Comments on Evaluation, Measurement and Verification (EM&V) Guidance for Demand-Side Energy Efficiency

Draft for Public Input

Submitted to the U.S. Environmental Protection Agency by
Advanced Energy Economy

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ADVANCED ENERGY ECONOMY

the business voice of advanced energy

January 21, 2016

Gina McCarthy
Administrator, U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, D.C., 20460

RE: Evaluation, Measurement and Verification Guidance for Demand-Side Energy Efficiency

Administrator McCarthy:

Advanced Energy Economy (AEE) is pleased to submit these comments on evaluation, measurement and verification (EM&V) for demand-side energy efficiency in the Clean Power Plan.

AEE is a national organization of businesses making the energy we use secure, clean, and affordable. Thanks to technological advances and innovation, we now have more options for meeting energy needs than ever before in history. We call these options "advanced energy."

AEE and its state and regional partner organizations, which are active in 26 states across the country, represent more than 1,000 companies and organizations that span the advanced energy industry and its value chains. 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 improving the availability and quality of customer-facing services.

AEE welcomes EPA's publication of a guidance document on EM&V for demand-side energy efficiency. This guidance will provide certainty to the efficiency industry and to the states surrounding which EM&V methods the Agency considers acceptable and will help ensure that these resources receive credit for the emission reductions they achieve. Our comments are designed to build off the document's solid foundation by identifying a number of commonsense revisions and clarifications that will help EPA achieve its goals of ensuring that EM&V can establish that savings are real and quantifiable, and comes at a cost that is commensurate with the emission reductions achieved.

Sincerely,

Matt Stanberry
Vice President, Market Development
Advanced Energy Economy

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I. INTRODUCTION AND BACKGROUND

Advanced Energy Economy ("AEE") is pleased to submit these comments on issues related to evaluation, measurement & verification ("EM&V") in the Clean Power Plan ("CPP").

EPA has requested comments on EM&V in several documents. On October 23, 2015, EPA issued the proposed Federal Plan and Model Trading Rules ("proposed Federal Plan") and Evaluation, Measurement and Verification (EM&V) Guidance for Demand-Side Energy Efficiency ("EM&V Guidance") and has requested comment on both documents in Docket No. EPA-HQ-OAR-2015-0199.[1,2] Separately, on October 21, 2015, EPA issued a document, the Clean Energy Incentive Program Next Steps document ("CEIP Next Steps") and requested comment on that document in Docket No. EPA-HQ-OAR-2015-0734.[3] In each of these documents, EPA provides a list of provisions for EM&V on which EPA is seeking stakeholder input.

These comments cover EM&V matters raised in those three documents related to the Clean Power Plan. AEE focuses its response on the issues raised in the EM&V Guidance, but also covers some elements of the proposed Federal Plan and CEIP Next Steps. AEE submitted separate comments on the CEIP Next Steps[4] and is simultaneously submitting comments on the proposed Federal Plan, but is covering EM&V matters here raised in the EM&V Guidance, CEIP Next Steps and proposed Federal Plan.[5] Given that the EM&V Guidance is focused on demand-side energy efficiency, these comments are principally centered on that technology area although there is brief discussion of additional guidance that is needed from EPA for other advanced energy technologies.[6]

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[1] Federal Plan Requirements for Greenhouse Gas Emissions From Electric Utility Generating Units Constructed on or Before January 8, 2014; Model Trading Rules; Amendments to Framework Regulations; Proposed Rule, 80 Fed. Reg. 64,996 (Oct. 23, 2015) [hereinafter "Proposed Federal Plan"].

[2] U.S. Environmental Protection Agency, Evaluation Measurement and Verification (EM&V) Guidance for Demand-Side Energy Efficiency Draft for Public Input (Aug. 3, 2015), http://www2.epa.gov/sites/production/files/2015-08/documents/cpp_emv_guidance_for_demand-side_ee_-_080315.pdf [hereinafter "EM&V Guidance"].

[3] U.S. Environmental Protection Agency, Clean Energy Incentive Program Next Steps (Oct. 21, 2015), http://www2.epa.gov/sites/production/files/2015-10/documents/ceip_next_steps_10_21_15.pdf [hereinafter "CEIP Next Steps"].

[4] Advanced Energy Econ., Comments on the Clean Energy Incentive Program, Docket ID No. EPA-HQ-OAR-2015-0734 (Dec. 15, 2015), http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2015-0734-0044.

[5] EM&V can refer to a variety of activities including savings estimation, market research and planning studies. In these comments, AEE focuses on EM&V designed to estimate energy savings resulting from energy efficiency projects, programs, codes, and standards, unless otherwise specified. However, in a point emphasized later in this document, AEE raises the issue that in an advanced energy economy, activities such as energy efficiency, demand response, energy storage, building analytics, and smart grid will interact in ways that are not currently contemplated or addressed in current EM&V demand-side measures and should be addressed by EPA.

[6] In most cases, energy efficiency savings are achieved by installing an efficient unit of equipment (e.g., lamp, chiller or refrigerator) instead of a standard one. However, energy efficiency can also include interventions that are not measure-based, such as programs to train building operators to use equipment more effectively or to optimize complex manufacturing systems in a manner that reduces energy use. In these comments, the term "measure" is used broadly to encompass both equipment measures, and measures that are characterized by training or other interventions that result in energy savings. "Measure" as used here also incudes activities related to advanced metering and/or analytics that serves to save energy by monitoring or altering energy use, and/or providing information that enables operators to use energy more efficiently.

A. About AEE

AEE is a national organization of businesses making the energy we use secure, clean, and affordable. 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."

AEE and its state and regional partner organizations, which are active in 26 states, represent more than 1,000 companies and organizations that span the advanced energy industry and its value chains. Technology areas represented include energy efficiency, demand response, natural gas, wind, solar photovoltaics ("PV"), solar thermal electric, ground source heat pumps, advanced metering infrastructure, transmission and distribution efficiency, smart grid, fuel cells, nuclear power, combined heat and 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. AEE promotes the interests of its members by engaging in policy advocacy at the federal, state, and regulatory levels, by convening groups of CEOs to identify and address cross-industry issues, and by conducting targeted outreach to key stakeholder groups and policymakers.

AEE has been an active participant in proceedings involving the CPP. AEE submitted recommendations to EPA on program design on March 5, 2014, before the CPP proposal was released, and AEE submitted comments on the proposed CPP on November 5, 2014[7] and December 1, 2014.[8] After the final CPP was released, AEE submitted comments on the Clean Energy Incentive Program ("CEIP") and is submitting separate comments on the proposed Federal Plan. The organization has also written a number of public papers related to the CPP, and AEE has filed a motion in support of EPA in the litigation in the United States Court of Appeals for the District of Columbia Circuit on the CPP.

B. Summary of Comments

AEE strongly supports the CPP, and believes that it represents a vital step toward modernizing the U.S. electric power system for greater efficiency, reliability, and resilience, while also creating more value for consumers, states, and the economy as a whole. AEE applauds the CPP's recognition and incorporation of advanced energy technologies as compliance options, which will allow states to adopt policies and plans that capture the carbon reduction and economic benefits of these technologies. EM&V is crucial to the success of the CPP because it ensures that investments made in emission reductions are real and quantifiable.

AEE also supports EPA's overall approach to EM&V in the proposed Federal Plan and EM&V Guidance. AEE commends EPA for recognizing that EM&V is a well-developed field of analysis, with well-established best practices that serve as a reliable basis for decision-making in both the public and private sectors. AEE welcomes the release of the EM&V Guidance, a detailed, comprehensive guidance

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[7] Advanced Energy Econ., Comments on the Clean Power Plan, Docket ID No. EPA-HQ-OAR-2013-0602 (Nov. 5, 2014), http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2013-0602-22276.

[8] Advanced Energy Econ., Supplemental Comments on the Clean Power Plan, Docket ID No. EPA-HQ-OAR-2013-0602 (Dec. 1, 2014), http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2013-0602-22924.

exclusively for demand-side energy efficiency. This document provides the energy efficiency industry with greater certainty surrounding which EM&V practices will be acceptable for CPP compliance and, indeed, could be expanded to provide the same certainty to other eligible measures. Lastly, AEE applauds EPA's recognition that EM&V is rapidly evolving due to ongoing innovations in technology, metering, and data analytics.

