

Major Recommendations Concerning the Clean Power Plan Evaluation Measurement and Verification (EM&V) Guidance for Demand-Side Energy Efficiency (EE) and Responses to EPA's EM&V Questions

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SWEEP has extensive experience accompanying the evaluation, measurement and verification (EM&V) of energy efficiency programs implemented by the electric utilities we work with in the Southwest. In addition, we met with and discussed the draft EM&V guidance document with a number of the major electric utilities in our region. Our comments are informed by these discussions but do not represent the views of the utilities. Our recommendations regarding EM&V of energy efficiency programs and measures are organized around the questions posed in the draft EM&V Guidance document issued by the EPA on Aug. 3, 2015.

1. Does the guidance provide enough information to help EE providers determine what EM&V methods (i.e., project-based measurement and verification, comparison group methods, and deemed savings) to use for purposes of quantifying savings from specific EE programs, projects, and measures?

In general the guidance does provide enough information to help EE providers determine what EM&V methods to use, while at the same time providing considerable flexibility for EE providers to select the most appropriate techniques and build on the EM&V practices already underway. The guidance takes into account the strong base of EM&V methodology and Best Practices that currently exists. The EM&V provisions in the Rule itself as well as the draft EM&V guidance document build on existing EM&V Best Practices. The provisions should increase both the quality and consistency of EM&V across the country.

SWEEP recommends that further guidance be provided regarding EM&V for EE programs and measures that were implemented during 2013-15 and that will continue to provide energy savings in 2022 and beyond, and thus be eligible for ERCs in states that choose emissions rate-based compliance. For previous programs that have already been evaluated or are in the process of being evaluated, we recommend that ERCs be based on gross energy savings if it can be shown that the EM&V was done in compliance with the requirements in the Rule and with the EM&V guidance once it is finalized. However, if this is not the case and not all of the EM&V requirements were met in the EM&V that was already conducted or is in the process of being conducted (e.g., if a common practice baseline was not used in the EM&V or in deemed savings estimates), we recommend allowing ERCs to be granted for energy savings starting in 2022 based on the net savings of the programs and measures previously implemented if the program implementer chooses not to redo the EM&V. Net savings estimates by and large are lower than gross energy savings estimates. However, if the program implementer chooses to redo the EM&V following all the EM&V requirements and guidance (or if EM&V was never done previously and is going to be done in accordance with the requirements and guidance), ERCs should be granted based on gross savings.

In addition, we recommend that the ERCs for these previously implemented and evaluated programs be limited to the gross savings; i.e., net savings can be used as long as net savings are equal to or less than gross savings. If the net savings are projected to be greater than gross savings, ERCs should be based on gross savings.

For those programs or projects implemented during 2013-15 that have not been evaluated yet, the program or project should be evaluated following the requirements in the Rule and final EM&V Guidance once it becomes available for the purpose of determining ERCs under the Clean Power Plan. Likewise, SWEEP recommends that the EM&V requirements and guidance be used for evaluating programs and projects implemented in 2016 or beyond, for the purpose of applying for and issuing ERCs. Doing so will ensure the accuracy and credibility of the ERCs that are issued for energy savings programs and projects, and provide for consistency across states.

Based on our experience working with electric utilities both large and small over the past 14 years as well as with other energy efficiency program implementers, we recommend that the EPA direct all states and all program and project implementers to follow the EM&V requirements and guidance. They are feasible to implement and should apply whether a utility or other program or project sponsor has been implementing energy efficiency measures for decades or is new to energy efficiency implementation. We base this comment on our experience observing numerous utilities including APS, NV Energy, Public Service Company of New Mexico, Rocky Mountain Power, Salt River Project, Southwestern Public Service Company and Xcel Energy that began to implement high quality EM&V shortly after initiating new energy efficiency programs.

As we noted in our comments on the draft Clean Power Plan Rule, SWEEP does not support multiple tiers or levels of EM&V and discounting of savings if substandard EM&V is carried out. Allowing multiple EM&V options could lead to confusion as well as less accuracy and credibility for energy savings credits. Multiple EM&V options are not necessary given the widespread adoption of many the methodologies and protocols recommended by the EPA, the flexibility provided in the EM&V guidance, and the strong base of EM&V professionals that are available to assist utilities and other program or project implementers carry out Best Practice EM&V in accordance with EPA's requirements and guidance.

