4 Measurement and Verification Using Stipulated Savings Factors

4.1 Overview

Measurement and verification (M&V) using stipulated savings factors involves comparing the efficiency of a new construction project to the efficiency of a project that meets the minimum requirements of the building code and then multiplying the difference by an agreed-upon, or "stipulated" factor, such as operating hours or system load. These stipulated factors represent a project's potential to generate savings based on engineering analysis and simple verification activities.

Stipulated savings factor M&V methods are appropriate only for projects in which the following apply:

- Electrical demand is constant, or varies as a function of operating scenarios—e.g., baseline damper position or installed motor speed; for each scenario, the electrical demand can be determined from spot measurements.
- Operating hours as a function of an operating schedule can be stipulated.

If the equipment involved in a project has a complex load profile and/or a complicated operating schedule, a different M&V method should be used.

Any Project Sponsor considering the use of stipulated savings factors should consult with CenterPoint Energy prior to submitting an M&V plan.

The M&V method described here is based on Option A of the 2001 International Performance Measurement and Verification Protocol (IPMVP).

4.1.1 Data Types

Three types of data sources may be needed to estimate energy savings with an M&V plan using stipulated savings factors:

- Published data, including manufacturer-supplied performance data, operator's logs, results from measures in similar facilities.
- Facility or equipment surveys that identify equipment type, nameplate data, counts, applications, general operating characteristics, and documented schedules from energy management systems.

- Spot/short term metering that indicates power draw for different operating characteristics.

The types of data needed to verify energy savings for a specific project will depend on its complexity and the availability of relevant stipulated data. All stipulated factors must be clearly explained and supported by the Project Sponsor in the M&V plan. There may be sizable differences between published equipment performance information and actual operating data. Where discrepancies exist or are believed to exist, equipment performance parameters should be measured directly.

4.2 Documenting Baseline Characteristics

Establishing the operating characteristics of the baseline equipment involves the following steps:

- The Project Sponsor prepares a pre-construction equipment inventory.
- Either CenterPoint Energy or its contractor performs a pre-construction inspection, if necessary.
- The Project Sponsor develops stipulated savings factors.

4.2.1 Pre-Construction Equipment Inventory

The Project Sponsor is required to conduct an inventory of all specified equipment as part of the Final Application. The purpose of the inventory is to identify all the equipment included in the project, and to characterize the expected operation of the equipment. For each piece of high-efficiency equipment, the survey should list (as applicable) the location, manufacturer, model number, rated capacity, energy use factors (such as voltage, rated amperage, fixture wattage), nominal efficiency, load served, and any other identifiers that affect system energy consumption.

4.2.2 Pre-Construction Inspection

A pre-construction site inspection is generally not required, but in some cases—such as projects involving additions to existing facilities—this inspection may be requested at CenterPoint Energy's discretion.

4.2.3 Development of Stipulated Savings Factors

The Project Sponsor may use a variety of sources in the development of stipulated savings factors, including manufacturer's data, historical values, documented schedules from energy management systems, and results from measures in similar facilities. Stipulated savings factors can be based on data that exist prior to construction. Alternatively, Project Sponsors may specify the post-construction data that will be collected and from which stipulations will be derived. The equipment

inventory is used to confirm that the stipulated factors proposed in the M&V plan are appropriate for the equipment type, application, and general operating characteristics of the project.

CenterPoint Energy must approve all stipulated savings factors, so all data sources, methodologies, and assumptions used in their development by the Project Sponsor must be clearly outlined in the M&V plan.

4.2.4 Compliance with Energy Standards

When using stipulated savings methods, the Project Sponsor should document the applicable minimum state and federal energy standards.

- Baseline equipment should meet *prescriptive* efficiency standard requirements for affected equipment (e.g., ASHRAE Standard 90.1).
- The baseline need not comply with performance compliance methods that require the project site to meet an energy budget.
- Minimum state and federal energy efficiency standards or codes must be incorporated into the baseline.

4.3 Documenting Post-Construction Characteristics

When construction is complete, the following steps are taken:

- The Project Sponsor conducts an equipment inventory.
- Either CenterPoint Energy or its contractor conducts an inspection.
- The Project Sponsor verifies stipulated savings factors using data from the installed system.

4.3.1 Post-Construction Equipment Survey

The Project Sponsor is required to conduct a post-construction equipment survey as part of the Installation Report. The purpose of this equipment survey is to document the equipment that was actually installed as part of a project. For each piece of equipment, the survey should list (as applicable) the location, manufacturer, model number, rated capacity, energy use factors (such as voltage, rated amperage, fixture wattage), nominal efficiency, load served, and any independent variables that affect system energy consumption.

4.3.2 Post-Construction Inspection

Either CenterPoint Energy or its contractor conducts an inspection to verify that the Project Sponsor has properly documented the installed equipment and that the stipulated savings values in the M&V plan are appropriate. After the inspection,

CenterPoint Energy either accepts or rejects the Installation Report and the proposed stipulated savings factors based on the inspection results and project review.

4.3.3 Verification of Stipulated Savings Factors

The post-construction inspection results are used by CenterPoint Energy to verify that the stipulated factors proposed in the M&V plan are still appropriate for the installed equipment and the general operating characteristics. Spot- or short-term monitoring may be required to confirm their applicability to a specific project.

4.4 Calculation of Demand and Energy Savings

Once the equipment installation is verified and the proposed stipulated savings factors have been approved by CenterPoint Energy, the Project Sponsor must calculate the demand and energy savings generated by the project. The best approach for calculating the project's savings depend on the type of project and the data collected, but, in general, actual metered/measured equipment operating data should be used as much as possible.

All equations used in calculating energy savings should be included in the project's M&V plan. For example, Equation 4.1 and Equation 4.2 may be used for a project that decreases equipment electric demand but causes no change in operating hours.

Equation 4.1 Demand Savings

$$\text{Demand Savings [kW]} = kW_{Baseline} - kW_{Post\text{-}installation}$$

Where:

$KW_{Baseline}$ = Baseline equipment demand as predicted during the utility peak, summer coincident load period.

$KW_{Post\text{-}Installation}$ = Installed equipment demand as measured by short-term metering during the utility peak, summer coincident load period.

Equation 4.2 Annual energy savings, stipulated hours

$$\text{Annual Energy Savings [kWh]} = (kW_{Baseline} - kW_{Post\text{-}installation}]) * Hours_{Stipulated}$$

Where:

$KW_{Baseline}$	=	Baseline equipment demand as predicted during the utility peak, summer coincident load period.
$KW_{Post\text{-}Installation}$	=	Installed equipment demand as measured by short-term metering during the utility peak, summer coincident load period.
$Hours_{Stipulated}$	=	Annual operating hours determined using stipulated factor.

4.5 Project-Specific M&V Issues

When stipulated factors are used to calculate energy savings, the Project Sponsor must address the following in the M&V plan:

- How accurately stipulated factors will reflect actual energy savings
- How well the stipulated factors are supported by other data sources, e.g. physical observations, monitoring data
- How appropriate the stipulated factors are to the equipment and operating conditions involved in the project
- How the baseline energy consumption estimates incorporate minimum state and federal energy efficiency standards or codes