U.S. DEPARTMENT of ENERGY | Federal Energy Management Program

Importance of Measurement and Verification and Performance Assurance Basics: Comparison by Case Studies

FEMP Summer Camp

T01 – S02, August 5, 2025

FEMP Summer CAMP (Courses Aligned with Mission Priorities)

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Agenda

- Session Learning Objectives
- M&V Fundamentals and M&V 5.0
- Ameresco Case Study - ESPC
- Performance Assurance Basics and Performance Assurance Guide
- NORESCO Case Study - UESC
- Question and Answers

Session Learning Outcomes

1. Identify methods used in energy savings performance contracts (ESPCs) and utility energy service contracts (UESCs) to measure and verify savings.
2. Assess which type of contract, ESPC or UESC, is most appropriate for a specific project scenario.
3. Determine how to develop a strong measurement and verification approach for your project.
4. Compare different M&V approaches using case studies and real-world examples.

M&V Fundamentals and M&V 5.0

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Christine Walker, PhD, PE, CEM, CMVP, PMVA

Senior Advisor

UESC & ESPC Support PNNL

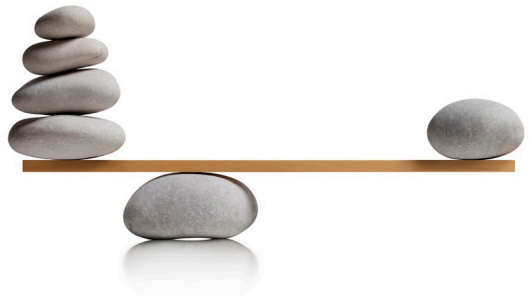
What Is M&V and Why Do You Need It?

- **What**: Includes activities (and reporting) to determine whether *guarantees* are met
    - Ensures guaranteed savings and performance are delivered
- **Why**: Mandatory per ESPC statute (42 U.S.C. 8287) and contract*:
    - Annual M&V activities and reporting
    - *Guaranteed savings* and performance are realized each year and cost savings exceed the payments
- **So what**: When done well, M&V can:
    - Limit uncertainty
    - Allocate risks appropriately
    - Potentially identify O&M issues

**For annual scoring, UESC requires performance assurance or guarantees of savings, M&V of savings through commissioning and retro-commissioning… OMB Memo 12-21*

Basic M&V Concepts

- Four M&V options: A, B, C, D
- M&V balances savings and performance assurance and added cost
- Degree of M&V should be proportional to ECMs savings and performance risk
- If M&V plan is weak, guarantee may be met only on paper



How to balance cost and risk?

Too little?

- Agency may not have assurance or confidence that savings are real

Too much?

- Project costs increase
- Can limit scope or kill project

Just right!

- Adequate for specifics of project, and reasonable

What's in the Savings Guarantee?

- Required by statute: Savings greater than payments each year
- Specified project-level of cost savings and performance
- Guarantee depends on who takes risk/responsibility for what
- Site-specific M&V plan details how savings will be determined, verified:
  - Specific M&V option, activities required to verify savings
  - Use of DOE ESPC IDIQ Risk Responsibility Matrix is recommended for UESCs; required for DOE ESPC IDIQ task orders
- Guarantee is typically ~95% of estimated cost savings

Acceptable savings:

- Energy/water cost savings
- Energy-/water-related cost savings

M&V Attributes and Details

- M&V activities include short-term measurements, visual verification, metering, data logging and trends, monitoring
- Goal is that ***each Facility*** is assigned an M&V option
  - Streamlined, single type of M&V activity by facility
  - Multiple building ECMs are generally combined in one M&V plan to consolidate efforts
- Measurements differ by:
  - Level, frequency, and duration
  - Whether key values are agreed to without performance period measurement (e.g., operating hours)
- Expense for typical projects
  - Up-front expense averages < 2% of project investment
  - Annual expense averages about 1-3% of annual savings

A well-written M&V plan:

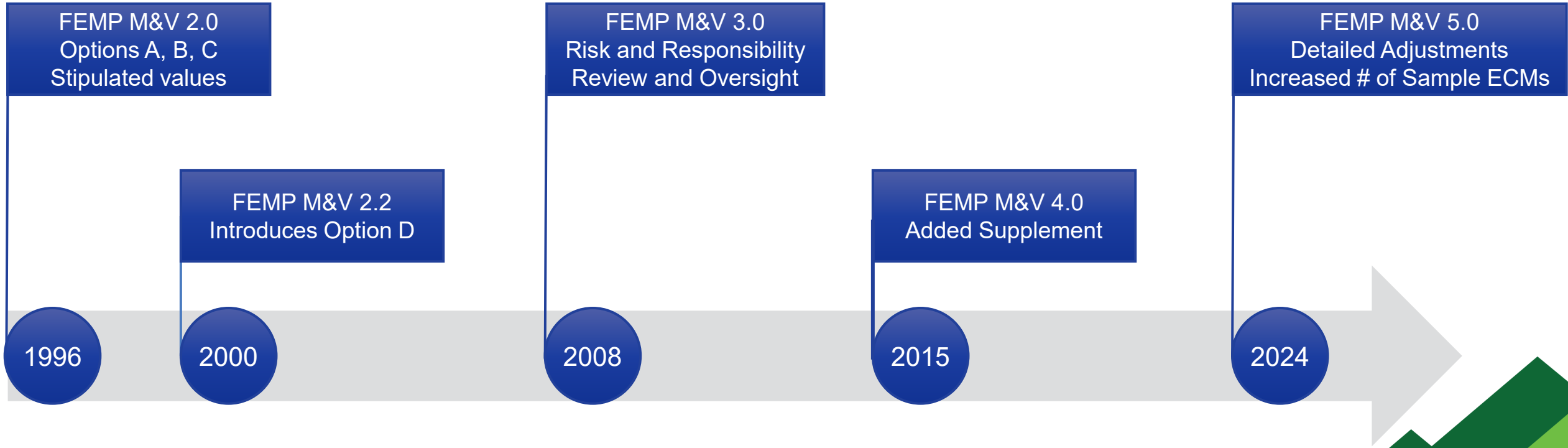
1. Mitigates risk to the agency and the facility.
2. Reduces conflict when systems fail to meet their expected performance or savings.
3. Ensures the ESCO remains engaged with the facility over the term of the contract.