AEE's comments align well with the four overarching objectives for EM&V identified in the final CPP, proposed Federal Plan, and EM&V Guidance: (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) defer to existing practices that are already robust, transparent and effective; (4) allow for innovations in EM&V approaches and techniques over time.

In order to better achieve these four objectives, AEE has identified areas in the proposed Federal Plan and EM&V Guidance that could be improved. Specifically, AEE's comments address the following:

- AEE strongly supports EPA's intent to defer to existing EM&V practices. EM&V is a well-established field of analysis that has demonstrated itself to be a reliable basis for decision making since the 1980s. Current industry best practices are well suited to implementation of the Clean Power Plan.

- AEE strongly supports EPA's intent to balance the accuracy and reliability of EM&V with the associated costs. EPA should clarify that this overarching principle guides and tempers specific provisions in the proposed Federal Plan and EM&V Guidance by explicitly stating the following: "The level of resources devoted to EM&V and the stringency of EM&V requirements should be commensurate with the magnitude of resulting CO_2 reductions, and the ability to reduce uncertainty with additional (or more complex or stringent) EM&V."

- EPA should avoid potential real or perceived contradictions between EM&V language in the final Federal Plan and final EM&V Guidance by drawing a clearer distinction between the EM&V topics included in the two documents. The Federal Plan should avoid prescribing specific EM&V methods, instead deferring to industry best practices and referring to the EM&V Guidance for details. The EM&V Guidance, and any subsequent guidance documents, should contain lengthier, nuanced guidance or technical specifications on where and under what circumstances an EM&V method is appropriate or acceptable. Specifically EPA should modify its discussion within the Federal Plan on the following topics: deemed savings, common practice baseline ("CPB"), allowable EM&V approaches, comparison group approaches, and Technical Reference Manuals ("TRMs").

- EPA's requirement for a CPB as presented in the proposed Federal Plan and EM&V Guidance is inconsistent with industry practice, difficult to interpret and implement, and does not accurately measure energy savings in many situations. EPA should eliminate the requirement for a CPB in the Federal Plan and modify the discussion on CPB in the EM&V Guidance to clarify that "existing conditions" baselines are suitable, without qualification, where this is an appropriate approach.

- AEE strongly supports EPA's intent to embrace evolving trends and new opportunities in EM&V that are being made possible by advances in technology, metering and data analytics. EPA should include a discussion of EM&V 2.0 in the EM&V Guidance.

- EPA should designate / encourage states to designate (an) appropriate entity(ies) to facilitate energy efficiency EM&V. Designated agents could provide expertise and infrastructure to facilitate a number of EM&V related activities, including but not limited to the storage of project document, evaluation of eligibility applications, and evaluation of EM&V plans.

- EPA should add a section in the EM&V Guidance on joint evaluation of energy efficiency and other demand-modifying activities (e.g., demand-response, distributed generation/renewables, storage, water-efficiency, and electric vehicles/electrification in general). In this subsequent guidance, EPA should address EM&V situations wherein several of these approaches affect a given site, project or program. While this is a new and rather undeveloped area of EM&V, advanced metering and data analytics are likely to offer opportunities and methodologies for these analyses that were previously unavailable for EM&V purposes.

- EPA should publish (an) additional guidance document(s), analogous to the EM&V Guidance, on EM&V for other eligible measures besides energy efficiency such as combined heat and power ("CHP"), waste heat and power ("WHP"), transmission and distribution ("T&D") efficiency, distributed generation, intelligent efficiency, and demand response.

II. OVERVIEW OF AEE'S PERSPECTIVE: EM&V should be designed to ensure that savings are verifiable and quantifiable, but requirements should be balanced so that EM&V does not unnecessarily serve as an impediment to emission reductions.

AEE strongly supports EPA's efforts to encourage the use of advanced energy technologies as proven, cost-effective, and widely available emission reduction measures for the power sector. The growth in advanced energy markets has coincided with dramatic reductions in cost over the last 5-10 years. In 2014, building efficiency took the lead as the largest advanced energy segment in the U.S. market, generating $60.1 billion in revenue.[9] The success of energy efficiency is unsurprising given that it 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[10] between zero and $50/MWh, lower on average than all the forms of new generation.[11] 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.[12]

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[9] Advanced Energy Econ., *Advanced Energy Now 2015 Market Report* (Mar. 2015), http://info.aee.net/aen-2015-market-report, at 29.

[10] Lazard's LCOE for energy efficiency measures the cost of avoided electricity, not the cost of generation, but is an appropriate point of comparison as an alternative to generating a unit of power.

[11] Advanced Energy Econ. Inst., *Competitiveness of Renewable Energy and Energy Efficiency in U.S. Markets* (Jun. 2015), http://info.aee.net/competitiveness-of-renewable-energy-and-energy-efficiency-in-us, at 9, 13.

[12] LBNL, *The Total Cost of Saving Electricity through Utility Customer-Funded Energy Efficiency Programs* (Apr. 2015), https://emp.lbl.gov/sites/all/files/total-cost-of-saved-energy.pdf at 11; Advanced Energy Econ. Inst. (Jan. 2015) at 13.

In order to help continue, and indeed accelerate, the tremendous growth already underway in energy efficiency, EM&V under the CPP must strike the right balance between verifying that savings are real and avoiding barriers to implementing energy efficiency. AEE believes that the EM&V requirements outlined in the final CPP, Federal Plan, and final EM&V Guidance will play a crucial role in determining if and how energy efficiency is implemented in state compliance plans. As discussed later in these comments, past experience in state-level energy efficiency programs shows that certain EM&V practices can create barriers to otherwise achievable energy efficiency savings.

Therefore, it is important for EPA to issue the right EM&V guidance for the CPP. Energy efficiency is a valuable, low-cost resource under both rate-based and mass-based plans and EM&V has a role to play in both types of plans. The EM&V requirements articulated in the proposed Federal Plan and EM&V Guidance apply directly to energy efficiency implemented and reported under rate-based plans and in both rate and mass-based plans for the CEIP. In addition, it is likely that state regulators or electric generating units ("EGUs") in mass-based plan states will find benefit in conducting EM&V on their energy efficiency programs and investments to ensure that the energy efficiency and projects are performing as planned.

In recognition of the well-developed EM&V industry, AEE offers comments on several related themes, all designed to help EPA ensure that energy efficiency savings are real and verifiable, and can contribute maximally to CO_2 reductions.

III. DETAILED COMMENTS

A. AEE strongly supports EPA's intent to defer to existing industry best practices and strike a balance between EM&V precision and cost – EPA should build an explicit statement of this intent into the EM&V Guidance.

AEE applauds EPA for the general approach throughout both the proposed Federal Plan and EM&V Guidance that defers to "established industry best-practice methods, procedures, and approaches" and recognizes certain approaches as presumptively approvable in a state plan.[13]

AEE believes that this is the right approach. 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 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.[14]

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[13] Proposed Federal Plan at 65,002.

[14] For example, in 2009, ten Northeastern and Mid-Atlantic states began the Regional Greenhouse Gas Initiative ("RGGI"), the country's first market-based program to reduce emissions of carbon dioxide (CO_2) from power plants. RGGI states account for one-sixth of the population in the United States and one-fifth of the nation's gross domestic product. See: Analysis Group., *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), http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/economic_impact_rggi_report.pdf , and Analysis Group., *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),* (Jul. 14, 2015), http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis_group_rggi_report_july_2015.pdf.

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.[15] 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.[16] The energy service company ("ESCO") industry in the United States transacts roughly $6 billion annually (generating an estimated 34 TWh of savings in 2012)[17] using contractual agreements between parties that rely on existing EM&V industry best practices.[18,19]

In addition to being a reliable basis for public and private decision-making, current best practices also successfully avoid many of the sources of potential bias that EPA has identified in the proposed Federal Plan and EM&V Guidance. 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. EPA is correct to prioritize deference to existing EM&V best practices when seeking to address these issues in the context of the CPP.

In keeping with this deference, EPA has wisely recognized "the importance of balancing the accuracy and reliability of EM&V results with the associated costs of EM&V."[20] This is a primary guiding principle for EM&V as it is practiced throughout the United States. Nonetheless, AEE believes that this principle has not been adequately emphasized enough or stated explicitly enough in the proposed Federal Plan and EM&V guidance. In practice, the tradeoff between the accuracy of EM&V and the cost of EM&V guides EM&V planning as a first principle: It is almost always possible to add EM&V resources to a given project. But there is a point of diminishing returns in which additional EM&V does not enhance the accuracy or reliability of results proportionally to the additional effort, and sometimes does not enhance accuracy and reliability at all.

