Guidance on the completion of a Measurement and Verification Report

EEOS, EXEED, CEG and Pathfinder programs

Version	Date	Details
Version 1.0	10/06/2024	Published

Sustainable Energy Authority of Ireland

SEAI is Ireland's national energy authority investing in, and delivering, appropriate, effective, and sustainable solutions to help Ireland's transition to a clean energy future. We work with the public, businesses, communities, and the Government to achieve this, through expertise, funding, educational programmes, policy advice, research and the development of new technologies.

SEAI is funded by the Government of Ireland.

Table of Contents

1. Introduction

This document provides guidance to relevant parties on the SEAI requirements for preparation of a measurement and verification (M&V) report required under the SEAI's Community Energies Grant (CEG), Excellence in Energy Efficient Design (EXEED) Grant, Pathfinders Program, and Energy Efficiency Obligation Scheme (EEOS).

Relevant parties are required to measure and verify the energy savings associated with an energy efficiency improvement project where CEG, EXEED or Pathfinders funding has been agreed, or where the energy credits are to be claimed by an obligated party under the EEOS.

M&V requires the creation and execution of a plan and the completion of a report detailing the work undertaken and the findings. In the case of the EEOS, certain derogations can be applied which permit the use of standardised calculation tools in the place of detailed M&V.

It is assumed that the reader is familiar with the International Standard ISO:50015, the International Performance Measurement and Verification Protocol (IPMVP®[1]) or equivalent protocol and the concepts of measurement and verification of savings. This guide references to IPMVP® Core Concepts 2022 specifically but should be used as an accompaniment to any appropriate standard or protocol.

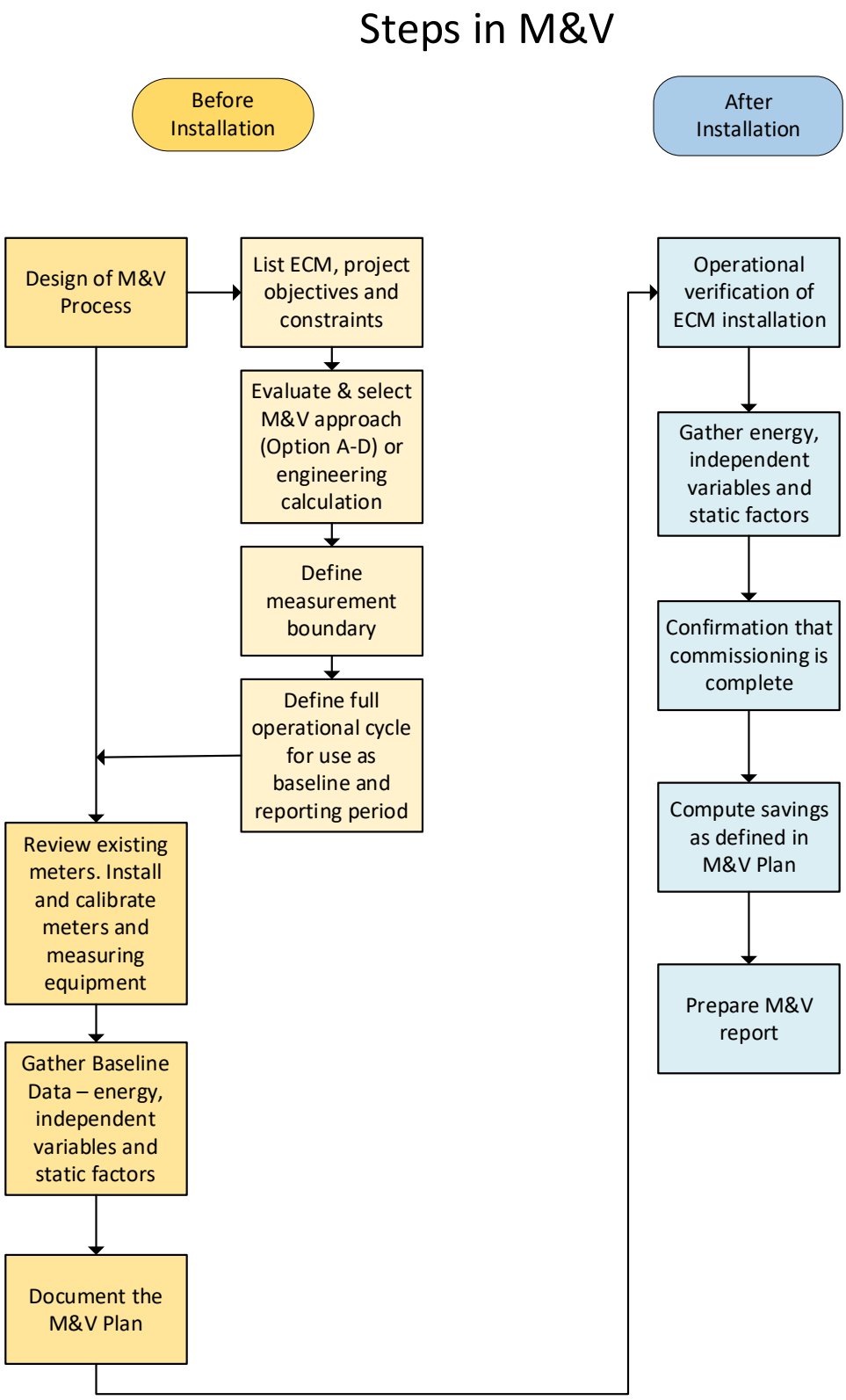
SEAI requires that the M&V approach adopted to verify savings from CEG, EXEED or Pathfinders funded projects, or for the purpose of claiming EEOS energy credits, is broadly similar to that outlined in IPMVP® Core Concepts 2022, or an equivalent protocol such as ISO:50015, ASHRAE Guideline 14 or FEMP, and strives to deliver results that are accurate, complete, conservative, consistent, relevant and transparent. However, SEAI does not require that the relevant parties provide M&V Reports that are fully IPMVP® (or equivalent protocol) compliant, and so this document clarifies where some latitude may be allowable. These guidelines are not intended to replicate or replace any IPMVP® or equivalent guidance documentation. M&V reports should be completed in conjunction with IPMVP® or equivalent guidelines with due regard given to the areas of latitude allowable by SEAI.