Overview of M&V in Performance Contracting Process

Project Phase		Agency Activities
Preliminary Assessment	• M&V approach proposed; M&V plan outline provided in Preliminary Assessment (PA)	Review in PA
Investment Grade Audit	• Baselines established; documented in Investment Grade Audit (IGA)	Witnessing, review in IGA and proposal
Project Implementation	• Post-installation M&V activities completed before project acceptance. Represents the first formal M&V report to verify ECMs' potential to perform.	Witnessing, documentation, review
Performance	• Annual M&V activities completed per M&V Plan. Documents findings in M&V report and eProject Builder.	Witnessing, documentation, review

M&V Best Practices

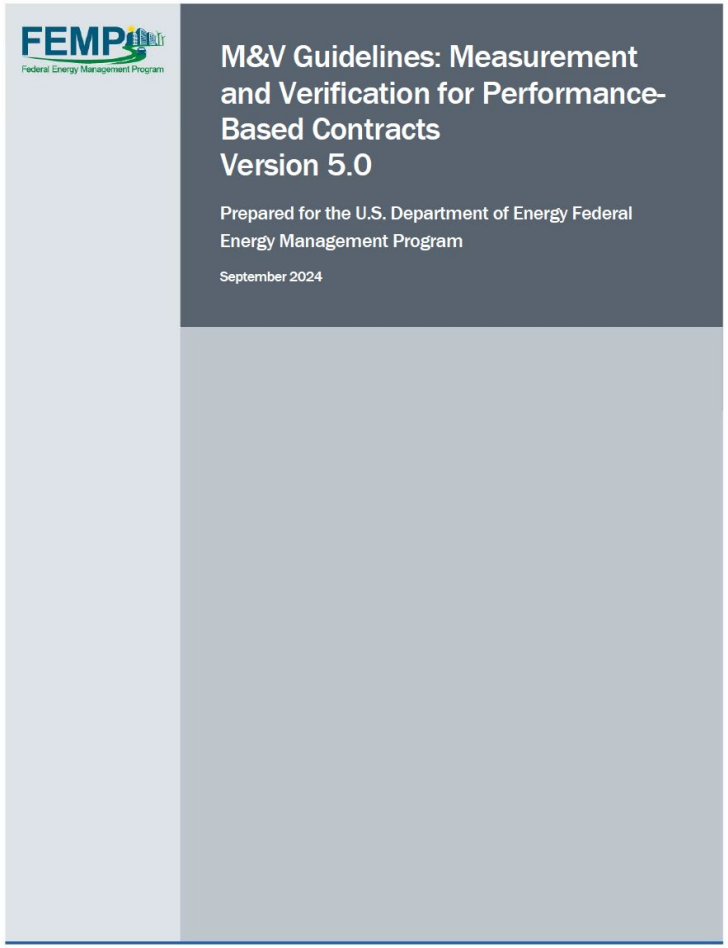
- ESPCs/UESCs are long-term contracts, and change during term is inevitable
- Ensure performance through close engagement with ESCO/utility
- Goal is reduced savings uncertainty… but more rigorous M&V adds cost



FEMP Guidance on M&V

M&V Guidelines: Measurement and Verification for Performance-Based Contracts Version 5.0 (2024)

- Overview of M&V process
- M&V plan, post-installation, and annual M&V
- M&V risk and responsibility (RRP Matrix)
- M&V options (A, B, C, D)
- Selecting an M&V approach
- Guidance for 30 specific ECMs across all technology categories
- DOE ESPC IDIQ requirements in appendices



M&V Resources and Guidance

FEMP webpage: M&V for federal ESPCs

M&V Guidelines

- M&V Guidelines: Measurement and Verification for Performance-Based Contracts Version 5.0
- Supplement to M&V Guidelines: Measurement and Verification for Performance-Based Contracts Version 4.0

M&V Checklists

- Annual Measurement and Verification Report Review Checklist
- Post-Installation Measurement and Verification Report Review Checklist
- Reviewing Measurement and Verification Plans for Federal ESPC Projects

On-Demand Training

- Long-Term Management Of Measurement And Verification (M&V) In Performance Contracts
- Advanced Measurement and Verification for ESPC

