep.org/changing-emv-paradigm

[NREL] National Renewable Energy Laboratory. 2014. *Chapter 17: Estimating Net Savings: Common Practices. The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures.* Golden, CO.: NREL. http://energy.gov/sites/prod/files/2015/01/f19/UMPChapter17-Estimating-Net-Savings.pdf

[NREL] National Renewable Energy Laboratory. 2013. *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures.* Golden, CO.: NREL. http://www.nrel.gov/docs/fy13osti/53827.pdf

[RAP] Regulatory Assistance Project. 2014. *Energy Efficiency Evaluation, Measurement, and Verification: A Regional Review of Practices in China, the European Union, India, and the United States.* http://www.raponline.org/document/download/id/7064

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

Cost-Effectiveness Screening

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

[NEEP] Northeast Energy Efficiency Partnerships. 2014. *Cost Effectiveness Screening Guidelines.* Lexington, Mass.: NEEP. http://www.neep.org/cost-effectiveness-screening-guidelines-2014-0
[NESP] National Efficiency Screening Project. 2014. *Resource Value Framework.* http://www.homeperformance.org/sites/default/files/nhpc_nesp-recommendations_20140816.pdf
[RAP] Regulatory Assistance Project. 2012. *Energy Efficiency Cost-Effectiveness Screening: How to Properly Account for "Other Program Impacts" and Environmental Compliance Costs.* http://www.raponline.org/document/download/id/6149

Project-Level M&V

[ASHRAE] American Society of Heating, Refrigerating, and Air-conditioning Engineers. 2002. *Guideline 14-2014: Measurement of Energy, Demand, and Water Savings.* Atlanta, GA: American Society of Heating, Refrigerating, and Air-conditioning Engineers. http://www.ashrae.org.
[DOE] Department of Energy. Uniform Methods Project. http://energy.gov/eere/about-us/ump-protocols
[EVO] Efficiency Valuation Organization. 2009. *International Performance Measurement and Verification Protocol (IPMVP): Concepts and Options for Determining Energy and Water Savings, Volume 1.* http://www.evo-world.org.
[FEMP] Federal Energy Management Program. 2015. *M&V Guidelines: Measurement & Verification for Performance-Based Contracts, Version 4.0.* Washington, DC: Department of Energy, Federal Energy Management Program. http://energy.gov/sites/prod/files/2016/01/f28/mv_guide_4_0.pdf

Additional Resources Consulted by the Virginia Energy Efficiency Council

https://energy.mo.gov/energy/about/missouri-technical-reference-manual-work-plan

ACEEE Intelligent Efficiency Conference; Presentation by Greg Lovett of Ameren of Missouri; Unique Insights from Usage Data: Leveraging Savings Measurement Software; December 7, 2015, Boston MA. http://aceee.org/sites/default/files/pdf/conferences/ie/2015/Session3C-Lovett-IE15-12.7.15.pdf

Madria Barnes

From:	zmiller@vahousingalliance.org
Sent:	Wednesday, May 25, 2016 4:58 PM
To:	PUE_Comments
Subject:	Case Comments Submission for Case # PUE-2016-00022
Importance:	High
Follow Up Flag:	Follow up
Flag Status:	Flagged

The following case comments were submitted online Wednesday, May 25, 2016 at 4:57:31 PM

