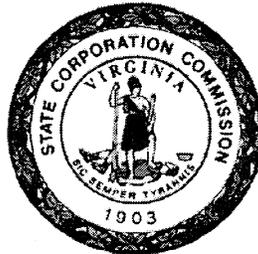


Commonwealth of Virginia
State Corporation Commission

**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

COMMONWEALTH OF VIRGINIA

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STATE CORPORATION COMMISSION

December 1, 2016

TO: The Honorable Terry McAuliffe
Governor, Commonwealth of Virginia

Members of the Virginia General Assembly

The State Corporation Commission is pleased to transmit its report regarding its recent evaluation of 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; 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, pursuant to Chapters 255 and 517 of the 2016 Acts of the General Assembly. As always, we will gladly provide additional information or assistance upon request.

Respectfully submitted,

Handwritten signature of James C. Dimitri in black ink.

James C. Dimitri
Chairman

Handwritten signature of Judith Williams Jagdmann in black ink.

Judith Williams Jagdmann
Commissioner

Handwritten signature of Mark C. Christie in black ink.

Mark C. Christie
Commissioner

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EXECUTIVE SUMMARY

Executive Summary

In accordance with Chapters 255 and 517 of the 2016 Acts of the Virginia General Assembly, the State Corporation Commission ("Commission") conducted a proceeding focused primarily on various aspects of the evaluation, measurement and verification ("EM&V") of energy efficiency programs¹ offered by utilities (the "Evaluation").² Because the costs of utility-sponsored energy efficiency programs are paid by ratepayers, the programs are subject to approval by the Commission. As provided for in the Code of Virginia, when approval is sought by a utility, the Commission evaluates the projected costs and benefits of the proposed program using certain industry-standard cost/benefit tests to assure that the additional costs to be borne by most ratepayers are reasonable in light of the benefits received.³ To date, the Commission has approved numerous programs for both electric and gas utilities,⁴ some of which did not pass all tests.⁵ Once a program receives approval and is implemented, utilities conduct evaluations of the

¹ Energy efficiency programs are generally programs designed to reduce the use of energy by participating customers. Common types of utility-sponsored energy efficiency programs include money for some customers to purchase more energy-efficient appliances, such as HVAC, refrigerators, and water heaters; money to upgrade lighting fixtures; and money to improve existing insulation.

² Specifically, the General Assembly directed the Commission: (i) 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; (ii) the establishment of a methodology for estimating annual kilowatt savings; and (iii) a formula to calculate the levelized cost of saved energy for such energy efficiency measures.

³ See Code §§ 56-576, 56-600. Pursuant to Code § 56-585.1 A 5, certain large industrial customers are exempt from paying the costs of energy efficiency programs approved under that section. Certain other large non-residential customers may opt out of paying for energy efficiency programs.

⁴ A complete list of current programs may be found in Attachment A to this report.

⁵ Examples of such programs and measures include: CGV's High Efficiency Gas Furnace Measure (approved in Case No. PUE-2015-00072); WGL's High Efficiency Reporting Program (implemented by OPower) (approved in Case No. PUE-2015-00138); APCo's Manufactured Housing ENERGY STAR® Program (approved in Case No. PUE-2014-00039); and Dominion's Small Business Improvement Program (approved in Case No. PUE-2015-00089).

program's actual performance, commonly referred to in the industry as EM&V, to determine, among other things, if the program has performed as expected, is cost-effective, and whether modifications may be needed.

Because an important part of EM&V is an evaluation of the cost and benefits of the program as implemented compared to the original projections used in the cost/benefit tests to support program approval, the Commission also considered whether the cost/benefit analyses are being conducted similarly by investor-owned electric and gas utilities.⁶

The Commission received written comments from 23 interested persons and entities and oral comments from 20 interested persons and entities at a public session. The Commission Staff ("Staff") also presented written and oral comments.

Upon completing its Evaluation, including consideration of all written and public comments, the Commission concludes as follows.

- First, with regard to the establishment of uniform protocols, the Commission finds it appropriate to promulgate formal regulations related to the EM&V of utility sponsored energy efficiency programs. Specifically, the Commission directs its Staff to draft proposed rules, incorporating Virginia-specific data where possible, to be considered in a separate docketed proceeding. Participants in the upcoming rulemaking may propose their own amendments to the draft rules should they desire to do so.
- Second, a method for estimating annual kilowatt savings is a related component of EM&V and will be included in the rulemaking.

⁶ With respect to the cost/benefit tests, as part of the Evaluation, the Commission considered: (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 desirable; and (iii) whether the application of the cost/benefit tests can be improved by enhanced evaluation and verification protocols for estimating savings actually realized.

- Third, a separate formula to calculate the levelized cost of saved energy ("LCSE") from energy efficiency measures or programs is unnecessary because an LCSE has limited application and does not consider all the costs and benefits that would be captured in connection with a more comprehensive approach to EM&V.
- Fourth, the application of costs and benefits is generally consistent across utilities, and warrants no further formal standardization at this time.

