EXISTING BUILDING COMMISSIONING PROGRAM
MEASUREMENT & VERIFICATION GUIDE

INTRODUCTION

This guideline is meant to help Commissioning Providers (CP) and Participants understand the Measurement & Verification (M&V) requirements of the Save on Energy Existing Building Commissioning Program (EBCx). This program has different requirements for M&V depending on the estimated savings of a proposed Energy Conservation Measure (ECM) or per Facility. In this program, the CP must ensure the M&V is conducted per the standards below, and the Participant is responsible to ensure the CP has access to the information required to complete an M&V Plan and Participant Reports. The IESO will rely on the findings in the Participant Reports and associated documentation to pay incentives to the Participant.

M&V PROCESS

GUIDING PRINCIPLES

- M&V is a valuable tool to help energy savings persist over time, and it can identify when corrective action may need to be taken on ECMs that may not be performing as expected. This provides value to the Participant, the IESO and Ontario ratepayers. An objective of this Program is to assist Participants to integrate M&V into their building management practices, so they may continue to save energy after completing this Program.
- Savings confirmed in submitted Participant Reports and associated documentation will be relied upon for the payment of incentives in this program, so it is critical that they are accurate. Savings should be calculated and confirmed in accordance with IPMVP protocols and the submitted M&V plan. The IESO may undertake detailed review and audit of submitted reports to ensure accurate reporting and incentive payments.
- The CP must be familiar with IPMVP protocols, and is responsible to ensure the correct level of M&V is completed at a Facility or for an ECM. The IESO will review and approve M&V Plans (or request changes to the plan for approval).
- Participants must ensure that they maintain the ECM during the Persistence Phase and collect the data required as per the M&V Plan.

M&V REQUIREMENTS OVERVIEW

As part of the application process, 12 months of historical facility energy data must be prepared and submitted. The CP or Participant will also provide an estimate about the potential energy savings which may be achieved. The annual estimated savings will determine what level of M&V would be required for the Program. The IESO will assess the application and inform the Participant what level of M&V would be required per application.

Table 1 below shows, at a glance, the savings thresholds and minimum M&V requirements for EBCx projects. Further detail and definitions follow the table.

M&V LEVEL	ESTIMATED FACILITY SAVINGS PER YEAR	MINIMUM M&V REQUIREMENTS
No M&V	<50 MWh	Facility Benchmark No formal M&V Plan required Engineering calculations required for measures claiming savings CP may be required to verify ECMs are still in service at the end of the Persistence Phase (only a sample of sites will be selected)
Basic M&V	≥50 & <500 MWh	Facility Benchmark BASIC M&V Plan to be completed by Commissioning Agent, adhering to IPMVP Option A or B (refer to BASIC M&V Plan template in Appendix A) Engineered Calculation may be required with some M&V Participant Report with Confirmed Savings calculations in accordance with IPMVP and submitted M&V Plan completed CP may be required to verify equipment operations at the end of the Persistence Phase (only a sample of sites will be selected)

Enhanced M&V	≥500 MWh	Facility Benchmark ENHANCED M&V Plan to be completed by Commissioning Agent adhering to Option A, B or C (refer to ENHANCED M&V Plan template in Appendix B) Participant Report with Confirmed Savings calculations in accordance with IPMVP and submitted M&V Plan completed CP may be required to verify equipment operations at the end of the Persistence Phase

Table 1: Savings Thresholds & Minimum M&V Requirements

M&V REQUIREMENTS BY PROGRAM PHASE

INVESTIGATION PHASE

FACILITY BENCHMARK

All Facilities are required to input monthly utility data (from the beginning of the Baseline Period until the end of the Persistence Phase) into Energy Star Portfolio Manager (ESPM) and share this data with IESO (see Saveonenergy.ca/EBCx for instructions on how to share your benchmark).

If a participating organization owns or manages multiple facilities and is already benchmarking energy use of multiple facilities which are similar to the Participating Facility, the custom benchmark may be submitted instead of the ESPM benchmark.