Full Name: Mr. Zack Miller
Group or Organization: Virginia Housing Alliance
Address Line One: 205 N. Robinson St.
Address Line Two:
City, State, Zip: Richmond, Virginia 23220
Email: zmiller@vahousingalliance.org
Case Number: PUE-2016-00022
Comments: This comment is made on behalf of the Virginia Housing Alliance along with Community Housing Partners, Virginia Community Capital, Housing Virginia, project:HOMES, Richmond Region Energy Alliance, Norfolk Redevelopment and Housing Authority, Viridiant, Virginia Poverty Law Center, Conway Green Construction, and Natural Resources Defense Council in reference to SCC case number PUE-2016-00022. These organizations form the core of a collaborative Virginia Multifamily Energy Efficiency Coalition made up of a diverse set of housing and energy professionals working to improve the efficiency of the Virginia's affordable multifamily housing stock. We commend the SCC for its timely attention to the area of considering the adoption of uniform evaluation, measurement, and verification (EM&V) protocols in Virginia in response to House Bill 1053 and Senate Bill 395 that passed in the 2016 General Assembly session. Our comments will focus on the merits and benefits our group believes would come from the adoption of uniform EM&V rather than provide specific technical suggestions as some other groups are submitting. We are grateful to Synapse Energy Economics Inc. for making available their technical memorandum in regards to the case which informed portions of our comments. Our group believes in the critical value of residential energy efficiency programs, especially those aimed at serving low-income renter households who are unlikely to have resources or incentive to make their own efficiency investments and would benefit the most from utility savings in their family budgets. A 2015 study from the Center for Housing Research at Virginia Tech analyzed actual utility usage in Low-Income Housing Tax Credit projects in Virginia built or renovated to EarthCraft standards found that the energy improvements in the program saved the average tenant over $600 a year, an amount that improved housing affordability by 9.3% for the extremely low-income renters living in these buildings. National groups such as the Natural Resources Defense Council, National Housing Trust and Energy Foundation also attest to the significant potential of energy efficiency programs targeting affordable multifamily housing. A 2015 study through their Energy Efficiency for All (EEFA) initiative found that with proper investment in this sector, by 2035 Virginia could cost effectively reduce electricity use in multifamily affordable buildings by 28% (838 GWh) and gas usage by 19% (1,497 BBtu), ultimately realizing $2.90 in benefits for every dollar invested. As promising as these numbers from Virginia Tech and EEFA are, they would hold much more value if they utilized uniform standards in the assumptions and calculations they made. Particularly in the case of the Virginia Tech study that analyzed actual usage data, the study could serve as part of the body of knowledge about efficiency programs in Virginia and allow for the comparison of the EarthCraft program's results with

others in the state. We believe that effective EM&V protocols that include uniform protocols, levelized costs and savings and 3rd party verification would help both utilities and the SCC make optimal decisions on the most effective and economic programs. We believe that as EM&V is implemented in Virginia and the body of energy savings data grows, the SCC will be given a clearer picture of the tradeoff between ratepayer funding of programs against the benefits to those the programs serve and can base its decisions on the actual results of similar programs, relying on as few assumptions as possible. Making the results of EM&V efforts public would also allow stakeholders such as our group to provide more valuable input to utilities and the SCC as well as better communicate to the public on the benefits of the programs the SCC oversees, sharing data that all parties have the highest level of confidence in. This group would also strongly urge the SCC to consider allowing for and encouraging the use of information and communication technologies (ICT) or what is commonly termed EM&V 2.0. Utilizing new utility tracking technologies such as smart meters reduce EM&V implementation costs, can scale relatively easily, can provide more up-to-date usage data at shorter intervals, and provide more granular data than traditional methods. These factors make pursuing EM&V 2.0 a sensible option in Virginia as more advanced and streamlined technologies continue to develop. We recommend transparent, timely reporting of EM&V findings, including "benchmarking" against results from comparable states and national and regional databases where possible. Lastly, we believe that it is absolutely critical to include a truly 3rd party review of EM&V findings in whatever protocols are developed. An outside review of the EM&V results that verifies the protocols were followed the same for every participating utility across different areas of the state and associated with different fuel types is essential to producing comparable, high quality data. We thank the SCC for this opportunity to provide input on this important and far-reaching issue. It is our hope that the SCC will take all of the comments and those of others as a sign that there is a strong constituency in the state that supports and sees the value in moving the state towards adopting uniform EM&V protocols.

Virginia Poverty Law Center

E info@vplc.org
T 804.782.9430
F 804.649.0974
www.vplc.org

919 E. Main St.
Suite 610
Richmond, VA 23219

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

RE: PUE-2016-00022
May 24, 2016

Dear Mr. Peck,

On behalf of the Virginia Poverty Law Center, I am pleased to submit the following comments in response to Case No. PUE-2016-00022. The comments provide feedback to the Cost/Benefit Questions and Objectives for utility energy efficiency programs outlined in the State Corporation Commission's order.

The Virginia General Assembly's passage of House Bill 1053 and Senate Bill 395 this year signals a significantly increased interest in expanding energy efficiency opportunities in the Commonwealth. The Virginia Poverty Law Center is excited by the prospect of programs and public policies that provide new opportunities for more cost effective and efficient methods of meeting energy needs. We are particularly interested in how these methods positively impact and benefit lower-income and other underserved communities in Virginia. Therefore, we urge the State Corporation Commission to adopt comprehensive measures to fully evaluate, monitor, and track the many benefits that energy efficiency programs have on the lives of individuals and families throughout Virginia.

