

Guide to Government Witnessing and Review of Measurement and Verification Activities

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1. Introduction

This document provides guidance pertaining to government witnessing of measurement and verification (M&V) activities in federal energy savings performance contract (ESPC) projects. The U.S. Department of Energy's Federal Energy Management Program (FEMP) recommends that government staff witness the M&V activities that are carried out by the energy services company (ESCO) to determine whether contractually guaranteed cost savings are delivered. Witnessing of M&V activities is a part of the process of reviewing and approving M&V deliverables and the on-site inspections, spot measurements, short-term monitoring, and performance tests described in the M&V plan.

Government witnessing is recommended to ensure that M&V activities are executed in accordance with the contract requirements, and will give agencies confidence that the M&V reports produced by the contractor represent accurate results and credible justification for payments based on guaranteed savings.

This guidance includes procedures for preparing for, coordinating, and witnessing ESCO M&V activities ([Section 2](#)) and discussion of a graded approach to M&V oversight and witnessing, including three levels of practice and minimum staff qualifications for each ([Section 3](#)).

[Appendix A](#) is a suggested format for recording government witnessing. [Appendix B](#) shows the Super ESPC master contract clauses and suggested language to be used in the ESPC task order RFP (TO-RFP) pertaining to contractor report submission and government review.

1.1 Anticipated Outcomes

Government witnessing should be recognized as just one aspect of due diligence in implementing an ESPC project. As in any contract, the government is responsible for ensuring that the ESPC is a good deal for the government through understanding the terms of the contract and providing competent contract administration. In ESPCs, due diligence also requires that the government understand the nature and terms of the savings guarantee, and how M&V determines whether the guarantee has been met. Government witnessing of ESCO M&V activities answers the question, "How does the agency know whether the M&V report is right?"

Anticipated positive outcomes of following this guidance also include these benefits:

- Agencies and ESCOs will communicate clearly and reach a full mutual understanding of the M&V plan and activities and how they demonstrate whether guaranteed performance and savings are being achieved.
- Active facilitation and observation of ESCO M&V activities by designated agency personnel will expedite the process of ESCO conduct of M&V and agency review and approval of the resulting M&V reports.
- Disputes about performance and verified savings can be prevented, minimized, or quickly resolved.

1.2 FEMP Guidance on M&V

This witnessing guidance is fully consistent with the procedures FEMP recommends for reviewing performance reports in *Reviewing Post-Installation and Annual Reports for Federal ESPC Projects* (on the ESPC Resources Web page. (Go to FEMP at energy.gov/eere/femp/federal-energy-management-program; navigate to ESPCs under Project Financing, then to the ESPC Resources page.) This witness should be implemented as simply an additional element in that process. More guidance on M&V and related aspects of federal ESPCs is also available on FEMP’s ESPC “Resources” Web page.

2. Procedures for Oversight and Witnessing of M&V Activities

The procedures outlined below apply primarily to witnessing post-installation and “annual” M&V activities after project acceptance. FEMP recommends that agencies also consider witnessing ESCO measurements of baseline parameters during the ESCO’s investment-grade audit and commissioning activities during the construction period.

Post-installation M&V is conducted after installation of the ECMs and documented in the post-installation report, which is reviewed and approved prior to project acceptance. Witnessing post-installation M&V is often critical for ECMs that are subject to Option A M&V methods, because their actual performance may be measured only at this point, with subsequent M&V activities limited to inspections to verify “potential to perform.”

The schedule for construction, inspections, submittal and review of the post-installation report, and project acceptance is specified in the task order. The agency is obligated to perform its oversight and review of M&V activities and reports in the timeframes described in the task order. It is important that the agency complete reviews in a timely fashion and not contribute to any delays related to project acceptance and payment.

Federal ESPC regulations require that M&V activities be conducted and reported to the agency at least annually during the performance period after project acceptance, and the recommendations here assume an annual schedule of performance-period M&V activities and reports. However, M&V inspections and reports may be conducted more frequently than annually, and M&V data collection may be done in various ways, such as during O&M visits, or through an energy management control system. These procedures can be adapted for those types of schedules as well as annual M&V activities.