Accordingly, the Commission will direct its Staff to draft proposed rules regarding EM&V and anticipates commencing a formal rulemaking proceeding during the first quarter of 2017, with associated public notice, an opportunity for comment by interested persons and entities, and a hearing before the Commission.

I.
Introduction and Procedural History

Chapters 255 and 517 of the 2016 Acts of the Virginia General Assembly⁷ are set forth

below:

§ 1. That the State Corporation Commission (the "Commission") shall 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 Commission shall promptly commence such evaluation following the effective date of this act and shall receive input from interested parties and the Department of Mines, Minerals and Energy ["DMME"]. The Commission shall submit to the Governor and the General Assembly a report of its findings and recommendations by December 1, 2016.

In accordance with the General Assembly's statutory directive, the Commission opened the Evaluation in advance of the effective date of the acts in order to receive timely input by issuing a Scheduling Order ("Scheduling Order") on March 30, 2016.

In its Scheduling Order, the Commission determined that the Evaluation should be conducted to consider the establishment of: (i) 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; (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.

In addition to the Evaluation directed by Chapter 255 and Chapter 517, the Scheduling Order also included a request for input from interested persons and entities related to the

⁷ Chapter 255 (Senate Bill 395) and Chapter 517 (House Bill 1053) of the 2016 Acts of Assembly, effective July 1, 2016.

methodologies by which utilities calculate the components of the requisite cost/benefit tests in proceedings requesting approval to implement energy efficiency programs.⁸ In particular, the Commission included the following questions ("Cost/Benefit Questions") related to the cost/benefit tests in its evaluation: (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.

In the Scheduling Order, the Commission established that a public session would be convened on July 12, 2016, for purposes of receiving comments from interested persons and entities; directed the Clerk of the Commission to provide copies of the Scheduling Order to DMME, the investor-owned electric utilities and natural gas companies serving customers in the Commonwealth, and the Office of the Attorney General's Division of Consumer Counsel ("Consumer Counsel"); directed the Staff to provide copies of the Scheduling Order to persons and entities identified by the Staff as potentially having an interest in this matter; and invited written comments from interested persons or entities by May 25, 2016. The Scheduling Order also directed the Staff to file a Staff Report by June 24, 2016.

The Commission received written comments from the following persons and entities: U.S. Green Building Council; DMME; EnergySavvy; Appalachian Power Company ("APCo"); the Business Council for Sustainable Energy; Kentucky Utilities Company d/b/a Old Dominion Power Company; Columbia Gas of Virginia, Inc., Virginia Natural Gas, Inc., and Washington

⁸ See *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, Doc. Con. Cen. No. 160340071, Scheduling Order (Mar. 30, 2016).

Gas Light Company ("collectively, the "Natural Gas Utilities"); the Virginia Energy Efficiency Council ("VAEEC"); Virginia Electric and Power Company d/b/a Dominion Virginia Power ("Dominion"); the Virginia, Maryland & Delaware Association of Electric Cooperatives ("Cooperatives"); Environmental Entrepreneurs; the Southern Environmental Law Center, Appalachian Voices, and the Chesapeake Climate Action Network (collectively, "Environmental Respondents"); the American Council for an Energy-Efficient Economy ("ACEEE"); Advanced Energy Economy; the North American Energy Standards Board; AJW, Inc.; the Virginia Housing Alliance ("VHA"); Viridiant; the National Resources Defense Council ("NRDC"); Opower; the Virginia Conservation Network; the Virginia Poverty Law Center ("VPLC"); the Honorable Albert C. Pollard, Jr.; and Staff. (These comments are included in the Appendix to this report)

On July 12, 2016, the Commission held a public session and received comments from the following persons and entities: EnergySavvy; Advanced Energy Economy; APCo; Consumer Counsel, Office of the Attorney General; the VAEEC; Dominion; DMME; the Cooperatives; Environmental Respondents; VHA; Viridiant; NRDC; VPLC; Consumers Union; the Virginia Sierra Club; Virginia Interfaith Power and Light; Social Action Linking Together; the Virginia Catholic Conference; the Local Energy Alliance Program; Howard Spinner; and Staff.⁹

II. DEFINITIONS

As used in this report, the following terms shall be defined as set forth below:

Cost-Benefit Tests:

Participant Test - The purpose of the Participant Test is to estimate the costs and benefits for those customers who choose to participate in a given conservation or energy

⁹ The Natural Gas Utilities also were present at the public session but stated during the session that they would rely on their filed comments. Tr. 45.

efficiency program, and thus, is a measure of the attractiveness of a given program to potential participants. It does not, however, capture the complexities and diversity of customer decision-making. The benefits in the calculation of the test are the reductions in participating customers' bills, any incentive paid by utilities or third parties, and any federal, state, or local tax credit received. The costs are any out-of-pocket expenses incurred by participants and any bill increases that participants incur.