The intention of this practice is to assist the Participants in understanding their performance relative to their peer group, and track energy use over time.

M&V PLAN

For facilities anticipating more than 50 MWh of savings, M&V Plans shall be developed by the end of the Investigation Phase. As needed these Plans would be updated at the Implementation Phase and would be used to develop the Participant Savings Reports, to be submitted at the end of the Implementation and Persistence Phases.

The M&V Plan templates can be found in Appendix A & B which are provided for guidance.

PROGRAM WORKBOOK

The CP and Participant will report the investigation in the Program Workbook findings log (found in the Program Reporting Templates). This log will be used to identify potential ECMs to implement, and track them over time.

IMPLEMENTATION PHASE

In this phase, as needed the Participant and CP will:

- update the Benchmark and Baseline Model if there are any adjustments required
- update the M&V Plan if any ECMs are added or removed from the original plan
- update the Program Workbook claimed savings as ECMs are implemented
- Prepare and submit the implementation phase savings report

A Baseline Model as defined by the IPMVP is a mathematical model that correlates independent variables to dependent variables with a set of acceptable statistical metrics.

Benchmarking here is defined as a comparison of similar facilities on the basis of energy density metrics such as ekWh/ft2.

The Baseline Model and M&V Plan should be updated as necessary. The IESO will request this information to justify paying incentives at this Phase. These updated files must be kept on record by the CP and Participant until they receive final incentive payment after completion of the Persistence Phase.

A Savings Report is to be created by the CP following project implementation, and submitted to the IESO. The Report should contain the following:

- Description of baseline conditions and final conditions following implementation;
- Collected data, and the method of data collection that was used;
- Data collection time periods for baseline measurement and verification of energy savings;
- Clear description of how energy savings are verified;
- Measurement and calculation methods and details;
- All assumptions and sources of data.

PERSISTENCE PHASE

When an ECM is implemented, the Program Workbook should be updated and M&V for that ECM should begin, per the M&V Plan (as applicable).

The CP will be required to verify that the ECMs were maintained and operating until the end of the Persistence Phase, which is 12 months since ECM implementation. At a minimum this verification will include photographs and attestations from the Participant and CP.

For projects with 500 MWh or less savings, an on site verification will occur on a sample of projects, and the CP will be required to demonstrate measure persistence to the IESO on site.

PERSISTENCE REPORT

A Savings Report is to be created by the CP following project implementation, and submitted to the IESO. The Report should contain the following:

- Description of baseline conditions and final conditions following implementation;
- Collected data, and the method of data collection that was used;
- Data collection time periods for baseline measurement and verification of energy savings;
- Clear description of how energy savings are verified;
- Measurement and calculation methods and details;
- All assumptions and sources of data.

M&V PROTOCOLS

Project Measurement and Verification (M&V) Procedures shall be consistent with IPMVP Protocols. IPMVP Protocols means the International Performance Measurement & Verification Protocol (IPMVP) – Core Concepts March 2022 EVO 10000 – 1:2022 or later as in effect from time to time.

BASELINE ADJUSTMENTS

Any Non-Routine Events (NREs) & Non-Routine Adjustments (NRAs) should be performed in accordance to the IPMVP Application Guide on Non-Routine Events & Adjustments October 2020 EVO 10400 – 1:2020

ENERGY & PEAK DEMAND SAVINGS

Energy Savings (kWh) are those electricity savings achieved over the course of the first year after the completion of a Project.

Demand Savings (kW) are the average load reduction between the Base Case and the Energy Efficient Case, over the block of hours during which the overall demand on the province's electricity grid tends to be higher. This occurs between 1 pm to 7 pm on business days June 1 through August 31 for summer, and between 4 pm to 9pm on business days November 1 through February 28 for winter. Refer to Evaluation, Measurement & Verification Protocols Version 4.0 February 2021, for more details on Standard Definition of peak for calculating demand Savings at EM&V Protocols.