Ameresco Case Study
ESPC

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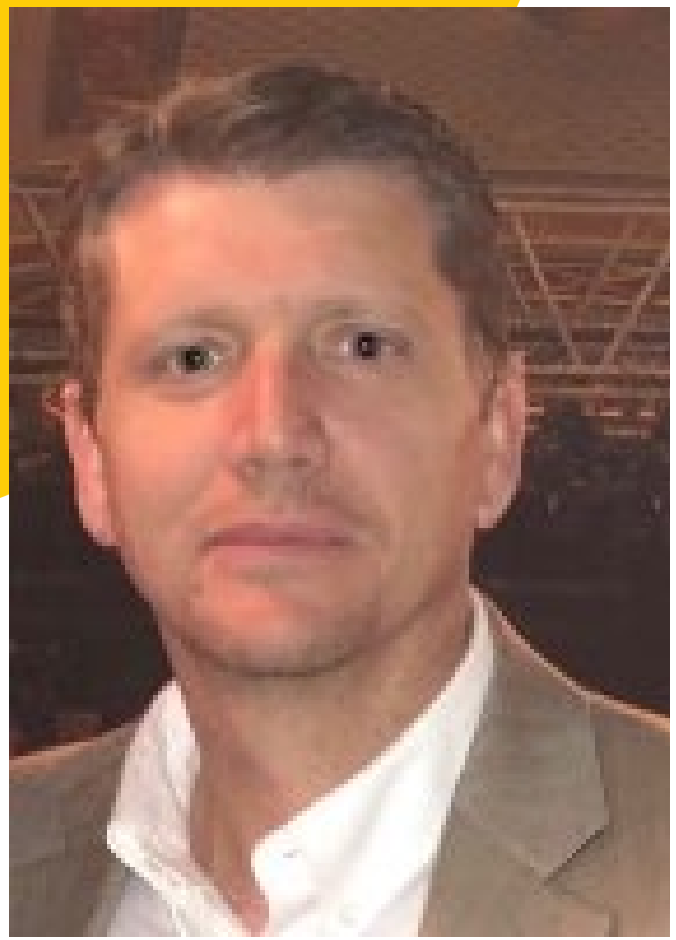


Patrick Williams

Senior Director, M&V

Ameresco

Marine Corps Recruitment Depot – Parris Island

Quick Facts

LOCATION: Parris Island, SC
MARKET SECTOR: Military installation
FACILITY SIZE: 3.1 million square feet
GENERATING CAPACITY: 3.5 megawatts (MW) CHP plus 5.5 MW solar PV
EQUIPMENT: 3.5 MW gas turbine, 5.5 MWac, solar PV, 8MWh lithium-ion battery
FUEL: Natural gas / solar PV
USE OF THERMAL ENERGY: Space and domestic water heating
ENVIRONMENTAL BENEFITS: 38,000 metric tons CO_2 reduction annually
TOTAL CONSTRUCTION COST: $91 million
ANNUAL ENERGY SAVINGS: $6.9 million
CHP IN OPERATION SINCE: 2019

MCRD's new central plant with microgrid and island mode capability providing 3.5 MW of electric and the full steam load required by MCRD Parris Island. Photo courtesy of Business Wire

Project involved 121 buildings (3.1 million square feet total) and 20 energy conservation measures, including combined heat and power (CHP)

M&V Approach for CHP ECM

- Replaced existing end-of-life steam plan with new natural gas fueled CHP plant.
- Used FEMP Option A - Track electrical generation, steam production, and natural gas consumption on an hourly or shorter basis. Information will be used to verify turbine heat rate and boiler efficiency under operating conditions to validate model assumptions used to determine savings.
- Simplifying project complexities around CHP for Parris.
- Minimizing future adjustments.

CHP Baseline

- Simplification
  - Auxiliaries (Pumps/Water Treatment/Air Compressors and Dryers/General Lighting/HVAC/Plug Load/Controls/Communications) assumed to remain the same from baseline to post
  - No weather/occupancy adjustments were made to the measured load profiles
- Challenge
  - Effect of other ECMs deducted (both steam and electricity)
  - Steam Load Profile Development
  - “Island Mode”

CHP Performance

- Measurements are around Efficiency and Availability

  "Measured values are used to validate system performance, not calculate savings directly"

- Points Measured:
  - N.G. consumption
  - Fuel Oil consumption
  - Electricity input
  - Steam output
  - Electricity output
  - Hours of CHP availability
- Heat Rate and Ambient Temperature

Performance Assurance Fundamentals and Performance Assurance Guide

FEMP Summer CAMP (Courses Aligned with Mission Priorities)