Program Administrator Test (also known as the "Utility Cost Test") – This test measures the net costs of a conservation or energy efficiency program as a resource option to the program administrator or the utility. For a given utility, the Program Administrator Test indicates the difference between a utility's avoided costs and the utility's costs to implement the program. The test does not include participants' costs, and thereby, reflects only a portion of the full costs of a program. The benefits considered are the avoided costs of energy and demand. The costs are the program or implementation costs for the utility, the incentives paid to participants, and any increased supply costs that may result from the program.

Ratepayer Impact Measure Test (also known as the "RIM Test" or the "Non-Participant Test") – The RIM Test provides an indication of any change in rate levels as a result of a program. In other words, it is an indication of the impact of a program on customer bills or rates due to changes in utility revenues and operating costs caused by the program. As its alternative name, the Non-Participant Test, indicates, the test provides a measure of the impact of a conservation or energy efficiency program on customers who do not participate.

The benefits considered in this test are the avoided supply costs related to transmission, distribution, capacity, and generation (if applicable). The avoided supply costs are measured as a reduction in total costs or revenue requirements as a result of the program. Any revenue gain resulting from a conservation or energy efficiency program is also considered a benefit. The costs used in this test are the program costs incurred by the utility and/or other entities incurring costs for creating or administering the program, the incentives paid by the utility, and any revenue loss associated with a program. Any increased supply cost resulting from a program's implementation is also considered a cost.

Total Resource Cost Test (also known as the "TRC Test") – The TRC Test is an indicator of net cost of a conservation and energy efficiency program based on the total costs including the participants' and the utility's costs. It has sometimes been called the All Ratepayers Test. It may be considered an indicator of the change in the average cost of energy services across all customers. In another sense, it may be considered as the summation of the benefit and cost terms in the Participant Test and the RIM Test. In this latter respect, the test ignores the issue of cross-subsidies between program participants and non-participants. The benefits used to calculate this test are the avoided supply costs and any applicable federal, state, and/or local tax credits. The costs in the test calculation are the utility's program costs, the net participant costs, and any increased utility supply costs.

Demand-side Management: Demand-side management (DSM) programs consist of the planning, implementing, and monitoring activities of electric and gas utilities which are designed to encourage consumers to modify their level and pattern of energy usage.

Deemed Value: Assumptions used in the evaluation, measurement, and verification of energy efficiency measures and programs that are derived from professional judgement, engineering estimates, and other available data.

Energy Efficiency Impact: Verified reductions in energy and/or demand usage attributed to an energy efficiency measure or program.

Energy Efficiency Measure: A project or technology intended to reduce energy usage of a process, building or other structure while providing the same or improved level of service to the consumer.

Energy Efficiency Program: A group of energy efficiency measures that are designed for similar end-uses (*e.g.*, refrigeration) or for specific customer classes (*e.g.*, residential).

Evaluation, Measurement, and Verification (EM&V): A collective term encompassing the methods and processes used to assess the effectiveness and performance of energy efficiency measures and programs.

Levelized Cost of Saved Energy: The present value of per kilowatt-hour cost of an energy efficiency measure or program over its economic life, converted to equal annual payments. Costs are levelized in real dollars (*i.e.*, adjusted to remove the impact of inflation).

Technical Resource Manual (TRM): A compilation of standardized assumptions and energy savings calculations for selected energy efficiency measures.

Uniform Protocols: Standard procedures for the measurement and verification of energy savings derived from energy efficiency measures and programs that can be applied uniformly across utilities throughout the Commonwealth.

III. DISCUSSION

Part 1 – General Assembly Directives

A. Evaluation of the Establishment of Uniform Protocols for Measuring, Verifying, Validating, and Reporting the Impact of Energy Efficiency Measures Implemented by Investor-Owned Electric Utilities

Generally, interested entities and persons supplying comments to the Commission supported the development or adoption of protocols. The record shows that there are several examples of uniform protocols designed for general application for electric utilities. The most

prominent of such protocols have been developed through the U.S. Department of Energy ("DOE") or organizations affiliated with DOE. For example, DOE has established the Uniform Methods Project ("UMP") in order to develop a set of protocols for determining energy savings from energy efficiency measures and programs. The UMP is an ongoing project of DOE. DOE also has facilitated the State and Local Energy Efficiency Action Network ("SEE Action"). SEE Action has developed the Energy Efficiency Program Impact Evaluation Guide ("SEE Action Evaluation Guide") as a resource to assist with energy efficiency program evaluation.¹⁰

The most well-known EM&V protocol associated with DOE is the International Performance Measurement and Verification Protocol ("IPMVP"). The Efficiency Valuation Organization ("EVO")¹¹ developed the IPMVP, which was updated most recently in 2012. The IPMVP is the most well-known set of uniform protocols for general application and, in general, has served as the foundation for the established protocols discussed above as well as protocols in other jurisdictions. According to the SEE Action website, "The IPMVP is an internationally recognized best practice protocol and is the leading [measurement and verification] industry protocol in the United States." As noted in the Staff Report, the IPMVP, by providing general guidelines to energy savings measurements, is primarily a framework for developing detailed EM&V methods and plans.