SEAI requires that the M&V report be completed by a professionally competent individual (i.e. requiring an understanding of the subject matter, underlying theory and the ability to apply these concepts). The M&V report does not necessarily require completion by a Certified Measurement & Verification Professional (CMVP®)[2]. However, the M&V report must be impartial, requiring the professional to be independent of the project, and to exercise professional integrity, objectivity, impartiality, and a degree of scepticism.

[1] IPMVP is a registered trademark of the Efficiency Valuation Organisation (EVO®), http://www.evo-world.org/

[2] CMVP is a registered trademark of the Association of Energy Engineers

2. M&V Process


Steps in M&V
Before Installation
After Installation
Design of M&V Process
List ECM, project objectives and constraints
Evaluate & select M&V approach (Option A-D) or engineering calculation
Define measurement boundary
Define full operational cycle for use as baseline and reporting period
Review existing meters. Install and calibrate meters and measuring equipment
Gather Baseline Data – energy, independent variables and static factors
Document the M&V Plan
Operational verification of ECM installation
Gather energy, independent variables and static factors
Confirmation that commissioning is complete
Compute savings as defined in M&V Plan
Prepare M&V report

The M&V Process should involve the following 11 steps, although it may not always follow this step-by-step sequence and timeline.

Overview of M&V Design and Reporting Process[3]

Step 1:	Determine the Goals of the M&V Process	Baseline Period
Step 2:	Select IPMVP Option(s) and define the Approach	
Step 3:	Determine Baseline period and Document Baseline data	
Step 4:	Develop M&V plan	
Step 5:	Set up metering and data collection process	
Step 6:	Monitor for changes in site conditions	Installation Period
Step 7:	Confirm Operational Verification	
Step 8:	Collection of Data for Reporting Period	Reporting Period
Step 9:	Determine savings for Period	
Step 10:	M&V Report	
Step 11:	Track energy Performance and Savings	

[3] IPMVP Core Concepts 2022, v1.02, Section 5

3. M&V Plan

For **all** grant funded and EEOS related projects, a M&V plan should be completed to outline how the relevant party is going to implement the project and how the savings will be verified after the installation of the ECM (refer to the section 2.0 M&V Process). Included in the M&V plan should be an assessment of how the project will meet the eligibility criteria, or the relevant SEAI grant, or the EEOS.

The M&V plan shall be completed by the relevant party in conjunction with the client/company and carried out by a competent practitioner. The M&V plan is only required for submission as part of the CEG, EXEED and Pathfinders grant application process and is not required for EEOS NREC application. However, it should be completed as part of the M&V of the project and may be requested by SEAI to support the eligibility of savings during an audit/evaluation. The M&V plan may also be used to respond to auditor queries, or to demonstrate the rationale behind the M&V approach used in a project.

The M&V plan shall clearly outline the process that is to be followed to allow the savings to be verified after the installation of the energy conservation measure (ECM). The M&V plan should complement the information contained in the M&V report and demonstrate adherence to the M&V process.

