16. Measurement Guidelines for Constant Load Motor Measures

16.1 Overview

This chapter presents the simplified M&V approach for projects involving the installation of constant load motors with efficiency ratings higher than those required by the applicable energy efficiency standard. Examples of qualifying equipment include:

- Constant load chilled water, hot water, or condenser water pumps
- Constant speed exhaust, return, and supply fans without dampers or pressure controls
- Single-speed cooling tower fans
- Constant load industrial processes
- Similar capacity, constant speed, energy efficiency motors

Project Sponsors should not use this approach if factors utilized to derive savings vary throughout the year. Examples may include schedule changes and load changes.

If the project does not meet the above requirements, please refer to Chapter 18 for the appropriate M&V approach.

Demand and energy savings for motor installations are based on post-construction peak demand (kW), the motor operating hours, and the difference in efficiency between baseline and higher-efficiency motors.

The peak demand period is defined as weekdays, between the hours of 1 PM and 7 PM, from June 1 through September 30 (excluding holidays). The operating hours are assumed to be the same for both baseline and higher-efficiency motors.

Prescriptive rebates are available for the installation of premium efficiency motors. Savings values can be obtained by completing the Premium Efficiency Motor Form.

Baseline motor efficiencies are listed in the Standard Motor Table in Appendix B of this document, which is based on ASHRAE Standard 90.1m-1995. The Standard Motor Table is categorized by motor size and rotation speed. The baselines for motors whose efficiencies are not listed in the table will be determined on a case-by-case basis by CenterPoint Energy. The project sponsor must provide demonstrable proof that energy efficiency was a key criterion in the motor-selection process in order to qualify for incentives. No incentive payments are made for replacement motors with efficiencies equal to or less than the baseline efficiency. In addition to having a higher efficiency than baseline motors, all new motors should meet minimum equipment standards as defined by state and federal law.

16.2 Pre-Construction Activities

16.2.1 Equipment Survey

Project Sponsors should use the Motor and VSD Inventory form to record the following information for each specified high-efficiency motor:

- Motor name
- Load served

- Motor location
- Operating schedule
- Equipment manufacturer
- Nameplate data including model, horsepower, and speed

16.2.2 Site 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.

16.3 Post-Construction Activities

16.3.1 Equipment Survey

The Project Sponsor provides a post-construction equipment survey, similar to the pre-construction equipment survey, to CenterPoint Energy as part of the Installation Report. The updated Motor and VSD Inventory Form reflects the actual, as-built conditions of the project.

16.3.2 Motor Demand Measurement

The Project Sponsor performs spot measurements of the power draw (one-hour average values) of all the high-efficiency motors installed, and includes these measurements in the Installation Report.

16.3.3 Calculation of Baseline Motor Demand

Equation below is used to determine what the demand would have been had a lower efficiency motor been specified for installation.

$$kW_{baseline} = \frac{\eta_{pre}}{\eta_{baseline}} \times kW_{\ metered}$$

Where:

$\eta_{specified}$=specified motor efficiency

$\eta_{baseline}$ = standard minimum motor efficiency

$kW_{metered}$= spot measured existing motor femand, kW

16.3.4 Site Inspection

After CenterPoint Energy receives an Installation Report, either CenterPoint Energy or its contractor conducts a post-construction site inspection to verify that the equipment specifications have been correctly reported by the Project Sponsor in the Installation Report. CenterPoint Energy will require the Project Sponsor to make any necessary corrections to the Installation Report based on the results of the inspection.

16.4 Calculation of Motor Operating Hours

After CenterPoint Energy approves the Installation Report, the Project Sponsor begins short-term metering of motor operating hours. The metering must be conducted for a minimum period of one week,

or an amount of time sufficient to capture the full range of operation. Equation below is used to calculate the annual operating hours using the metered data.

$$Hours_{annual} = \frac{Hours_{on}}{Hours_{metered}} \times 8760$$

Where:

$Hours_{annual}$ = average annual operating hours

$Hours_{on}$ = operating hours observed during the metering period

$Hours_{metered}$ = total number of hours in the metering period

16.5 Calculation of Peak Demand and Energy Savings

Project Sponsors can claim demand savings only for equipment that operates on weekdays between the hours of 1 PM and 7 PM, Monday through Friday, from June 1 through September 30 (excluding holidays).

Peak demand and energy savings are calculated according to Equations below.

$$kW_{saved} = kW_{pre} - kW_{post,metered}$$

$$kWh_{saved} = kW_{saved} \times Hours_{annual}$$

Where:

kW_{saved} = The kilowatt savings realized during the year

$kW_{post,metered}$= Spot Measured New Motor Demand, kW

kWh_{saved} = The kilowatt-hour savings realized during the year

The Sponsor reports the peak demand and energy savings to CenterPoint Energy in the project Savings Report.

17. Prescriptive Program: Premium Efficiency Motors

17.1 Qualifying Equipment

The installed premium efficiency motor must meet the NEMA efficiency standards listed in the table below.

NEMA Full Load Efficiencies (%)						
HP	1,200 RPM		1,800 RPM		3,600 RPM	
	ODP	TEFC	ODP	TEFC	ODP	TEFC
1	82.50%	82.50%	85.50%	85.50%	77.00%	77.00%
1.5	86.50%	87.50%	86.50%	86.50%	84.00%	84.00%
2	87.50%	88.50%	86.50%	86.50%	85.50%	85.50%
3	88.50%	89.50%	89.50%	89.50%	85.50%	86.50%
5	89.50%	89.50%	89.50%	89.50%	86.50%	88.50%
7.5	90.20%	91.00%	91.00%	91.70%	88.50%	89.50%
10	91.70%	91.00%	91.70%	91.70%	89.50%	90.20%
15	91.70%	91.70%	93.00%	92.40%	90.20%	91.00%
20	92.40%	91.70%	93.00%	93.00%	91.00%	91.00%
25	93.00%	93.00%	93.60%	93.60%	91.70%	91.70%
30	93.60%	93.00%	94.10%	93.60%	91.70%	91.70%
40	94.10%	94.10%	94.10%	94.10%	92.40%	92.40%
50	94.10%	94.10%	94.50%	94.50%	93.00%	93.00%
60	94.50%	94.50%	95.00%	95.00%	93.60%	93.60%
75	94.50%	94.50%	95.00%	95.40%	93.60%	93.60%
100	95.00%	95.00%	95.40%	95.40%	93.60%	94.10%
125	95.00%	95.00%	95.40%	95.40%	94.10%	95.00%
150	95.40%	95.80%	95.80%	95.80%	94.10%	95.00%
200	95.40%	95.80%	95.80%	96.20%	95.00%	95.40%

17.2 Savings Calculations

The savings are calculated based on Equations below. The motor incentive form applies these equations automatically to calculate savings for installation of premium efficiency motors.

$$kW_{saved} = 0.746 \times hp \times \%Load \times CF \times \left(\frac{1}{\eta_{EPACT}} - \frac{1}{\eta_{NEMA}}\right)$$

$$kWh_{saved} = kW_{saved} \times Hours_{annual}$$

kW_{saved} = The kilowatt savings realized during the year

kWh_{saved} = The kilowatt-hour savings realized during the year

hp =The horsepower of the motor

$\%Load$ =Stipulated %load of the motor

CF =Stipulated coincident factor

η_{EPACT}=Baseline efficiency standard. Based on 1992 EPACT standards

η_{NEMA}=New motor efficiency standard. Based on NEMA premium efficiency standards

$Hours_{annual}$= Stipulated Operating hours. Different values for C&I applications