Several interested entities and persons, including DMME, supported the use of one of the protocols discussed above.¹² DMME supported the use of the SEE Action Evaluation Guide, the

¹⁰ Other organizations, such as the North American Energy Standards Board and PJM Interconnection, LLC, also have developed sets of general protocols.

¹¹ According to the organization's website, EVO began as "a committee of volunteers who came together under a DOE 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.

¹² As noted above, interested entities and persons generally supported the use of uniform protocols; however, many of the comments did not specify particular protocols.

UMP, or the IPMVP. The Virginia Conservation Network encouraged the use of the UMP. The Environmental Respondents supported the IPMVP among other options, and Dominion and APCo suggested the use of the UMP or IPMVP.

Each set of uniform protocols described above may have certain strengths and weaknesses. Further, it is most efficacious to ensure that appropriate flexibility in design and implementation of uniform protocols is maintained to accommodate the EM&V of a potentially diverse array of proposed energy efficiency measures and programs, as well as any novel measures and programs that may be designed by investor-owned electric utilities. The Commission does not believe that a mechanical, formulaic protocol or approach that limits discretion to consider the overall public interest with respect to programs is helpful or appropriate.

The Commission finds that it is appropriate to promulgate formal regulations related to the EM&V of energy efficiency programs of general applicability to both electric and natural gas utilities ("Proposed Rules"). The goal of these Proposed Rules is to achieve, to the extent possible, reliable and consistent estimation of energy savings and related impacts at a reasonable and appropriate cost; to provide guidance to utilities in planning and offering energy efficiency programs; and to provide a transparent basis for assessing cost-effectiveness of proposed programs. The Commission will consider the Proposed Rules in a separate docketed proceeding, anticipated to commence during the first quarter of 2017, with associated public notice, an appropriate opportunity for comment by interested persons and entities, and a hearing before the Commission.

The Proposed Rules will include general standards and procedures, consistent with prior Commission precedent, with respect to measuring, verifying, validating, and reporting on the

impacts of energy efficiency measures. Previous orders by this Commission have contained relevant directives that also will be considered in the Proposed Rules. For example, in Case No. PUE-2010-00084, the Commission found that "[t]he use of purely secondary sources of formulae and data generated from outside of Virginia is less rigorous at measuring and verifying decreased consumption of electricity from [Dominion's Compact Fluorescent Light] Program than Virginia-specific data would be."¹³ Similarly, with respect to the EM&V of Columbia Gas of Virginia's Conservation and Ratemaking Efficiency Plan, the Commission directed that "annual reports . . . shall utilize Company-specific data to analyze the natural gas savings for each measure, program, and overall portfolio."¹⁴

B. Evaluation of the Establishment of a Methodology for Estimating Annual Kilowatt Savings

A method for estimating annual kilowatt savings is a related component of EM&V and will be included in the rulemaking. Interested persons and entities supporting the establishment of a methodology for estimating annual kilowatt savings generally supported accomplishing this through the establishment of a technical resource manual ("TRM"). For example, Dominion, APCo, and DMME suggested the use of a TRM. The Environmental Respondents also suggested the development of a TRM. TRMs are reference documents that provide standardized assumptions and energy savings calculations for energy efficiency measures implemented by electric and gas utilities. TRMs have been developed and employed in multiple jurisdictions.

¹³ *Application of Virginia Electric and Power Company, For approval to continue two rate adjustment clauses, Rider 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. 22, 2011).*

¹⁴ *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).*

As the evidence shows, TRMs rely heavily on deemed values. Deemed values are energy savings estimates and other assumptions that are based on professional judgement, engineering calculations, and available assumptions rather than direct measurement. These estimates can introduce considerable inaccuracy into estimates of energy savings derived from TRMs. For instance, Staff presented an example taken from the Mid-Atlantic TRM¹⁵ where the energy savings related to low-flow showerheads were based on dated water use estimates from 1998 that were never intended for general application. An examination of extant TRMs also revealed that many deemed values are derived from assumptions that are not specific to the jurisdiction to which they are applied. Thus, substantial questions exist as to the reliability and accuracy of TRMs for use in estimating annual kilowatt savings.

While TRMs may be of some value in the consideration of new energy efficiency measures and programs that are proposed to the Commission for approval, the Commission believes that estimates of annual kilowatt or kilowatt-hour savings should be, where possible, based upon Virginia-specific data so as to reflect as closely as possible the actual savings achieved through the energy efficiency measures and programs implemented by investor-owned electric utilities in the Commonwealth.