COMMISSIONING MEASURES

MEASURES REQUIRING A BASELINE ADJUSTMENT

Certain ECMs are not be eligible for incentive funding. These measures require a baseline adjustment to ensure the savings are not counted towards the incentive payments. If the following ECMs are intended to be implemented, or if they are implemented in the Baseline Period, or during the time in which the Facility is participating in the Program, the CP and or Participant will inform the IESO and obtain guidance on how to address this in the M&V Plan and/or Participant Savings Reports.

- Lighting Projects including new fixtures, re-lamping or replacing ballasts
    - Repairing or rescheduling lighting controls does not require baseline adjustment
- Equipment replacement;
    - These measures may be eligible for incentive through IESO's Save on Energy Retrofit Program
- Process Load ECM;
- Behind the Meter Generation Projects;
- Fuel Switching; and
- Measures Funded Under Other Incentive Programs

BEHAVIORAL MEASURES M&V

This section provides guidance on what supporting documentation to submit when claiming behavioral measure savings.

Examples of occupancy behavior and education measures can be found on the Energy Star website.

Behavioral ECMs are encouraged through improved training and awareness, and may be reinforced through the introduction of standard operating procedures; however, unless there is an ongoing process to maintain the awareness and verify the use of the operating procedures, the effective useful life of these measure may be limited.

The following are suggested supporting documentation that can be submitted to report behavioral measure savings:

- Maintenance plan that includes a process to ensure sustainability of the measure.

Supporting documentation should describe the plan and periodic action taken for the specific measure
- Supportive evidence to verify the savings are unlikely to change
- Training schedule and documents for equipment operators including supportive details
- Supporting documentation for long-term equipment status control operations
- Corporate sustainability plan that explains the actions taken to ensure sustainability of non-equipment-related behavioral measures such as administrative activities, budget review, work control system, personnel planning, etc.
- Periodic re-commissioning studies and appropriate funds allocated to such studies
- Periodic energy audits or other studies planned by the facility
- Operations and maintenance service contracts

One or more of the above suggested documentation may be required to substantiate savings and its persistence depending on the nature of the behavior measures. It is recommended for Program Participants to specify the agreed upon documentation with the IESO prior to the implementation phase.

If behavioral measures are going to be implemented while the Facility is participating in the Program, the CP and/or the Participant will inform the IESO and obtain guidance on how to address this in the M&V Plan and/or Savings Report.

DEFINITIONS

Application means a complete application (including all supporting documentation) for funding under the EBCx Program, which is in the form specified by the IESO on the Save on Energy website and executed by the Participant.

Baseline Adjustment means a change to the Baseline Model necessitated by an adjustment made pursuant to Section 3.3 of the program requirements document, or per the M&V Guide.

Baseline Model means the Facility-specific model with inputs of at least 12 months of energy use and weather data. It is used to predict the electricity consumption and peak demand of a Facility over a set period of time in the absence of the implementation of ECMs.

Baseline Period means a minimum consecutive period of at least 12 months that is used to establish a Baseline Model that is representative of the Facility's energy use prior to implementation of any ECMs.

Behind the Meter Generation Projects means any electricity generating equipment installed or operating at the Facility following the commencement of the Baseline Period, in which case a Baseline Adjustment is required.

Claimed Energy Savings means the Energy Savings reported by the Commissioning Provider in the Implementation Report, in accordance with the M&V Guide.

Claimed Peak Demand Savings means the Peak Demand Savings reported by the Commissioning Provider in the Implementation Report, in accordance with the M&V Guide.
Claimed Persisting Energy Savings means the Energy Savings reported by the Commissioning Provider in the Persistence Report, in accordance with the M&V Guide.

Claimed Persisting Peak Demand Savings means the Peak Demand Savings reported by the Commissioning Provider in the Persistence Report, in accordance with the M&V Guide.

