SCEP
STATE & COMMUNITY ENERGY PROGRAMS

ESPC Campaign Webinar
Updates on IPMVP for Project Performance Monitoring

October 1, 2025

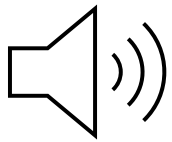
A copy of the slides from today's presentation will be provided to you for reference.

ENERGY SERVICES COALITION
A Public Private Partnership
www.energyservicescoalition.org

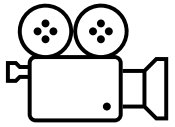
ESPC Campaign

Virtual Housekeeping

Drop your questions in the Q&A box – or raise your hand at the end!



Unmute your microphone to ask questions or join the conversation



A recording of this training (minus the final Q&A) will be posted online

Speakers

Dub Taylor
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PE, CEM, CMVP, DOE PF
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Phil Combs
EVO,
IPMVP Committee/
M&V Engineer, Trane
Energy Services &
Controls.
phil.combs@trane.com

Presenter's Bios

- **Dub Taylor:** Dub is the Executive Director of the Energy Services Coalition, and the COO of the Texas PACE Authority. Dub has over 25 years of clean energy policy, programmatic, operations and technology deployment experience, including 20 years as the Director of the Texas State Energy Conservation Office.

- **Chris Halpin:** Chris runs Celtic Energy, PLLC, based in Las Vegas, NV. ESC, U.S. DOE, and Berkeley Lab are his primary clients. He has 40 years' experience in the energy efficiency industry, including founding and running an ESPC Owner's Rep firm for 18+ years where he oversaw over $2.5 billion of ESPC projects. He has a BS Mechanical Engineering, is a registered PE in Nevada, and Certified by the Association of Energy Engineers (AEE) as a Certified Energy Manager (CEM) and Certified Measurement & Verification Professional (CMVP). He is also a USDOE FEMP certified Project Facilitator.

- **Phil Combs:** Phil is on EVO's IPMVP Technical Subcommittee and was deeply involved in developing the Application Guide for M&V and ESPC for Facility Owners. He has provided M&V for performance contracting customers including K-12 schools, higher education, municipalities, hospitals, commercial, industrial, and federal. Phil has over 30 years of experience in the HVAC industry including commercial HVAC testing and design, test facility design, acoustics, reliability, controls, automation, and equipment efficiency. Phil is a Certified Energy Manager (CEM), Certified Measurement and Verification Professional (CMVP), and Professional Measurement and Verification Analyst (PMVA). He holds a B.S. EET from Oklahoma State University.

About ESC

The Energy Services Coalition (ESC) is a national nonprofit organization composed of a network of experts from a wide range of organizations working together at the state and local level to increase energy efficiency and building upgrades through Energy Savings Performance Contracting.

Local chapters; public and private sector individuals coming together to provide outreach and education.

Acronyms Explained

- BAS = Building Automation System
- Cx = Commissioning
- DOE = Department of Energy
- ECM = Energy Conservation Measure
- ESCO = Energy Services Company
- ESPC = Energy Savings Performance Contract
- FA = Financial Advisor
- HVAC = Heating, Ventilation, and Air Conditioning
- IGA = Investment Grade Audit
- IGAA = Investment Grade Audit Agreement
- M&V = Measurement & Verification
- OMR&R = Operations, Maintenance, Repair and Replacement
- OR = Owner's Representative
- PIR = Post-Installation Report
- RFP = Request for Proposal

Agenda

Learning Objective: An overview of measurement & verification of savings in an ESPC project, and employing best practices to ensure successful outcomes:

- Introductions
- What is ESPC?
- Where are we in the ESPC Process?
- Review of the Measurement & Verification Process
- Application of International Performance Measurement & Verification Protocols
- Case Studies
- Questions and Discussion
- Resources, Closing Thoughts, and Next Steps

What is ESPC?

The use of guaranteed savings from the maintenance and operations budget (utilities) as capital to make needed upgrades and modernizations to your building environmental systems, financed over a specified period of time."