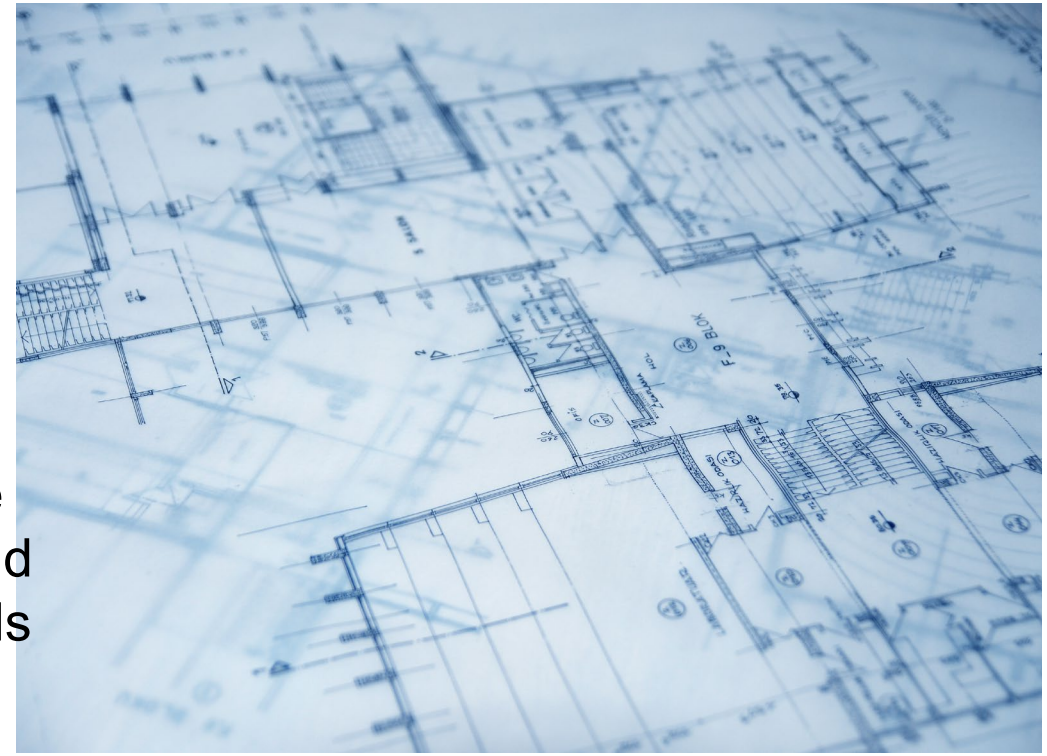
Heather Colbert

Project Manager

NREL

What is Performance Assurance?

- Project specific set of actionable protocols that define important tasks and responsibilities that occur throughout the life of a UESC
- Reflects the site conditions, complexities, agency capabilities, O&M, and repair and replacement (R&R) requirements for the planned ECMs
- Performance Assurance Plans detail steps that will be taken during project development, implementation, and the performance phase of the contract to ensure ECMs perform as designed



Policy Drivers

Under 42 U.S.C. § 8253 (f)(5), "Follow-Up on Implemented Measures" states, "each energy manager shall ensure that -

(A) equipment, including building and equipment controls, is fully commissioned at acceptance to be operating at design specifications;

(B) a plan for appropriate operations, maintenance, and repair of the equipment is in place at acceptance and is followed;

(C) equipment and system performance is measured during its entire life to ensure proper operations, maintenance, and repair; and

(D) energy and water savings are measured and verified."

Under section II of OMB Memorandum 12-21, Through this authority, a UESC may be scored on an annual basis if:

(1) energy savings performance assurances or guarantees of the savings to be generated by improvements, which must cover the full cost of the Federal investment for the improvements;

(2) measurement and verification (M&V) of savings through commissioning and retrocommissioning; and

(3) competition or an alternatives analysis as part of the selection process prior to entering into a UESC.

Performance Assurance Plan Objectives

- **Ensure overall project success**
- **Demonstrate validity of realized savings**
- **Sustain long-term ECM performance**
- **Support healthy and functional facility environments**
- **Ensure compliance with legislative mandates and OMB scoring requirements**
- **Complement agency capabilities and resources**

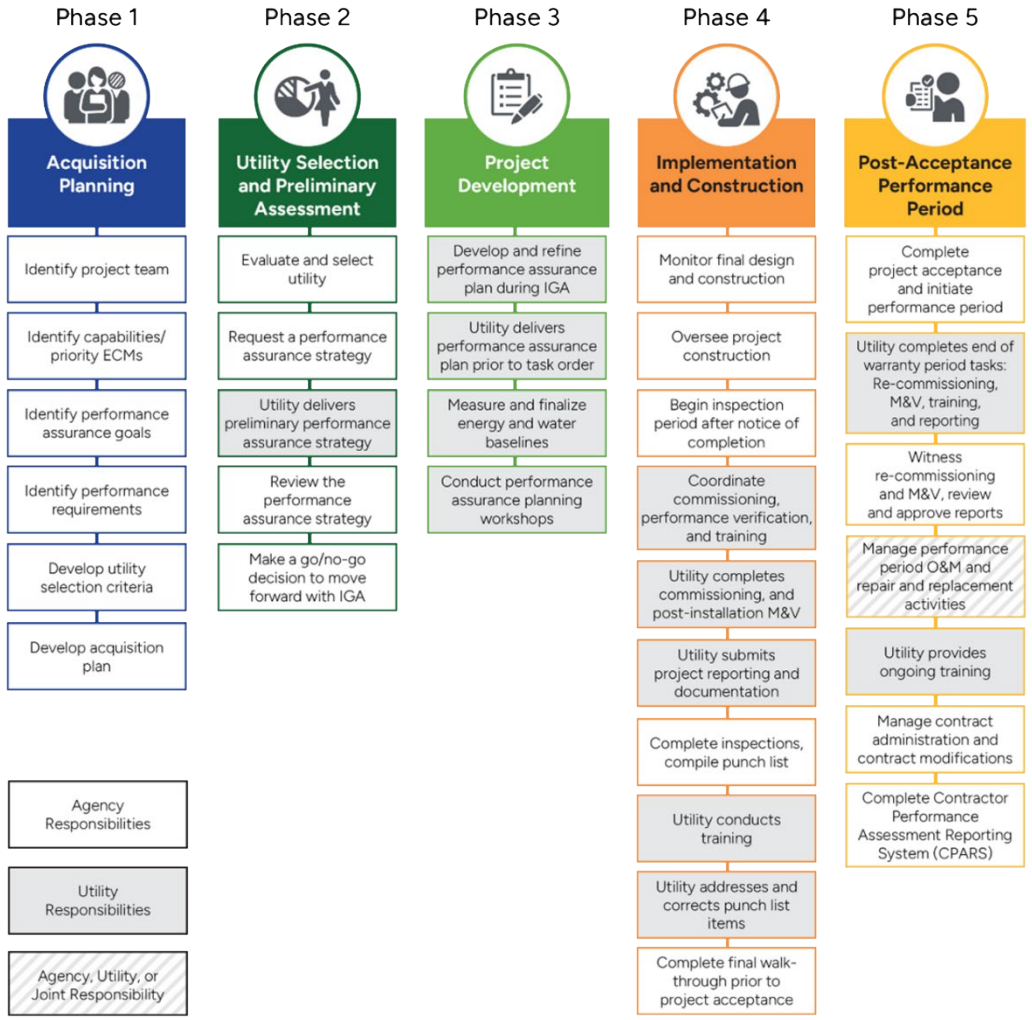
UESCs are long-term contracts, and performance assurance is intended to ensure that ECMs perform as designed through the life of the project.