The recommended procedures below include steps for the agency to take (1) in preparation for M&V activities, (2) during facilitation and witnessing of M&V activities, and (3) after the ESCO’s annual M&V inspections are completed.

These procedures are intended to enable government oversight and review of M&V activities in order to

- verify that all M&V activities are conducted in accordance with the M&V plan,
- confirm that the reported results of inspections and measurements are accurate and represent actual operation of the equipment or systems involved, and
- ensure that M&V activities are properly documented.

2.1 Agency Preparation for Facilitation and Witnessing of M&V

Typically the agency contracting officer’s (CO’s) representative or technical representative (COR or COTR) is ultimately responsible for M&V oversight and/or witnessing, per delegation by the CO.

The designated agency COR or COTR for the ESPC project may carry out oversight of agency M&V activities, witnessing, and review and approval of M&V reports, or delegate oversight to another individual the agency judges to be qualified to perform the work.

Decisions regarding the level of oversight and review that is necessary and who will be responsible for specific tasks should be made in advance and communicated to all parties, including the agency CO and the ESCO, prior to scheduling M&V activities.

Given the wide range of technologies implemented in ESPCs and the skills and experience that may be needed to review a project, a single individual may not have all of the qualifications necessary to provide proper oversight, witnessing, and review. Agencies may contract with a third party (e.g., the FEMP project facilitator) to provide these services if in-house time or expertise is lacking.

(See [Section 3](#) for a graded approach to government witnessing and recommended minimum qualifications for personnel conducting M&V oversight and witnessing.)

The key preparatory tasks for the designated agency representative(s) in advance of the ESCO's visit are the following.

1. Review and understand the expected performance of the ECMs, their baselines, and how performance will be measured and/or verified per the M&V plan (including the tests and equipment to be used). Materials to be reviewed include the ECM descriptions, baseline definitions, M&V plan, and financial schedules in the final proposal/task order; any contract modifications; post-installation M&V report; and any previous annual M&V reports.

2. Coordinate ESCO visits with site personnel.

Coordinate visits to occupied spaces with appropriate agency/site personnel. Ensure that arrangements are made for the ESCO to have access to all equipment and all areas necessary to evaluate performance of ECMs.

Ensure that operations and maintenance (O&M) personnel that may have information relevant to the assessment of ECM performance will be available.

3. Prepare forms for documenting witnessing.

Ensure that forms for recording dates, personnel, and measurement information are prepared (by either the agency or the ESCO) for each ECM for which measurements will be witnessed. (A sample form is given in Appendix A.) Completed forms will be signed by the agency witness(es) and attached to the agency's review of the ESCO's M&V report.

4. Coordinate with ESCO.

Communicate with the ESCO prior to the visit to determine needs for access, for information and records, and for any required or helpful participation of site personnel in tests and monitoring (e.g., boiler operators to facilitate combustion efficiency tests).

Review and provide to the ESCO pertinent records per the M&V plan, e.g., utility bills, O&M records, and documentation of occupancy or usage changes in affected spaces. If possible, provide records to the ESCO in advance of M&V inspections.

5. Schedule ESCO M&V inspections for times that are not disruptive to agency operations. To the extent possible, schedule for dates and times when ECMs are subject to actual, normal operating conditions.

2.2 Facilitating and Witnessing ESCO M&V Activities

Once the ESCO arrives at the site, the agency representative(s) should then:

1. Conduct a meeting with the COR or COTR, witness(es), and ESCO personnel to review the schedule, access requirements, and tests and monitoring that the ESCO intends to perform. Ensure that all parties understand how the performance of ECMs is to be tested and what constitutes performance that meets the terms of the contract. Any participation by agency personnel to facilitate M&V tests and monitoring, either during or after the visit (e.g., to operate equipment for testing, or record or transmit information from data loggers) should be agreed upon.
2. Provide any utility, occupancy, or O&M data or records needed by the ESCO that could not be provided in advance.
3. Escort ESCO personnel, observe tests or observations performed, record test or measurement equipment used, record results if available on site, and obtain any needed clarification of how tests are being performed. Ensure that all needed access is provided and that all agreed upon tests are performed, and record any anomalies that affect M&V (e.g., equipment not operable or available for testing). Record any observed malfunctions either of ECMs or monitoring equipment. Sign the data collection forms used to record these observations (Appendix A).
4. Ensure that facility operating staff brings to the attention of the ESCO any problems they have experienced with ECM performance.
5. For inspections for **initial post-installation M&V and/or commissioning** (prior to project acceptance), agency witnessing should include, for critical ECMs, confirmation that the equipment installed matches what was specified, and that it was properly installed in accordance with applicable M&V and commissioning plans.