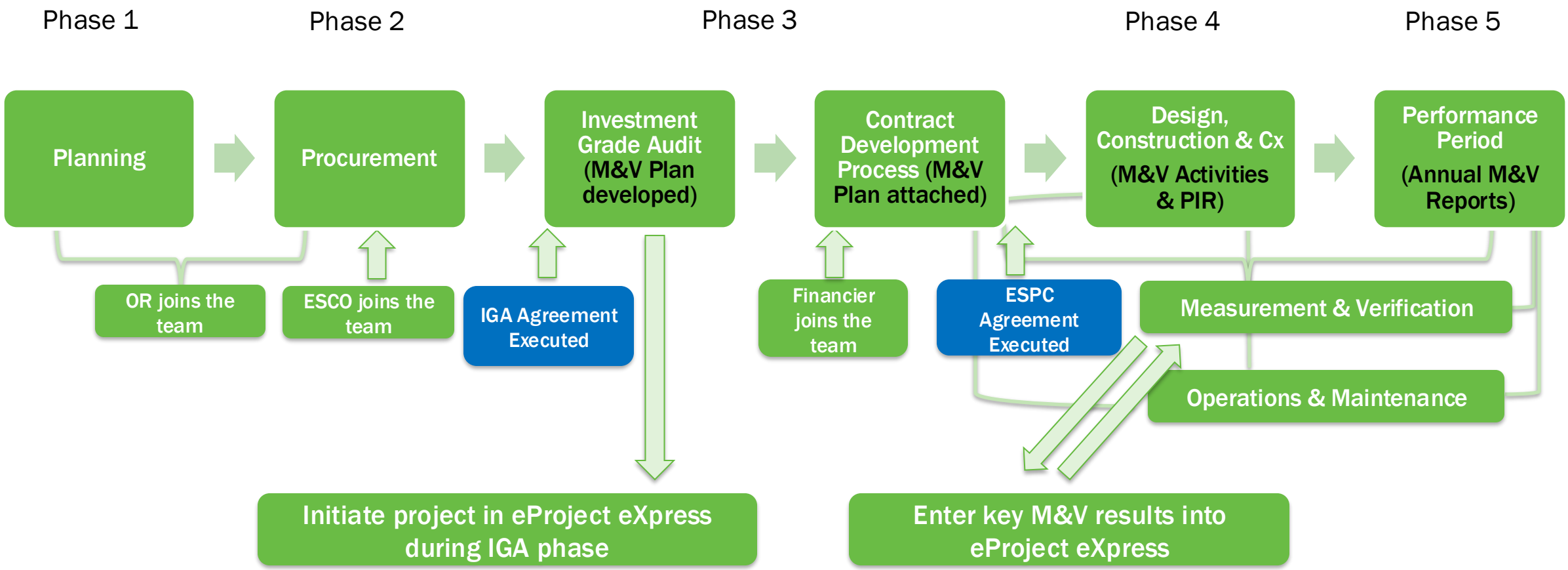
- United States Department of Energy - 1999

"ESPC is a financial mechanism used to pay for today's facility upgrades with tomorrow's energy savings – without tapping your organization's capital budget. Done properly, it has the performance of a hedge fund, with the risk of a T-bill."

- Chris Halpin - seems like every day

A version of **design-build** contracting, with a focus on guaranteed energy savings.

Where are we in the ESPC Process?



Review of Measurement & Verification Process

Measurement & Verification (M&V) Plan

2. M&V & Commissioning Plan

A detailed plan to verify that the ECMs are delivering the promised energy savings. **This involves ongoing monitoring and assessment to ensure that energy savings are achieved and sustained over time.**

This includes:

- Selection of M&V methods (e.g., IPMVP options)
- Determination of key performance indicators
- Scheduling of M&V activities
- Commissioning plan and activities
- *Owner's Reps provide great value for whole project, but especially M&V*

Slide from 10/24/24 Workshop: Reviewing Investment Grade Audits and Project Proposals

M&V Overview (from U.S. DOE's PCNRC Training Certificate Series)

Customer and ESCO agree to general M&V approach prior to developing the plan (preliminary M&V workshop).

IPMVP based M&V methods chosen affect how baseline is defined, savings are calculated, and performance is verified.

