How Measurement & Verification Improves Performance of Energy Efficiency Projects

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M&V is a set of best practices and principles for planning, tracking, and analyzing data to verify and report on the energy savings of an individual facility resulting from implementing an Energy Efficiency Measure (EEM). It is a flexible, living methodology that has expanded over the decades to incorporate a wider audience and greater variety of efficiency investments, formed to promote energy efficiency measures as a means to decarbonise. M&V determines what energy use would have been without the intervention under comparable conditions, with savings calculated as the difference between that counterfactual and actual post-project consumption.

Publication context: This article reflects its publication date. Market prices, program rules, reporting duties and deadlines may have changed. Confirm current official guidance before making a decision.

Improving energy efficiency is a critical aspect of decarbonisation. With the built environment accounting for roughly 40% of global greenhouse gas (GHG) emissions, there exists an extensive opportunity for energy efficiency improvements to strengthen building performance while using existing infrastructure. For businesses, implementing Energy Efficiency Measure (EEM) serves as a way to progress toward corporate emissions targets and reduce operational expenses. The allure of savings is enticing, but how can an organisation be certain of an EEM's impact on energy and cost savings? That is where the measurement and verification (M&V) process comes into play.

Without measurement, it is impossible to track progress; without verifiable outcomes, it is less appealing to pursue improvement projects . With a strong M&V process, a business has a transparent and reliable system to determine the energy savings - and therefore the cost savings - provided by an EEM. Having the system in place to quantify these savings often boosts EEM performance and enhances the business case for pursuing energy efficiency projects.

What is M&V

Measurement and verification (M&V) is a set of best practices and principles for planning, tracking, and analyzing data to verify and report on the energy savings of an individual facility resulting from implementing an EEM. Formed to promote energy efficiency measures as a means to decarbonise, the M&V methodology is a flexible and living system that has expanded over the decades to incorporate a wider audience and a greater variety of efficiency investments.

In 1997, an international collaboration of national organisations, industry, and individual experts led to the creation of the International Performance Measurement and Verification Protocol (IPMVP), which established an internationally recognised set of guidelines and procedures for M&V. Emerging as the

gold standard for M&V, the IPMVP presents a set of principles that are critical for any significant M&V process:

accuracy

completeness

conservativeness

consistency

relevance

transparency

Following IPMVP principles and guidelines , each project must have a tailored M&V plan that encompasses the fundamental principles and is well-suited to provide reliable reporting on its energy-saving initiatives.

How Does The M&V Process Work

A reliable measurement of energy savings calculates the difference between baseline energy use and post-retrofit energy while also factoring in any meaningful adjustments:

Energy Savings = Baseline Energy Use - Post-retrofit Energy Use +/- Adjustments

Therefore, determining savings from an EEM requires a clear understanding of the energy use before and after project implementation. To gain this clarity, the M&V process begins well before project installation.

Once an energy efficiency project is determined (often after an energy audit to identify areas of opportunity for improved energy efficiency), the scope and boundary of the M&V process are defined to align with the EEM and the purpose for reporting.

There are four M&V options under the IMPVP:

Option A - Retrofit isolation: key parameters : used to determine energy savings from a singular system, such as a lighting upgrade or single piece of equipment, where the energy performance can be measured and other stable parameters like operations can be specified (i.e., standard business hours apply before and after EEM installation)

Option B - Retrofit isolation: all parameters measured : used to determine energy savings from a singular system, such as replacing a boiler, where the energy performance and operations can be measured

Option C - Whole facility : used for a whole facility approach where one or multiple energy efficiency measures may affect the whole site, or where only site-level energy data is available

Option D - Calibrated simulation : a calibrated simulation that applies Option C for situations when no historical energy use data is available (i.e., new development)

Homing in on the M&V option involves consideration of data availability and quality of the measurement boundary - whether it be around a single piece of equipment or the entire facility - as well as the interactive effects that may arise from the efficiency improvement measure.