4. M&V Report Layout

The cover or first inside page of the M&V Report **must** include the following table, duly completed:

SEAI M&V Report	
Project Title	
SEAI grant scheme (if relevant)	
Obligated Party (if relevant)	
Obligated Party Contact Name (if relevant)	
Client Organisation	
Client Organisation Contact Name	
Prepared by	[name and qualifications of person who prepared the M&V Report] *
Competency rational	[Qualification and/or experience relevant to M&V and the technology/industry associated with the project] *
Signature	I have completed this M&V Report acting as an impartial professional:
Date	
Status	[e.g. issued for client review, complete]

*Note: Placing the name of the M&V practitioner on the cover page indicates that the M&V practitioner stands over all of the information contained within this report.

The M&V Report **MUST** contain the following headings, numbered as shown below:

1. Executive Summary
2. Project Description
3. Measurement and Verification Method Chosen
4. Measurement and Verification Boundary
5. Baseline and Baseline Period Analysis
6. Reporting Period Data and Analysis
7. Unforeseen Changes or Adjustments
8. Analysis Procedure
9. Meter Specification
10. Principles of Good M&V
    - 10.1. Conservativeness of the approach
    - 10.2. Need to repeat the M&V
    - 10.3. Interactive effects of ECMs outside of the project scope
    - 10.4. Sustainability of savings
11. M&V Practitioner
12. Consideration and adherence to relevant SEAI requirements
    - 12.1 EEOS requirements
    - 12.2 Communities Energy Grant requirements
    - 12.3 Pathfinders requirements
13. Conclusion

The requirements for each of these sections are detailed in sections 4.1 through 4.13.

Although in many cases some of the sections may not be applicable, all sections must be completed. Where a section is not relevant, an explanation should be provided as to why the section has been deemed not relevant. This layout maintains consistency with IPMVP® and should be applied to all M&V reports.

4.1. Executive Summary

Include a summary of the project, refer to the M&V plan, the options explored prior to energy efficiency improvement measure(s) being installed, the action(s) on the measure(s) undertaken and why they were the best option chosen, and the conclusions around the energy savings and ROI/NPV/ Time value of money assessment.

This shall be a max **one-page** executive summary that the M&V practitioner will stand over, and the remaining report and appendices substantiate.

4.2. Project Description

This section is intended to give the reader of the report an overview of the site, project description, and pertinent data associated with the project at a high level.

Outline the intent of the project and options explored before the energy efficiency improvement measure(s) were undertaken. What were the aims and objectives of the project and why this was the best option chosen (including the payback time and lifetime of the measure(s)). This section should include all of the following points:

I. Why is the action/upgrade happening in the first place?

II. What options are available and have been considered?

III. What would the standard solution be without external intervention (e.g. market baseline/industry standard)

IV. What minimum equipment / energy use / design standards apply?

V. What is required to ensure savings (energy and financial) will continue to be delivered over the lifetime of the action(s) undertaken?

VI. What is the payback time, and how is it calculated?

Each ECM description should include a brief explanation along with detail of how the ECM will deliver energy savings. It should identify the area/piece of equipment and the scope of works. This should be described in a way so that a reader unfamiliar with the site will gain an understanding of the project intent. A well described ECM including commentary on the energy or demand drivers will assist the reader in determining if the appropriate M&V methodologies have been used to measure ECM savings.

Where there are multiple ECMs, each should be numbered and described separately. For example:

- ECM 1 – Variable speed control of AHU LTHW circuit pump
  The AHU LTHW circuit pump (P004) control ECM will modify the existing method of pump control from fixed speed constant volume operation to variable speed demand-based operation. This will be achieved through installation of VSDs, replacement of 3 port valves with 2 port valves at each AHU, and a controlling pressure sensor to determine when flow demand is satisfied. The electricity saving will arise from the reduction of pump power consumption when AHUs are off or have a low heat load. Gas savings will arise from a reduction in return water temperature which will improve boiler operating efficiency."

4.3. Measurement and Verification Method Chosen

Outline the reason for selecting the measurement and verification method (IPMVP / ISO:50015 are recommended) and calculations used. Note this could be a description of the approach taken including the steps of the methodology used to arrive at the energy savings. Include the cost considerations and limitations to the availability of data associated with the M&V approach if justification is required for suboptimal options selected.

It should be noted that a description of the measurement and verification approach could be used as an alternative to Option A-D of the IPMVP protocol.

In general, the selection of an M&V method is based upon the following:

- Project costs and expected savings
- Complexity of the ECMs
- Number of interrelated ECMs at a single facility
- Uncertainty or risk of savings being achieved
- Other uses for M&V data and systems

SEAI Specific Guidance:

Option selection should follow a similar principle to those outined in IPMVP® Core Concepts 2022.

Since Option A involves assumptions, it generally involves fewer measurement points and lower costs than other options. For electricity and gas, Option C has the advantage of using existing metering which is considered to be 100% accurate and for which historical records are generally available.