As the Commission has previously recognized, even if a methodology is sound and consistent with the definition of "measured and verified" in Code § 56-576, "the reasonableness of its use for determining cost effectiveness or lost revenues will be further dependent upon the

¹⁵ The Mid-Atlantic TRM is produced by the Regional Evaluation, Measurement and Verification Forum ("EM&V Forum"). The EM&V Forum is facilitated by the Northeast Energy Efficiency Partnerships, Inc. The Mid-Atlantic TRM is a well-known TRM that is often referenced in the evaluation of energy efficiency measures implemented in the mid-Atlantic states.

actual application thereof."¹⁶ The data used in such methodology must meet a sufficient level of rigor and credibility. For example, the Commission also has previously determined that "[t]he use of purely secondary sources of formulae and data gathered from outside of Virginia is less rigorous at measuring and verifying decreased consumption of electricity . . . than [using] Virginia-specific data would be."¹⁷ The Commission also has recognized that mistakes can be made in the application of a methodology, samples can be taken incorrectly, and general statistical approximations may be applied in methodologies where it is not appropriate to do so.

The Evaluation has indicated that estimation of annual kilowatt savings to the most acceptable extent of reliability can be accomplished through each investor-owned electric utility's EM&V process as enhanced by the Proposed Rules to be promulgated as described above. The respective EM&V processes, properly conducted, should yield the most reliable and appropriate estimates of annual kilowatt savings for these utilities.

Consistent with this determination, the Commission declines to formally adopt a TRM in this proceeding. Notwithstanding, participants in the upcoming rulemaking may propose their own amendments to the draft rules should they desire to do so.

C. Evaluation of a Formula to Calculate the Levelized Cost of Saved Energy for Energy Efficiency Measures

Interested persons and entities provided varying degrees of support for the establishment of a formula for the LCSE, including DMME, Dominion, APCo, Advanced Energy Economy, ACEEE and the Environmental Respondents; however, several of these interested persons and entities

¹⁶ *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, 2012 S.C.C. Ann. Rept. 298, Order (Apr. 30, 2012).

¹⁷ *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. 22, 2011).

suggested that an LCSE should not be used as the primary metric for the evaluation of energy efficiency programs.

While the mathematical methodology for an LCSE is relatively standard, disagreements can arise concerning the proper inputs to include in the formula depending upon the purpose for which the formula is to be utilized. As a measure of cost-effectiveness, and as several comments indicate, an LCSE is an inadequate indicator of the cost-effectiveness of an energy efficiency measure or program because an LCSE formula does not include any component to account for the value of saved energy. Moreover, as the Staff pointed out in its comments, an LCSE does not provide an "apples-to-apples" comparison with the cost of electricity generation. An LCSE is informative with respect to the relative costs of energy efficiency measures and programs but does not provide any new information beyond that contained in the cost/benefits tests set forth in § 56-576 of the Code.

Thus, the Commission does not believe it is appropriate to establish an LCSE at this time. An LCSE formula has limited application and will not consider all the costs and benefits captured in connection with a more comprehensive approach to EM&V.

Part 2 – Commission's Cost/Benefit Questions

In responding to the cost/benefit questions, several interested persons and entities commented on the Commission's evaluation of the cost/benefit tests specified in §§ 56-576 and 56-600 of the Code. The comments of these interested persons and entities addressed a perceived reliance by the Commission on the RIM Test when considering approval of proposed energy efficiency measures and programs.

Despite representations to the contrary, the Commission's current and ongoing policies would not provide for rejection of any energy efficiency measure or program proposed by an electric or gas utility solely on the basis of the RIM Test. In fact, the Commission cannot legally reject a proposed energy efficiency program or portfolio of programs solely on the basis of one

of the four requisite cost/benefit tests pursuant to §§ 56-576 and 56-600 of the Code but, rather, must make its determinations with respect to proposed measures and programs following an analysis of all four of the requisite cost/benefit tests enumerated in the Code. To date, the Commission has approved numerous programs for both electric and gas utilities, some of which did not pass the RIM Test.¹⁸

As noted in the Staff Report, notwithstanding that many criticisms of the RIM Test have been offered, singling out the RIM Test for criticism ignores the mathematical nature of the requisite cost/benefit tests.¹⁹ The four cost/benefit tests are mathematically interrelated. Each test provides a measure of cost-effectiveness from a particular perspective – that of the participant, the utility, the non-participating ratepayers, and all ratepayers (participants and non-participants). The tests are not designed to be used individually or in isolation.²⁰ (Tables listing the energy efficiency measures and programs currently implemented by the investor-owned electric and natural gas companies serving customers in the Commonwealth may be found in Attachment A to this report.)

While criticism of the RIM Test has led to comments that rejection of energy efficiency measures by the Commission has resulted in higher electric bills for customers in the Commonwealth relative to national averages, the Commission is not aware of any empirical analysis that lower average electricity bills in a given state are solely attributable to the

¹⁸ Examples of such programs and measures include: CGV's High Efficiency Gas Furnace Measure (approved in Case No. PUE-2015-00072); WGL's High Efficiency Reporting Program (implemented by OPower) (approved in Case No. PUE-2015-00138); APCo's Manufactured Housing ENERGY STAR® Program (approved in Case No. PUE-2014-00039); and Dominion's Small Business Improvement Program (approved in Case No. PUE-2015-00089).