	Energy Service Company (ESCO) Responsibilities	Recommended Customer Activities
Baselines	Estimate for scoping, define in Investment-Grade Audit (IGA) phase	Provide utility data, witnessing, review in IGA
M&V Plan	In IGA, include a detailed M&V plan for each ECM, including description of pre- /post-install activities and performance period activities to determine ECM performance and methods for determining energy and O&M savings. Submit M&V plan in final IGA report.	Review, approval
Post-Installation M&V	Complete after Cx and before project acceptance. First formal M&V report (post-install report) to verify ECMs' potential to perform.	Witnessing, review, approval
Annual M&V in Performance Period	Complete per M&V Plan. Document findings in M&V reports and eProject eXpress. Address performance issues or savings shortfalls.	Witnessing, review, approval

Benefits of M&V Plan

- A solid M&V plan (that is included in the contract and followed) provides benefits, such as:
  - Limit uncertainty
  - Allocate risks appropriately
  - Potentially identify operations and maintenance issues
  - Safeguarding against future audits
    - Verifying and documenting performance
    - Documenting ESCO and owner due diligence
  - Demonstrating performance to external stakeholders
    - Elected officials can claim credit for proven success … or point fingers when performance cannot be determined
    - Share progress with community
    - Shows financial responsibility
  - Supporting success of overall organizational ESPC program
    - Quantifying and tracking total actual verified savings for entire ESPC portfolio
  - Understanding the cost of M&V, compared to the risks. Typically, 1%-5% of savings.

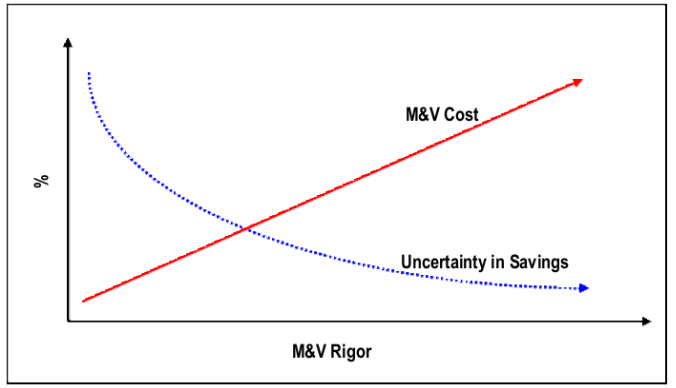


Figure 5-1. The Law of Diminishing Returns for Measurement and Verification (M&V).

Types of M&V Reports

Commissioning (Cx) Report

- Closely related to M&V, prior to post-install M&V activities
- Purpose: Verify equipment operating as intended and delivering specified conditions
- Functional performance testing to meet “design intent”

Post-Installation (Year 0) M&V Report

- Prior to acceptance (Gives Customer some leverage with ESCO prior to acceptance)
- Not always a requirement, but highly recommended
- Purpose: Verify potential for savings (Owner’s Rep can be used for detailed technical review)
- Ensure that ECMs meet performance requirements as laid out in IPMVP-based M&V Plan

Annual M&V Reports

- Annually according to contract
- Purpose: Verify achievement of savings following IPMVP (OR can be used for detailed technical review)
- Ensure ESCO followed M&V plan, ECM operations & maintenance (O&M) and repair & replacement (R&R) documented
- Note that customer witnessed savings validation