In order for specific EM&V approaches to be interpreted and implemented effectively, EPA must emphasize this principle, in particular as part of the EM&V Guidance. EPA should emphasize, in the introduction to the EM&V Guidance, "the importance of balancing the accuracy and reliability of EM&V results with the associated costs of EM&V" by adding language that establishes this principle as a context for interpreting the rest of the EM&V Guidance. Specifically, EPA should state:

> *The level of resources devoted to EM&V and the stringency of EM&V requirements should be commensurate with the magnitude of resulting CO_2 reductions, and the ability to reduce uncertainty with additional (or more complex or stringent) EM&V.*

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

[16] 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* (Jan. 15, 2016), https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=15-IEPR-03

[17] LBNL, Juan Pablo Carvallo, Peter H. Larsen, Charles A. Goldman, *Estimating Customer Electricity Savings from Projects Installed by the U.S. ESCO Industry* (2014) https://emp.lbl.gov/sites/all/files/lbnl-6877e_0.pdf.

[18] Information on the ESCO industry is available from LBNL, https://emp.lbl.gov/projects/energy-saving-performance.

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

[20] Proposed Federal Plan at 65,003.

B. EPA should clarify that EM&V requirements are flexible provided that they are consistent with industry best practices, and the Agency should reserve any necessary technical specificity for the EM&V Guidance.

Energy efficiency as a resource is by definition decentralized, diffuse and diverse. It involves installing a wide variety of efficient measures (i.e., appliances, equipment, building envelope features) or practices (i.e., building operations) that use energy more efficiently than the alternatives. There are tens of thousands of possible types, sizes, and vintages of equipment, and the savings vary by climate, building and industry type, occupancy, and a variety of other factors. Moreover, efficiency measures are often installed as part of a bundle or a system, adding even more complexity to the measurement.

As a result, EM&V for energy efficiency is, in large part, a customized process that requires practitioners to carefully apply analytic concepts tailored to meet evaluation needs for a given situation. The industry has developed these approaches, concepts and guidelines over several decades. As evidenced by the number of protocols and guidelines referenced in the EM&V Guidance,[21] there are many factors to consider when designing an approach to assess savings from a particular program or project. "One-size fits all" instructions or requirements, like those AEE has identified in the proposed Federal Plan, are not appropriate for evaluating energy efficiency.

EPA must maintain the flexibility inherent in industry best practice while ensuring that EM&V is reliable and accurate. All of these considerations cannot be adequately reflected in a few pages of requirements in the Federal Plan. To the extent possible, EPA should remove lengthy or overly prescriptive requirements currently included in the proposed Federal Plan and place a discussion of these requirements in the EM&V Guidance. The EM&V Guidance is a lengthier document better suited to convey complexities, nuances and trade-offs in industry best practices and approaches.

In summary, EPA should 1) avoid prescribing the applicability of EM&V approaches without taking into consideration the context in which they are used; 2) reduce the level of specificity with which it discusses EM&V approaches in the Federal Plan; and 3) place detailed discussion of the tradeoffs and applicability of various EM&V approaches exclusively in the EM&V Guidance.

With this in mind, AEE has identified several specific topic areas where these three recommendations should be applied to improve the proposed Federal Plan and EM&V Guidance, thereby reducing confusion and better reflecting industry best practices:

1. Deemed Savings

The proposed Federal Plan includes language that appears to prohibit the use of "*ex ante"* savings estimates or "projections." The use of these terms throughout the proposed Federal Plan is imprecise and may unintentionally prohibit the use of deemed savings, a well-established industry practice. Language in the proposed Federal Plan seems to equate, or partially equate "deemed savings" and "*ex ante*" estimates. It also seems to confuse "deemed" or "*ex ante*" savings with "unevaluated" estimates.

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[21] See EM&V Guidance, Appendix C.

AEE believes that it is EPA's intent that savings estimates should not be based on unevaluated engineering projections that do not take into account operational issues such as usage patterns, weather, technical degradation and so forth. Moreover, deemed savings approaches must be employed in situations where the estimates are suited for the new application. AEE agrees with this intent. Additionally, AEE recognizes that using poorly crafted or overly optimistic deemed savings as a "shortcut" for conducting more complex EM&V is not acceptable, nor is it consistent with industry best practice.

AEE supports the intention behind the current language in the proposed Federal Plan and EM&V Guidance, which is to ensure that energy efficiency savings estimates are real and quantifiable. AEE supports the notion that savings estimates should be subject to *ex post* review of key parameters (e.g., number of installations, usage patterns, etc.) and should be judged by EM&V to be of high quality and applied properly in a given situation. Depending on the situation, key parameters to be measured *ex post* might include program participation, verified installations, operating hours, or a combination of factors. Determining which parameters, approaches and protocols would apply, etc. is a complex process that derives from overall industry standard practice for a given situation.

Deemed (or "stipulated") savings approaches, which are based on estimates, can be valuable, accurate, and cost-effective approaches to EM&V, provided that the estimates are crafted carefully and applied in proper situations. As EM&V has evolved, *ex ante* projections are increasingly based on prior evaluations. In fact, deemed savings estimates that are based on prior EM&V results and/or calibrated engineering estimates can be highly accurate and should be allowable in contexts governed by EM&V industry best practice.

As such, AEE urges EPA to modify language in the proposed Federal Plan that prohibits or could appear to prohibit use of *"ex ante"* energy savings estimates, or "projections."[22] This language is imprecise and as a result is used incorrectly in the proposed Federal Plan. *"Ex ante"* and *"ex post"* are relative terms that refer to a step that is either before ("*ex ante* to,") or after *("ex post"* to) another step in a given process. Although both terms of art are used in EM&V, they must be employed carefully since a step that is "*ex post*" for one process can simultaneously be "*ex ante*" for the next process. EM&V estimates are developed using a variety of parameters. It is possible, indeed, likely, that some of those parameters are based on *ex ante* information while others are developed *ex post*. For example, program implementer's initial estimates of energy savings from a residential CFL program might include estimates of unit savings per lamp, and an estimate of the likely number of lamps that will be installed in a given year. Both of these components of an overall savings estimate could be characterized as *ex ante*. At the end of the year, when the number of participants is known, total savings - a product of the savings per unit and the number of participants - is known "*ex post*" or "after" program implementation.

Similarly, EPA should recognize, where appropriate in the proposed Federal Plan subsequent text, that the phraseology prohibiting "projections" is confusing since all estimates of energy efficiency savings involve some type of projection.

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[22] Proposed Federal Plan at 65,033 and 65,072.

2. Common Practice Baseline ("CPB")

AEE believes EPA's requirement for a CPB as presented in the proposed Federal Plan and EM&V Guidance is inconsistent with industry practice, difficult to interpret and implement, and does not accurately measure energy savings in many situations. EPA should eliminate the requirement for a CPB in the Federal Plan and modify the discussion on CPB in the EM&V Guidance to clarify that "existing conditions" baselines are suitable, without qualification, where this is an appropriate approach.[23]

EPA's intent when including a CPB requirement in the proposed Federal Plan and EM&V Guidance is unclear and open to one of two interpretations. One interpretation of the proposed language requiring CPB is that CPB excludes "existing practice," "as built," and "existing conditions" baselines – baselines defined, in most cases, as those measured from the condition of building shell and/or equipment before the energy efficient measure(s) are implemented. Another interpretation is that EPA's definition of CPB encompasses these other baseline approaches, in situations where employing an "existing conditions" baseline constitutes EM&V best practice. Under this second interpretation, the "existing conditions" baseline is a subset of CPB and can be applied in instances where using this baseline is also the "common practice."

