

Building Optimization Program Guide

Capture your Building's Optimal Energy
Performance

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1. Program Overview

1.1. Introduction

Efficiency Nova Scotia's Building Optimization Program is a part of the larger Custom Program, where Efficiency Nova Scotia offers technical assistance, financial incentives and financing to offset the cost of engineering studies, energy efficient equipment and installation for customized projects.

The Building Optimization Program provides a similar offering but with a streamlined application process and a simplified incentive structure to be better suited to recommissioning measures in existing buildings that save electrical energy.

Recommissioning is an optimization process for existing buildings that ensures that its systems and equipment operate as intended, and meet current operational needs. It is recommended that this process be repeated several times over a building's useful life, as building uses often change, systems may have been incorrectly commissioned, designed or installed initially, or the operational performance of major systems may have degraded over time.

A major differentiating factor between a recommissioning project and a standard retrofit project is that the former is focused on low or no cost operational improvements. See section 1.3.5 for examples of recommissioning measures that are well suited to the Program (CanmetENERGY, 2008).

1.1.1. Definitions

For the purposes of this Program Guide:

"Program" refers to the Efficiency Nova Scotia Building Optimization Program;

"Customer" refers to participants of the Program, or possible participants;

"Service Provider" refers to the selected proponent providing the services necessary to complete a project through the Program.

1.2. Program Benefits

The recommissioning process can provide a variety of benefits for an existing building, including:

- **Reduced utility costs:** Recommissioning measures can reduce whole-building energy usage by 5-15%, on average. Some measures may result in reductions as high as 30%.
- **Competitive edge:** An eco-friendly building with low operating costs may help attract new tenants and retain current ones, giving building owners a competitive market edge.
- **Additional protection from future liability:** Issues with major systems and indoor environmental quality may be identified before they worsen and/or are beyond repair.
- **Reduced repairs and replacement costs:** Recommissioning can improve system and equipment performances, extend the useful life of equipment, and reduce the need for repairs.
- **Increased tenant comfort:** Reduced system breakdowns and cooling, heating, and ventilation set point adjustments can majorly improve tenant comfort in a building.
- **Public and Tenant Recognition:** Energy usage and environmental issues are becoming more and more of a concern for tenants and the general public. Energy savings efforts can result in significant positive recognition for a company or brand.

1.3. Eligibility

1.3.1. Building Eligibility

Eligible buildings or facilities include:

- Institutional, charitable, commercial or industrial facilities served (directly or indirectly) by Nova Scotia Power Inc. (NSPI);
- Eligible Nova Scotia Power accounts typically have a peak electrical demand of 50 kW (kVA) or higher. Customers may group multiple smaller (<50 kW) facilities for a project, if this approach is cost-effective, and the project meets all other requirements.

1.3.2. Customer Eligibility

To be eligible for the Program, the Customer must meet the following criteria:

- Owns or supervises an institutional, charitable, commercial or industrial facility that meets the building criteria outlined in section 1.3.1. ;

- Requires an incentive from Efficiency Nova Scotia to proceed with the project scope.

1.3.3. Service Provider Eligibility

An approved Building Optimization Service Provider must oversee each project for the Customer in order to qualify for incentives through the Program. The list of approved Service Providers for the Program and the [application](#) to become an approved Service Provider is listed on the [Efficiency Nova Scotia website](#).

Approved Service Providers are evaluated on an on-going basis to ensure they meet the Program requirements. Service Providers that are unable to meet these requirements and standards may be removed from the list at any time, at Efficiency Nova Scotia’s sole discretion. On-going negative customer feedback may also constitute grounds for removal. If removed from the list, Service Providers must demonstrate steps taken to remediate previous concerns and will only be eligible to re-apply after six months have passed.

1.3.4. Eligible Projects

Eligible projects should:

- Save at least 20,000 kWh of electrical energy per year;
- Be implemented in under a one year time period.

Eligible projects must save electrical energy and the electrical energy and demand savings from the project must not exceed the actual usage provided by Nova Scotia Power.

1.3.5. Eligible Measures

Any recommissioning measure funded by this program must save electrical energy with low to no implementation costs. Recommissioning measures typically have a simple payback ranging from 0.1 to 2.1 years. The savings calculations used to establish energy savings estimates are determined on a custom basis; with assumptions based on specific equipment, facility and participant factors. The responsibility for accurately determining relevant energy savings lies with the Service Provider. Examples of eligible measures are included in Table 1.