Commissioning Provider means the third party corporation, partnership or sole proprietorship that is listed on the Qualified Commissioning Providers List to deliver services in the EBCx Program. The IESO verifies the Commissioning Provider meets minimal technical competencies, and ensures they are trained on the operation of the EBCx Program, but the IESO does not specifically endorse or recommend any Commissioning Provider. The Participant must enter into a contract with the Commissioning Provider and IESO is not party to that contract or liable for any non performance or damages which may occur.

Commissioning Provider Participation Agreement is an agreement between the IESO and each Commissioning Provider outlining roles and responsibilities in connection with the delivery of the commissioning services under this Program. The current version of this agreement may be found at saveONenergy.ca/ebcx.

Confirmed Energy Savings means the Energy Savings reported by the Commissioning Provider and confirmed by the IESO at the end of the Implementation Phase, in accordance with the M&V Guide.

Confirmed Persisting Energy Savings means the Energy Savings reported by the Commissioning Provider and confirmed by the IESO at the end of the Persistence Phase, in accordance with the M&V Guide.

Energy Conservation Measure or ECM means an action taken which is intended to reduce electricity consumption at a Facility.

Energy Savings means the reduction in modeled annualized electrical energy consumption (in kWh) resulting from the implementation of ECMs at a Facility, calculated in accordance with the M&V Guide.

EBCx Minimum Phase Report Requirements means the set of minimum requirements to be met in the preparation and content of the Investigation Report, the Implementation Report, and the Persistence Report, in the form made available by the IESO, as updated from time to time.

Facility or Facilities means the buildings, premises or lands, or part thereof, owned or occupied by a Participant and in respect of which such Participant is participating in the Program.

Fuel Switching means any electricity load or end use which is converted to use some other fuel or source following the commencement of the Baseline Period, in which case a Baseline Adjustment is required.

Implementation Phase means the second phase of the Program, during which ECMs are implemented at the Facility.

Implementation Report means the report prepared by the Commissioning Provider, in accordance with the EBCx Minimum Phase Report Requirements, and submitted by the Participant to the IESO for Technical Review and approval, which: (a) describes the ECMs that have been implemented at the Facility; (b) includes an updated version of the M&V Plan included with the Investigation Report, if any; (c) sets out the Claimed Energy Savings and Claimed Peak Demand Savings; and (d) includes confirmation from the Commissioning Provider that the Participant has been trained on the proper use of the implemented ECMs and provided a copy of the Implementation Report and any other documentation necessary to maintain the ECMs during the Persistence Phase. Following approval of this report, IESO will pay the eligible Implementation Incentive in accordance with Section 2 of the Program Requirements document.

IESO means the Independent Electricity System Operator in the province of Ontario, or its authorized agent. For clarity, the Commissioning Provider is not the IESO's authorized agent.

Investigation Phase means the first phase of the Program, during which the Commissioning Provider and Participant conduct energy baseline exercises, inspect the Facility, identify potential ECMs, and plan for the Implementation Phase.

Investigation Report means the report prepared by the Commissioning Provider, in accordance with the EBCx Minimum Phase Report Requirements, and submitted by the Participant, to the IESO for Technical Review and approval, which: (a) documents the existing conditions of the Facility; and (b) includes a list of ECM opportunities and energy savings estimates for each such opportunity, an implementation plan and the initial M&V Plan, if required by the M&V Guide. Following approval of this report, IESO will pay the eligible Investigation Incentive in accordance with Section 2 of the Program Requirements document.

Lighting Projects means the addition or replacement of any lamps or lighting fixtures, which measures are not eligible for incentives under this Program. For certainty, measures that consist of adding, modifying or replacing any lighting controls devices are not considered to be Lighting Projects for the purposes of this Program and are eligible ECMs under this Program.

Measurement & Verification or M&V means the process of planning, measuring, collecting and analyzing data for the purpose of verifying and reporting Energy Savings within a Facility resulting from the implementation of ECMs.