UESCs require a Performance Assurance Plan or a savings guarantee, which agencies should determine prior to utility selection.

UESCs are a flexible acquisition vehicle, allowing for performance assurance approaches tailored to the site capabilities and needs.

New Step-by-Step Performance Assurance Guidance

- Phase-by phase objectives, strategies, and key milestones
- Provides guidelines and considerations when identifying the agency's unique project needs, and requirements
- Provides discussion on importance of critical elements in Performance Assurance Plan development
- Develops some consistency between certain FEMP tools and resources.



What Does it Accomplish?

The new Guide provides updated best practices for agencies to follow to ensure a comprehensive Performance Assurance Plan is developed.

- New in-depth **guidance and discussion on the process, by phase**, of developing of a comprehensive Performance Assurance Plan
- Incorporates **new guidance starting in Phase 1**
    - Begin identifying key tasks and responsibility defining agency requirements
    - Identify and engage a well-qualified, diverse project team
- Explores key **strategy considerations and approaches** to performance assurance
- Outlines Performance Assurance Plan components, with **important factors by subplan**
- Provides links to **additional resources and tools**
- Updates to best practices and incorporates lessons learned into the Guide

Performance Assurance Plan Components

The Performance Assurance Plan deliverables should be developed specifically for each ECM:

- UESC Project Overview and ECM Summary
- Communications Plan
- Commissioning Plan and Report
  - Seasonal Commissioning Plan
  - Re-Commissioning Plan
- Energy- and Water-Use Baselines
- Post Installation M&V Plan and Reporting
- Training Plan
- O&M Plan
- R&R Plans
- Warranty Plan
- Risk, Responsibility, and Performance Matrix (RRPM)
- Performance Discrepancy Plan
- Project Documents

Determine Performance Assurance Requirements

The project team should iteratively develop a plan based on prospective ECMs, weighing internal capabilities, site conditions, and other relevant factors to identify the agency's ability to support ECM performance throughout the performance period.

Determine if site has staff resources and capacity necessary for long-term operations and maintenance of proposed ECMs.

- Agency may need the utility to provide these performance assurance services.

Determine whether agency will require savings guarantees.

- Savings guarantees will increase project costs but may mitigate long-term exposure to ECM under-performance.

Consider an ECM-by-ECM approach for performance assurance.

- Evaluate and approach savings guarantees, O&M and/or other performance assurance services for more complex ECMs.

Performance Assurance and M&V

When properly planned & applied, M&V can:

- Accurately assess and monitor ECM performance
- Ensure energy and/or water savings are achieved
- Reduce risk of lapses in equipment performance
- Inform O&M processes

What to expect in the M&V Plan for UESCs:

- Who is responsible to conduct M&V
- What will be measured (by ECM or facility)
- M&V methodology selected
- How frequently measurement should be made

Considerations:

- Both OMB 12-21 and 42 U.S.C. § 8253 (f)(5) include M&V requirements
- Agencies must determine how to satisfy this requirement

UESC and Performance Assurance Resources

Performance Assurance Planning Resources:

Performance Assurance Planning for Utility Energy Service Contracts

Performance Assurance Planning Guide

UESC Resources:

Resources for Implementing Federal Utility Energy Service Contracts

NORESCO Case Study
UESC

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Director of Engineering

NORESCO

PA Plan & Requirements (per FEMP)

A performance assurance plan is a set of deliverables with performance obligations and an absolute requirement of delivering a fully functional project that meets or exceeds the design performance for the term of the contract.

Furthermore, the plan must prepare the agency (or a designated source) to operate, maintain, verify performance, and recommission each ECM implemented as well as to offer continued utility engagement as outlined in the contract.