In addition to Options A to D, in some cases engineering calculations may be employed. Use "Engineering Calculations" as appropriate, and provide a description of the calculation approach used, how this approach was deemed to be optimal, and what other options were explored. If using an SEAI standardised calculation method, simply state the name of the tool used.

Additional practical considerations for M&V are detailed below. This is intended to assist in ensuring that the M&V input (cost and effort) is appropriate to the scale and extent of the ECM(s). Ensure that the considerations below are included in the selection of the appropriate M&V boundary in the M&V plan and M&V report.

- What is the expected financial value of ECM savings?
    - Consider what is an appropriate metering and M&V budget for this project
    - Can existing sub metering be used/optimised
- Is historical data available relating to
    - Occupancy?
    - Production Rates?
    - Operating hours?
- Can the ECM be readily isolated using sub metering?
    - This can reduce the effort required to determine static factors and independent variables.
- Will additional data collection systems be required?

4.4. Measurement and Verification Boundary

IPMVP® Guidance:

"The measurement boundary is used to isolate the equipment and related energy use which are impacted by the EEM(s) from those unaffected by the EEM(s). All energy used or generated within the boundary must be measured or estimated using meters at the measurement boundary."[4]

(For instance, a lighting retrofit project may result in less heat output from the lights, which may in turn increase heating requirements and reduce cooling requirements).

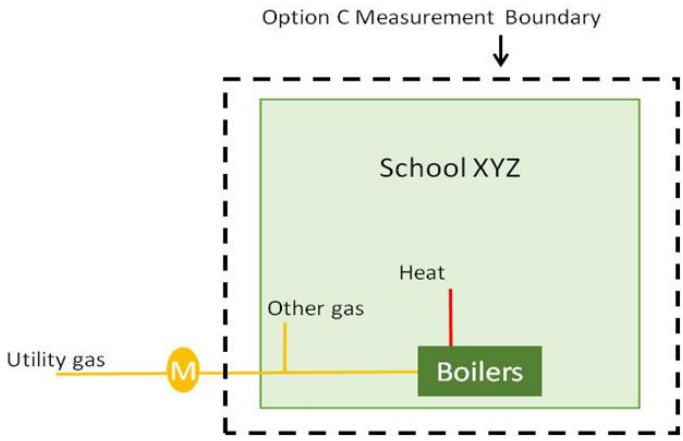
SEAI Specific Guidance:

Project savings can be calculated for an entire building or just a section of it. Depending on the ECM type it may be more appropriate to meter or measure just the ECM. In the case of multiple larger ECMs within a facility it may be appropriate to measure the entire facility.

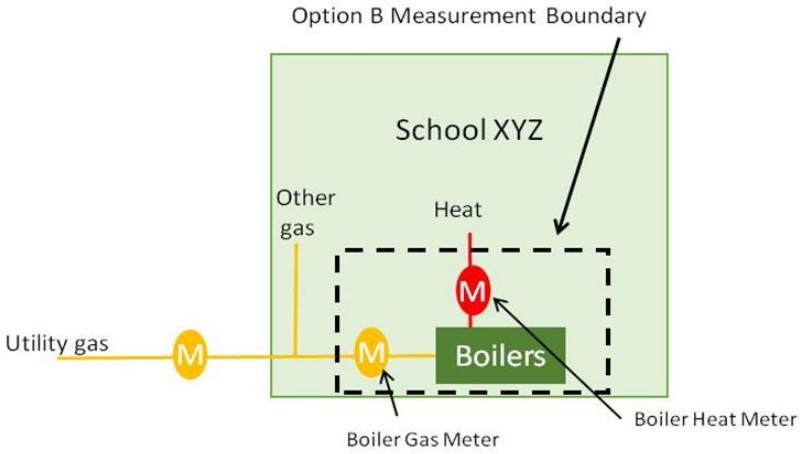
Examples of typical measurement boundaries are illustrated below.

[4] IPMVP Core Concepts 2022, v1.02, Section 7.1

Option C – Whole Facility Measurement Boundary Example



Option B- Retrofit Isolation-Measurement Boundary Example



Required Outcome:

- Clearly detail the M&V approach selected, briefly including the logic for this decision.
- Identify the measurement boundary
    - Where the measurement boundary is Option A or B, prepare a sketch detailing the boundary – insert in the M&V Report or in the appendix (appendix should be referenced here).
    - Where there are a number of ECMs and each is measured and verified individually (using Options A and/or B), number each ECM and identify both the M&V approach and the measurement boundary.
- Where Option A is selected, identify the estimated parameter and measured parameter.
- Identify interactive effects and discuss their possible effect/impact.

4.5. Baseline and Baseline Scenario Analysis

Document the facility's baseline conditions and energy data, within the measurement boundary.

