

Better Buildings Partnership

Measurement and Verification Industry Practice and Principles

General

Savings cannot be directly measured...only calculated.

Savings = Baseline Energy Use – Post Retrofit Energy Use

The challenge is to balance M&V costs, savings certainty, and the value of the conservation measure.

Four generic M&V options can be employed:

- A. Engineering calculations (using both stipulated values and measurements)
- B. Metering and monitoring (spot, short term, or continuous measurements)
- C. Utility bill analysis
- D. Computer simulation models

Considerations in selecting the M&V option include:

- Complexity of the measure
- Potential for changes in key factors that affect the baseline and post retrofit conditions
- The measure's savings value
- The measure's cost and program incentive level

Option A and B are applied at the measure or system level.

Option C is applied at the whole building level.

Option D is applied at either the whole building or measure level.

When M&V is applied at the measure the primary considerations are:

- Is the load constant (e.g. lighting fixture) or variable (e.g. VSD applied to a fan).
- Are the operating hours constant (e.g. garage lighting) or variable (e.g. cooling hours)

Spot measurements can suffice for constant loads, whereas short term or continuous measurements may be required for variable load.

Where operating hours are constant, stipulated values can be applied, subject to validation.

Where operating hours are variable, short term or continuous measurement may be required.

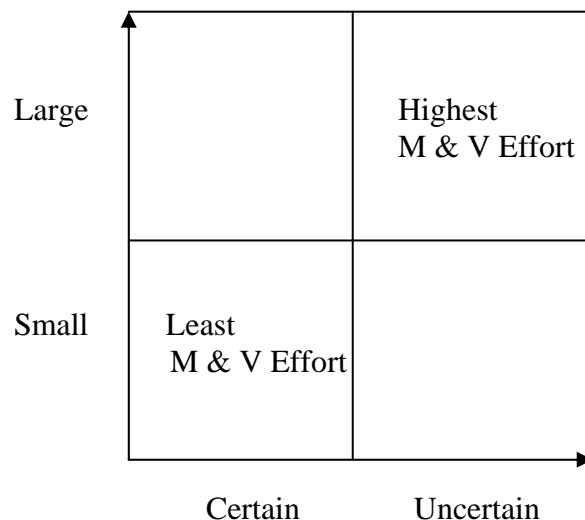
Measurement and Verification (M&V) – General Principles to be Applied under the BBP

The BBP’s Agreement with the Ontario Power Authority stipulates that the criteria used in evaluating projects for energy and demand reductions “shall be consistent with IPMVP Protocols”.

IPMVP Protocols means the International Performance Measurement & Verification Protocol (IPMVP) Volume 1 – Concepts and Options for Determining Energy and Water Savings as in effect from time to time. See www.evo-world.org

As it relates to projects being evaluated under the BBP ECI Program:

- M&V will be applied at the measure level only. No interactive savings effects are considered. This simplifies M&V efforts to a large extent, and limits the options to consider.
- Only Options A and B will normally be employed – i.e. using a combination of stipulated values (referenced to industry standards or agreed site operating conditions), spot and short-term measurements.
- M&V will ensure diligence in establishing the baseline conditions and in defining the requirements for confirmation of post-retrofit savings.
- M&V efforts will vary according to:
 - Savings size (projected savings and potential incentive)
 - Savings uncertainty (doubt about likely result of the measure’s activity)



- Measures that attract the kW Demand Savings incentive will generally have greater M&V rigor applied than measures attracting only the kWh energy savings incentive.
- kW Demand Savings are determined over a one hour period, as occurring during the hours of 7am to 8 pm, Monday to Friday, June through September. For measures that are weather dependent, kW savings shall be considered as occurring at peak design load conditions.
- All measures will be required to report kW demand reduction and kWh savings. However, more attention should be paid for the measurement that determines the incentive amount.
- For ‘small’ and ‘certain’ projects, ‘least M&V effort’ will involve acceptance of stipulated kW or kWh values, subject to reasonableness and validity checks, relative to industry norms.
- For ‘large’ and ‘uncertain’ projects, the ‘highest M&V effort’ will involve more rigorous scrutiny of baseline conditions specific to the facility, involving spot or short term measurements on all, or a representative sample, of loads or operating hours as applicable.
- **All projects, regardless of certainty and size, will have baseline and post-retrofit conditions confirmed through physical audits/inspections.**
- Extended post retrofit monitoring is not generally contemplated. (Extended monitoring may be done for other purposes, but will not be a condition of incentive payment, except if it is a specific condition of the accepted M&V plan for a particular project.)
- Where available, existing data, as obtained through sub-metering, BAS logs, etc., will be utilized to the fullest extent, and will be considered as greatly enhancing the quality of the M&V.
- Enhanced M&V efforts undertaken by the Participant, including the use of existing monitoring data, can be used to support savings claims (subject to acceptability of the data quality).
- Measures with a high degree of savings uncertainty will be conservatively discounted with an option (and onus) for Program Participants to prove greater savings through extended pre and/or post-retrofit monitoring.
- M&V Procedures are subject to continuous improvement, consistent with the principles described here, as program experience and empirical data are gained.