There is a crucial difference between *a requirement to use a baseline* that is "common practice" in the sense that it is a common industry practice in a particular given circumstance (which would include an "existing practice" baseline), and *the requirement to use a specific baseline*, like the CPB. CPB is an appropriate and useful baseline that is indeed common industry practice in some cases. CPB makes sense, for example, in instances where large numbers of particular measures are installed through a program, and where energy use from the baseline equipment is known or can be studied effectively. For example, a program may use a CPB to measure savings from the replacement of a large number of air conditioning units; the efficiency for baseline air conditioning units is known and can easily be compared to the efficiency of units installed through the program. However, for other measure-types, particularly large, complex, and individualized sites, CPB is not an applicable concept. For example, CPB is not always appropriate when multiple measures are installed at a site such as in a retrofit that includes several types of lighting, occupancy sensors for certain areas of a building, and portions of an industrial process. It is not clear how to construct, craft or estimate a baseline or counterfactual analysis when the energy efficiency upgrade is complex and unique for this kind of site.

Moreover, compared to other industry practices, the CPB is a relatively new concept. Existing inconsistencies across the industry with respect to the CPB add to the confusion in EPA's requirement in the proposed Federal Plan and EM&V Guidance. CPB is not consistently defined, calculated, understood, or used across all jurisdictions. A 2014 report published by the National Renewable Energy Laboratory ("NREL") is abundantly clear on this point:

> The common practice baseline method is relatively new in the broader evaluation literature and its application has been somewhat limited; however, the Northwest Power and Conservation

[23] Proposed Federal Plan at 65,072 and EM&V Guidance at Section 2.2.

> Council (NW Council) in the Pacific Northwest has applied a variant of this method for a number of years in estimating *ex ante* net savings.[24,25]

The NREL report contains a lengthy discussion of the merits of different CPB definitions, approaches, pros and cons, leading to the conclusion:

> The common practice baseline has not been advocated as applicable to all programs, even within a single jurisdiction. An evaluator can select from among the many other methods for estimating net savings, each with its own sources of error, and decide which is most likely to produce estimates that have the least error. Hall et al. (2013)[26] state that they "are not suggesting that the direct net analysis approaches (i.e., common practice baselines) should be used in all evaluations or that they can be applied to all types of program configurations or target markets." As a result, the common practice baseline approach should be considered as another method in the toolkit that evaluators could use to address net savings, based on an analysis of the market and the appropriate counterfactual scenario.[27]

In other words, current industry practices do not clearly define CPB. This makes EPA's CPB requirement, and use of the term generally, even more difficult to interpret in the context of EM&V best practices and adds to the need to remove the requirement from the Federal Plan and provide additional clarity in the EM&V Guidance.

EPA's own attempts to precisely define CPB are confusing. An entire section in the EM&V Guidance is devoted to establishing baselines. Yet, the discussion of CPB is unclear. For example, the EM&V Guidance states that CPB is "consistent with baseline definitions used for gross savings by many existing programs."[28] However, this assertion is confusing, at a minimum, because the supporting example one paragraph later describes a comparison group approach that would yield *net* savings, not *gross* savings:

> When a well-designed comparison group method is used, use the control group (with randomized control trials) or the comparison group of non-participants (with quasi-experimental approaches) to quantify the CPB electricity consumption.[29]

The EM&V Guidance does mention that baselines can be measured from "existing conditions" in some cases but also suggests that if any of the equipment has been replaced before the end of its useful life, a "dual baseline" approach should be used.[30]

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[24] NREL, Daniel Violette, Pamela Rathbun, Charles Kurnik, *Estimating Net Savings: Common Practices The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures* (2014), http://energy.gov/sites/prod/files/2015/01/f19/UMPChapter17-Estimating-Net-Savings.pdf, at 35.
[25] The NREL (2014) report also characterizes CPB as a "net" approach whereas the EM&V Guidance describes CPB as being consistent with "definitions used from gross savings." This is not a typographical error but rather is emblematic of the problem that CPB is not yet a common, well-defined or well-understood approach.
[26] Hall, N; Ladd, D., Khawaja, M.S. *Setting Net Energy Impact Baselines: Building Reliable Evaluation Approaches*, paper presented at the 2013 International Energy Program Evaluation Conference, Chicago, IL (2013).
[27] NREL, Violette et al (2014) at 39.
[28] EM&V Guidance at 12.
[29] *Id.*
[30] *Id.* at 13.

The EM&V Guidance offers nearly three pages describing different ways to conceptualize CPBs,[31] depending on considerations including program- and measure-type, relationship between the existing and new equipment, wide-spread practice in the area or region, market segment or industry, code compliance, and data availability. It is possible that EPA therefore intends to interpret CPB broadly to encompass "code-baselines" (which are described in the Guidance), "existing-conditions" or "as found" baselines, and other blends as part of the CPB "umbrella". If EPA intends for "existing conditions" and "as built" baselines to fall within the definition of CPB, EPA should clarify this intention. Discussion in the EM&V Guidance should indicate that "existing conditions" and "as built" baselines are often appropriate baselines, as opposed to giving the impression that those approaches are either precluded, rare, or likely to require establishing a dual baseline. AEE notes that there are EM&V situations that are suited to a dual baseline approach, but this is not necessarily the case. The EM&V Guidance should state that an "existing conditions" baseline approach does not necessarily trigger a "dual baseline." EPA should clarify that the definition of CPB *readily and fully* encompasses "existing conditions" and "as built" approaches, and that EM&V in these situations does not necessarily require a "dual baseline" analysis.

Despite the consideration given to baselines in the EM&V Guidance, the discussion of the CPB seems to be predicated on the assumption that CPB is readily knowable, measurable, and identifiable within the context of ordinary EM&V best practices. This assumption is inaccurate. Moreover, it does not represent industry best practice, especially (but not exclusively) for large, complex sites that involve numerous measures, systems, and operational innovations that, taken together, save energy. It would be impractical and, for some sites, impossible to identify a CPB for these numerous, diverse and complex systems with measure and practice updates that interact with one another. In these situations, industry EM&V best practices would be to measure savings in whole or in part from an "as built" or "existing conditions" baseline – not a CPB.

AEE believes that the CPB requirement would be counter-productive and provide a perverse incentive to avoid deploying achievable energy efficiency measures. A recent, lengthy example from California is worth noting because it highlights how a CPB requirement, like the one currently included in the proposed Federal Plan, can have the perverse effect of discouraging energy efficiency savings. In 2015, the California state legislature recognized that significant savings opportunities in certain building types and markets were being overlooked as the result of regulatory requirements to measure efficiency savings from a "current code" baseline as opposed to an "as built" or "current conditions" baseline.). To take advantage of this lost opportunity, the state legislature ordered the Public Utilities Commission to recognize savings from an "existing conditions" or "as built" baseline, "taking into consideration the overall reduction in normalized metered electricity and natural gas consumption."[32] The legislature authorized the Commission to use ratepayer funds to provide incentives for energy efficiency savings measured from this new, existing conditions baseline, in appropriate situations.

The state took this step as part of an overall strategy to double energy efficiency savings.[33] California recognized that in many cases, requiring energy savings to be measured from a "current code" baseline (akin to a CPB) had the perverse effect of preventing programs from performing upgrades to buildings and equipment that are operating at levels far below current energy codes. This approach leaves in place a variety of measures using far more energy than an efficient upgrade because they do

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[31] *Id.* at 11 – 14.
[32] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350
[33] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350

not meet the current code. California recognized – and EPA should recognize – that capturing those savings is crucial to reducing energy use. For example, Pacific Gas & Electric Company (PG&E), presented preliminary results from one recent study indicating that as much as 75 percent of available savings in commercial buildings derives from bringing outdated measures to code and from operational improvements.[34]

If EPA intends for "existing conditions" baselines to be acceptable within the CPB framework (as AEE believes it should), EPA should clarify this point by removing the CPB requirement in the Federal Plan and adding clarification in the EM&V Guidance including an explicit recognition that "existing conditions" and "as built" baselines are acceptable and, indeed, appropriate in a number of circumstances. Specifically, EPA should:

1) Remove the CPB requirement in the Federal Plan. Instead, the proposed Federal Plan should require use of an "appropriate" baseline and defer to the EM&V Guidance and industry best practices for selecting and describing the appropriate baseline from which to measure savings for a given project, program or portfolio; and

2) Clarify that "existing practice" or "existing conditions" baselines are a subset of CPB in the EM&V Guidance. The document should indicate that CPB can be an appropriate baseline approach in certain instances, and should offer discussion and examples for situations when other approaches, for example "existing conditions" would be appropriate. The EM&V Guidance should clarify that CPB is an emerging concept, and should cross-reference the CPB discussion with other industry best-practice sources (e.g., the NREL reports noted above on the same topic).