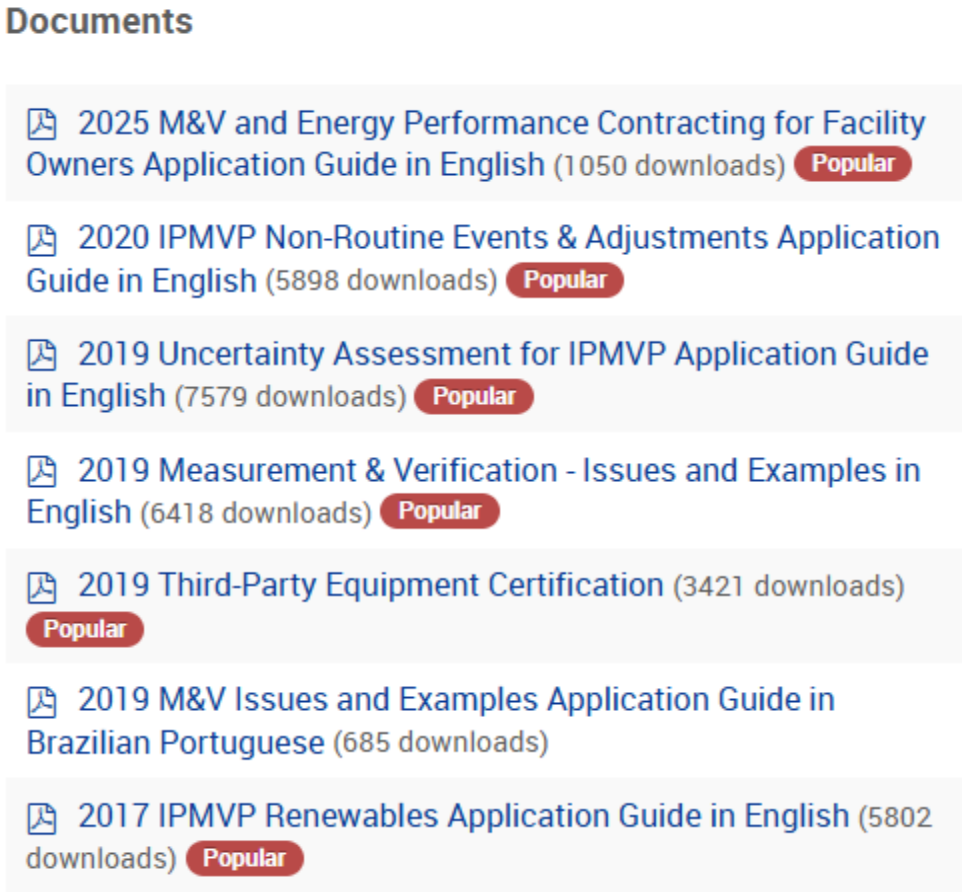
Application of International Performance Measurement & Verification Protocols

Phil Combs

EVO - IPMVP Committee

EVO and IPMVP

- EVO (Efficiency Valuation Organization): Non-profit parent organization of IPMVP
- IPMVP – International Performance Measurement and Verification Protocol
  - Began in 1994, renamed in 1997 to reflect larger, international audience
  - Core Concepts: fundamental M&V guide, March 2022 current version
  - Publishes and maintains several application guides
- EVO and AEE collaboration until 2022, now provide separate certifications:
  - AEE:
    - Certified Measurement and Verification Professional (CMVP)
  - EVO:
    - Performance Measurement and Verification Analyst (PMVA)
    - Performance Measurement and Verification Expert (PMVE)



Selecting a Method

Retrofit Isolation

OPTION A
Retrofit-Isolation:
Key Parameter(s) Measurement

OPTION B
Retrofit-Isolation:
All Parameter Measurement

Whole Facility

OPTION C
Whole Facility

OPTION D
Calibrated Simulation

2 Options within each method allows flexibility for various situations

M&V Measurement Options

International Performance Measurement and Verification Protocol (IPMVP) provides a framework that is used to:

1) Verify a project has the potential to perform and save energy, and
2) Quantify site-level energy and cost impacts from a targeted project

Option	Performance (e.g., power)	Usage (e.g., hrs.)	Total Energy	Calculations	Cost	Typical ECMs
A: Retrofit Isolation w/ Key Parameter Measurement	Short- or long-term	Measured or agreed upon		Spreadsheets	$	Lighting Motors Water
B: Retrofit Isolation w/ All Parameter Measurement	Usually long-term	Usually long-term	Often (via meter), but at component level	Spreadsheets	$$	Chiller repl. Solar PV
C: Whole-Facility Measurement	Usually long-term	Usually long-term	Whole-building level	Utility bills	$$	Deep retrofits Plant replaced
D: Calibrated Computer Simulation	Component level for calibration		Building level for calibration	Simulation	$$$	Repurposed building

Option A: Best Applications

OPTION A

- **Retrofit Isolation: Key Parameter(s) Measurement**
  - Level of savings is lower
  - A contractor is not responsible for all parameters affecting energy consumption
  - Able to assume a parameter with a level of certainty acceptable to all parties
  - On-going measurement is not required, but to ensure persistence of savings, regularly verify that equipment remains in place and is operated and maintained properly (operational verification)