From FEMP "Performance Assurance Planning" February 2019

A performance assurance plan is, in effect:

- A commissioning plan
- A training plan
- An implementation plan

Preparing the agency to operate, maintain, verify performance and recommission each implemented ECM is essential whether the post-acceptance implementation will be done by the agency in-house, by the utility team as a requirement of the UESC, or as a performance services contract.

From FEMP website "Performance Assurance Planning for Utility Energy Service Contracts"

What is the Goal of the Performance Assurance Plan?

The goal of the Performance Assurance Plan is to meet the objective of delivering a fully functional project that meets or exceeds design performance

- Provide a cost-effective and accurate assurance of ECM performance throughout the post-acceptance performance period.
- Develop a Site and ECM-specific plan collaboratively between the Utility/ESCO team and the Agency Site/Government teams.

NORESCO's UESC Case Study Approach

Due to confidentiality, CUI data, and associated restrictions on disclosure of site/project specific information under the Utility UESC contract structure, the Performance Assurance Case Study presented is a combination of:

- Three signed UESCs in last two years (most relevant)
- Over a dozen ECMs across three sites (three different agencies)
- Representative ECMs to highlight and illustrate PA Planning and Implementation approach
- Significant projects, illustrating continued increase in leveraging the UESC program

NORESCO/Utility UESC Case Study Project-Specific Goals

The example projects all have aspects and outcomes that contribute to mission assurance by leveraging utility partnerships via UESCs, such as:

- Operational resiliency
- Reinvigoration of the industrial base infrastructure
- Mission critical infrastructure modernization upgrades
- Significant energy reduction
- Alternative sources of energy generation
- Optimization of resource efficiency
- Ensured improved performance
- Streamlined/reduced maintenance costs

Key Performance Assurance Plan Elements

Activity	When
• Installation Performance Verification (Commissioning)	Post-Installation and prior to ECM Acceptance
• Performance Assurance Training	Upon Completion of Installation
• Periodic Inspection Performance Verification	Quarterly or Annual
• Performance Assurance Report	Annually

Key Performance Assurance Plan Considerations & Insights

- **UESCs are different than ESPCs!**
  - Performance assurance: Focused on **verification that ECM performance** meets contractual design performance
  - M&V: Focused on the **verification and quantification that the savings** meets the contractual guaranteed savings – support payments
- UESC contracts have more allowed flexibility – larger spectrum
- UESC Performance Assurance is very Commissioning centric (Cx and rCx)
- Watch out and be cognizant of Agency preferences!! Know the rules of engagement
  - Agencies have their own playbooks…
  - Agency requirements for Guaranteed Savings, if any (i.e. Air Force)
- Utilities may need to seek approval on their proposed Performance Assurance methodology early during development
  - HNC KO or PM need to be engaged - especially if there are proposed deviations or non-standard methodologies.
- Start collaborative team discussions as ***early*** as possible during project development, e.g., workshops and charettes

COLLABORATIVE TRANSPARENT PARTNERSHIP

Key Performance Assurance Reporting Considerations & Insights

- **UESCs are different than ESPCs!**
- Due to the inherent flexibility of UESCs, performance assurance responsibilities for the performance period can be put on the Utility team or kept by the Agency – in particular the recommissioning
- Key Performance Assurance reports include
    - The Cx Report
    - The Recommissioning Report due one year after acceptance
    - The Recommissioning Reports due annually or at agreed upon intervals per the plan
        - This Report can be the responsibility of the Utility team or the Agency, as agreed to in the performance plan
- An important responsibility of the Utility team is to train and prepare the Agency for having the ability to perform the recommissioning activities – and associated reporting
    - The associated capabilities to be defined are a critical part of the performance assurance planning

UESC Case Study – Example ECM Performance Assurance Plan Summaries

The following slides provide excerpts from the case study projects, summarizing the Performance Assurance Plans for a variety of ECMs.

- Lighting
- EMCS
- Solar PV
- Electrical Distribution Upgrade

None of these UESC projects incorporated Guaranteed Savings into the Contract

UESC Project #1 – Lighting ECM

ECM-05.1: Interior Lighting Retrofits | ECM-05.2: Parking and Street Lighting Retrofits		
Activity	**When**	**Tasks**
Startup Performance Verification (Commissioning)	Upon Completion of Installation	▶ Manufacturer's lamp and ballast power consumption will be used for baseline and post-installation energy demand (kW) calculation. ▶ Operating hours shall be agreed to by Agency before the retrofit and assumed to remain the same in post scenario.
Performance Verification (Ongoing Commissioning)	Through the Warranty Period	▶ Conduct physical inspection after one year of the retrofitted fixtures to verify that the installed equipment and its components have been properly operated and maintained. ▶ Identify changes in fixture/equipment counts and types. ▶ Report any deviations from the expected conditions to the Agency.
O&M Training	Upon Completion of Installation	▶ Provide original equipment manufacturer manuals and cut sheets. ▶ Provide hands-on classroom training to O&M personnel and include video recordings.
Periodic Inspections and Verification (Performance Assurance)	Once Yearly for One Year	▶ Performance assurance for this ECM will be based on retrofit isolation. ▶ Provide visual inspection after one year to verify that the installed equipment and its components have been properly operated and maintained (per the O&M Manual). Changes in fixture/equipment counts and types based on sample surveys will be documented. ▶ Fixture wattage will be recorded as manufacturer specifications during construction. Operating hours will be assumed to remain the same post retrofit. ▶ Savings calculations will be updated based on as-built fixture wattages and quantities. ▶ Provide recommended corrective action if required.
Performance Discrepancy Resolution	Every Time Performance Assurance Service is Completed	▶ If the activities described above indicate that equipment is not performing as designed, or is not being properly operated and maintained, a report will be provided to the Agency indicating necessary corrective action. ▶ The Agency will be responsible for implementing corrective action at its sole cost.