2. Does the guidance include sufficient information about the appropriate circumstances and safeguards for the use of deemed savings values? For project-based measurement and verification and comparison group methods?

In general we believe it does. Regarding use of deemed savings values, we support the requirements in the Rule and in the draft Federal Plan/Model Trading Rules. These requirements are important so that deemed savings values are not misused or result in excessive energy savings claims. In particular, we support requiring that deemed savings values be updated where appropriate based ex-post EM&V studies conducted at least once every three years to ensure that deemed savings values are as up-to-date and as accurate as possible. Conducting EM&V studies at least once every three years has become standard practice in the utility energy efficiency program evaluation field and can be extended beyond utility efficiency programs in those states

that choose to obtain ERCs for energy savings from non-utility energy efficiency programs. In addition, we support use of Technical Reference Manuals (TRMs) to document energy savings values, input factors, and algorithms. Many utilities in our region maintain and use TRMs.

Regarding the revision of deemed savings values after new EM&V studies have been conducted, we recommend use of the revised values for energy savings estimates from recently implemented programs and measures in situations where ERCs have not yet been issued. But if ERCs have already been issued based on the previous (i.e., unrevised) deemed savings values, we recommend that there be no retrospective adjustment to these ERCs. Trying to revise them after they have been issued would be problematic in our view, and in the view of the utilities we consulted with.

Regarding applying the results of new EM&V studies to energy savings going forward over the remaining useful life of the programs or measures previously implemented (i.e., more than three years previously) but where ERCs have not been issued yet for the remaining useful life of the programs or measures (“so-called forward adjustments”), we have some comments which we provide in the Reporting Timeframes and Considerations section below.

3. Should the guidance specifically encourage greater use of comparison group approaches? Under what circumstances is the application of such empirical methods practical and cost-effective? Would additional guidance be useful on “top-down” econometric EM&V methods, and the ways in which such methods can be used to verify savings at a high level of aggregation?

The Model Rule and the EM&V guidance encourage the use of Comparison Group methods for energy savings evaluation. We think this is a reasonable recommendation, with discretion left up to program managers and project implementers as to when to employ this approach. The Comparison Group approach is widely used for certain types of programs, such as behavior change programs involving large numbers of customers in the treatment group but not all customers. In addition, it may be possible to use this approach for other types of energy efficiency programs. For example, the Salt River Project in Arizona has used it to evaluate the energy savings from its building energy code advocacy and support program by comparing the electricity use of new homes in local jurisdictions that have adopted a state-of-the-art building energy code to the electricity use of home in local jurisdictions that have not.

The growing availability of AMI data and advance data analytical tools can support greater use of Comparison Group evaluation methods. However, Comparison Group approaches are not applicable to evaluation of all types of energy efficiency programs or projects. As an enhancement to the current draft, we recommend that the final guidance include a list the types of programs where Comparison Group methods are a reasonable approach to energy savings evaluation (and by absence from the list those where it is not).

Regarding the merit of “top-down” econometric EM&V methods and whether or not EPA should provide additional guidance concerning them, we first note that this approach has not been widely used to evaluate energy savings and that some past attempts to use it have met with data limitations and issues about whether or not model forms or variables are correctly specified. If variables that influence energy consumption are left out of the model due to absence of data or if data are missing or of poor quality, the results of econometric analyses can be biased

or imprecise. Examples of top-down econometric analyses that have suffered from these problems include attempts to analyze savings from utility DSM programs in this manner¹, and to evaluate savings in the residential sector as a whole². Given these limitations and challenges, we think it is premature for EPA to recommend top-down econometric methods as a preferred approach to energy savings EM&V.

- 4. Is the guidance in Section 3 on particular EE program types (consumer-funded EE programs, project-based EE, building energy codes, and appliance standards) helpful, clearly presented, and sufficient/complete? Can this guidance be reasonably implemented, considering data availability, cost effectiveness, accuracy of results, and other factors?**

In general the guidance is helpful and clearly presented. However we have a number of substantive recommendations that we present by program type. Our comments under building energy codes in particular are intended to make the guidance easier to implement, while providing what we believe to be appropriate energy savings credit.