Since the selection of baselines for measuring energy efficiency savings is an absolutely critical component of EM&V, AEE requests in the strongest possible terms that EPA undertake to clarify the items listed above. This would be in line with the overarching principle of deferring to industry best EM&V practices.

3. Do Not Restrict the List of Allowable EM&V Approaches

In keeping with the overarching principle of deferring to industry best practices, and refraining from over-specifying requirements in the proposed Federal Plan, EPA should eliminate language that limits to three the general types of EM&V approaches that must be incorporated into an EM&V plan.[35] The current language indicates that EM&V plans must include "the method applied: project-based measurement and verification (PB-MV), comparison group approaches, or deemed savings" and goes on to state, "All electricity savings must be quantified by applying one or more of the following methods: PB-MV, comparison group approaches, or deemed savings."[36]

These passages are overly prescriptive. It is clear in the expository language of the EM&V Guidance that these are broad categories, with many permutations, whereas the specific language in the

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[34] Berman, J. *Achieving Ambitious Energy Efficiency Targets: Emerging Opportunities for Existing Buildings.* Behavior Energy and Climate Change Conference, California (2015), http://beccconference.org/wp-content/uploads/2015/10/presentation_berman.pdf.
[35] Proposed Federal Plan at 65,072.
[36] *Id.*

proposed Federal Plan unnecessarily limits EM&V now, and in the future, to three types with specific "names." The discussion of these three broad categories of EM&V is more appropriately situated in the EM&V Guidance discussion[37] rather than the proposed Federal Plan.

In fact, elsewhere the proposed Federal Plan contemplates EM&V based on "real time" data (presumably data analytics and/or advanced metering). It is not clear that EM&V approaches using emerging technological and analytic capabilities fall neatly into one of the three categories, or even a combination thereof as allowed in the proposed Federal Plan.

By limiting EM&V approaches to three types, EPA may inadvertently preclude or restrict the application of new, promising EM&V approaches, particularly those based on advanced metering and data analytics. These new designs may fall under the category of "project-based measurement and verification" (PB-MV) or they may not. While the totality of discussion in both the proposed Federal Plan and EM&V Guidance does indicate that EPA anticipates that EM&V methods technologies will evolve, there is no benefit to retaining the restrictive "three category" language at this time, especially in the proposed Federal Plan, since that limitation might lead to confusion at a later time.

The proposed Federal Plan should require simply that EM&V plans describe the method to be used as provided for within the EM&V Guidance without pre-supposing particular names for those methods. The EM&V Guidance should retain the discussion in section 2.1 that characterizes several general types of EM&V approaches. However, it should clarify that these are general approaches not exclusive, definitive categories.

4. Remove the discussion of comparison group approaches in the proposed Federal Plan.

The proposed Federal Plan describes requirements for comparison group approaches.[38] This text is overly specific in the context of the proposed Federal Plan, and indeed is redundant in light of the similar, more complete, more nuanced discussion of comparison group approaches in the EM&V Guidance. EPA should remove this language from the Federal Plan and maintain the lengthier discussion of comparison group approaches in the EM&V Guidance.

5. Modify and shorten the discussion of deemed savings approaches and Technical Reference Manuals ("TRM") in the Federal Plan and develop a longer section on TRMs in the EM&V Guidance.[39]

AEE supports the use of deemed savings values, in appropriate situations, and supports EPAs intention of ensuring that deemed savings estimates are properly prepared, thoroughly documented, and vetted publically and professionally, and available throughout the life of the affected measures. Appropriate and careful use of deemed savings, developed for and published in TRMs, can provide accurate, tested, and cost-effective savings estimates for measures that tend to have widespread applications and to be installed in large numbers. Well-crafted savings estimates, based on prior EM&V, can be highly reliable. Often, TRM estimates have been developed based on results from multiple studies aggregated over time. In these cases, deemed savings estimates captured in TRMs can be more accurate than single-instance evaluation conducted for a specific project, program or portfolio.

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[37] EM&V Guidance at 8 - 11.
[38] Proposed Federal Plan at 65,072.
[39] *Id.* at 65,072 and 65,073.

However, the deemed savings discussion, as written in the proposed Federal Plan, is difficult to interpret and possibly incorrect. The proposed Federal Plan states that "If deemed savings are used, then the EM&V plan must specify that the deemed savings values will only be used for the specific EM&V measure for which they were derived."[40] The phrase "for the specific measure for which they were derived" does not have clear meaning in practice. This is because jurisdictions describe and define measures differently. For example, some jurisdictions might define refrigerators in individual categories that denote size, features (e.g., in-door ice; cold water), door configuration (side-by-side or freezer on top or bottom), etc. A different jurisdiction might group sizes into categories that are defined slightly differently than a different jurisdiction, or might not differentiate between features that do not materially affect energy use and the resulting savings.

Evaluators commonly, and appropriately, use savings estimates from other jurisdictions or other markets, while modifying key parameters that affect savings. In this manner, evaluators are able to leverage the best available data, usually derived from *ex post* studies, while at the same time calibrating savings estimates to better fit the new situation. For example, high quality estimates of pool pump energy usage in a temperate climate can be used effectively in a hotter climate, provided that operating hours for the equipment is modified to reflect that pools that, on average, are used during a longer season in hot climates vs. cold ones.

The Federal Plan should eliminate the requirements that EM&V plans that use deemed savings only use estimates "for the specific measure for which they were derived" and, instead, the EM&V Guidance should state that deemed savings should be crafted using estimates from appropriate "similar" measures, and should provide discussion about factors to consider – geography, climate, building type, comparability of the base-case and efficient measures in both situations, quality of the overall estimates, etc.

We are generally encouraging EPA to make it clear that EPA standardized deemed savings approaches at the national as well as regional level are presumptively approvable. EM&V across multiple states would be extremely administratively burdensome were each to have its own separate TRM. AEE strongly supports EPAs intent, per the EM&V Guidance, to embrace national approaches such as the U.S. DOE Uniform Methods Project ("UMP").[41]

While it is appropriate and suitable for the proposed Federal Plan to require a public review process, the specificity of the current language describing the process is excessive. The proposed Federal Plan describes a process "in which the public, stakeholders, and experts are invited – with adequate advance notification (via the internet and other social media) … have at least 2 months to provide comment …"[42] This language should be elevated in the Federal Plan to prescribe a general approach with "sufficient" public review including stakeholders and experts, in accord with "industry best practices."

Details such as the list of variables that should be presented within a TRM should be captured as recommendations in the EM&V Guidance, rather than in the Federal Plan.[43] See for example, the following text from the proposed Federal Plan:

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[40] Proposed Federal Plan at 65,072 and 65,073.
[41] http://energy.gov/eere/about-us/ump-home
[42] Proposed Federal Plan at 65,072.
[43] See for example, Proposed Federal Plan at 65,006 and 65,072.

> The associated electricity savings value, the conditions under which the value can be applied (including the climate zone, building type, manner of implementation, applicable end uses, operating conditions and effective useful life), and the manner in which the electricity savings value was quantified, which must include applicable engineering algorithms, source documentation, specific assumptions and other relevant data. [44]

In contrast to the proposed Federal Plan, the EM&V Guidance devotes comparatively little attention to TRMs.[45]AEE generally supports EPA's characterization of information that should be included in TRMs. However, these specific details are better suited to the EM&V Guidance rather than the proposed Federal Plan. Industry best practices may indeed require more, or more refined information than that specified in the Proposed Federal Plan. The EM&V Guidance document offers an opportunity for a lengthier discussion that can be updated over time.

The proposed Federal Plan also indicates that TRMs should be updated "at least every 3 years." We recommend that more information about industry-standard practices for updating be incorporated into the EM&V Guidance. The new information should describe conditions under which deemed savings estimates and TRMs should be reviewed more frequently than the minimum interval specified in the proposed Federal Plan. We do support EPA specifying minimum update intervals in the proposed Federal Plan. However we recommend that the language be modified to indicate that deemed savings estimates/TRMs should be: "reviewed, refreshed and if needed, updated at least every 3-5 years" rather than "updated ... at least every 3 years."

The text of the proposed Federal Plan also suggests that "the TRMs should be publicly accessible over the full period of time in which they are being used in conjunction with an EM&V plan for the purpose of quantifying savings."[46] We support that concept and add that the TRMs for each cycle should be retained and available in perpetuity to the extent feasible, for as long as the affected measures are generating energy savings. AEE agrees that this provision should be retained in the proposed Federal Plan and echoed in the EM&V Guidance.