Measures Funded Under Other Incentive Programs means any activities or measures funded through a different program or initiative designed to incentivize electricity savings and/or Peak Demand Savings undertaken by the Government of Ontario or the IESO.

M&V Plan means the document prepared by the Commissioning Provider and agreed to by the Participant that specifies the approach to Measurement & Verification. For this Program, M&V Plan requirements are contained in the M&V Guide.

M&V Guide means the document containing the procedures for Measurement & Verification applicable to this Program and made available at SaveOnEnergy.ca/EBCx.

Participant means, in respect of the Program, a person who meets the eligibility requirements in Section 3.1 of the Program Requirements document, whose Application has been accepted by the IESO, and who has entered into a Participant Agreement to be eligible to receive a Participant Incentive.

Participant Agreement means, in respect of the Program, any one or more agreements or terms and conditions that an eligible person entitled to receive a Participant Incentive must enter into or agree to be bound by in order to participate in the Program or to receive such Participant Incentive.

Participant Incentive means, in respect of the Program, the financial incentives paid or payable to the Participant pursuant to these Program Requirements and includes the Investigation Incentive, the Implementation Incentive and the Persistence Incentive as defined in Section 2 of the Program Requirements document.

Peak Demand Savings means the average load reduction in electricity demand between the business case and the energy efficient case occurring between 1 p.m. to 7 p.m. on Business Days, June 1 through August 31 at the Participant's Facility.

Persistence Phase means the third and final phase of the Program, comprising of the 12-month period following the Implementation Phase, during which the Participant will maintain the ECMs, and apply the training and instructions provided by the Commissioning Provider.

Persistence Report means the report prepared by the Commissioning Provider, in accordance with the EBCx Minimum Phase Report Requirements, and submitted by the Participant, to the IESO for Technical Review and approval, which: (a) documents the results of the Program activities of the Participant and the Commissioning Provider during the Persistence Phase (including maintenance of the ECMs); and (b) sets out the Claimed Persisting Energy Savings and Claimed Persisting Peak Demand Savings.

Process Loads means any systems, equipment and components used in the manufacturing of goods, conveyance or transportation.

Program Requirements means the terms and conditions contained herein governing the Program.

Qualified Commissioning Providers List means the list maintained by the IESO of the names of Commissioning Providers that are qualified to deliver the commissioning services under this Program. Organizations seeking to be on this list must apply to the IESO and enter into and comply with the terms in the Commissioning Provider Participation Agreement. Participants must work with an organization on this list to qualify for Participant Incentives.

Technical Review means the process undertaken by the IESO to review and confirm the reports submitted to the Program. Through this process, the IESO may request further information to confirm eligibility and technical accuracy, and/or to verify the reporting of Energy Savings and Peak Demand Savings, and the accuracy of incentive calculations.

APPENDIX A – BASIC M&V PLAN TEMPLATE

This Appendix is to illustrate the IESO intent on level of detail required in the Program.

1.0 PROJECT GENERAL INFORMATION
Application Identifier
Building Name: Building Address: Building Type: Application #:
Facility Overview
Provide a brief description of the facility where the retrofit project will take place including approximately square footage, number of floors, type of facility (e.g. office, warehouse, etc.) and occupancy schedule. *Note: This will help the reviewer to evaluate the appropriateness of the M&V plan, given the size and complexity of the facility.*
Timelines and Dates
Details of project time lines and milestones and document dates such as: Estimated Start Date: Estimated Completion Date: Actual Start Date: Actual Completion Date: In Service Date:
2.0 ENERGY CONSERVATION MEASURES (ECM) INTENT
Describe the ECM, its intended result, and the operational verification procedures that will be used to verify the successful implementation of each ECM. Identify any planned changes to conditions of the baseline, such as unoccupied building temperature settings.
3.0 BASELINE: PERIOD, ENERGY AND CONDITIONS
Document the facility's baseline conditions and energy data, within the boundary. This baseline documentation should include: a. baseline energy consumption and demand data; b. independent variable data coinciding with the energy data (e.g., production data, ambient temperature); c. static factors coinciding with the energy data;