2.3 Post-M&V Steps – Review of M&V Reports

1. Follow up on any requests by the ESCO for information not available at time of visit, and follow up with the ESCO for any clarification that may be needed.
2. Follow up as necessary with operating personnel for any observations they may have of ESCO conduct of testing and monitoring.
3. Review the ESCO's M&V report in accordance with FEMP's guidance on reviewing M&V reports (cited in Section 1.2). Prepare a written review (or edit and approve the review prepared by others). This review should include all comments for the ESCO and should clearly specify any action or information requested of the ESCO. The report should be delivered in a timely fashion (within 30 days of receipt is suggested). If necessary, the ESCO may be required to submit a revised report.

(The FEMP project facilitator will normally prepare reviews of the commissioning report, post-installation report, and the first annual M&V report.)
4. Provide copies of the review, with completed government witnessing forms attached, to the ESCO, the agency CO, and the DOE Super ESPC CO, who will archive it for project records. Electronic files are required for DOE documentation.
5. Any dispute between agency and ESCO must be resolved in a manner consistent with the dispute resolution language in the M&V plan, the IDIQ, and the task order/TO-RFP. Payments should not be delayed for issues that do not have a material impact on savings, and any payments withheld should be proportional to the perceived savings discrepancy or performance shortfall.

3. Agency Roles, Responsibilities, and Qualifications Recommended for M&V Oversight and Government Witnessing

3.1 The COR/COTR's Lead Responsibilities for Contract Administration

A COR/COTR appointed by the agency generally carries lead responsibility for M&V oversight and project acceptance for an ESPC task order. FEMP recommends that the COR/COTR be a Certified Energy Manager or have equivalent knowledge combined with at least five years of experience with energy efficiency projects. Contract administration requirements for the agency COR/COTR for the ESPC task order include the following.

- Provide technical oversight to the development and implementation of the M&V plan and commissioning plan.
- Prior to ECM installation, witness measurements and review calculations, records (e.g., utility bills), and other elements of baselines to confirm accuracy and consistency with the approved M&V plan.
- During ECM installation, witness ECM testing identified in M&V and commissioning plans based on ESCO advance notification of scheduled system testing.
- During post-installation 30-day pre-acceptance test period, witness ECM testing and performance measurements conducted by ESCO.
- Review post-installation and commissioning reports to confirm that ECMs are installed and performing as specified; complete review of reports within 30 days of receipt.
- Witness scheduled inspections conducted by ESCO during the performance period to confirm ECM performance.
- Review annual M&V reports; complete report review within 30 days of receipt (or within the time specified in the task order).

In case of a change in agency staff serving as COR/COTR, it is critical for the agency to ensure that as much knowledge as practical of the ESPC project and task order be transmitted to succeeding personnel. Both the ESCO and the DOE CO should be provided with written notice of changes in CO or COR/COTR assignments.

3.2 A Graded Approach

3.2.1 Focused Review of High-Value ECMs

This guidance recognizes that many agencies may be limited in time and expertise to devote to government witnessing of ESCO M&V activities, and suggests that a prioritized or graded approach may be considered.

FEMP's guidance on reviewing post-installation and annual reports (cited in Section 1.2) recommends placing priority on the ECMs that account for the greatest share of the savings:

Principal review efforts should be focused on the measures providing the largest portion of the cost savings for the project. This strategy of reviewing the principal cost-saving measures first will help the reviewer spend the smallest amount of time necessary while maximizing the value of the review, and is especially helpful when review time is limited. Complete a detailed review of each ECM if possible.