C. AEE strongly supports EPA's intent to embrace evolving trends and new opportunities in EM&V that are being made possible by advances in technology, metering and data analytics. EPA must include a discussion of EM&V 2.0 in the EM&V Guidance document.

AEE applauds EPA's explicit recognition that EM&V "is routinely evolving to reflect changes in markets, technologies and data availability and expects to update its EM&V guidance over time."[47] Developments in data analytics and advanced metering infrastructure offer opportunities to determine savings from efficiency programs in a manner that might be dramatically different than the current paradigm. Investments in the smart grid, combined with other technological advances in residential interval meter data, nonintrusive load monitoring, and equipment-embedded sensors and controls are transforming the way energy savings are measured.[48] These changes will give efficiency evaluators new

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[44] Proposed Federal Plan at 65,072 and 65,073.
[45] EM&V Guidance at 16.
[46] Proposed Federal Plan at 65,072.
[47] See Proposed Federal Plan, footnote 78 at 65,002.
[48] Eckman, Tom. "EM&V 2.0 – New Tools for Measuring Energy Efficiency Program Savings," *Electric Light & Power* (Feb. 2, 2014), http://www.elp.com/Electric-Light-Power-Newsletter/articles/2014/02/em-v-2-0-new-tools-for-measuring-energy-efficiency-program-savings.html.

tools that will have the potential to reduce the cost of EM&V, produce more timely results, and increase the acceptance of the savings calculations. The combination of metering, information and communications technology, remote monitoring, and scale of data analytics offers a suite of emerging activities the industry sometimes calls "automated M&V," "information and communications technologies (ICT)," "data analytics," or simply "EM&V 2.0."

The EM&V Guidance discusses certain EM&V 2.0 approaches to the extent that it discusses various approaches that involve metering. Many EM&V 2.0 approaches involve metering, and metering can be used in PB-MV, in comparison group methods, and, to some extent, in the development of deemed savings estimates. The EM&V Guidance also uses the term "real-time data." The EM&V Guidance does not preclude EM&V 2.0 approaches. However, there are no particular passages in either the proposed Federal Plan or EM&V Guidance that mention this exciting new frontier for EM&V. The transformational nature of these new capabilities merits explicit recognition in the Federal Plan and significant discussion in the EM&V Guidance.

In addition to creating emission reduction opportunities in its own right, ICT can automate and transform EM&V. For example it can enable the remote monitoring and sophisticated analysis of energy, increasing the speed and scale of many EM&V activities. Advanced EM&V approaches that utilize ICT, data analytics, advanced metering infrastructure ("AMI") or interval data, and machine learning are a growing cost-effective tool to help identify and track near-real time energy efficiency savings. These tools support intelligent efficiency through continuous M&V from meter-based energy savings and present a realistic view of how energy consumption has changed post-implementation of an energy efficiency measure. Data analytics can bring together consumption data, localized weather, building address, and other building attributes to construct an energy baseline. By relying on actual energy consumption for forecasting future energy use, this approach reduces the uncertainty of modeled assumptions and deemed estimates.

Analytics-enabled platforms can also incorporate statistical approaches to determine building consumption before and after energy efficiency intervention, which is critical to showing performance of certain energy efficiency activities that are harder to prove, such as retro commissioning programs. Advanced metering and sensors also allow evaluation and verification of efficiency improvements for line losses associated with transmission and distribution. T&D efficiency reduces emissions by lowering the amount of electricity that is lost as it is delivered to customers.

Other opportunities for EM&V 2.0 include: [49]

- Nonintrusive Load Monitoring - Nonintrusive load monitoring (NILM) has the potential to dramatically reduce the cost of metering individual pieces of equipment and devices. This new monitoring technology, combined with software, can disaggregate loads using nothing more than the characteristics of the electricity that flows to the meter. As the technology evolves, it seems reasonable to expect that more end uses will be distinguishable. Reducing or eliminating the need to enter a premise will reduce the cost and burden of EM&V; modern communication technology promises to quicken that availability dramatically.

[49] Eckman (2014).

- Large-scale Data Analysis - Large-scale data analysis that uses interval data might be able to replace other methods that are more labor-intensive and intrusive to customers. By combining large-scale data analysis with experimental design and the use of randomized controlled trials, the availability of interval data might not only reduce the cost of EM&V but also could provide the program implementer and administrator near instantaneous feedback on program performance. This will help the implementer make adjustments to the program sooner and increase its effectiveness.

- Current Uses of Interval Meter Data - Interval data from smart meters is affecting the solar and demand response business models dramatically. Solar and demand response companies are using interval data to gain insight on the load profiles of buildings, which helps them understand the economics of a given location.

Ever since the term EM&V 2.0 was first coined in 2014, the energy efficiency industry has been debating how the emerging landscape of tools, technologies, and software products will modernize energy efficiency measurement.[50] One effect this might have on EM&V is to alter the balance of preferred approaches or required levels of precision to the extent that it becomes less and less costly to obtain and analyze data. Other effects may be subtler. For example, programmatic efforts for continuous monitoring and improvement may blur the line between "program activity" and "evaluation," requiring development of new protocols for measurement.

EM&V 2.0 promises to dramatically change the way EM&V is conducted. It is imperative that EPA provides discussion on these topics in the EM&V Guidance. Even if there are many issues yet to be resolved regarding EM&V 2.0, providing a discussion in the EM&V Guidance will be an opportunity to discuss industry best practices, and to set the stage for adding additional material when the EM&V Guidance is updated.

D. EPA should designate / encourage states to designate (an) appropriate entity(ies) to facilitate energy efficiency EM&V.

EPA has proposed that, for the rate-based Federal Plan, the Agency "may designate an agent to coordinate the project application process and assist with review of applications,"[51] and that the Agency "may designate an agent to coordinate and assist with M&V reports."[52] While discussed in the context of a rate-based federal plan, this model is applicable to rate-based state plans as well as mass-based federal and state plans (which require any allowances issued to non-EGU resources to fulfill the same requirements outlined for the issuance of ERCs).[53] As outlined in our comments to the Federal Plan and

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[50] See: DNV GL, *The Changing EM&V Paradigm: A Review of Key Trends and New Industry Developments, and Their Implications on Current and Future EM&V Practices*, A project of the Regional Evaluation, Measurement and Verification Forum, Northeast Energy Efficiency Partnerships ("NEEP") (2015), http://www.neep.org/sites/default/files/resources/NEEP-DNV GL EMV 2.0.pdf; and Am. Council for an Energy Efficient Econ. ("ACEEE"), Ethan A. Rogers, Edward Carley, Sagar Deo, and Frederick Grossberg, *How Information and Communications Technologies Will Change the Evaluation, Measurement, and Verification of Energy Efficiency Programs*, (2015),. http://aceee.org/research-report/ie1503; and Oster, Jake, "Energy Efficiency Organizations Outline the Next Generation of Measurement Tools," Energy Savvy Blog (Dec. 15, 2015), http://blog.energysavvy.com/.

[51] Proposed Federal Plan at 65,000.

[52] *Id*.

[53] Final CPP at 64,951 (codified at 40 C.F.R. § 60.5815(c) ("Provisions for allocation of set-aside allowance, if applicable, must be established to ensure that the eligible resources must meet the same requirements for the ERC eligible resource

Model Trading Rule proposal, AEE strongly supports this approach to the issuance of compliance instruments. By designating an agent to help process and review eligibility applications and M&V reports, federal and state compliance plans can leverage the expertise of a third-party – such as a relevant federal agency, an expert state agency such as a state public utility commission or energy office, or an independent private or non-profit entity – in order to incorporate compliance instruments such as energy efficiency that might otherwise require resources or expertise that EPA or a state environmental offices does not possess.