1. occupancy type, density and periods;
2. operating conditions for each baseline operating period and season, other than the independent variables;
3. description of any baseline conditions that fall short of required conditions;

d. details of adjustments that are necessary to the baseline energy data to reflect the energy management program's expected improvement from baseline conditions;

4.0 REPORTING PERIOD

Identify the reporting period, which may be as short as an instantaneous measurement during commission of an ECM, or as long as the time required to recover the investment cost of the ECM.

5.0 BASIS FOR ADJUSTMENT

Declare the set of conditions to which energy measurements will be adjusted. The conditions may be those of the reporting period or some other set of fixed conditions. The conditions for the basis for adjustment determine whether savings are reported as avoided energy or as normalized savings.

6.0 ANALYSIS PROCEDURE

Specify the exact data analysis procedures, algorithms and assumptions to be used in each savings report. For each mathematical model used, report the terms, and range of independent variables over which it is valid. The energy and demand savings estimates are used to determine the pre-approved incentive amount. For Basic M&V, these estimates are reviewed by a project evaluator and, barring any revisions, used to determine the actual incentive amount.

7.0 REPORT FORMAT

Specify how demand and energy savings will be reported and documented.

APPENDIX B – ENHANCED M&V PLAN TEMPLATE

This Appendix is to illustrate the IESO intent on level of detail required in the Program.

1.0 GENERAL
Application Identifier
Building Name: Building Address: Building Type: Application #:
Facility Overview
Provide a brief description of the facility where the retrofit project will take place including approximately square footage, number of floors, type of facility (e.g. office, warehouse, etc.) and occupancy schedule. *Note: This will help the reviewer to evaluate the appropriateness of the M&V plan, given the size and complexity of the facility.*
Timelines and Dates
Details of project time lines and milestones and document dates such as: Estimated Start Date: Estimated Completion Date: Actual Start Date: Actual Completion Date: In Service Date:
2.0 ENERGY CONSERVATION MEASURES (ECM) INTENT
Describe the ECM, its intended result, and the operational verification procedures that will be used to verify the successful implementation of each ECM. Identify any planned changes to conditions of the baseline, such as unoccupied building temperature settings.

3.0 SELECTED IPMVP OPTION AND MEASUREMENT BOUNDARY

Specify which IPMVP option will be used to determine savings. Identify the measurement boundary of the savings determination. The boundary may be as narrow as the flow of energy through a pipe or wire, or as broad as the total energy use of one or many facilities. Describe the nature of any interactive effects beyond the measurement boundary together with their possible effects.

Identify IPMVP Core Concepts October 2016 EVO 10000 – 1:2016 M&V Option that will be used for determining the energy and demand savings including brief justification* for the selection of this M&V Option. (Check one box only)

- o Option A Retrofit Isolation: Key Parameter Measurement
- o Option B Retrofit Isolation: All Parameter Measurement
- o Option C Whole Facility: Utility Bill Analysis
- o Option D Calibrated Simulation (not applicable to ReCx Program)

**For example, M&V Option A is chosen for this lighting retrofit project because it involves only one energy conservation measures – Lighting Retrofit, which retrofit isolation allows the narrowing of the measurement boundary in order to reduce the effort required to monitor independent variables and static factors, when retrofits affect only a portion of the facility.*

4.0 BASELINE: PERIOD, ENERGY AND CONDITIONS

Document the facility's baseline conditions and energy data, within the measurement boundary. This baseline documentation should include:

a) identification of the baseline period;
b) baseline energy consumption and demand data;
c) independent variable data coinciding with the energy data (e.g., production data, ambient temperature);
d) static factors coinciding with the energy data;
e) occupancy type, density and periods;
f) operating conditions for each baseline operating period and season, other than the independent variables;
g) description of any baseline conditions that fall short of required conditions;
h) details of adjustments that are necessary to the baseline energy data to reflect the energy management program's expected improvement from baseline conditions;
i) size, type and insulation of any relevant building envelope elements such as walls, roofs, doors, windows;
j) equipment inventory;
k) equipment operating practices;
l) any design, install, calibrate, and commission and any special measurement equipment that is needed under the plan;
m) Significant equipment problems or outages during the baseline period.

