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Baseline Methodology Guidelines

ONTARIO POWER AUTHORITY℠

Baseline Methodology Guidelines

Purpose

This document is intended to provide **PROCESS & SYSTEMS** Program Participants and engineering consultants with guidelines around acceptable methodologies to determine the Base Case Baseline .

The participant must establish a Base Case Baseline for their project as part of a Detailed Engineering Study. The Technical Reviewer is available to consult with the Participant and their consultant around the development of the Baseline prior to submission of the Draft Report.

The participant/consultant must document and obtain approval for the Base Case Baseline methodology for Detailed Engineering Studies (DES) in the study report.

However, please note that the Ontario Power Authority (OPA) will assess each project and the proposed methodology on a case-by-case basis, and may consider factors other than those addressed here, or may not consider factors set out in these guidelines. Following these guidelines does not guarantee that the OPA will approve your proposed methodology.

The intent is that the Base Case Baseline established within the DES will be used when the results of the study progress to a Project Incentive Application, without further need for pre-metering of the target system. The Base Case Baseline is used to verify and measure the electricity savings at the Measurement and Verification phase.

Capitalized terms below are defined in the Detailed Study Participant Agreement or the International Performance Measurement and Verification Protocol (IPMVP) Volume 1, 2010 (EVO 10000 – 1:2010). The IPMVP Volume 1 can be obtained from the Efficiency Valuation Organization website (www.evo-world.org).

Background

It is recommended that personnel involved in the Base Case Baseline methodology development and implementation have a working knowledge of IPMVP Volume 1. Section 4.5 specifically discusses the selection of the Measurement Period and sections 4.7 - 4.11 provide an overview and selection guide for the four IPMVP Options. Information on certification as a Certified Measurement and Verification Professional (CMVP) is available on the Canadian Institute for Energy Training (CIET) website (www.cietcanada.com).

Baseline Development **PROCESS**

STEP	
Step 1	Identify the IPMVP Option for the Base Case Baseline methodology
Step 2	Define the Measurement Boundary
Step 3	Identify the factors affecting energy consumption of the system
Step 4	Define the Base Case Baseline Measurement Period and Uncertainty
Step 5	Define the measurement points
Step 6	Submit the Base Case Baseline methodology to the OPA

Step 1 Identify the IPMVP Option for the Base Case Baseline methodology

The Base Case Baseline methodology starts by choosing an appropriate IPMVP Option for the Industrial System and proposed Energy Conservation Measure to be investigated. The methodology should address the selection and measurement of variables necessary to implement the selected IPMVP Option (based on typical scale/size and complexity).

Most **PROCESS & SYSTEMS** projects require IPMVP Option B, and to a lesser extent, Option A (IPMVP Volume 1, 2010, Section 4.7).

Option B refers to measuring all parameters of the energy conservation measure, where savings are determined by field measurement of the energy use of the Energy Conversation Measure (ECM) effected System. Measurement frequency ranges from short-term to continuous, depending on the expected variations in the savings and the length of the reporting period.

Example: Consider the application of a variable-speed drive and controls to a motor to adjust pump flow, measure the electric power with a kW meter installed on the electrical supply to the motor, which read the power every minute. In the baseline period this meter is in place for a week to verify constant loading. The meter is in place throughout the reporting period to track variations in use.

Option A refers to measuring the most important key performance parameters and estimating other minor parameters from which their effects will not significantly affect the overall electricity savings. Parameters not selected for field measurement are estimated. Estimates can be based on historical data, manufacturers specifications, or engineering judgement. Documentation of the source or justification of the estimated parameter will be required. The plausible savings error arising from estimation is evaluated.

Step 2 Define the Measurement Boundary

Clearly identify the equipment involved in the electricity savings. The Measurement Boundary is drawn around that equipment, and defines the scope of the project. Then identify the variables that need to be measured or collected and the metering points within the Measurement Boundary. The Energy Conservation Measure may alter energy flows located outside the Measurement Boundary. These are known as Interactive Effects. If applicable, the Interactive Effects on other systems or equipment should be estimated using acceptable engineering methods.