This approach can be applied to government witnessing of M&V activities as well. The resources invested by the government in oversight and review of M&V activities may vary based on the magnitude of the savings, complexity of the ECMs, and the resources available.

3.2.2 Minimum, Recommended, and Best Practices for M&V Oversight and Witnessing

This graded approach, addressing progressive levels of rigor in M&V oversight, is defined below to guide agencies in determining the type of review that is necessary and who will be responsible for specific tasks. These decisions should be communicated to all parties, including the agency CO and the ESCO, prior to scheduling M&V and witnessing activities. Given the wide range of technologies implemented and the skills and experience needed to review a particular project, it is unlikely that a single individual will have all of the qualifications necessary to provide proper oversight and review.

Three levels of oversight and review of M&V activities and minimum qualifications for staff to carry out each level are described below:

1. Minimum required government witnessing and oversight activities (should be applied to all projects),
2. Recommended practices (more rigorous than minimum activities), and
3. Best practices (should be implemented where resources permit).

By applying the appropriate level of rigor in M&V oversight and differentiating between the qualifications needed to witness M&V activities and those needed to assess compliance with the M&V plan and the validity of the measurements, it is expected that agencies will be able to apply resources efficiently to provide adequate oversight at minimal cost.

Level 1 - Minimum Required Government Witnessing and Oversight Activities

Actions: At a minimum, a qualified government representative should do the following:

- Review the M&V plan prior to the site visit
- Provide comments or request for clarification to the ESCO prior to the site visit
- Review the inspection and/or measurement data collection forms to confirm that all of the required tasks were performed
- Sign data collection forms acknowledging that the ESCO was on site to conduct M&V activities on a particular day or time
- Confirm that the results reported on the inspection and measurement data collection forms are consistent with the expected operation of the ECMs and the requirements of the task order

Qualifications: The minimum required qualifications for the government representative for Level 1 M&V oversight are as follows:

- A minimum of two years of experience in the operation, maintenance and/or engineering of the equipment and/or systems being inspected
- Familiarity with the scope of the specific ECMs to be inspected
- Familiarity with the specific equipment and systems to be inspected
- Completion of all necessary safety training required to perform inspection activities

Level 2 - Recommended Practices

Actions: It is recommended that a qualified government representative should complete the following in addition to the minimum activities described above:

- Review calibration requirements for portable instrumentation and verify that they are in compliance with the M&V plan
- Conduct spot checks of ESCO M&V activities while they are on site, and verify that the inspection, measurements, monitoring, and performance tests are being conducted in accordance with the M&V plan
- Sign the data collection forms used for the activities witnessed
- Review the results to verify that they are consistent with the witness's understanding of the expected results at the observed operating conditions

Qualifications: The minimum qualifications for the government representative for recommended practices are the following, in addition to those for Level 1 activities:

- Working knowledge of the instrumentation to be used
- Understanding of the measurement, monitoring, and performance tests to be conducted based on the M&V plan

Level 3 – Best Practices

Actions: In addition to the activities shown above, recommended best practices for M&V oversight and witnessing include the following:

- Accompany ESCO personnel during the site visit data collection, witness the inspection, measurements, and performance tests, and observe installation and removal of monitoring equipment
- Review the information recorded on the data collection forms to verify that it is consistent with your understanding of the results of M&V activities and with the expected operation of the monitored equipment

Qualifications: The minimum qualifications for the lead government representative responsible for coordinating oversight of M&V activities, reviewing results, and reporting findings to CO and ESCO at the best practices level include the following, in addition to those listed above for levels 1 and 2:

- Certification as a Certified Energy Manager (CEM), Certified M&V Professional (CMVP) or Certified Building Commissioning Professional (CBCXP), or registration as a professional engineer (P.E.) in the appropriate discipline
- A minimum of 5 years of experience in the analysis, design, commissioning, or M&V of energy efficiency projects
- Familiarity with both the site and the details of the proposed ESPC project
- Experience with the specific technologies subject to M&V
- Familiarity with the safety training requirements and site-specific safety requirements for activities to be conducted