A recent report released by the American Council for an Energy-Efficient Economy (ACEEE) in April of this year examined energy costs of households in 48 large American cities, including Virginia Beach and Richmond. It found that low-income single and multi-family households, as well as minority families in general, pay much more in energy costs as a percentage of their overall income than the average American household. In fact, the study found that the "median energy burden for low-income households is more than two times that of the median household (7.2% and 3.5%, respectively), and three times greater than higher income households (2.3%)." As a result, when paying their energy bills, far too many families do so at the expense of other essential household necessities, such as food, clothing, and transportation.

Numerous entities have published studies detailing the positive value of energy efficiency programs for families. For example, one study found that every dollar invested in energy efficiency programs will save nearly three dollars in energy costs in multi-family housing. Energy costs can vary widely from month-to-month in homes that are not properly equipped with the most up-to-date weatherization and energy efficiency measures. Long-term energy savings and more stable and predictable monthly energy bills provide enormous value to our

Virginia Poverty Law Center

lower-income and underserved communities in Virginia. They help families accurately budget their income, thus making funds available to address other important needs for the household.

The Commission has the critical task to establish protocols to measure and verify the impacts of energy efficiency measures. The Virginia Poverty Law Center recommends that the Commission take a holistic approach to evaluating and measuring the effectiveness of energy efficiency programs and consider their full impacts. Although some benefits of energy efficiency programs are challenging to measure, there are many significant positive outcomes for families in underserved communities. Some of these benefits are non-energy related. These non-energy benefits, also known as NEBs, increasingly include positive health impacts derived from living in a cleaner environment and reduced maintenance costs resulting from upgraded systems.

We believe that robust energy efficiency efforts along with expanded federal weatherization and bill assistance programs are much needed throughout the Commonwealth. This is especially true for Virginians living in multi-family and lower-income households, as lack of resources or up-front capital make beneficial changes challenging. When the Commission evaluates and reports on the programs it studies, we hope it will compare its results with those of similar states. This will provide an opportunity to determine if Virginia is utilizing best practices in program design and implementation. Doing so will help Virginia make progress towards energy savings while improving access to successful programs for families in need.

The energy efficiency programs that are approved and implemented will result in dramatic improvements for many households. The Virginia Poverty Law Center hopes the State Corporation Commission will create comprehensive and uniform evaluation methods that acknowledge the need for more utility-funded programs. We also hope that the total savings potential provided by the programs available to families will be realized.

Thank you for the opportunity to provide our input to the Commission for this important study.

Sincerely,

Dana Wiggins and Ben Greenberg

The Virginia Poverty Law Center

Madria Barnes

From: kc.bleile@viridiant.org
Sent: Wednesday, May 25, 2016 4:51 PM
To: PUE_Comments
Subject: Case Comments Submission for Case # PUE-2016-00022

Importance: High

Follow Up Flag: Follow up
Flag Status: Flagged

The following case comments were submitted online Wednesday, May 25, 2016 **at** 4:50:53 PM