This baseline documentation should include:

1. Identification of the baseline scenario
2. All baseline energy consumption and demand data
3. All independent variable data coinciding with the energy data (e.g. production rate, ambient temperature)
4. All static factors coinciding with the energy data.[5]

The Baseline Scenario should be established to:

- Represent all operating modes of the facility or the equipment during a normal operating cycle. This period should span a full operating cycle, from maximum to minimum energy use and fairly represent all operating conditions of a normal operating cycle.[6]
- Include only time periods for which factors that impact energy use of the facility are known. These include independent variables and static factors (i.e. energy influencing factors).
    - The extension of baseline periods backward in time to include multiple cycles of operation requires equal knowledge of factors that impact energy use to properly derive routine and non-routine adjustments after ECM installation.
- Coincide with the period immediately before implementing the energy efficiency measure(s).
    - Periods further back in time may not necessarily reflect the conditions existing before the retrofit and therefore may not provide a proper baseline for measuring the effect of the ECM in isolation.

Baseline Energy Data Considerations

- Whole building energy consumption and demand can be significantly affected by weather conditions. Typically, a full year of monthly data is required to define a full operating cycle. If interval data (hourly or daily) are used, a full operating cycle may be captured in less than a year if the full range of weather conditions is included.
- The energy consumption and demand of a compressed air system may only be governed by plant production levels, which vary on a weekly cycle. In this case, several weeks' data may be all that is needed to define baseline performance across a full range of operating conditions.

[5] IPMVP Vol. 1, Chapter 5.

[6] IPMVP Vol. 1, Chapter 4. IPMVP, v1.02, Section 7.2.

- The collection and documentation of static actors such as scheduled hours of operation can be critical to applying adjustments in the M&V reporting period.

SEAI Specific Guidance:

The duration of a full operating cycle will vary:

- in the case of a building energy consumption associated with space heating or cooling, the duration is typically a year as this allows for variations in weather.
- in the case of occupancy control of lighting, a full operating cycle may be a week.
- in the case of daylight control of lighting, a full operating cycle may be a year.

Static Factor Requirements

Whilst due consideration must be given to Static Factors, it is only necessary to identify those that are at risk of changing during the term of the reporting period, as this may substantially impact the savings.

What to do if the baseline data does not cover a full operating cycle

For some projects a full cycle of baseline energy data will not be readily available, particularly in the case of retrofit isolation ECMs (as these do not use utility meters). In these cases, one option is to operate the existing installation over a shorter period but at different loads that represent the range of operating conditions of a normal operating cycle. This may be achieved, for instance, by using the BMS to simulate different operating loads of a boiler and establishing its efficiency at different points. Where such an approach is adopted, the logic by which baseline, and reporting period data can be related must be clear.

It is also acceptable to extrapolate smaller or incomplete data sets to a full operating cycle provided:

- The extrapolated data is clearly identified (e.g. by colour code or footnote).
- The extrapolation methodology is clearly identified (including equations).
- The logic for the method is explained.
- All assumptions are identified.
- Calculations result in a conservative outcome (i.e. err on the side of underestimating savings) .
- The implications of this approach on the overall accuracy of the M&V savings are discussed. A statistical analysis is not required.
- Reporting Period energy data is recorded for a full operating cycle (i.e. extrapolation of both baseline and reporting period energy data is not allowed).

Regression Analysis

It is important to state the source of any regression analysis input data be stated as well as any basis for adjustment. If conducting a degree days regression analysis, test different base temperatures (e.g. 14.5, 16.5 degC) as default base temperatures (typically 15.5 degC) may not be appropriate for the facility in question.

Consider utilising open sources for weather data such as **www.degreedays.net**.If other sources of data are used, reference the source in the report for transparency and reproducibility.

Baseline documentation

The baseline data set (actual meter data and estimated data) should be included in the M&V Report in tabular form in an embedded spreadsheet or accompanying spreadsheet for reproducibility and transparency purposes. Separate tables for each energy type (e.g. electricity table separate from gas table). Associated Independent Variables should be included, as illustrated:

Month	Gas Submeter 1 [unit kWh, converted @ 10.6kWh/m3]	Gas Submeter 2 [unit kWh, converted @ 10.6kWh/m3]	Degree Days (15.5degC base, Dublin Airport)	Comment
Jan 2022	12,300	78,450	451	Actual values

Required Outcome:

- Identify the Baseline Period (start and end dates).
- Note the duration of a complete operating cycle and whether or not the baseline period data (including independent variables) for that period is complete. If incomplete, identify how many data points are missing.
- Where the Baseline Period data is not complete, comply with the extrapolation requirements identified above and discuss each (i.e. extrapolation methodology, logic, assumptions, conservativeness, implications for accuracy) in the Report.
- Baseline Period dataset to be included in M&V Report in an embedded spreadsheet or accompanying spreadsheet for reproducibility and transparency purposes. Calculated baseline period data should be clearly identified.
- Where Option A is selected, report the values to be used for all estimated values. Identify the source of these estimated values and justify their use.
- Document Static Factors as appropriate.