Table 1: Examples of Eligible Measures

System Type	Measure Description
HVAC	<ul style="list-style-type: none"> • Optimize economizer operation • Calibrate sensors • Clean heat exchangers • Reduce pressure drops across equipment • Add equipment lockouts to prevent unnecessary heating, cooling, or cycling • Change equipment set points or control parameters • Re-insulate exposed pipe or tank insulation • Reduce duct static pressures in air distribution systems • Reduce head pressures in water systems <p>Implement control system strategies, such as:</p> <ul style="list-style-type: none"> • Time of day scheduling • Scheduling based on building occupancy • Duct static pressure reset • Chilled water reset • Condenser water reset • Supply air reset • Optimum start/stop • Night setback • Demand controlled ventilation
Refrigeration	<ul style="list-style-type: none"> • Change temperature set points • Clean and calibrate sensors • Verify correct refrigerant charge in systems and repair any leaks • Verify optimal head and suction pressures
Lighting	<ul style="list-style-type: none"> • Recalibrate photo sensors if daylight harvesting is used • Implement lighting control system strategies, such as: <ul style="list-style-type: none"> ◦ Time of day scheduling ◦ Occupancy scheduling
Air and Water System Balancing	<ul style="list-style-type: none"> • Balance flow modulation devices, chilled water and hot water pumps and valves, and supply air temperatures

Note that only measures that save electrical energy will be eligible for incentives. The following section outlines the few ineligible measures for the Program.

1.3.6. Ineligible Measures

Certain measures will not be considered for funding. These measures are listed in the table below.

Table 2 - Ineligible measures with rationale for their exclusion.

Measures <u>Not Eligible</u> for Program Funding	
Ineligible Measure	Rationale for Exclusion
Demand-Limiting Controls: installed to reschedule discretionary electrical loads as the facility electrical demand is approaching peak.	These measures have a limited lifespan and could lose their effectiveness over time. These measures do not save energy, making them ineligible for incentives.
Power Factor Correction: capacitors or similar devices installed behind the customer meter, to increase the billing power factor (reduce peak billing demand in kVA).	Although power factor correction can save moderate amounts of energy, the savings are typically not significant enough to qualify for incentives.

Other ineligible measures include major retrofits and equipment replacements. These measures may instead be eligible for incentives through Efficiency Nova Scotia’s Custom Program.

1.3.7. Eligible Costs

Eligible costs are expenses incurred by the Customer in completing an eligible study or project. Costs for the following are eligible for assistance under the Program:

- Engineering (consultant or in-house staff);
- Equipment purchase and delivery costs;
- Installation labour; and
- Harmonized Sales Tax (if the customer pays HST and is not eligible for recovery).

Contingency amounts (e.g. additional budget allowances for cost overruns) are not considered eligible project costs.

Projects with high costs may be re-directed to the Efficiency Nova Scotia Custom Program.

1.4. Incentives

1.4.1. Investigation Incentive

The following investigation incentive will be offered to complete an investigation study to identify potential recommissioning measures within a selected building:

- 100% of eligible project costs up to a maximum of \$5,000.

1.4.2. Implementation Incentive

The following implementation incentive will be offered to implement recommissioning measures that are approved by Efficiency Nova Scotia within a selected building.

Implementation Incentive = Maximum Total Incentive - Investigation Incentive - Financing Costs (if applicable)

The Maximum Total Incentive will be:

- Up to 75% of eligible project costs, depending on the electrical energy savings associated with the project.

Efficiency Nova Scotia may reduce incentive amounts if:

1. Project costs are deemed ineligible. This may happen if:
 - a. The claimant cannot provide sufficient proof of the cost;
 - b. The cost is not related to electrical energy saving measures;
 - c. The cost was not identified in the *Implementation Application*; and
 - d. The cost applies to measures not implemented, as verified by the post-implementation inspection.
2. The project’s electrical energy savings, as identified in the *Master List of Findings* and the *Implementation Application*, are less than 85% of the amount(s) listed. In this event, the incentive claim amount (after any reductions for ineligible costs) is prorated as described in the *Implementation Application Review*.

1.4.3. On-Bill Financing

Efficiency Nova Scotia will provide zero-interest, on-the-bill financing of eligible costs for qualified Building Optimization projects in the case where only financing is chosen. In the case where the customer receives financing and an incentive to complete the project, the implementation incentive will deduct respective financing costs. If applicable, financing details are defined by an agreement separate from the investigation or implementation reviews. Please contact the Efficiency Nova Scotia Custom team at cicustom@efficiencyns.ca for more details.

2. Program Delivery

The Program structure is broken up into two stages in the following order:

1. Investigation;
2. Implementation.

The following sections will describe the structure and deliverables at each stage.

2.1. Investigation

The investigation stage of this Program is comprised of the completion of an investigation study that identifies recommissioning opportunities in the selected building.