Demand-Side EE Programs

Section 3.1 of the draft Guidance includes lists of common direct action and indirect action programs. The list of indirect action programs should include “Upstream incentives provided to retailers, distributors, and/or manufacturers.” This type of program has proven to be a very effective strategy for stimulating greater adoption of certain energy efficiency measures such as LED lamps and high efficiency air conditioning equipment, and is growing in popularity. In addition, the applicable guidance for indirect action programs should include the same EM&V methods that are specified for direct action programs; i.e., PB-MV and deemed savings, in addition to comparison group approaches. All three approaches can be applied to upstream incentive programs where information is available or can be obtained on consumers that obtained energy efficiency measures through this type of program.

Building Energy Codes

Section 3.3 of the draft guidance discusses evaluation of building codes. Building codes are one of the major energy efficiency policies states and local jurisdictions can use to advance greater energy efficiency. However, the potential for states and local jurisdictions to receive energy savings credits for their building code efforts is almost entirely nullified by footnote 58 on page 41 of the draft guidance which states that “adopting codes that the federal government has already determined to be cost-effective cannot be used for compliance with EPA’s emissions guidelines.” **We strongly recommend that the EPA delete this provision.** Under existing law, the U.S. DOE is supposed to speedily review model energy codes for energy savings and cost-effectiveness. Thus this limitation leaves only a small time window for states or local governments to receive credit for energy savings resulting from the adoption and enforcement of

¹ Arimura et al. 2009. *Cost-Effectiveness of Electricity Energy Efficiency Programs*. Washington, DC: Resources for the Future. <http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-09-48.pdf>.

² Foster, et al. 2012. *The 2012 State Energy Efficiency Scorecard*. Washington, DC: ACEEE. <http://aceee.org/research-report/e12c>.

new building codes – at most the window extends from when a model code is published until when DOE determines the code to be cost-effective.

Furthermore, even when DOE determines that a code is cost-effective, it does not mean that states or local governments must adopt this code. Many states or local governments are slow to adopt new model energy codes and some states never adopt these codes, for reasons other than cost effectiveness. In practice, adopting model energy codes is not mandatory even when DOE indicates that a new code is cost effective from a national perspective. There are no adverse consequences if a state does not adopt a new code and even DOE recognizes that in some states “home rule” laws prohibit adoption of a mandatory code at the state level. Allowing states and local governments to receive ERCs for adopting new building codes would provide further incentive to spur such adoption.

Likewise, numerous utilities including APS, SRP, Xcel Energy, Rocky Mountain Power and Public Service Company of New Mexico in our region implement building energy code support programs. Utilities that implement such programs should be able to obtain ERCs for energy savings after appropriate EM&V is performed, whether or not the DOE has determined that the energy code is cost-effective at the national level. In addition, both adoption of more stringent building energy codes and programs or efforts focused on improving code compliance should be eligible for ERCs.

It is also important to recognize that the type of restriction indicated in footnote 58 of the guidance document is not applied to other energy efficiency measures or programs that DOE may find to be cost-effective, such as LED lights or other lighting efficiency measures that are promoted through demand-side programs, ESCO projects and the like. It would be inconsistent to apply the restriction to building energy codes and not other policies or measures. Moreover, the restriction should not be applied to any energy efficiency policies or measures unless they are explicitly mandated by federal law such as through new federal appliance or equipment minimum energy efficiency standards.

In addition, we have concerns about the portion of Section 3.3.2 of the draft guidance which directs states to document NOMAD (naturally occurring market adoption) and then use NOMAD to establish a Common Practice Baseline (CPB). This requirement would be complicated and costly for many states or local governments to comply with, and is not something they normally do or contemplate doing in conjunction with adoption and enforcement of building energy codes. This provision could inhibit the adoption of stronger building energy codes if states are unwilling or unable to comply with this requirement, in those states that adopt a rate-based approach to Clean Power Plan compliance.