4.6. Reporting Period Data and Analysis

"The reporting period should encompass at least one complete normal operating cycle of the equipment or facility to fully characterize the savings effectiveness in normal operating modes."[7]

In the planning phase the developer of the M&V Plan should recommend the length of the overall reporting period for the project, over which measurement will be taken, and the period each saving report will cover. Energy data collected during this period will be compared to the baseline period energy, to develop verified savings.

The reporting period should encompass long-term performance monitoring for some projects, while other may cease reporting verified savings after a shorter measurement period.

The length of any reporting period should be determined with due consideration of the life of the energy efficiency measure(s), the likelihood of degradation of originally achieved savings over time, costs or resources required to perform M&V activities, and the purpose of ongoing savings reporting.

SEAI Specific Guidance:

The reporting period, identified in the M&V Report, should be agreed with the project sponsors. Identify the energy data, independent variables, and static factors to be recorded during the reporting period. These should mirror those identified in the baseline period.

Examples of static factors are multiple and may include:

- Facility size installed equipment and systems.
- Occupancy details of type, occupancy density, equipment loads, and equipment run times.
- Operating conditions (e.g. equipment control sequences and set points, lighting levels, ventilation levels) for each operational mode and season.

Required Outcome:

- Identify the reporting period (start and end dates).
- State the duration of a complete operating cycle and duration of the reporting period (should be the same).
- Identify the energy data, independent variables and static factors (i.e. record changes to static factors) to be recorded during the reporting period.

[7] IPMVP Core Concepts 2022, v1.02, Section 7.2.3

4.7. Unforeseen Changes or Adjustments

IPMVP® Guidance:

"Non-routine adjustments are needed where a change occurs in equipment or operations that effect the energy use within the measurement boundary. Such changes occur to static factors, not to independent variables. These changes may occur during the M&V period and changes may include facility size, equipment efficiency, capacity, operating sequence, or any other element that results in changes in energy use within the measurement boundary.

It is important to have a method of tracking and reporting changes in these static factors. Tracking of conditions may be performed by one or more parties, including the facility owner, the agent creating savings, or a third-party verifier. It should be established in the M&V plan who will track and report each static factor." [8]

SEAI Specific Guidance:

In general savings are to be calculated using the "Avoided Energy Use" method. This method makes completion of the M&V Report less onerous. It calculates the energy consumption for the reporting period had the ECM not taken place. This is achieved by inputting values for the reporting period conditions (variables) into the equation for the baseline period.

"Avoided Energy Use" style of savings:

- are dependent upon the reporting period's operating conditions. Even though savings can be properly adjusted for phenomena such as weather, the level of reported savings depends upon the actual weather.
- cannot be directly compared with savings predicted under baseline conditions.

Equation:

Avoided Energy Use (Savings) = (Adjusted Baseline Period Energy – Reporting Period Energy)

+/- Static Factor adjustments of baseline energy to reporting period conditions

[8] IPMVP Core Concepts 2022, v1.02, Section 12.1

In circumstances where the Avoided Energy Use method is not suitable, the Normalised Savings may be calculated.[9] Normalised savings should generally be normalised to the Baseline Period, rather than a "Typical" year. When this occurs, a conservative approach to the savings calculation will need to be demonstrated.

Required Outcome:

- State the savings calculation method is Avoided Energy Use or Normalised Savings.
- Where Normalised Savings are used, explain why Avoided Energy Use was not suitable. Advise if the Normalised period is the Baseline Period or another specific period.

4.8. Analysis Procedure

IPMVP® Guidance:

"Specify the exact data analysis procedures, algorithms and assumptions to be used in each savings report. For each mathematical model used, report all of its terms and the range of independent variables over which it is valid."[10]

SEAI Specific M&V Guidance

The analysis method and resulting equation of any analysis of baseline energy consumption against the independent variable(s) - such as heating degree days, cooling degree days, bed nights - should be included in this section (with possible references to appendix).

In many cases simply pasting in the results from an excel regression analysis will be sufficient. Where there is only one independent variable, a simple plot with line of best fit, associated R^2 and equation in the format "y = mx + c" is adequate. Where there are a number of independent variables the associated excel regression analysis results table should be provided along with the interpretation of the results.

If there are different meters or different energy types, then each will have its own analysis.

Where account is being taken of interactive effects, a logical explanation of how the savings (or increase in energy use) associated with the interactive effect is calculated (or metered) and any assumptions.

[9] This might arise where there is insufficient detailed energy data available during the baseline year to provide a reasonable regression analysis, but total energy data for the baseline is available.

[10] IPMVP 2022 section 13.1.8.