UESC Project #2 – Lighting ECM

ECM-09: LED Lighting Improvements		
Activity	When	Task
Installation Performance Verification	Post-installation and prior to ECM acceptance	Commission the lighting system and ensure that it is operating correctly and as intended. Use manufacturer's data for fixture wattage for the newly installed light fixtures and as-built quantity reconciliation to calculate the expected savings.
Post-Warranty Performance Verification	First periodic inspection will be six months after project acceptance	Perform a visual inspection of a representative sample of the lighting system to confirm that the lighting equipment is installed and operational consistent with the design intent.
Periodic Inspections	Quarterly	Inspect the condition of the sample of lighting systems installed as part of this ECM. Review records of any maintenance activities performed by facility personnel. Interview operators of affected systems to determine changes or modifications to operations.
Outbrief	At completion of each site visit	Review field inspection notes with facility personnel. Discuss any deficiencies identified and establish a corrective action plan. Document participants via sign-in sheet, including name, position, and contact information.
Performance Assurance Report	Annually within 60 days of each performance year anniversary	Summarize equipment condition and ability to perform during the previous year. Include field inspection notes and documentation. Identify any deficiencies and corrective action in order to reestablish equipment performance.
Performance Discrepancy Resolution	At completion of each Performance Assurance Report	Customer will review Performance Assurance Report. Outstanding issues will be discussed and a corrective action plan will be established.

UESC Project #1 – Solar Photovoltaic (PV) ECM

ECM-11.2: Roof-Mounted Solar PV System		
Activity	**When**	**Tasks**
Startup Performance Verification (Commissioning)	Upon Completion of Installation	▶ Perform startup of new equipment installed by Utility/NORESCO with Agency witness. ▶ Perform physical inspection, array testing, and complete system testing of PV system at Buildings 4912 and 4913 per IEC 62446 "*Grid Connected Photovoltaic Systems-Minimum Requirements for System Documentation, Commissioning Tests, and Inspections"* (2009 or most recent), which requires documentation of the system, array testing, and whole-system performance test (applicable to commercial, industrial, and utility-scale systems). For PV module strings that do not precisely provide the open circuit voltage and short circuit current expected for the conditions, I-V curve testing shall also be conducted to identify the problem. ▶ Review available trend logs of PV system at Buildings X and Y after two weeks of operation to verify that the system is performing as expected.
Performance Verification (Ongoing Commissioning)	Through the Warranty Period	▶ Conduct a physical inspection after one year of PV modules and array at Buildings X and Y. Conduct an infrared camera inspection of array, combiner boxes, inverter fuse holders, and switchgear, and torque any loose connections. Conduct electrical inspection. Check all fuses and position of all switches and disconnects. Conduct system performance test- report performance ratio and temperature-corrected performance ratio. Performance ratios based on either standard test condition data or performance test condition data as per IEC 61724. Correct issues found. ▶ Report any deviations from the expected conditions to the Agency.
O&M Training	Upon Completion of Installation	▶ Provide original equipment manufacturer manuals and cut sheets. ▶ Provide hands-on classroom training to O&M personnel and include video recordings. Also consider FEMP eTraining "*O&M Best Practices for Small-Scale PV Systems*."
Periodic Inspections and Verification (Performance Assurance)	Quarterly for One Year	▶ For PV system at Buildings X and Y, provide system monitoring and data presentation according to transparent measurement protocols and procedures. The approach depends on the size of the system and associated savings/revenue. IEC 61724 "Photovoltaic System Performance Monitoring – Guidelines for Measurement, Data Exchange and Analysis" has classifications of monitoring system (A, B, C), and the O&M related to monitoring depends on the system class. Communications protocols with facility energy information system as per IEC 61850-90-7 "*Object Models for Photovoltaic, Storage and Other DER Inverters*." ▶ Perform quarterly review (every 3 months) of available PV trend data at Buildings X and Y to verify that the system is performing as expected. ▶ Conduct visual inspection of Buildings X and Y PV system after one year to verify that the installed equipment and its components have been properly operated and maintained (per the O&M Manual).
Performance Discrepancy Resolution	Every Time Performance Assurance Service is Completed	▶ If the activities described above indicate that equipment is not performing as designed, or is not being properly operated and maintained, a report will be provided to the Agency indicating necessary corrective action. ▶ The Agency will be responsible for implementing corrective action at its sole cost.