In addition, it is critical to collect accurate baseline data . This ensures that the post-retrofit energy performance can be compared to a pre-installation data set to reliably determine EEM savings. The baseline energy use should be derived from a time period immediately before project implementation, and it should reflect a normal operating period that considers all operational modes of the facility. The post-retrofit period should also be determined prior to EEM implementation to ensure the reporting length, frequency, and scope align with the M&V process and provide accurate measurements for comparison against baseline conditions.

Considering external factors that impact energy use, it is also important to incorporate adjustments into the energy savings calculation that may have had a significant impact on energy use and demand. For instance, if post-retrofit reporting for an HVAC installation is conducted during an uncharacteristically

hot year, then this weather factor needs to be considered as an adjustment to show that energy efficiency improved despite the rising utility costs resulting from increased HVAC use. Other adjustments to consider include changes in building occupancy, changes to the amount of space being heated or cooled and changes made to indoor environmental settings, etc.

How Does M&V Benefit Business

The M&V process instills best energy management practices that often translate to enhanced savings and improved financial opportunity. A well-established M&V process ensures proper performance measurement and also outlines how improved performance should look. This creates cohesion around the project and embeds a protocol for effective project design, operation, and maintenance that often leads to greater energy savings than would be experienced without an intact M&V process. Ultimately, this reduces risk around the project, strengthening the business case for the EEM.

Reduced risk from a strong M&V process makes it easier to secure financing, a pivotal aspect of implementing energy-efficient improvements. A strong, verifiable M&V process improves financial credibility. This instills confidence that savings will incur and increases the likelihood for an investor to consider such an energy project for their debt portfolios.

The energy savings from verifiable M&V processes can be rewarded with energy certificates. Depending on the location of an accredited project, Victorian Energy Efficiency Certificates (VEECs), NSW's Energy Savings Certificates (ESCs), and Australian Carbon Credit Units (ACCUs) can be created from the project's delivered energy savings.

How Northmore Gordon Can Help

At the heart of Northmore Gordon is a large team of Certified Measurement & Verification Professionals (CMVP®) who are eager to guide Australian businesses through the impactful M&V process so they can optimise the environmental and financial benefits associated with their energy efficiency projects. Our CMVPs are critical to successful compliant M&V modelling, statistical analysis, and detailed reports that are required for M&V under the ERF , ESS , & VEU and numerous international programs.

Coupling our M&V expertise, regulatory knowledge, and our in-depth understanding of energy usage in C&I environments allows our consultants to identify the parameters that drive energy usage or carbon emissions. This allows us to build the highest quality compliant models and maximise the savings or abatement.

A partnership with Northmore Gordon removes the stress and hassle of establishing an M&V process, helping businesses streamline their energy management approach, strengthen business performance, and create energy certificates from their project's delivered energy savings.

Reporting and compliance context

Confirm the reporting entity and period, current thresholds, regulator guidance, evidence boundary and assurance obligations before applying the dated discussion to a live report.

Related guidance

Carbon advisory

Scope 1, 2 and 3 emissions

Contact us

Read the original article for the source publication and its full context.

What is measurement and verification (M&V) in the context of energy efficiency projects?

M&V is a set of best practices and principles for planning, tracking, and analyzing data to verify and report on the energy savings of an individual facility resulting from implementing an Energy Efficiency Measure (EEM). It is a flexible, living methodology that has expanded over the decades to incorporate a wider audience and greater variety of efficiency investments, formed to promote energy efficiency measures as a means to decarbonise. M&V determines what energy use would have been without the intervention under comparable conditions, with savings calculated as the difference between that counterfactual and actual post-project consumption.

Why is early measurement planning critical before project implementation?

Early measurement planning ensures the project can meet chosen scheme requirements and establish proper baseline conditions while meaningful data can still be obtained. The NSW Government's M&V guidance emphasises that a complete operating cycle must be captured to represent typical conditions. Leaving measurement until immediately before installation can make the intended analysis difficult or impossible. Early planning also preserves funding options and prevents timing-sensitive eligibility pathways from becoming unavailable after commitments are made.

How should baseline data be collected and what makes it representative?