Option B: Best Applications

OPTION B

- **Retrofit Isolation: All Parameter Measurement**
  - Energy consumption of ECM can be isolated
  - Equipment has variable loads and variable hours
  - A contractor is responsible for all aspects of energy use in the system that was retrofitted
  - On-going measurement helps to verify that the ECM remains in place and savings persist
  - Metering system installation, operation, maintenance and data evaluation costs are small relative to savings

Option C: Best Applications

- **Whole-Facility (Option C)**
  - Significant energy saving (usually 10% or more of consumption measured by the utility meter)
  - Multiple ECMs with potential interactive effects
  - Complex ECMs
  - Soft or deemed savings ECMs (eg. building leakage reduction, operator training, occupant/user awareness)

Option C: Considerations

- **Whole-Facility (Option C) considerations**
  - Easy access to utility data
  - Does facility have predictable load profile based on weather, occupation? IE, school versus event center
  - Annual savings per meter > M&V cost to verify
  - ECM savings versus other facility load ratio (signal to noise). As stated before 10% or more of overall consumption
  - Onsite generation (PV) adds a twist

Option D: Best Applications

- **Calibrated Simulation**
  - If missing either baseline or reporting period data:
    - Buildings built in a compound with one central meter
    - Repurposed building
    - Gives the opportunity to use the IPMVP with new construction
    - Can help determine a building's performance relative to a Standard, a Code, or to some energy performance objectives
  - Not common
  - Requires experienced modeling expertise

M&V Best Practices

- Stipulated or deemed savings can be used (agreed upon savings values with no M&V), but **this is not an IPMVP "Option" (there is no Option E)**
  - Essentially this is an agreement that no M&V will be performed for an ECM
- Adjustments are made to the baseline based on post-retrofit conditions (routine and non-routine)
  - E.g., non-routine adjustment: equipment schedules longer than previous year
  - How much of the "savings lost" were due to schedule change?

We adjust baseline and reporting period energy consumption to the same set of conditions for valid comparisons

THE **ADJUSTMENTS** CAN BE

- Trivial
- Simple
- Complex

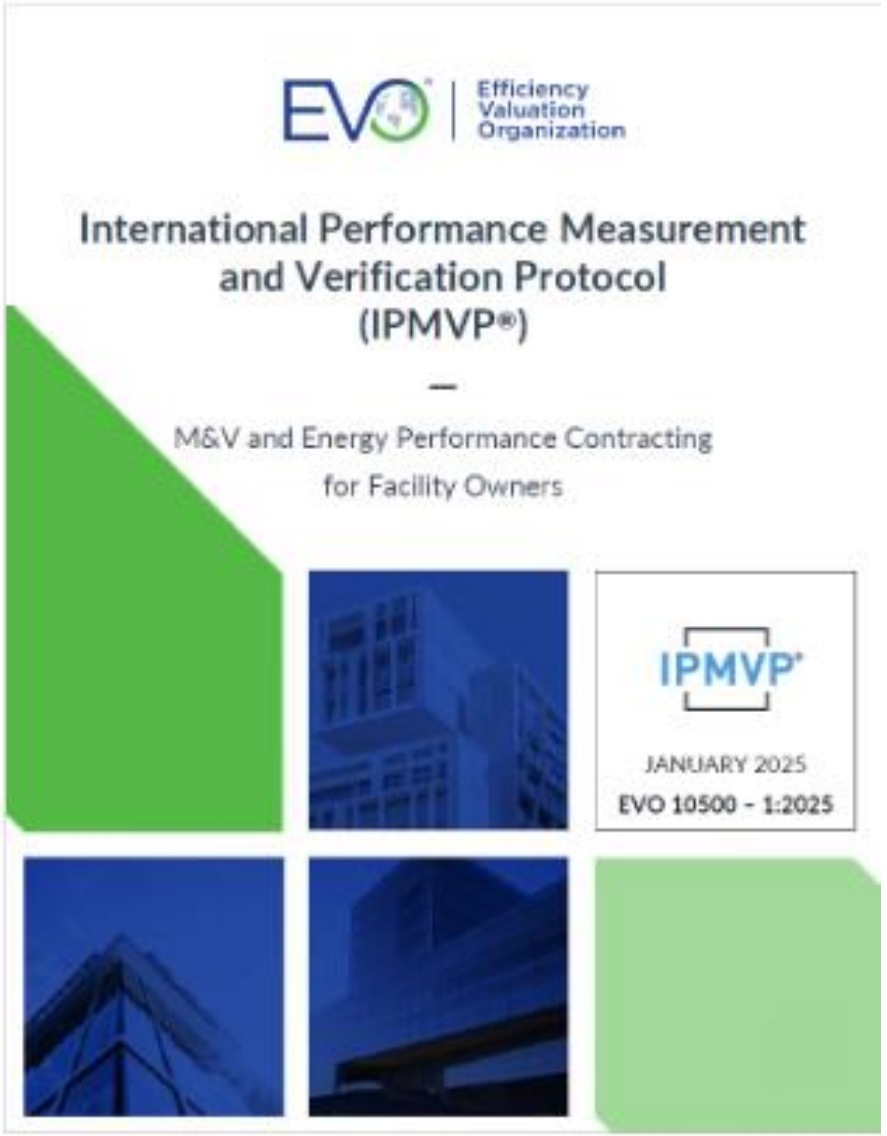
They can consist of engineering calculations.