Appendix A: Suggested Format for Recording Government Witnessing of M&V

Government Witnessing Data, by ECM

ECM Name /#: _____
Date/time measured: _____
Equipment Used _____ Calibration Date: _____
Location of Measurement (Room, building, site) _____
Contractor Staff: _____
Gov't Staff: _____ Title: _____
Description of what was measured _____
Data for ECM Name /#: _____
Location of measurement: (Center of room, pipe surface, inside duct, etc.) _____
Baseline Data: (Pre-Install) _____
Expected Data: (Post- Install) _____
As-Found Data _____
Other observations _____

[Repeat for all ECMs to be witnessed]

Government Witnessing Signatures

This document accurately represents the M&V activities I have witnessed, for the ECMs indicated and on the dates indicated.

Name: _____
Title: _____
Signature: _____
Date: _____

Name: _____
Title: _____
Signature: _____
Date: _____

Appendix B: DOE IDIQ Master Contract Clauses Related to M&V Submittals and Suggested TO-RFP Language

This appendix shows contract section C.4.6 on M&V submittals, along with suggested language to be added to the task order RFP.

Note that other relevant contract requirements are in Super ESPC IDIQ sections C.4.1 through C.4.5 (M&V), C.5.4 (commissioning), C.6 through C.10 (operations, repair, and maintenance of ECMs), E.2 (inspection of installed ECMs), E.3 (acceptance), and G.5 (payment to the government in case of savings shortfall).

Attachments to the Super ESPC IDIQ related to M&V include Attachment J-8, M&V Plan and Savings Calculation Methods Outline; J-9, Post-Installation Report Outline; and J-10, Annual M&V Report Outline.

C.4.6 M&V SUBMITTALS DURING TASK ORDER DEVELOPMENT AND POST-AWARD

- A. The contractor shall prepare and submit a general M&V approach with its Preliminary Assessment (PA), identifying the M&V options and methods to determine a site-specific pre-installation baseline and post-installation ECM performance for each proposed ECM.
- B. The contractor shall prepare and submit a site-specific M&V plan with its final proposal, per the requirements in Section H and Attachment J-8 of this master IDIQ contract. This site-specific M&V plan shall include a schedule indicating M&V activities and post-award M&V reporting milestones for each ECM. Prior to installation of ECMs, the agency should witness measurements and review calculations, records (e.g., utility bills) and other elements of the baseline, to confirm its accuracy and to confirm that methods are consistent with the approved M&V plan, as described in FEMP's "Guide to Government Witnessing and Review of Post-Installation and Annual M&V Activities."
- C. The contractor shall prepare and submit a post-installation report to the agency (Attachment J-9), which should verify that installed ECMs will meet the required standards of service and the guaranteed annual energy, water, and related cost savings specified in the awarded TO. Inspections and measurements conducted by the contractor for this post-installation report should be witnessed by the agency, in accordance with FEMP's "Guide to Government Witnessing and Review of Post-Installation and Annual M&V Activities." The post-installation report should be reviewed as recommended in FEMP's "Reviewing Performance Reports for Federal ESPC Projects," and must be accepted in writing, by the agency.
- D. The contractor shall prepare and submit an annual M&V report to the agency (Attachment J-10), including data and calculations that demonstrate that continued ECM performance achieves the guaranteed annual energy, water, and related cost savings as required by the TO. Inspections and measurements conducted by the contractor for this annual M&V report should be witnessed by the agency in accordance with FEMP's "Guide to Government Witnessing and Review of Post-Installation and Annual M&V Activities." The annual M&V report should be reviewed, as recommended in FEMP's "Reviewing Performance Reports for Federal ESPC Projects," and must be accepted, in writing, by the agency. Review and acceptance of the annual M&V report, in accordance with FEMP's "Guide to Government Witnessing and Review of Post-Installation and Annual M&V Activities" constitutes documentation to determine amount of contractor payment.

Suggested additional language for inclusion in task order RFP:

The Contractor shall submit the annual M&V report within thirty (30) days of completion of Performance Year, and the Government shall complete its review within thirty (30) days of receipt of the report. Any review comments will be incorporated by the contractor and a revised report, if appropriate, will be submitted within fifteen (15) calendar days of receipt of the review comments.