Instead, we recommend that EPA provide guidance on what states can presumptively use as a CPB for determining code savings, and we have a specific recommendation in this regard. For the first new code adopted after the publication of the final Rule, we recommend that whatever energy code a state or local jurisdiction had in place as of the date of publication of the CPP Final Rule in the Federal Register be used as the baseline. If a state or local jurisdiction had no energy code in place, then common practice as of this date would need to be documented.

Then for subsequent code revisions, the baseline for the new code would be the prior code, as suggested on page 39 of the draft EM&V guidance.

Regarding new energy codes adopted after January 1, 2013 but before the publication of the Final Rule, we recommend using the same approach, namely to indicate that the baseline for the new code be the prior code that was in place in the state or locality. States or local jurisdictions should be allowed to get energy savings credits for building energy codes (or efforts that increase code compliance) adopted after January 1, 2013 as long as they conduct proper EM&V.

- 5. Is the guidance on important technical topics (e.g., common practice baselines, accuracy and reliability, verification) helpful, clearly presented, and sufficient/complete? Can this guidance be reasonably implemented, considering data availability, cost effectiveness, accuracy of results, and other factors?**

In general the guidance is helpful, clearly presented and complete. However we do have some substantive recommendations that we present by technical topic below.

Common Practice Baseline (CPB)

EPA proposes to use a CPB approach for purposes of establishing a baseline for EM&V savings estimates. As defined in the Model Rule and supporting draft EM&V guidance, CPB is used in conjunction with the gross energy savings. We support this approach. Some energy efficiency programs already use a baseline that is consistent with CPB, but other programs will need modify their baseline assumptions going forward for the purpose of obtaining ERCs under the Clean Power Plan.

While SWEEP supports the CPB approach including use of a dual baseline for equipment early replacement programs, we note that the approach may be new to some states, utilities and other energy efficiency policy, program and project implementers. These entities may need help in figuring out how to properly implement this approach. To address this concern, we recommend that EPA or DOE develop additional CPB methodological guidance as well as proxy values where possible for common energy efficiency measures. If EPA accepts this recommendation, the state-of-the-art proxy values should be updated periodically, and should vary by climate zone as appropriate. Use of these proxy values would not be required and should not be used if a program or project implementer has reason to believe the proxy values are not accurate in their situation, or if a program or project implementer has obtained locally-specific CPB values.

Accuracy and Reliability

The Model Rule provides that “Sampling of populations is appropriate, provided that the quantified MWh derived from sampling have at least 90 percent confidence intervals whose end points are no more than +/-10 percent of the estimate.” We support this requirement and note that this level of confidence and precision is routinely used in EM&V studies which involve sampling of participants in energy efficiency programs today, and is considered a best practice. However, we recommend that the guidance note that there are situations where either a higher or lower

confidence interval or level of precision is appropriate. For example, behavioral programs with very large participant and control groups are often evaluated with a 95% confidence interval while an 80% confidence interval may be acceptable for individual programs that contribute minimal energy savings to the total savings achieved by a utility or other provider implementing a portfolio of energy savings programs. Regarding a quantitative threshold for minimal energy savings, we suggest a threshold of programs providing less than 1,000 MWh/yr of energy savings. Considering the programs implemented by utilities in the Southwest, programs providing less than 1,000 MWh/yr represent a small fraction of the total savings achieved by a single utility or state. In addition, we suggest that language along these lines be added to Section 2.6 of the guidance document.

Effective Useful Life and Persistence of Savings

EPA requires that EM&V Plans address how the duration of EE program or project electricity savings will be determined, using industry ‘best-practice’ protocols and procedures involving annual verification assessments, industry-standard persistence studies, deemed estimates of effective useful life (EUL), or a combination of all three. We note that Chapter 13 of the Uniform Methods Protocols, Assessing Persistence and Other Cross-Cutting Methods Protocols, provides a helpful discussion of the data/benchmarking approach and periodic field studies. We support all of the methods identified by EPA, but expect many states to ultimately rely most heavily on industry-standard persistence studies and deemed estimates of effective useful life.

In practice, field studies of energy efficiency measure life and energy savings persistence by utilities are rarely done as part of program evaluation because of the high cost and inherent research challenges especially with long-lived (e.g. over 5 year EUL) measures. A number of industry-standard survival curves have been published and make it easier for utilities and states to estimate EUL for common measures. These EUL tables and curves include the effects of factors that degrade energy savings over time. We recommend that the guidance document support the use of and provide references to these curves.