Full Name: Mrs. KC Bleile
Group or Organization: Viridiant
Address Line One: 1431 W. Main Street
Address Line Two:
City, State, Zip: Richmond, VA 23220
Email: kc.bleile@viridiant.org
Case Number: PUE-2016-00022
Comments: May 24, 2016 Joel H. Peck, Clerk Document Control Center State Corporation Commission 1300 E. Main Street, Tyler Building 1st Fl. Richmond, VA 23219 Ex Parte: In the matter of receiving input for evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures Case No. PUE-2016-00022 Attention SCC: Dear Mr. Peck, In response to SCC Scheduling Order Case No. PUE-2016-00022, dated March 30th 2016, we offer the following comment on behalf of Viridiant (formerly EarthCraft Virginia). Viridiant is a Richmond-based non-profit organization committed to the advancement of sustainable, affordable and energy-efficient construction, through education and technical support serving Virginia, Washington D.C and Maryland. Over the last decade we have helped homeowners, builders, and developers achieve significant energy savings on their deep energy retrofits and new construction projects affecting nearly 19,000 Virginia families of all incomes. Our partners include the Home Builders Association of Virginia (HBAV), Virginia Housing Development Authority (VHDA), Habitat for Humanity of Virginia (HFHVA), and Southface Energy Institute. We serve on VHDA's Rental Housing Advisory Board and the newly formed Multifamily Energy Efficiency Coalition. Framing Our Perspective In February 2015, the Virginia Center for Housing Research (VCHR) at Virginia Tech's published The Impact of Energy Efficient Design and Construction on LIHTC Housing in Virginia1. This two year study was focused on measuring the efficacy of the our program and energy modeling method. The work analyzed 15 EarthCraft Certified Multifamily projects across the state of Virginia. It found on average, projects consumed 16.6% less energy than energy modeling predictions and consumed less 30% energy compared to standard housing in Virginia2. This level of measured and verified performance translated to $648 annual energy savings to low income families. Executive Takeaway 4 in the report noted the value of 3rd party verification in achieving high levels of energy performance in residential buildings. McCoy et al. (2015) noted, "In the design process, green certification agents add value as independent, third parties that implement green buildings. This study notes the need for concurrent process that integrates designers, contractors, managers and other stakeholders critical to estimating and implementing the long-term goals of a green building. The integration of a "concurrent certification" process needs to begin early, continue throughout the design-build-operate process and can be measured along the way for better results in energy savings." Based on our experience in the advancement of energy efficient construction, we support: • The development of uniform protocols for measuring, verifying, validating and reporting the impacts of energy efficiency measures implemented; and • Establishment of

methodology for estimating annual kilowatt savings and a formula to calculate the levelized cost of saved energy for such energy efficiency measures; and • Opportunities to improve the cost/benefit test application using enhanced evaluation and verification protocols for estimating savings actually realized. We support the evaluation and establishment of uniform protocols, methodologies and formula for measuring, verifying, validating, and reporting the impact(s) of energy efficiency measures implemented by investor-owned electric utilities and investor-owned natural gas utilities conducting energy efficient programs in the Commonwealth of Virginia. In other states, such uniform protocols, methodologies, and formula have been incorporated into consolidated Technical Resource Manuals (TRM); examples of which can be found for Arkansas,California, Illinois, Maine, Massachusetts, Michigan, Mid-Atlantic (Maryland, Delaware & D.C.), Minnesota, New Mexico, New York, Ohio, Pennsylvania, Texas, Tennessee Valley Authority (covers most of Tennessee, portions of Alabama, Mississippi, and Kentucky, and parts of Georgia, North Carolina, and Virginia), and Vermont. These TRM provide consistent saving values and formulas, for investor owned utility program administrators to follow and the location of savings to be realized (source or end use). Such uniform protocols, methodologies, and formula shall be derived from a consensus process drawing upon established and recognized by industry organizations and standards such as RESNET,ASHRAE (Standards 90.1 and 90.2), NRDC, DOE (COMcheck and REScheck), EPA (ENERGY STAR®), NIBS/BETEC, IECC, and ACEEE, and guided by exisiting TRM available. We support the establishment of a methodology for estimating annual kilowatt savings, recommend limiting the use of deemed savings for EM&V programs as emerging technologies can provide more accurate performance based reporting, and support a formula to calculate the levelized cost of saved energy for such energy efficiency measures. We are well experienced in helping our partners navigate multiple energy efficiency measures to optimize energy savings through the EarthCraft family of programs, which outlines prescriptive and incentive based measures during project design, includes preliminary energy modeling, site visits throughout construction, documentation of project details including but not limited to equipment sizing,installation, quality of installation of products/systems, diagnostic testing and final energy modeling to project whole building energy use and net savings. As we've coordinated several near net-zero and confirmed net-zero projects, we've begun analysis on actual utility performance. Through our project specific M&V program, we have amassed valuable project data and begun quantifying our results. As we've incorporated utility tracking systems in our projects, we commend the SCC's support for automated M&V in approved Demand Side Management Programs (DSM) including AMI or smart metering. For projects of increasing complexity, we see value in automated M&V's ability to capture performance based data in real time. We've used this approach to verify our results, calibrate our programs, identify affordable options towards energy efficiency and better understand variables such as occupant behavior. Advances in Data Collection and Automation Technologies New information and communication technologies (ICT) available allow program administrators to operate programs more efficiently and effectively. Examples of ICT include, but are not limited to: smart meters, smart thermostats and devices, and non-intrusive load metering (NILM) devices. Automated M&V offers real time feedback to program administrators and is anticipated to be more cost effective than reliance on traditional onsite inspections. Viridiant has utilized meter-level and circuit-level monitoring systems to evaluate the efficacy of energy efficiency measures and the impact of occupant behavior on net-zero and small commercial buildings in Virginia. The ability to efficiently gather energy consumption data has allowed our organization to calibrate our own program models to better serve the energy conservation goals of our clients and mission. Tests & Tools With consideration to the objective and the cost/benefit tests, energy efficiency program evaluation relies on legislative mandates (VA Code Section 56-585.1.A.5.c3). Virginia uses four of the five traditional cost/benefit tests identified: Total Resource Cost (TRC), Utility Cost Test (UCT) Participant (PCT) and Ratepayer Impact Measure (RIM) and specifies the RIM to be the primary test for decision, recognizing 2012 rules prohibit rejecting or screening out energy efficiency measures based on the results of any one test. Consideration to include the fifth test, the Societal Cost Test (SCT), which Cadmus' Who's Perspective? The Impact of the Utility Cost Test4 abstract notes, "varies from the TRC in two ways: 1) while the TRC uses an average cost of capital discount rate, the SCT uses a societal discount rate and 2)the SCT also includes all quantifiable benefits attributable to program, such as avoided pollutants, water savings, detergent savings, and other non-energy benefits" (Daykin, 2012). Per a Cadmus survey, the TRC was found to be the prominent cost-effective test5 but that more jurisdictions are relying on the UCT, and recommends DSM