¹⁹ The four cost/benefit tests (see the Definitions section above) required by §§ 56-576 and 56-600 of the Code originated with the California Standard Practice Manual ("CSPM") published by the California Public Utilities Commission. The Commission generally follows the CSPM practices when evaluating the cost/benefit tests of proposed energy efficiency measures and programs.

²⁰ CSPM, July 2002 at 6.

effectiveness of that state's utility-sponsored energy efficiency programs. In this regard, a study undertaken by Staff showed that Virginians use electricity for heating and cooling to a much greater extent than the national average but that Virginia residential customers consume approximately four percent less total energy than the national average. Staff's research also found that compared to other states ranked highly by the ACEEE for their effort in energy efficiency, Virginia consumes less total energy than many highly ranked states.

D. Whether the Application of Costs and Benefits Is Consistent Across Utilities

As explained by the Staff, the CSPM defines and discusses the cost/benefit tests required by §§ 56-576 and 56-600 of the Code and the application of costs and benefits is generally consistent with the CSPM and, furthermore, is generally consistent across utilities in Virginia. However, the Commission also acknowledges that consistent application of costs and benefits in electric and natural gas utilities cost/benefit analysis will not always yield similar results across all electric and natural gas utilities. This is particularly true for utilities serving different geographic areas of the Commonwealth. Further, differences in each utility's approach to EM&V could have impacts on the cost-effectiveness evaluations of each utility's ongoing programs. As APCo commented, the four cost benefit tests required by § 56-576 of the Code and interpreted using the CSPM are the industry standard, but a lack of uniform EM&V protocols could lead to differences in how utilities approach their EM&V.

E. Whether Consistent Application of Costs and Benefits Across Utilities Is Necessary or Reasonable

As noted above, consistent application of costs and benefits will not necessarily result in consistent results among programs. There are various geographical and demographical differences in the Commonwealth that can affect various inputs into the calculation of utilities' costs and benefits. For example, Northern Virginia experiences approximately 30% more

heating degree days annually than the Tidewater region. Similarly, the Eastern Piedmont region of the Commonwealth experiences approximately twice the number of cooling degree days than does the Southwest Mountain region. Such differences can have impacts on the energy savings assumed or realized through similar energy efficiency programs. Also, as noted in APCo's comments and those of Staff, there may be other instances where it may be reasonable for the components of the costs and benefits to differ.

The Commission believes that consistent application of costs and benefits does not preclude consideration of such differences in assessing the costs and benefits of energy efficiency measures and programs when these differences affect the costs and benefits of similar programs. However, under appropriate circumstances, the criteria for cost-effectiveness under §§ 56-600 and 56-576 of the Code have a proper degree of generality to allow the Commission to determine whether the consistent application of costs and benefits across utilities is reasonable. The Commission will not, at this time, require further standardization of the application of the cost/benefit tests; however, the Commission may revisit this determination at a later time as circumstances require.

F. Whether the Application of the Cost/Benefit Tests Can Be Improved By Enhanced Evaluation and Verification Protocols for Estimating Savings Actually Realized

The approval process for energy efficiency programs and measures and the subsequent EM&V of those programs and their reevaluation constitute a cyclic process similar to that described in Dominion's comments; however, the reliability of the estimates of energy efficiency measure savings across electric and natural gas utilities in the Commonwealth should be as consistent and as reliable as possible.

Enhanced and more detailed evaluation and verification protocols would serve several purposes toward reliable and verifiable energy savings estimates which can be utilized to provide

maximum benefits to ratepayers in the Commonwealth. They will ensure (i) that all utilities are providing equally reliable and comparable EM&V results; (ii) electric and natural gas utilities will be prompted to make more diligent efforts to measure and verify savings for many of the efficiency measures that they employ but are difficult to assess; and (iii) that energy savings from similar energy efficiency measures and programs are measured and verified using similar methodologies.

Given these advantages of enhanced EM&V protocols, the Commission recognizes that the cost of enhanced EM&V also is relevant. Enhanced protocols also should include considerations of the cost of particular EM&V methodologies relative to the benefits of a program. With such considerations, more reliable EM&V may not eliminate inherent uncertainty in energy efficiency program measurement but, nevertheless, will provide a firmer basis for the inputs into the cost/benefit tests at a reasonable cost.

IV. CONCLUSIONS AND FURTHER STEPS

The Commission conducted the Evaluation following the statutory directives in Chapters 255 and 517 of the 2016 Acts of the General Assembly. As a result of the Evaluation, the Commission finds that it is appropriate to promulgate, through a separate docketed proceeding, formal regulations related to the EM&V of energy efficiency programs of general applicability to both electric and natural gas utilities, with the goal of developing reliable and consistent estimation of energy savings and related impacts at a reasonable and appropriate cost. The Commission directs its Staff to draft Proposed Rules and anticipates commencing a formal rulemaking proceeding during the first quarter of 2017, with associated public notice, an appropriate opportunity for comment by interested persons and entities and a hearing before the Commission.