THE EXTENT OF THE **ADJUSTMENTS** DEPENDS ON:

- the need for accuracy,
- the complexity of factors driving energy use and consumption and/or demand,
- the amount of equipment having its performance assessed (e.g., "measurement boundary"), and
- the available budget.

M&V Best Practices

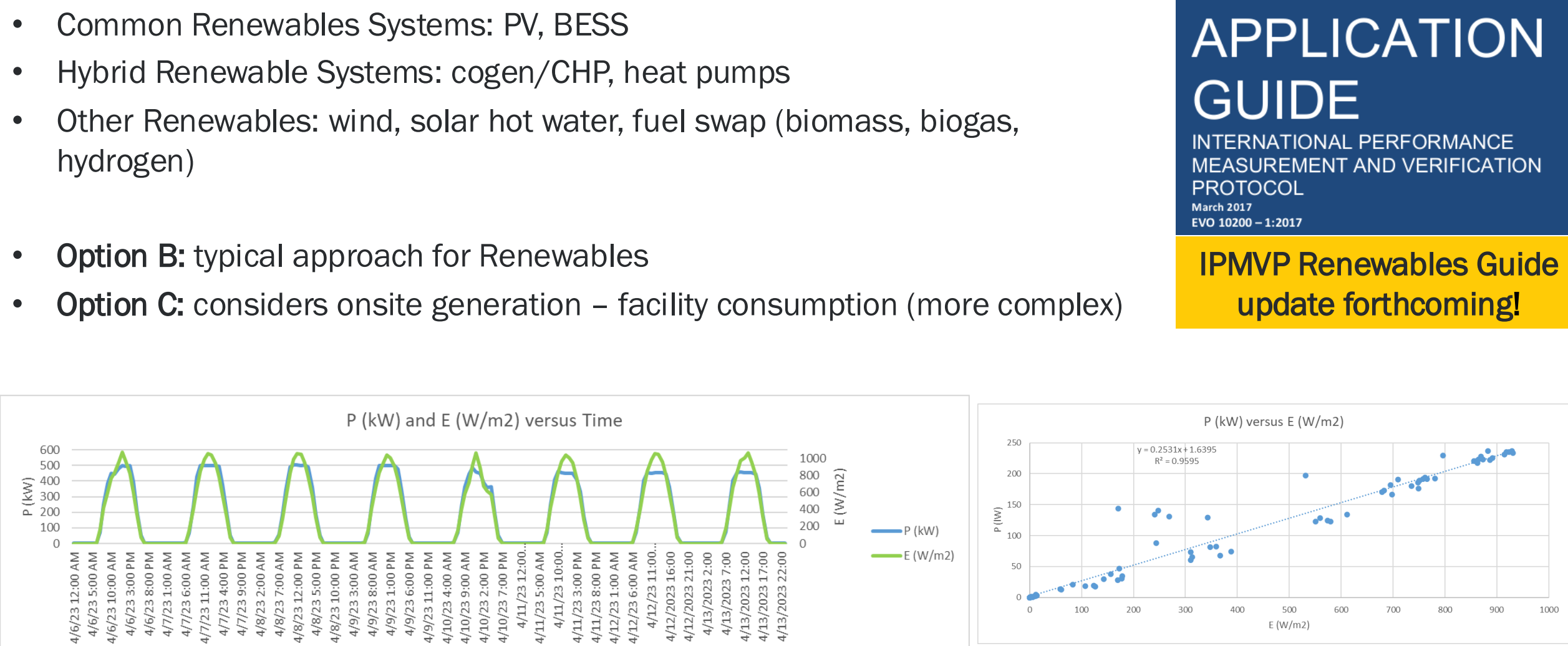
- Owners should consider engaging an Owners Rep (OR) to review the ESCO's M&V plan, annual reports
  - Confirm the M&V options selected in the plan and methodologies have been properly followed
  - Confirm appropriate data have been collected supporting the methods detailed in the M&V plan
  - Review the verified savings calculations – inputs based on data collected or agreed upon values, using the same methodology from the estimated savings estimates performed during the audit for Options A, B, C and D
    - Access to "live" spreadsheets or energy models
  - Confirm non-routine adjustments have been used appropriately when necessary
- New IPMVP application guide on *M&V and Energy Performance Contracting for Facility Owners* (evo-world.org)