Example: Consider a pump servicing the main header of a water distribution system. The pump is replaced with an energy efficient pump with a lower head pressure. The Measurement Boundary should only contain the new pump, and not the entire water distribution system. Interactive Effects may include an increase in electrical energy for a booster pump further downstream to the new pump, because the booster pump may have to work harder to maintain the original pressure.

Step 3 Identify the factors affecting energy consumption of the system

Analyze whether Independent Variables and/or key performance indicators show a relationship with the energy consumption of equipment.

For example, an increase in production would normally increase the utilization of equipment thus increasing their energy usage. Look for variables or parameters that are expected to influence the equipment utilization or energy usage and make provision to collect them. Identify the type of energy usage for all equipment (constant or variable load) and plan for the development of load profiles and load duration curves.

Step 4 Define the Base Case Baseline Measurement Period and Uncertainty

The selected Measurement Period and data logging interval should be robust enough to be statistically valid for building an annual Base Case Baseline and to provide acceptable measurement precision to calculate the savings. A Base Case Baseline Measurement Period of one year is considered best practice. However when historical data logs of the required variables are not available, estimates based on smaller interval data can be used to make projections. In these cases, a combination of different seasonal and operational profiles may need to be employed to account for existing data gaps.

Where the duration of the metering is less than a full-year, the Base Case Baseline measurement period must include the following operating cycles:

a. Modes and batches – Identify if the system operating mode varies according to programmed or regular occurring events and if the system is a batch or continuous operation. The Measurement Period must capture a sufficient number of modes or batches to facilitate a statistically valid extrapolation to an annual Base Case Baseline. Modes and batches need to be understood prior to preparation of the Base Case Baseline methodology. For example, a fan may be running in idle mode when the process is being re-charged and in production mode when supplying full air requirements to the process.

b. Production variations – If the system, or the process that it is a part of, produces different products or uses different input materials or varies by season and has an impact on energy consumption, then measurement of each production variation is required. If it is impractical to measure all the variations, the Base Case Baseline methodology should present an acceptable engineering method for estimating energy changes and projecting a production mix in terms of hours per year for each.

c. Short-term variations – The data logging interval must provide sufficient resolution to understand short-term variations that play a role in the statistical uncertainty calculation. Usually a logging interval between one minute and 15 minutes is chosen.

Statistically, the Base Case Baseline Measurement Period increases with increasing variability of the variable being measured and with decreasing electricity savings. As a general rule, if the estimated electricity savings are 5% or less of the system's electricity consumption, the Base Case Baseline Measurement Period is expected to last at least one month to guarantee savings within a 10% precision with a confidence level of 90%. Refer to Appendix B of the IPMVP for details.

Step 5 Define the measurement points

All measurements should be collected simultaneously and synchronized. Include, as good practice, a process and instrumentation diagram (P&ID) and an electrical single line diagram showing the location of the measuring devices or measurement points. List the meters or instrumentation to be used (make, model, accuracy, range, and calibration history). Identify if an existing data historian or SCADA system will be used or if temporary instrumentation will need to be installed.

It is highly recommended that true RMS power meters be used for electrical energy recording. It is not acceptable to measure current (A) as a substitute for power (kW). All power, process meters and transducers must be calibrated periodically using the manufacturer recommended procedures, and be traceable to a standard reference unit calibrated by a certified test and measurement lab.

Additional considerations (state reasoning if not applicable)

- Annual hours of operation (accounting for maintenance, outages and routine shutdowns);
- Variables or parameters that cannot be measured (unavailability, inaccessibility, safety, etc.) with rationale and valid assumptions.

Step 6 Submit the Base Case Baseline methodology to the OPA

The Participant or the consultant submits the Base Case Baseline methodology to the OPA. The methodology is reviewed and if clarification or explanation is required, a request for information is sent to the Participant. Upon satisfactory response from the consultant and/or Participant, the OPA approves the methodology. The Participant can then proceed with the study. Base Case Baseline energy and production data will be collected according to the approved methodology.

The Base Case Baseline data is compiled and analyzed by the Participant and/or the consultant. The results of the analysis form the estimated Base Case Baseline (including all relevant procedures and calculations) that is presented in the DES report (in annual MWh).

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