ATTACHMENT A

**CURRENT ENERGY EFFICIENCY AND DEMAND-SIDE MANAGEMENT
PROGRAMS OF INVESTOR-OWNED UTILITIES IN THE COMMONWEALTH OF
VIRGINIA**

CURRENT DOMINION ENERGY EFFICIENCY MEASURES AND PROGRAMS

<u>CUSTOMER CLASS(ES)</u>	<u>PROGRAM NAME</u>	<u>PROGRAM DESCRIPTION</u>	<u>YEAR IMPLEMENTED</u>
Residential	Lighting Program	Provides instant rebates on energy efficient lighting.	2010
Residential	Low Income Program	Provides energy audits and improvements for low-income customers.	2010
Commercial	Heating/Air Conditioning Upgrade Program	Provides heating, ventilation and air conditioning ("HVAC") system upgrades to more efficient systems in exchange for a financial incentive.	2010
Commercial	Lighting Program	Provides an opportunity to retrofit existing lighting to more energy efficient lighting in exchange for a financial incentive.	2010
Residential	Air Conditioner Cycling Program	Allows Dominion to control the central air conditioner or heat pump of participating customers by cycling the unit off and on during peak periods in return for an incentive payment.	2010
Residential	Home Energy Check-up	Provides low-cost energy audits for single-family homes.	2012
Residential	Duct Testing and Sealing Program	Provides a financial incentive to employ a contractor to test and seal air ducts in homes.	2012
Residential	Heat Pump Tune-up	Provides a financial incentive to employ a contractor to tune up existing heat pumps every five years.	2012
Residential	Heat Pump Upgrade	Provides a financial incentive to install a high-efficiency heat pump exceeding federal mandates.	2012
Non-Residential	Energy Audit Program	Provides on-site energy audits at customer facilities; customers receive a rebate of the audit's cost if they implement any identified measures.	2012
Non-Residential	Duct Testing and Sealing	Provides financial incentives to employ a contractor to seal ducts using program-approved methods.	2012
Non-Residential	Distributed Generation Program	Allows qualifying customers to receive a financial incentive to curtail load using customer-owned backup generation.	2012
Non-Residential	Heating & Cooling Efficiency Program	Provides incentives to implement new and upgrade existing HVAC technologies.	2014
Non-Residential	Lighting Systems and Controls Program	Provides incentives to implement more efficient lighting technologies.	2014
Non-Residential	Solar Window Film Program	Provides qualifying customers with incentives to install solar reduction window film to lower cooling bills.	2014

CURRENT DOMINION ENERGY EFFICIENCY MEASURES AND PROGRAMS

Residential	Income and Age-Qualifying Home Improvement Program	Provides qualifying customers with energy assessments and direct install measures at no cost.	2015
Residential	Appliance Recycling Program	Provides incentives to recycle secondary refrigerators and freezers.	2015
Non-Residential	Small Business Improvement Program	Provides small businesses energy assessments and financial incentives to install specific energy efficiency measures.	2016

CURRENT APCO ENERGY EFFICIENCY MEASURES AND PROGRAMS

<u>CUSTOMER CLASS(ES)</u>	<u>PROGRAM NAME</u>	<u>PROGRAM DESCRIPTION</u>	<u>YEAR IMPLEMENTED</u>
Non-Residential	Peak Shaving Demand Response	Incentivizes customers to reduce energy use during periods of high demand.	2011
Non-Residential	Peak Shaving and Emergency Demand Response	Allows customers' load to be curtailed during system emergencies in return for a financial credit.	2011
Residential	Low Income Program	Provides weatherization and energy efficiency services to low-income customers residing in electrically heated single-family homes.	2014
Residential	Direct Load Control Program	Uses direct load controllers attached to air conditioners and heat pumps of participating customers to reduce peak demand.	2014
Residential	Home Performance Program	Offers incentives for energy efficiency measures installed or implemented following an energy audit of a customer's home.	2015
Residential	Appliance Recycling Program	Offers incentives to customers to recycle secondary refrigerators and freezers.	2015
Residential	Manufactured Housing Energy Star Program	Offers incentives to manufacturers to buy down the additional cost of constructing ENERGY STAR [®] manufactured homes.	2015
Residential	Efficient Products Program	Provides incentives for energy efficiency products, such as LED lighting, dehumidifiers, refrigerators, and freezers.	2015
Commercial Industrial	Prescriptive Program	Provides incentives for the installation of specific energy efficiency measures related to HVAC, lighting, and other measures.	2015

CURRENT COLUMBIA GAS OF VIRGINIA ENERGY EFFICIENCY MEASURES AND PROGRAMS*

(* Closed programs have included residential duct sealing; commercial direct water heater, commercial storage water heaters ($\geq 200,000$ Btu/hr), etc.)