IPMVP for Renewables

- Common Renewables Systems: PV, BESS
- Hybrid Renewable Systems: cogen/CHP, heat pumps
- Other Renewables: wind, solar hot water, fuel swap (biomass, biogas, hydrogen)

- **Option B:** typical approach for Renewables
- **Option C:** considers onsite generation – facility consumption (more complex)



IPMVP Renewables Guide update forthcoming!

Case Studies

Case Study Submission Form Here

Featured Case Study:
Rockingham County School District, North Carolina

Link to more information on this case study

Rockingham County School District was facing the challenge of aging facilities and systems. A Guaranteed Energy Savings Performance Contract including lighting and HVAC upgrades, water conservation, and enhanced indoor air quality breathed new life into Rockingham County Schools and provided the District significantly more control over its facilities.

Scope and Benefits

Improved indoor air quality

- HVAC deferred maintenance
- Installed a new chiller and replaced two Air Handler Units

LED lighting upgrades

Upgraded digital controls

Water conservation

- Upgraded plumbing fixtures
- Submetering for irrigation

Insulated chilled water piping (addressed deferred maintenance)

Streamlined internal operational processes

- 21 School Sites, 6 District Locations
- 12K+ student population
- 2,330,216 sq feet addressed as part of project

IPMVP Methods: Option A (some lighting, HVAC, water conservation) and B (some Lighting)

ESCO: Johnson Controls Inc.
OR: Locklear, Locklear, and Jacobs

Featured Case Study:
Clark County School District, Nevada

Link to more information on this Case Study

Clark County School District, serving Las Vegas and the surrounding area, is one of the largest school districts in the nation. Rising energy costs, a backlog of deferred maintenance, and sustainability goals necessitated a district need for a comprehensive facility investment strategy. This project will achieve economic, environmental, resiliency, comfort, safety, and deferred maintenance goals. It facilitates scalable future growth and technology implementation for the District and will improve the learning environment for students and faculty, emphasizing sustainability and long-term efficiency, and deliver guaranteed operational savings to the District.

Scope and Benefits:

Safety Improvements, user friendly, wireless control and increased long-term controllability for:

- LED Lighting
- Building Automation Systems / Controls
- Dwell time adjustments
- Motion activation
- Daylight Harvesting

Waste management/efficiency analysis to reduce waste in materials, storage, and transit miles

Decreased O&M costs and burden

Futureproofing

- To reduce need for rework of an additional ESPC by deploying BACnet
- To expand into HVAC and renewable energy in later phases of work

276 Local Subcontractors Engaged

>40% Subcontractors are MWBE

IPMVP Option A

•Student population: 300,000

•Fifth largest District in the US

•205 campuses retrofitted as part of project

•23,639,650 square feet addressed as part of project

ESCO: Willdan Engineering
OR: NV5

Q&A and Discussion

Common M&V Questions

- How much does it cost for an ESCO to provide an annual savings guarantee, and M&V report?
- How many years should I pay for an M&V report?
- Are implementing building analytics in an ESPC project helpful for M&V of savings?
- Should I hire an Owner's Rep to review the M&V Plan, Post-Installation M&V Report, Annual M&V Reports submitted by the ESCO?