In the context of energy efficiency EM&V, designated agents could perform the following functions related to the use of energy efficiency as a compliance measure:

- Provide a consistent, robust infrastructure needed to facilitate the inclusion of energy efficiency as an eligible resource in state or federal CPP compliance plans;
- Act as a central repository for all documentation needed to issue a compliance instrument (allowance or ERC) to an energy efficiency project based on MWh of savings including: (a) EM&V plans associated with eligibility applications, (b) third party verification reports approving such plans, (c) M&V reports identifying MWhs of energy savings consistent with a measure's EM&V plan, and (d) third party verification reports of M&V reports; and,
- Evaluate the submission of eligibility applications (including EM&V plans) and M&V reports (including for consistency with EM&V plans) to ensure consistency with the eligibility and M&V report requirements established by EPA, individual states, or groups of states;
- Periodically review eligible resource EM&V plans to ensure that they remain consistent with EM&V developments including evolving industry best practices and advancing technological progress.[54]

In addition, a designated agent or other entity could assist in the maintenance of a robust and useable system of EM&V requirements. Capturing energy efficiency means capturing many millions of individual opportunities to use less energy – in the aggregate these small actions pay off in big energy savings. While on the whole EPA has captured *current* industry best practice on EM&V for a wide variety of energy efficiency possibilities in the EM&V Guidance, some level of customization of EM&V is necessary to adequately measure and report the full spectrum of efficiency savings. This type of customization underpins current industry best practices, and makes it difficult to capture firm EM&V "requirements" that are applicable across diverse situations. Yet we recognize that allowing "unlimited" customization of EM&V does meet the Clean Power Plan's requirements that reported energy savings represent robust carbon emission reductions. EPA and states can strike a balance between customization and environmental integrity and can help ensure energy efficiency EM&V remain up-to-date,[55] by relying, to some degree, on outside expertise such as an agent or other advisor to assist in interpreting

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requirements of § 60.5800, and the state must include eligibility application and verification provisions equivalent to those for ERCs in § 60.5805 and EM&V plan and M&V report provisions that meet the requirements of § 60.5830 and § 60.5835.").

[54] Kellen, *Peggy, Introduction to the National Energy Efficiency Registry*, Presentation to the U.S. Department of Energy, State Energy Efficiency Action Network (SEE Action Network) (Nov. 5, 2015), https://www4.eere.energy.gov/seeaction/sites/default/files/pdfs/TCR SEE Action Webinar 11-05-15.pdf.

[55] EPA recognizes that "best-practice EM&V approaches, protocols, and procedures that are now used by states, efficiency providers, and others – and upon which this guidance is largely based – will evolve and improve over time as new technologies emerge and the efficiency marketplace changes," EM&V Guidance at 6.

and updating EM&V requirements and guidance in conjunction with industry best practices. This could be consistent with EPA's use of outside experts in the context of the Science Advisory Board and Clean Air Science Advisory Committee.

Finally, designated agents can meet additional state and EPA needs with respect to the inclusion of energy efficiency in state and/or federal CPP compliance plans, including facilitating tracking and interstate transfer of certificates representing MWhs of energy savings, acting as an agent of a compliance jurisdiction to *issue* eligibility determinations and/or compliance instruments based on a review of the information provided in eligibility applications and M&V reports (subject to compliance jurisdiction oversight), independent verifier accreditation, or compliance auditing. Those administrative functions not related to EM&V are discussed in further detail in AEE's comments to EPA's Federal Plan and Model Trading Rule proposed rule.

Importantly, EPA and states can use a variety of different designated agents and other partners for each of these various functions (or could perform some or all functions themselves).[56]

In fact, the CPP has already stimulated a concerted effort by states, third-party experts and data-system providers to develop infrastructure that can help provide some or all of these functions. In 2015, the Climate Registry (TCR),[57] six U.S. states[58] and the National Association of State Energy Offices (NASEO)[59] received a grant from the U.S. Department of Energy to develop a national energy efficiency registry (NEER).[60] The registry will allow states to track initiatives within their own energy efficiency programs both annually and over time, as well as to facilitate the incorporation of energy efficiency into CPP compliance plans.

As is the case with other registries, the NEER will be a ***policy neutral*** tool for states to track and report energy efficiency savings. It is designed to minimize the administrative costs associated with tracking the MWh of savings resulting from energy efficiency policies and programs, address concerns about potential double-counting of energy savings, and create greater transparency for understanding energy efficiency and its impacts. While the NEER will facilitate the tracking of energy efficiency savings for use in a variety of settings outside the scope of the CPP (e.g., state energy efficiency programs), the NEER is being designed to reduce the administrative burdens of incorporating energy efficiency into state and federal CPP compliance plans. The NEER will be capable of serving many of the functions of a designated agent outlined above to the extent EPA or states choose to rely on it.

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[56] In fact, one benefit of this model is that it allows states and or EPA to elect the *degree* to which they want their staff participating in the process of determining the eligibility and issuing compliance instruments for eligibility measures and the degree to which vendor(s) can be designated to handle additional services, in accordance with the standards set by the compliance jurisdiction. For example, vendors could provide protocols and procedures for states to designate individuals (employees of the state or an agent) who are authorized to determine project qualification and to certify that a claim for certificate issuance is approved.

[57] http://www.theclimateregistry.org/

[58] Tennessee and its project partners – Georgia, Michigan, Minnesota, Oregon, Pennsylvania, are the founding states. Tennessee and its partners will develop a roadmap with potential pathways for voluntary adoption and implementation of a national energy efficiency registry. States will benefit from the road mapping and registry exercise, as it will support multi-agency intra- and inter-state dialogue related to broader state energy and environmental planning and policy. http://energy.gov/eere/wipo/state-energy-program-2015-competitive-award-selections

[59] http://www.naseo.org/sreeps

[60] http://www.theclimateregistry.org/thoughtleadership/energy-efficiency/

E. EPA should add a section in the EM&V Guidance on EM&V methods that interact with other demand-modifying resources (e.g., demand-response, distributed generation, storage, water efficiency, electric vehicles and electrification in general).

As early as 2007, Ed Vine of Lawrence Berkeley National Laboratory was publishing thoughts on EM&V in situations where energy efficiency, demand response and distributed generation were interacting in a given site, project or program. Vine begins:

> This paper explores the feasibility of integrating energy efficiency program evaluation with the emerging need for the evaluation of programs from different "energy cultures" (demand response, renewable energy, and climate change). The paper reviews key features and information needs of the energy cultures and critically reviews the opportunities and challenges associated with integrating these with energy efficiency program evaluation. There is a need to integrate the different policy arenas where energy efficiency, demand response, and climate change programs are developed, and there are positive signs that this integration is starting to occur. [61]

Vine's paper was ahead of its time, to say the least. In the intervening period of nearly a decade, very little work has been done on 1) joint program implementation (multiple demand-side resources) and 2) joint EM&V (multiple demand-side resources). In a 2015 blog post on Energy Efficiency Markets.Com, Merhav put it:

> While it seems obvious today why energy efficiency, demand response, and renewable energy programs should be seamlessly integrated, these programs grew up under disparate circumstances in the utility environment, and it is only in the past few years that the landscape has become increasingly ripe for their integration and greater adoption.[62]

California has attempted to implement integrated demand-side management (IDSM) programs since about 2007, but arguably with little progress to date. The California Public Utilities Commission website says:

> Since 2007, the Commission has sought to work with the utilities to provide their customers with efficient and sensible ways of making energy management decisions easier for their customers. Decision (D.07-10-032) directs that utilities "Integrate customer demand-side programs, such as energy efficiency, self-generation, advanced metering, and demand response, in a coherent and efficient manner." The integration of demand side programs and technologies was expected to achieve maximum savings while avoiding duplicative efforts and reduce transaction costs and customer confusion. In short, IDSM is a strategy that seeks to provide comprehensive building energy management solutions via the integration of technologies, programs, and strategies to facilitate customer behavior changes that reduce load and grid inefficiencies.

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[61] LBNL, Edward Vine, *The Integration of Energy Efficiency, Renewable Energy, Demand Response and Climate Change: Challenges and Opportunities for Evaluators and Planners* (2007).
[62] Merhav, U., "The Shift to Integrated Demand Side Management Programs," *Energy Efficiency Markets.com* (Apr. 2015), http://energyefficiencymarkets.com/the-shift-to-integrated-demand-side-management-programs/.