Some utilities or regions have conducted meta-analyses and other cross-cutting studies to estimate EUL and/or energy savings degradation over time for commonly used measures or collections of measures (e.g. HVAC system improvements). We recommend that the EPA encourage greater use of this approach. Also, states or utilities that currently lack such studies should be allowed to reference and use measure life or savings persistence studies from other states or utilities, as long as there are no apparent reasons why EUL or energy savings degradation would vary from state-to-state or utility-to-utility.

Reporting Timeframes and Considerations

The Reporting Timeframes and Considerations section of the draft EM&V guidance discusses the issue of forward adjustments to energy efficiency measure savings as new evaluation data become available. We first note that this type of ongoing evaluation of the energy savings from energy measures over the lifetime of the measures is not typically carried out in energy program evaluation work today. Most ex-post program evaluations are done one time after a program is implemented, with annual energy savings estimates for the program and

measures adjusted in some cases for the year being evaluated as well as going forward and in other cases only going forward. SWEEP supports continued use of this type of process for determining ERCs under the CPP, namely adjusting actual energy savings values after ex-post EM&V studies are completed for programs going forward and where feasible for energy savings in the year of program implementation and measure installation.

Regarding the concept of forward adjustments to energy savings after further evaluations of the same type of program is done as described in the box on page 15 of the draft EM&V guidance document, we note that such forward adjustments may be possible in some cases namely when energy efficiency measures and the types of consumers or businesses adopting them do not significantly change over time. For example, some lighting efficiency measures such as LED lamps adopted by households may become a stable technology and market such that new evaluations of a residential lighting program can be used to adjust the annual energy savings for the same program implemented five years or seven years or ten years previously.

However, the energy efficiency measures in other types of efficiency programs do change significantly over time. For example, residential appliance and air conditioning technologies are changing in terms of their energy efficiency over time, as are consumer electronic products. Because of this, the ex-post energy savings per measure of program implemented in year X should not be used to adjust the energy savings of the same program implemented five or seven or ten years previously. The only way to accurately adjust the energy savings over time of older programs would be to re-evaluate the energy savings being provided by the measures installed five or seven or ten years previously. This is not done in efficiency programs today and would be complicated and costly to do in practice. We recommend that EPA acknowledge this situation in the EM&V guidance and provide these caveats about the feasibility and necessity of forward adjustment of energy savings.

At the same time, forward adjustments to energy savings should be made when facilities are shut down, buildings are heavily renovated, industrial operations are significantly modified or other actions are taken that significantly affect the energy savings occurring over time. These factors can be accounted for either directly or indirectly through use of standardized energy savings degradation curves and/or assumptions about effective useful lifetime that account for the effects for programs as a whole.

In the case of large or customized energy efficiency projects that provide a significant fraction of the total energy savings achieved by a utility or other program provider in a particular year (say any project providing at least 1,000 MWh/yr of savings or more than 1% of more of total portfolio savings), site visits should be made periodically over the lifetime of the projects to ensure that they are continuing to provide energy savings close to the initially assessed value. If initial conditions significantly change, forward adjustments to energy savings (either upwards or downwards) should be made.

Another concern we have regards timing of installations as described in Section 2.3.2 of the guidance document. EPA first recommends that when reporting savings, first year savings should be based pro rata on the day an efficiency measure was installed. EPA then indicates that for state measure plans, savings should be reported as if they started accruing on January 1 of the

reporting year. This latter approach is standard practice in the energy efficiency industry. We recommend that EPA adopt this second approach for both a rate-based emissions standards plan and a state measures plan. Day of installation would be extremely complicated and difficult for utilities and other program providers to track given the thousands of energy efficiency measures installed through energy efficiency programs each year. And in some cases such as in upstream programs where incentives go to retailers, distributors and/or manufactures, date of measure installation is not known.

If our recommendation is accepted and January 1 is the approved date for starting energy savings for all measures installed in a particular calendar year, then savings persistence should be adjusted appropriately so that energy savings are not assumed for longer than the estimated useful lifetime of different measures and projects, assuming installation as of January 1.