be screened by the "TRC for cost comparison with supply side resources" and "rely on the UCT as the threshold test for program approval and cost recovery" (Daykin, 2012). Furthermore, Energy Efficiency Cost Considerations for State Compliance Plans6 by the Southeast Energy Efficiency Alliance (SEEA) notes that these cost/benefit tests can vary in results due to, "at what level the test is applied (measure, program or portfolio); what discount rate is used; if savings are reported as net or gross and if a net-to gross ration (NTG) is being applied; if non-energy benefits (NEBs)are accounted for; and if greenhouse gas emissions assumptions are included" (Southworth & Fox, 2015)identifies the four most common tools used to evaluate cost and cost-effectiveness of energy efficiency programs: levelized cost of energy, levelized cost of saved energy, acquisition cost and cost effectiveness tests7. Given the application of these various tests and tools, Virginia must carefully consider the best approach to result in the most cost effective impact. Development and Management of TRM Further, based on successful models, we recommend a group of stakeholders be established to develop and update the TRM. Representation shall include Virginia Department of Mines Minerals & Energy, investor-owned utilities and investor-owned natural gas utilities providing services in the Commonwealth, the Office of the Attorney General, electric cooperatives and EM&V technical consultants. To this end, and based on our experience in achieving significant energy savings, we are interested in serving in the development and management of the uniform TRM. Sincerely, KC Bleile Executive Director, Viridiant 1 Virginia Center for Housing Research (VCHR), Virginia Tech, 2015. The Impact of Energy Efficient Design and Construction on LIHTC Housing in Virginia, Contract Report submitted to Housing Virginia, Richmond, VA. Retrieved January 15, 2016, from http://www.vchr.vt.edu/wpcontent/ uploads/2015/02/Housing-VA-LIHTC-Study-Full-Report.pdf

2https://www.eia.gov/consumption/residential/reports/2009/state_briefs/pdf/va.pdf 3 VA Code Section 56-585.1.A.5.c 4 Daykin, E. et al. 2012 Who's Perspective? The Impact of the Utility Cost Test. Cadmus. Retrieved May 24, 2016, from http://www.cadmusgroup.com/wpcontent/ uploads/2012/11/TRC_UCT-Paper_12DEC11.pdf 5 Cadmus 2012, p. 2 6 Southworth, K & Fox, A. 2015 Energy Efficiency Cost Considerations for State Compliance Plans. Southeast Energy Efficiency Alliance. Retreived May 24, 2016 from http://www.seealliance.org/wp-content/uploads/Resource-Paper-5-Energy-Efficiency-Costs-FINAL.pdf 7 SEEA 2015, p.6