Required Outcome:

- Specify step by step how avoided energy use will be calculated at the end of the reporting period, taking account of both the independent variables and interactive effects. For example:
    1. The baseline regression equation (algorithm) for gas use will be applied to reporting period heating degree days to calculate adjusted baseline period energy for each week.
    2. The results will be totalled to calculate the kWh for one year.
    3. Actual reporting period utility metered gas use during the reporting period will be totalled for 1 year and the kitchen submeter gas use subtracted from this.
    4. Actual reporting period gas volumes will be converted to kWh using the weighted average kWh conversion factor from the utility bills.
    5. Reporting period gas volume will be subtracted from adjusted baseline gas use.
    6. Due account will be taken of static factor adjustments if required.
- Provide the equations / algorithms.
- Provide a worked example to illustrate the exact data analysis procedures, algorithms, and assumptions to be used in the savings report. Spreadsheet may be identified as an attachment for evaluation purposes, and the spreadsheet values should be pasted into this document (possibly as appendix).

4.9. Meter Specification

IPMVP® Guidance:

"The M&V Report should specify the details for collecting each metering point that will be used as M&V data, and period(s) if metering is not continuous."[11]

SEAI Specific M&V Guidance:

Specify recording intervals where recording is automatic or recording dates and times where recording is manual. Where metering errors occur, this needs to be clearly itemised in the M&V report.

It is important to appropriately select and to manage the installation of energy meters to ensure that the installation quality/method does not compromise device accuracy.

Meters should be selected based on engineering judgement by a competent person. For instance, in the case of electricity, ammeters should only be used where there will be no change in power factor or voltage between the before and after readings. In the case of heat meters, the meter should be sized to the expected normal operating flow range, and not to the size of the pipe; orifice plate meters are particularly inaccurate when used outside their design flow range.

For non-utility meters the M&V Report should specify:

"witnessing protocol, meter commissioning procedure, routine calibration process and method of dealing with lost data" are not required. Calibration certificates are not required.

All meters used should be listed and referenced (see sample meter table below). Note: For engineering calculation derived reports, meter model, location and reference are sufficient.

[11] IPMVP 2022 section 13.1.10.

4.10. Principles of Good M&V

IPMVP® Guidance:

Accurate: "M&V Reports should be as accurate as can be justified based on the project value and goals. M&V costs should normally be "small" relative to the monetary value of the savings being evaluated. M&V expenditures should also be consistent with the financial implications of over or under-reporting of a project's performance. The M&V methodology's accuracy should be accompanied by increased conservativeness with increased use of estimated factors that affect accuracy is a guiding principle of IPMVP."

Complete: "The reporting of energy savings should consider all effects of a project. M&V activities should use measurements to quantify energy use within the measurement boundary, document energy influencing factors, and detail any estimated values. By identifying key areas where judgment is required, IPMVP helps to avoid inconsistencies arising from a lack of consideration of important aspects."

Conservative: "Where judgments are made about uncertain quantities, M&V procedures should be designed to reasonably estimate savings such that they are not over or under-stated. An assessment of a project's impact should be made to assure its energy-saving benefits are reasonable and conservative with due consideration to the level of statistical confidence in the estimation."

Consistent: "The reporting of a project's energy performance should be consistent and comparable across:

- Different types of energy efficiency projects
- Different energy management professionals for any project.
- Different periods of time for the same project.
- Energy efficiency projects and new energy supply projects.

Consistent does not mean identical since it is recognized that any empirically derived report involves assumptions based on sound engineering judgment, which may not be made identically by all reporters."

Relevant: "The determination of savings should be based on current measurements and information pertaining to the facility where the storm occurs. This determination of the savings effort must measure the energy influencing factors and verify performance indicators that are of concern related to the EEM."

Transparent: "All M&V activities should be clearly documented and fully disclosed. Full disclosure should include presentation of all the elements of an M&V Plan and savings reports, and confirmation that the M&V Plan is agreed upon and understood by all stakeholders. Data and information collected, data presentation techniques, algorithms, spreadsheets, software, assumptions used, and analysis should follow industry standard best practices as closely as possible, be well formatted and documented – such that and involved party or independent reviewer can understand how the data and analysis conformed to the M&V Plan and savings reporting procedures. Transparency also means that any possible conflicts of interest are disclosed to all stakeholders in the project."[12]

SEAI Specific M&V Guidance:

All M&V work should follow good practice procedures. M&V practitioners should ensure any, and all information provided is accurate, complete, conservative, consistent, relevant, and transparent, as defined above. These principles should be considered and applied throughout the M&V process. This section should detail how the M&V approach carried out aligns with these principals.

4.10.1. Conservativeness of Approach

All M&V results must be conservative, as defined above. Conservativeness of an M&V process should be assessed with respect to all assumptions made, and the M&V approach take. This section should detail how the M&V approach is conservative.