Transmission and distribution (T&D) savings adders

Regarding T&D savings adders intended to account for the reduction in line losses due to end-use energy efficiency improvements, the EPA proposes to use the smaller of six percent or the calculated statewide annual average T&D loss rate (expressed as a percentage), calculated using the most recent data published in the Energy Information Administration's State Electricity Profiles. We suggest a different approach. We recommend that in case of utility-sponsored efficiency programs, utilities be directed to use their own T&D savings adders instead, as they routinely do so for reporting energy efficiency program savings to their state utility commissions. Using utility-specific values will be more accurate than statewide averages or an arbitrary six percent adder.

In addition, states and utilities should be encouraged to use different T&D savings adders for different types of energy efficiency programs because there can be significant differences across program types; e.g., between programs targeted to residential customers and those targeted to higher voltage commercial and industrial customers. We recommend that state-average values be used for programs that are truly statewide, such as adoption of updated state building energy codes or state appliance efficiency standards.

6. How useful and usable is the guidance, overall? Does the relationship between the component parts (i.e., Sections 1-3 and Appendices A-C) clear and relatively easy to follow? Is each of these sections and appendices helpful, clearly presented, and sufficient/complete? What specific examples, graphics, or other visual elements would help illustrate concepts described in the guidance.

In general, we believe that the draft EM&V guidance is mostly workable for those who are familiar with EM&V but we are concerned that, as written, some of the language and description may be too complicated for some of the air regulators and others who are new to energy efficiency EM&V. Therefore, we recommend that simple explanations and graphics/visuals be prepared to help explain the key points to those without extensive EM&V experience. In addition, use of jargon and acronyms should be minimized (e.g. NOMAD and PB-MV). In the measurement and verification industry, project M&V and the supporting IPMVP framework is well known, and introducing the acronym PB-MV seems unnecessary. We suggest

simply using the term project M&V. And rather than introducing the term NOMAD we suggest rewriting these sections to refer to the CPB instead.

- 7. Does the guidance *not* cover any important EM&V topics relevant to fulfilling the EM&V related requirements of the emission guidelines? Is additional guidance needed to support the implementation of other eligible zero- and low-emitting measures that are directly metered? What topics, if any, are unnecessarily included?**

We recommend that EPA provide sample EM&V plans for some common energy efficiency policies, programs and measures to help show states exactly what they need to include in their EM&V plans and provide a template that states could modify. For example, templates could be provided for new state or local building codes, residential appliance, lighting and weatherization programs, commercial and industrial prescriptive and custom rebate programs, behavioral change programs, and energy savings performance contracts.

- 8. How can the guidance most effectively anticipate the expected changes and evolution in quantification and verification approaches over time (given the time horizon for the emission guidelines)?**

We recommend that guidance discuss and reference the emergence of new forms of data collection via AMI, wifi-enabled smart thermostats, and advanced data analytics. While current efforts around these technologies are primarily focused on serving as a customer engagement tool, these technologies are also evolving to serve as an automated EM&V tool, applicable specifically to either single measure or whole building programs where large scale billing or AMI energy use data analysis is used. AMI-based data and advanced analytics can also be used to help identify savings from large C&I projects in near real-time.³ We suggest that the EM&V guidance make note of these developments and support their use, including referencing work being done to standardize testing of these advanced data analytic tools by Lawrence Berkeley National Laboratory.

In addition, we recommend that the EM&V guidance set forth how the guidance document will be updated, through what process, managed by what agency/entity, and in what timeframe or cycle. Specifically, we recommend that the EPA update the guidance document at least once every three years and solicit input from interested stakeholders at the beginning of the process and as well as on a draft of the updated guidance. In addition, we recommend that the list of recommended EM&V protocols and guidelines in Table 2-2 of the Guidance be periodically updated. New or revised protocols or guidelines should be added to the list as they become available. To this end, we recommend that EPA set up a web site that would provide the most up-to-date list of industry-standard EM&V protocols and guidelines.

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³ Rogers, Ethan, et al. 2015. *How Information and Communications Technologies Will Change the Evaluation, Measurement, and Verification of Energy Efficiency Programs*. Washington, DC: American Council for an Energy-Efficient Economy. Dec.