<u>Customer Class(es)</u>	<u>Measure/Program Name</u>	<u>Program Description</u>	<u>Year Implemented</u>
Residential	High-efficiency Gas Furnace	Provides a \$300 rebate for installation of a natural gas furnace with AFUE $\geq 90\%$.	2013
Residential	High-efficiency Windows	Provides rebates for the installation of high-efficiency windows.	2013
Residential	High-efficiency Doors	Provides rebates for the installation of high-efficiency doors.	2016
Residential	Attic/Floor Insulation	Provides rebates for insulation of single and multi-family homes.	2013
Residential	Wi-Fi Programmable Thermostats	Provides a \$50 rebate for the installation of a Wi-Fi programmable thermostat.	2016
Residential	High-efficiency Faucet Aerators and Showerheads	Provides free direct installation of high-efficiency faucet aerators and showerheads in single-family homes.	2016
Residential	Web-based Audit Program	Provides high-efficiency faucet aerators, showerheads, door sweeps, and weather stripping to customers completing an online survey.	2010
Residential	Low Income Program	Provides high-efficiency faucet aerators, showerheads, door sweeps, weather stripping, pipe insulation, attic insulation, duct sealing, water heater wraps, and furnace filters to qualified low-income customers.	2013
Residential	Elderly Audit Program	Provides high-efficiency faucet aerators, showerheads, door sweeps, weather stripping, pipe insulation, attic insulation, duct sealing, water heater wraps, and furnace filters to qualified elderly customers.	2012
Commercial	High-efficiency Pre-rinse Spray Valve (retrofit)	Provides free high-efficiency pre-rinse spray valve to qualifying commercial customers.	2010
Commercial	Infrared Heater	Provides a \$200 rebate to commercial customers installing a high-efficiency infrared heater.	2013
Commercial	Outside Air Reset Controls	Provides a \$250 rebate to commercial customers installing outside air reset controls.	2013
Commercial	High-efficiency Furnace	Provides a \$300 rebate for installation of a natural gas furnace with AFUE $\geq 90\%$.	2010
Commercial	Wi-Fi Thermostat	Provides a \$50 incentive to commercial customers who install a Wi-Fi thermostat.	2016
Commercial	Attic Insulation	Provides incentive to install attic insulation in multi-family housing units.	2014
Commercial	High-efficiency Faucet Aerators and Showerheads	Provides for the direct installation of high-efficiency faucet aerators and showerheads in multi-family housing units.	2016

CURRENT VIRGINIA NATURAL GAS ENERGY EFFICIENCY MEASURES AND PROGRAMS

<u>Customer Class(es)</u>	<u>Measure/Program Name</u>	<u>Program Description</u>	<u>Year Implemented</u>
Residential	High-efficiency Gas Storage Water Heater	Provides a \$70 rebate for customers who install a high-efficiency gas storage water heater.	2012
Residential	High-efficiency Gas Furnace, AFUE \geq 90%	Provides a \$250 rebate for installation of a natural gas furnace with AFUE \geq 90%.	2014
Residential	Programmable Thermostat	Provides a \$25 rebate for the installation of a standard or Wi-Fi programmable thermostat.	2015
Residential	Low-Income Weatherization Program	Provides \$1,000 in financial incentives to local weatherization assistance providers to install energy efficiency measures leading to lower natural gas usage in the homes of qualifying low-income customers.	2014
Residential	Home Energy Audit Program	Customers can make online requests for a free home energy efficiency kit after taking an online survey. The Company offers three separate kits.	2014

CURRENT WASHINGTON GAS LIGHT ENERGY EFFICIENCY MEASURES AND PROGRAMS

(* Closed programs have included commercial direct contact water heaters, commercial ovens and cookers, commercial outdoor air reset controls, etc.)

<u>Customer Class(es)</u>	<u>Measure/Program Name</u>	<u>Program Description</u>	<u>Year Implemented</u>
Residential	Wi-Fi Programmable Thermostat	Provides a \$50 rebate for customers who install a Wi-Fi programmable thermostat.	2012
Residential	High-efficiency Gas Furnace, AFUE \geq 90%	Provides a \$300 rebate for installation of a natural gas furnace with AFUE \geq 90%.	2014
Residential	Home Energy Audit Program	Provides free high-efficiency faucet aerators, showerheads, door sweeps, and weather stripping to customers completing an online audit.	2015
Residential	Low-Income Program	Offers an energy audit, customer education, and installation of duct and building envelope insulation, pipe insulation, infiltration reduction, etc. to qualifying low income customers.	2013
Residential	Home Energy Reporting Program	Customers receive individualized reports on home energy usage from Opower designed to promote reduced gas usage.	2013
Commercial	High-efficiency Gas Furnace, AFUE \geq 90%	Provides a \$300 rebate to commercial customers for installation of a natural gas furnace with AFUE \geq 90%.	2013
Commercial	Wi-Fi Programmable Thermostat	Provides a \$50 rebate for customers who install a Wi-Fi programmable thermostat.	2015
Commercial	Direct Install	Provides for the free direct installation of high-efficiency faucet aerators, showerheads, and pre-rinse spray valves to schools, hospitals, restaurants, etc.	2015