"*Was expected to*" [italics added] may be the operative phrase above. Simply put, it has proven to be difficult to integrate delivery, let alone evaluation of these demand-side resources – at least from large-scale publicly funded programs. Certain ESCOs may do a better job of integration, since their service delivery is highly customized for each site – dollar savings for customers are determined both by reductions in peak energy demand and reductions in overall energy use. Given Vine's thoughts on integrated EM&V in 2007 and the California Public Utilities Commission's efforts to develop IDSM programs similarly starting in 2007, it's informative to do a quick internet search and see titles such as *"It's Time to Set Up Integrated Demand-Side Management (2012)"*[63] In fact, as Woychik and Martinez (2012) point out, the difficulties in evaluating the different demand-side management approaches from the same valuation platform may be a key barrier for developing and implementing IDSM programs.[64]

Still, as of now, 2016, customers' energy use is likely to be affected by multiple activities that affect energy demand ("demand-modifiers") including energy efficiency, demand response, distributed generation/renewables, water efficiency, storage, and uptake of electric vehicles. This is happening whether or not the demand-modifiers are being offered in a coordinated or integrated fashion as contemplated by large-scale, utility/publicly-sponsored programs.

The key questions from an EM&V perspective are essentially the same as those proposed by Vine in 2007 except that, in addition to energy efficiency, demand response, and distributed generation, water efficiency, storage, and electrification are now part of the mix:

1. How can the evaluation of efficiency programs provide guidance on the design and evaluation of these other types of programs? Specifically, what evaluation issues are similar and what are different?

2. What efficiency program evaluation approaches are useful for evaluating renewable energy, demand response, and climate change mitigation programs?

3. How are state evaluation protocols developed for evaluating efficiency programs being expanded to include other topics and being extended regionally and nationally?

4. What policy mechanisms are needed for integrating efficiency programs with these other types of programs?

AEE strongly urges EPA include a section in the EM&V Guidance on considerations for EM&V in light of these other demand-modifying activities. We recognize that there may be very little information to draw upon, but it would be an oversight for EPA to ignore this very real phenomenon in as important a document as the EM&V Guidance. Adding at least a small section in the EM&V Guidance would serve to legitimize the issue and provide an opportunity for the EM&V industry to begin considering these joint effects as they affect CO_2 reductions. AEE notes that this is an area where advanced metering, data analytics, and other forms of EM&V 2.0 may offer exciting opportunities that were not previously available to evaluators.

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[63] Salazar, A., "It's Time to Set Up Integrated Demand-Side Management," *E-Source* (Oct. 2012), https://www.esource.com/Blog/ESource/10-16-12-iDSM.

[64] Martinez, M. and Woychik, E., *Integrated Demand Side Management Cost-Effectiveness: Is Valuation the Major Barrier to New "Smart-Grid" Opportunities?* Conference Proceedings for ACEEE Sumer Study (2012).

F. EPA should publish (an) additional guidance document(s), analogous to the EM&V Guidance, on EM&V for other eligible measures besides energy efficiency such as combined heat and power ("CHP"), waste heat and power ("WHP"), distributed generation, transmission and distribution ("T&D") efficiency, intelligent efficiency, and demand response.

The final Clean Power Plan recognized and incorporated many advanced energy technologies as eligible emission reduction measures, which will allow states to adopt policies and plans that capture the carbon reduction and economic benefits of these technologies. However, without clarity regarding acceptable means to evaluate, measure and verify savings, states may not know how to include advanced energy in their implementation plans, even if they would otherwise choose to do so. Furthermore, investors and project providers would lack confidence in the ability to actually earn credits from these measures. Accordingly, EPA must do more than simply list advanced energy technologies as eligible for compliance purposes.

AEE applauds EPA for publishing the EM&V Guidance for energy efficiency and for seeking public comment on the document. As described above, the EM&V Guidance will provide certainty to state regulators seeking to include energy efficiency in their state implementation plans by describing how credit for these measures can be evaluated, measured, and verified in the context of the Clean Power Plan. AEE believes that EPA can provide the same kind of certainty for other eligible compliance measures.

The EM&V Guidance is an excellent model on which to design additional guidance documents to rectify this uncertainty. AEE has identified a number of technologies that would benefit from additional guidance analogous to the guidance provided for energy efficiency in the EM&V Guidance, including demand response, CHP, WHP, distributed generation including solar PV and fuel cells, intelligent efficiency, and T&D efficiency. Consistent with our above comment that EPA should avoid technical specificity in the Federal Plan and rely instead on lengthier discussions in a separate guidance document, AEE believes that these technologies should be noted as compliance options in the Federal Plan and Model Trading Rules with reference to separate EM&V guidance published by the Agency detailing applicable evaluation, measurement, and verification.

1. Demand Response

EPA has recognized that demand response is an eligible measure for Clean Power Plan compliance to the extent that it reduces, as opposed to shifts, electricity use. While well-established and accurate EM&V practices for demand response exist, current protocols for measuring demand response savings tend to focus on peak demand reduction rather than MWh savings. This is not because demand response does not reduce MWh energy use but rather because demand response customers and providers are typically compensated based on peak demand reduction during a specific period of time, Protocols have been developed in the past that demonstrate MWh savings from demand response, [65] and AEE believes that industry stakeholders can develop protocols that can be used for Clean Power Plan compliance. EPA should ensure that it has the ability to provide future guidance on acceptable methods to determine how much energy savings is derived from demand response. That way, if protocols are

[65] See for example: California Public Utilities Commission, *Load Impact Estimation for Demand Response: Protocols and Regulatory Guidance* (2008), http://www.calmac.org/events/FinalDecision_AttachementA.pdf

developed in the future to compare, for example, a demand response customer's usage before and after a demand response event, EPA, with input from industry, can develop guidelines for practices that it deems approvable.

2. Combined Heat and Power ("CHP") and Waste Heat and Power ("WHP")

These resources are unique in that they provide both thermal and electric outputs. EM&V protocols exist or are in development for measuring efficiency from CHP and WHP.[66] In recognition of the efficiency provided by the resources, EPA should provide guidance on EM&V methodologies that account for thermal and electric outputs separately. This would allow for more accurate evaluation and crediting of CHP and WHP for CPP compliance.

3. Distributed Generation including Solar PV and Fuel Cells

AEE believes that some of the requirements in the proposed Federal Plan are unnecessarily restrictive and not in line with industry best practices. EPA should work with distributed generation providers and other stakeholders to develop guidance on EM&V for distributed generation that is more consistent with industry best practices and ensures that distributed generation can be used as a compliance measure.

4. Transmission and Distribution ("T&D") Efficiency

Advanced metering and sensors allow evaluation and verification of efficiency improvements for line losses associated with transmission and distribution. But T&D efficiency reduces emissions in its own right by lowering the amount of electricity that is lost as it is delivered to customers.[67,68] Lack of clarity surrounding EM&V for this type of efficiency may prohibit states from including it in their implementation plans. EPA has already recognized the contribution of T&D efficiency to emission reduction, and should publish additional guidance on acceptable EM&V methods for it.

5. Intelligent Efficiency

Intelligent efficiency (also known as "ICT-enabled efficiency") is defined as energy savings that result from the use of information and communications technology ("ICT"). In addition to enabling better EM&V for other technologies, ICT deployment can also reduce the MWh of energy used by equipment. Digital technology can make power generation and end use smarter and more efficient, reducing emissions in the process. This rapidly evolving technology has not been fully realized or implemented and so protocols to evaluate and measure energy savings from ICT have not fully developed either. There are groups now working on the development of protocols that will ensure that this cost-effective method of reducing energy use can be accurately evaluated. EPA should recognize

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[66] The UMP is developing a protocol for evaluating impacts from CHP installations. The draft protocol is available for public review and will be published in 2016. See: U.S. DOE "Combined Heat and Power: DRAFT v3 – Steering Committee Review," *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures* (2015), http://cdn.iotwf.com/resources/12/Utility-distribution-networks_2013.pdf.

[67] See for example: The New York State Energy Research and Development, Razanousky, M., Short, T., Swayne, T., *Assessment of Transmission and Distribution Losses in New York* (2012), https://www.nyserda.ny.gov/-/media/Files/Publications/Research/Electic-Power-Delivery/epri-assessment-losses.pdf.

[68] Clemence, M., Coccioni, R. Glatigny, A., *How Utility Electrical Grid Distribution Networks Can Save Energy in the Smart Grid Era* (2013), http://cdn.iotwf.com/resources/12/Utility-distribution-networks_2013.pdf.

this developing area of energy efficiency and ensure that it has the ability to provide future guidance, with industry input, on acceptable EM&V methods once protocols are developed.