4.10.2. Need to repeat M&V

The M&V process should be assessed for issues or areas of improvement. Areas where good M&V principles have not been followed should be outlined, and their impact on the M&V process discussed. It is the responsibility of the M&V practitioner to determine the quality of the M&V process, and to determine if adherence of the M&V process to good M&V principles impacted the M&V outcome. If this is the case, the M&V practitioner should detail these impacts and determine whether the M&V process should be repeated.

[12] IPMVP Core Concepts 2022, v1.02, Section 4

4.10.3. Interactive effects of ECMs outside of the project scope

The M&V process should detail any other ECMs relevant to the site(s) in question. Consideration should be given to the interactive effect of previous projects.

Interactive effects which are beyond the M&V measurement boundary should be identified. Any interactive effects within the M&V boundary should be detailed and discussed with respect to their interaction, how they were addressed, and how interactive effects were accounted for during the M&V process.

4.10.4. Sustainability of savings

The process used to determine the sustainability of savings should be detailed. Consideration should be given to any future interaction which may impact the sustainability of the savings achieved.

The risk of savings not being sustained shall be assessed and detailed here, along with detail of how these risks have been mitigated against. If the sustainability of savings is dependent on maintenance or the repetition of actions or processes around a system, a schedule of these should be provided here. This is to ensure the client/site ensure the sustainability of savings until the end of the obligation period.

4.11. M&V Practitioner

The M&V report should be completed by competent individuals who are independent of the qualifying actions carried out. Any qualifications or experience relevant to M&V and the project technology or Industry which was used in the competency rational shall be detailed here.

4.12. Consideration and adherence to relevant SEAI scheme requirements

This section shall detail how the relevant SEAI requirements were considered and how the project addressed these requirements. This should be done for all relevant SEAI supports, including CEG or Pathfinders grant requirements and/or EEOS requirements. Where one of the following sections is not relevant, it may be excluded from the report.

4.12.2. EEOS requirements

Materiality

Outline how the obligated party is material to the energy savings claimed for in the M&V report.

Examples of materiality include but are not limited to the following:

- Financial or technical support for the feasibility study into the project and/or
- Financial or technical support for the capital element of the project in the delivery of the new action

Additionality

Outline how the additionality has been demonstrated[13] by the obligated party for the savings claimed for in the M&V report. Examples of additionality include but are not limited to the following:

- Actions above legal requirements such as building elements above Part L compliance.
- Energy efficiency improvements above ”End of life replacement”.
- Change of technology which would not have occurred without support of a feasibility study as outlined in materiality above.
- Maintenance practice improvements such as steam trap repairs, air leak repairs, and heat exchange surface cleaning, will require the demonstration of additionality through the controls in place to prevent the energy performance deterioration of savings over time. This can be in the form of fault detection diagnostic software to prevent recurrence of maintenance issues or through a maintenance schedule. Any such actions should be detailed here.
- Reduced payback time if a more expensive project with longer return of investment is selected due to obligated party involvement.

Previous Energy Credits Claimed for and accounting for interactive effects.

This section should include all previous projects completed on site for which energy credits have been claimed for and outline which of these projects may impact the eligible energy savings claimed for from this energy efficiency improvement measure(s). Interactive effects need to be accounted for to avoid any duplications and/or overestimating of energy savings.

This information should be supplied by the client organisation/beneficiary who’s receiving the energy efficiency improvement measure(s) as earlier projects might not be visible to the obligated party supporting this action.

[13] SEAI Workshop given in 2021.

4.12.3. Communities' Energy Grant requirements.

The relevant party should provide a breakdown of the expected and achieved energy savings for each site/building under the CEG project. This should be presented in the form of the below table.

Site/Building	Predicted Savings (kWh)	Verified Savings (kWh)	% Difference
Site 1			
Site 2			
Site 3			

The completed table shall be accompanied by an analysis of any differences found between predicted and verified savings, along with an explanation of the cause.

4.12.4. Pathfinders grant requirements.

The relevant party should provide a breakdown of the expected and achieved energy savings for each site/building under the Pathfinders project. This should be presented in the form of the below table.

Site/Building	Predicted Savings (kWh)	Verified Savings (kWh)	% Difference
Site 1			
Site 2			
Site 3			

The completed table shall be accompanied by an analysis of any differences found between predicted and verified savings, along with an explanation of the cause.

4.13. Conclusion

The conclusion should summarise the entire M&V report. An overview of the process should be highlighted, along with an assessment by the practitioner of the suitability of the M&V process with respect to the project undertaken. The results should be clearly presented to conclude the M&V report.

w: www.seai.ie

e: info@seai.ie

t: 01 8082100

SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Rialtas na hÉireann
Government of Ireland