The baseline documentation typically requires well-documented short term metering activities. The extent of this information is determined by the measurement boundary chosen or the scope of the savings determination. If the whole-facility M&V methods are employed, all facility equipment and conditions should be documented.

5.0 REPORTING PERIOD

Identify the reporting period, which may be as short as an instantaneous measurement during commission of an ECM, or as long as the time required to recover the investment cost of the ECM.

6.0 BASIS FOR ADJUSTMENT

Declare the set of conditions to which energy measurements will be adjusted. The conditions may be those of the reporting period or some other set of fixed conditions. The conditions for the basis for adjustment determine whether savings are reported as avoided energy or as normalized savings.

7.0 ANALYSIS PROCEDURE

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

8.0 METER SPECIFICATIONS

Specify the metering points and period if metering is not continuous. For non-utility meters, specify:

- meter characteristics;
- meter reading and witnessing protocol;
- meter commissioning or calibration procedure;
- routine calibration process;
- Method of dealing with lost data and data transfer.

9.0 MONITORING RESPONSIBILITIES

Assign responsibilities for reporting and recording during the reporting period:

a. energy data;
b. independent variables;
c. Static factors within the measurement boundary.

Identify those individuals that are responsible for conducting M&V activities and prepared the M&V report (analyses and documentation).

Name:	
Title:	
Company:	
Email Address:	
Phone:	
Address:	

10.0 EXPECTED ACCURACY

Evaluate the expected accuracy associated with the measurement, data capture, sampling and data analysis. This assessment should include qualitative and any feasible quantitative measures of the level of uncertainty in the measurements and adjustments to be used in the planned savings report.

11.0 REPORT FORMAT

Specify how results will be reported and documented.

12.0 QUALITY ASSURANCE

Specify quality-assurance procedures that will be used for savings reports and any interim steps in preparing reports.

APPENDIX C – KEY PARAMETER SUGGESTIONS

This Appendix contains suggestions for pre-stage and post-stage measurement parameters for common measure categories.

HVAC AND BUILDING AUTOMATION SYSTEMS

Pre-stage:

- Weather data;
- Building automation set points that are pertinent to project;
- Operating schedule and sequence of operation for the portion of system that the measure is impacting.
- For the equipment that will be affected by the measure, include:
- Equipment power usage at full load;
- Equipment efficiency at full load; state efficiencies at representative load levels if the efficiency varies with loading;
- Equipment load profile with corresponding hours of operation

Post-stage:

- Weather data;
- Revised equipment and control sequences, set points, operating schedule and load changes, as applicable;
- Revised equipment power usage(s).

PLUG AND PROCESS LOADS

Pre-stage:

- Baseline system and/or equipment power usage(s);
- Equipment load profile with corresponding power usage, collected from building automation system OR from a data logging device;
- Operating schedule and sequence of operation

Post-stage:

- A log of all system changes that were made;
- List of equipment replacements that were made, along with manufacturer's data for the new equipment;
- Revised system and/or equipment power usage(s).

AIR AND WATER SYSTEM BALANCING

Pre-stage:

- Baseline system and/or equipment power usage(s);
- Balance report from when the system was last balanced;
- System set points that are pertinent to measure;
- Operating schedule and sequence of operation for the portion of system that the measure is impacting.

Post-stage:

- A balance report that is completed after measures were implemented;
- Revised system set points that are pertinent to measure;
- Revised operating schedule and sequence of operation for the portion of system that the measure is impacting;
- Revised system and/or equipment power usage(s)