



Efficiency
Valuation
Organization

IPMVP APPLICATION GUIDES FAMILY

WHAT IS MEASUREMENT AND VERIFICATION (M&V)?

Measurement & Verification (M&V) is the process of planning, measuring, collecting and analyzing data to verify and report energy savings resulting from the implementation of an energy conservation measure. Energy savings are, by definition, the absence of energy use and subsequently cannot be measured. However, we do measure energy use. M&V therefore represents the process of analyzing measured energy use before and after a retrofit to determine savings.

M&V is the meter of an energy efficiency project. Nobody would invest in a power generation project without installing a meter to measure the energy generated as this serves as the basis for determining how investors will get paid. Similarly, it is unreasonable to expect that large energy efficiency investments will be made on a consistent basis without an M&V "meter," and unreasonable to expect that clean and cost-effective energy efficiency resources will be recognized as a sustainable and reliable market if they are not measured. Energy efficiency needs M&V as much as pension funds need to track their investments or buying departments need to have an inventory system.

WHY M&V

M&V is necessary to accurately determine the return on investment and other benefits generated from an energy efficiency project. Verification of the potential to achieve savings is referred to as operational verification, which may involve inspection, commissioning of equipment, functional performance testing and/or data trending. IPMVP-adherent M&V includes both operational verification and an accounting of savings based on site energy measurements before and after implementation of a project, and adjustments.

WHAT IS THE IPMVP?

First published in 1997, the International Performance Measurement and Verification Protocol (IPMVP) and its family of protocols and application guides represent a structured presentation of common principles and terms that are basic to any good energy and water use (M&V) process. The IPMVP provides a framework for each M&V project which must be individually designed to suit the objectives and desired accuracy of energy or water-saving efforts.

PRINCIPLES OF M&V

Good M&V practice is based on **six fundamental** principles.

- 1 **Accurate:** M&V reports should be as accurate as the M&V budget will allow.
- 2 **Complete:** The reporting of energy savings should consider all effects of a project
- 3 **Conservative:** Where judgements are made about uncertain quantities, M&V procedures should be designed to under-estimate savings.
- 4 **Consistent:** The reporting of a project's energy effectiveness should be consistent. The IPMVP helps to avoid inconsistencies arising from lack of consideration of important dimensions.
- 5 **Relevant:** The determination of savings should measure the performance parameters of concern, while other less critical or predictable parameters may be estimated.
- 6 **Transparent:** All M&V activities should be clearly and fully disclosed.

PURPOSE OF M&V

- Increase energy savings
- Document financial transactions
- Enhance financing for efficiency projects
- Improve engineering design and facility operations and maintenance
- Manage energy budgets
- Enhance the value of emission-reduction credits
- Support evaluation of regional efficiency programs
- Increase public understanding of energy management as a public policy tool



IPMVP

Core Concepts
EVO 10000-1:2016
(April 2016)

This protocol provides the core concepts of M&V. It defines the commonly used terminology and guiding principles for applying M&V. It describes the project framework in which M&V activities take place as well as the contents and requirements of adherent M&V plans and saving reports. Finally, it describes the attributes of fully adherent IPMVP projects.

Generally Accepted M&V Principles
(November 2018)

This document presents the fundamentals of measurement and verification. It is a condensed and less technical version of the Core Concepts and is an excellent reference for policy stakeholders.

APPLICATION GUIDES

Renewables Application Guide
EVO 10200-1:2016
(March 2017)

This application guide includes M&V options for renewable energy systems within the IPMVP framework and includes examples and recommendations for specific applications. Renewable energy technologies include solar, wind, biomass, geothermal, small hydroelectric, ocean thermal, wave and tidal energy.

Uncertainty Assessment
EVO 10100-1:2018
(April 2018)

The objective of M&V is to reliably determine energy savings with a reasonable level of uncertainty. The uncertainty of a savings report can be managed by controlling random errors and data bias. Errors occurs in three ways: modelling, sampling, and measurement. This application guide provides guidance on quantifying the uncertainties created by these three forms of error.

M&V Issues and Examples
EVO 10300-1:2019
(February 2019)

This application guide presents a variety of project types and discusses the key M&V design issues arising from the described situations. Each example shows just one IPMVP adherent M&V design, though there are numerous possible designs for any project. This guide also addresses issues common to M&V projects.

UPCOMING APPLICATION GUIDES

M&V for Energy Performance Contracting
EVO 10XXX-1:20XX
(In preparation)

This application guide is intended to provide additional information to the facility owner or industrial facility manager that would like to implement an energy performance contract involving guaranteed savings by an energy services company.

Program Evaluation M&V
EVO 10XXX-1: 20XX
(In preparation)

This application guide provides guidance on utilizing the IPMVP for energy efficiency (EE) program gross impact evaluation. It seeks to bridge the gap between program evaluation guidance documents and the IPMVP and to provide more detailed guidance to impact evaluators planning, reviewing, or conducting M&V within impact evaluation.

Non-Routine Events and Non-Routine Adjustment in M&V
EVO 10XXX-1:20XX
(In preparation)

Routine events are factors that are expected to change routinely and can be accounted for (through regressions or other techniques) to adjust both the baseline and reporting periods to the same set of conditions. Non-routine events are factors that were not expected to change, but that will affect the building's energy use. This guide will address the proper identification, quantification, and application of non-routine events and adjustments.

Water Application
EVO 10XXX-1:20XX
(In preparation)

This application guide presents the application of the IPMVP framework to water savings.

FINANCING PROTOCOL

International Energy Efficiency Financing Protocol
EVO 40000-1:2009
(April 2009)

This first edition of IEEFP provides insight to financial institutions to understand the benefits and risks of financing energy efficiency projects. This protocol is currently under revision.

Efficiency Valuation Organization (EVO) is a non-profit organization whose products and services help people engineer and invest in energy efficiency projects worldwide. EVO is the only global organization solely dedicated to M&V.

EVO's vision is to create a world that has confidence in energy efficiency as a reliable and sustainable energy resource.

EVO's mission is to ensure that the savings and impact of energy efficiency and sustainability projects are accurately measured and verified.

The International Performance Measurement and Verification Protocol (IPMVP®) is owned and published by EVO.



**Efficiency
Valuation
Organization**



evo-world.org



evo.central@evo-world.org
dtanguay@evo-world.org



+1 202-738-4639



CORPORATE ADDRESS
1629 K St. NW, Suite 300
Washington, DC 20006, USA