UESC Project #1 – EMCS Upgrade ECM

ECM-03: EMCS Upgrades		
Activity	**When**	**Tasks**
Startup Performance Verification (Commissioning)	Upon Completion of Installation	▶ Commission the controls system upgrades implemented by Utility/NORESCO to determine if it performs as designed. Verify that the control strategies are programmed in the controls system. Set trends to track temperature setpoints, hours of HVAC operation, and other variables applicable to the equipment it controls. Review available trend logs after two weeks of operation to verify control settings and the proper operation of the control strategies. ▶ Develop tests and functional performance tests and document results in the Commissioning Report.
Performance Verification (Ongoing Commissioning)	Through the Warranty Period	▶ Conduct a physical inspection after one year to verify that the installed equipment and components have been properly maintained (per the O&M Manual). ▶ Conduct quarterly reviews of available controls trends, status, and alarm reports to ensure that the controls setpoints, algorithms, and sequences are as originally specified and performing as intended. ▶ Analyze system response during seasonal changes and adjust programming as needed. ▶ Verify that the system continues to meet operating parameters. ▶ Report any deviations from the expected conditions to the Agency.
O&M Training	Upon Completion of Installation	▶ Provide original equipment manufacturer manuals and cut sheets. ▶ Provide hands-on classroom training to O&M personnel and include video recordings.
Periodic Inspections and Verification (Performance Assurance)	Quarterly for One Year	▶ Performance assurance for this ECM will be based on calibrated computer simulation utilized for the savings calculations. ▶ Perform quarterly trend reviews (every 3 months). Review available trends to ensure that controls setpoints, algorithms, and sequences are as originally specified and performing as intended. ▶ Visually inspect a sample of the installed thermostats after one year to confirm that proper programming is still in place. ▶ Provide recommended corrective action if required.
Performance Discrepancy Resolution	Every Time Performance Assurance Service is Completed	▶ If the activities described above indicate that equipment is not performing as designed, or is not being properly operated and maintained, a report will be provided to the Agency indicating necessary corrective action. ▶ The Agency will be responsible for implementing corrective action at its sole cost.

UESC Project #2 – EMCS Upgrade ECM

ECM-08: Site-Wide EMCS Improvements		
Activity	**When**	**Task**
Installation Performance Verification	Post-installation and prior to ECM acceptance	Commission unoccupied setback and air valve control strategies and ensure that they are operating correctly and as intended. Commission new controllers installed at XXX buildings and associated sequences of operation.
Post-Warranty Performance Verification	First periodic inspection will be six months after project acceptance	Review EMCS front end and document any communications errors and changes to setpoints, schedules, or operating sequences.
Periodic Inspections	Quarterly	Review EMCS front end and document any communications errors and changes to setpoints, schedules, or operating sequences. Review records of any overrides or maintenance activities performed by facility personnel. Interview EMCS operators to determine changes or modifications to operations.
Outbrief	At completion of each site visit	Review field inspection notes with facility personnel. Discuss any deficiencies identified and establish a corrective action plan. Document participants via sign-in sheet, including name, position, and contact information.
Performance Assurance Report	Annually within 60 days of each performance year anniversary	Summarize equipment condition and ability to perform during the previous year. Include field inspection notes and documentation. Identify any deficiencies and corrective action in order to reestablish equipment performance.
Performance Discrepancy Resolution	At completion of each Performance Assurance Report	Customer will review Performance Assurance Report. Outstanding issues will be discussed and a corrective action plan will be established.

UESC Project #3 – Electrical Transformer ECM

ECM-01: Electrical Distribution Improvements		
Activity	**When**	**Tasks**
Installation Performance Verification	Post-installation and prior to ECM acceptance	Commission the system and ensure that it is operating correctly and meets the design intent..
Post-Warranty Performance Verification	First periodic inspection will be one year after project acceptance	Perform a visual inspection to ensure that the installed transformers are functioning as designed and per the manufacturer's intent.
Periodic Inspections	Annually	Inspect the condition of the aboveground components installed as part of this ECM. Review records of any maintenance activities performed by facility personnel.
Outbrief	At completion of each site visit	Review field inspection notes with facility personnel. Discuss any deficiencies identified and establish a corrective action plan. Document participants via sign-in sheet, including name, position, and contact information.
Performance Assurance Report	Annually within 60 days of each performance year anniversary	Summarize equipment condition and ability to perform during the previous year. Include field inspection notes and documentation. Identify any deficiencies and corrective action in order to reestablish equipment performance.
Performance Discrepancy Resolution	At completion of each Performance Assurance Report	Customer will review Performance Assurance Report. Outstanding issues will be discussed and a corrective action plan will be established.

Questions?

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How to obtain your CEUs:

1. Log in to https://edu.wbdg.org/ using your WBDG credentials
   - The assessment and evaluation will be made available to attendees at 8:00am ET on Monday, August 11th
   - The assessment and evaluation will close on September 22nd
2. In the list of trainings you attended, click on the Visit link by the course you wish to complete
   - If the course you're looking for is not listed, click on My Account in the top right menu
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3. Complete the assessment with a score of 80% or above
4. Upon passing the assessment, click the Post-Evaluation Survey button
5. Complete and submit the evaluation
6. Click Download Your Certificate to generate your certificate of completion, which can be downloaded for your records

Questions or issues? Contact WBDG Support at wbdg@nibs.org.

What's an IACET CEU?

A continuing education unit (CEU) from the International Association for Continuing Education and Training (IACET) equals 10 hours of learning in an approved program for licensed or certified professionals.

Thank You

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