Baseline data should be collected from a representative pre-project period immediately before implementation, covering a complete operating cycle to account for seasonal variation or variable operations. The baseline establishes representative pre-project conditions and defines how changes in operating conditions will be treated. Collecting actual meter readings, production volumes, occupancy records and other relevant operating variables is essential. For sites with seasonal operations, a full year of data may be required to ensure the baseline represents typical conditions that the investment will serve.

Why are adjustments necessary in M&V calculations, and what factors require adjustment?

Adjustments account for external factors affecting energy use that are unrelated to the equipment improvement. Weather changes, production declines, operating hours changes, occupancy variations, and changes to indoor environmental settings can all affect consumption independent of the upgrade. For example, a post-retrofit HVAC system installed during an unusually hot year requires weather adjustment to show that energy efficiency improved despite higher cooling loads. Proper adjustments separate the effect of the improvement from other business changes, preventing electricity bills alone from misleading project assessment.

What are the key differences between the four IPMVP measurement options?

Option A measures key parameters for singular systems like lighting upgrades where operations are stable. Option B measures all parameters for single systems like boiler replacements where operations vary. Option C applies whole-facility analysis when multiple measures affect the entire site or only site-level data is available. Option D uses calibrated simulation for new developments with no historical energy data. The choice depends on project boundary, available data, operating conditions, and the level of accuracy required for the intended decision or certificate scheme.

How does M&V support environmental certificate eligibility and financial credibility?

Verifiable M&V processes can generate Victorian Energy Efficiency Certificates (VEECs), NSW Energy Savings Certificates (ESCs), and Australian Carbon Credit Units (ACCUs), depending on project location and scheme requirements. A strong M&V framework strengthens the business case by reducing investment risk and making it easier to secure financing, as verifiable savings improve financial credibility and instil investor confidence. However, eligibility depends on meeting the specific scheme's method requirements, calculation standards, and evidence quality thresholds—an analysis prepared for one purpose should not be assumed to satisfy another.

What practical M&V components should be included in a project brief?

A practical M&V brief should define: Purpose (internal performance, investment contract, reporting, or certificate scheme); Boundary (equipment, meters, energy streams and interactions included); Baseline (representative pre-project conditions and treatment of operating changes); Measurement (instruments, intervals, quality checks and data-access responsibilities); Implementation record (what was installed, commissioning dates and other changes); and Reporting (calculation, uncertainty, adjustments and exceptions for peer review). These components establish clarity on project stage, objectives and state of readiness for environmental certificate assessments or internal performance tracking.

Why must adjustments for operating changes be documented and approved?

Operating changes such as production increases, expanded cooling loads, or modified operating schedules can affect energy use independently of equipment improvements. These must be documented, approved, and monitored to verify they produce intended energy management outcomes. In NSW's PIAM&V pathway, baseline measurement procedures must be deemed appropriate by an independent M&V professional with written explanatory reasoning provided before implementation begins. Documenting how operating changes will be treated in analysis ensures the verified result reflects the actual effect of the equipment improvement, not confounding operational changes.

What role does measurement and monitoring play in ongoing energy management?

Metering and monitoring collect and track energy consumption data to support energy management decision-making, providing the data foundation for energy performance measures and review cycles. A useful metering system begins by specifying the operational or investment question it answers, the equipment boundary, and who will use the information. Interval data, production records, and operating variables must be recorded with clear data-access responsibilities, quality checks, and procedures for detecting missing periods or implausible values. This ongoing data framework enables identification of equipment performance changes, tracking of management improvements, and adjustment of baselines when operational changes occur.

How can Northmore Gordon assist with M&V planning and scheme compliance?

We provide measurement and verification services including project-boundary selection, baseline modelling, savings calculation and reporting. We employ Certified Measurement & Verification Professionals who guide businesses through M&V processes compliant with the IPMVP framework and Australian scheme requirements including the Energy Savings Scheme, Victorian Energy Upgrades, and ACCU methods. We help establish appropriate measurement responsibilities, design metering

systems that answer specific business questions, and ensure evidence meets the particular scheme's requirements before detailed assessment or installation proceeds.