DOE Resources and Upcoming Events

Technical Assistance

State and local ESPC Campaign partners are invited to set up a time to speak with an ESPC Subject Matter Expert for direct technical assistance. Discussion topics can be anything regarding an ESPC project or program, including specific questions on your project. **To request a meeting time,** please complete this **Technical Assistance Sign-Up Form**.

"The USDOE's ESPC Campaign has been an invaluable partner in helping us strengthen collaboration with ESCOs and implement the eProject eXpress (ePX) platform effectively. Through opportunities like speaking at the Energy Services Coalition Regional Meeting and participating in a Peer Exchange, as well as receiving direct support from a DOE subject matter expert, we've made significant progress. Our ePX portfolio has become far more usable, and the interest from partners across our state has grown tremendously. The Campaign's technical assistance makes complex information clear and actionable, and I would strongly recommend it to any organization looking to advance their ESPC efforts."

-Miracle Wilson
Energy Resource Project Manager
Georgia Environmental Finance Authority

Upcoming Events (click to register)

Webinars

- ESPC: A Resilient Model to Achieve Operational Resiliency
  October 8, 2025, 1:00pm CT
- Ally in Your Corner: Working with Owner's Reps
  October 16, 2025, 1:00pm CT
- Using eProject eXpress to Track and Report ESPC Legacy Project Data (Led by LBNL)
  October 21, 2025, 1:00pm CT
- State of States : The evolving role of State Energy Offices in fostering successful MUSH market projects
  October 28, 2025, 1:00pm CT
- Using eProject eXpress to Track and Store ESPC Legacy M&V Data (Led by LBNL)
  November 10, 2025, 1:00pm CT

In-Person

- 2025 Annual R3 Conference and Innovation Expo - Join us in Las Vegas for the Annual Conference of the National Association of Energy Service Companies!
  November 3-5, 2025 - Paris Las Vegas, Las Vegas, NV

Resources

U. S. DOE Better Buildings Program:

- ESPC Toolkit
  - Evaluating ESPC Results
  - The Business Case for Conducting Measurement and Verification In State and Local Government Energy Savings Performance Contract Projects

U.S DOE Federal Energy Management Program:

- Performance Contracting National Resource Center - Hub for ESPC resources: legislation by state, SEO contacts, trainings
- M&V Guidelines: Measurement and Verification for Performance-Based Contracts Version 5.0

Written Guides & Reports:

- IPMVP Core Concepts
- M&V and Energy Performance Contracting for Facility Owners

IPMVP Certifications:

AEE:

- Certified Measurement and Verification Professional (CMVP)

EVO:

- Performance Measurement and Verification Analyst (PMVA)
- Performance Measurement and Verification Expert (PMVE)

Resources: ESPC Campaign

The Energy Savings Performance Contracting (ESPC) Campaign engages states, local governments, school districts, universities and colleges, hospitals, and other market stakeholders to:

- **Support** the use of performance contracting to increase efficiency, modernize public buildings, reduce utility expenses, increase resilience, and meet lead-by-example goals
- **Share and Leverage Practical Resources** to strengthen ESPC and measurement & verification (M&V)
- **Amplify and Implement Best Practice Approaches** for ESPC projects and programs
- **Demonstrate Impact** with measured and verified energy and cost savings
- **Showcase Achievements** and share examples of successful ESPC implementation

- ✓ *Expert-led Trainings*
- ✓ *Webinars*
- ✓ *Peer Exchanges*
- ✓ *"Ask-an-Expert" Office Hours*
- ✓ *Resource Library*

Case Study Submission Form Here

Complete the Expression of Interest form to obtain a Partner Agreement

Thank you!

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