2.1.1. Structure and Deliverables

1. Customer selects an approved Building Optimization Service Provider.
2. The Customer works with the Service Provider to complete an [Investigation Application](#) and submit a signed copy to Efficiency Nova Scotia.
3. An *Investigation Application Review* by Efficiency Nova Scotia is sent to the Customer. This review will contain the incentive amount available for the study.
4. If the Customer approves of the *Investigation Application Review*, the Service Provider then completes an investigation study and develops a [Master List of Findings](#). This form must be accompanied by supporting documentation which justifies the energy savings estimates that were used. See section 2.1.2 for more details.
5. The Service Provider provides the Customer and Efficiency Nova Scotia with a copy of the *Master List of Findings* with supporting documentation.
6. If Efficiency Nova Scotia approves of the *Master List of Findings* and supporting documentation, a cheque or direct deposit for the full amount of the investigation incentive is issued to the Customer.

2.1.2. Scope of work

The investigation study is a short-term study focused on identifying low to no cost operational improvements in a building that reduce energy consumption. The intent of the study is to provide maximum value to the Customer by identifying opportunities with short simple payback periods while keeping study costs at a minimum.

In-depth investigation of the building operations, extensive data collection and/or reporting, functional testing, small repairs and baseline measurements of energy usage should be completed during the implementation stage of the Program.

2.1.3. Energy Savings Estimates

The measures that are listed in the *Master List of Findings* must be accompanied by supporting documentation which justifies their energy savings estimates. No formal measurement and verification is needed for this justification. However, the methodologies, assumptions, calculations, and data that were used to produce these estimates must be noted in these documents.

Some acceptable methods to support energy savings estimates include:

- Engineering calculations (using both stipulated values and measurements);
- Metering, data logging, and monitoring (spot, short term, or continuous measurements);
- Building automation system or energy management system data;
- Natural Resources Canada Historical Weather Data (BIN data), collected at a weather station closest to the selected building's location. The selected data should reflect a time frame that is as close to the implementation stage of the project as possible. This data can be accessed at no cost at: <http://climate.weather.gc.ca/>;
- Computer simulation models that meet the International Performance Measurement & Verification Protocol (IMPVP) standards;
- Utility bill analysis (dependent on measure type, meter infrastructure and potential measure impact).

2.2. Implementation

The implementation stage of the Program is comprised of a baseline measurement of energy usage, functional testing, project implementation, and a final verification of energy savings.

2.2.1. Structure and Deliverables

(Continued from Section 2.1.1)

7. The Customer selects the recommissioning measures that they would like to implement from the *Master List of Findings*. With help from the Service Provider, the Customer completes an [Implementation Application](#) and submits a signed copy to Efficiency Nova Scotia.
8. Efficiency Nova Scotia sends the Customer an *Implementation Application Review*, which provides incentive payment details.
9. If the Customer approves of the *Implementation Application Review* and would like to proceed with implementation, they are to send a signed copy of the review to Efficiency Nova Scotia.
10. The Service Provider completes a baseline measurement (pre-measurement & verification) of the project conditions and further investigates the feasibility of the approved measures as needed prior to their implementation.
11. The Service Provider implements all approved measures.
12. Once the measures have been implemented, the Service Provider completes a final measurement and verification of the energy savings as a result of the implemented measures.
13. The Service Provider then develops a *Measurement & Verification Report*, which contains the following information:
 - a. Measurement and verification results with a clear methodology describing how the energy savings have been quantified. See Section 2.2.2 for more details;
 - b. Any changes that were made to the project following the approval of the *Implementation Application*;
 - c. Copies of invoices for any eligible project costs.
14. Once the Customer approves of the *Measurement & Verification Report*, it is then sent to Efficiency Nova Scotia.
15. If the *Measurement & Verification Report* is approved by Efficiency Nova Scotia and the verified electrical energy savings are within 15% of the estimated savings listed in the *Implementation Application Review*, a cheque or direct deposit for the implementation incentive amount that was listed on the *Implementation Application Review* will be paid to the Customer;
 - a. If there is a discrepancy in energy savings of more than 15%, Efficiency Nova Scotia reserves the right to reduce the implementation incentive accordingly. See section 1.4.2 for more details.

2.2.2. Measurement & Verification (M&V)

Measurement and verification is an essential part of the Building Optimization Program as it proves the effectiveness of a project and quantifies the energy savings that are attributed to a project. In order to quantify the energy savings impact of implemented measures within a project, a baseline of energy usage pertaining to these measures prior to their implementation (pre-M&V) must be established, and then compared to a measurement of energy usage following their implementation (post-M&V).

A *Measurement and Verification (M&V) Report* is to be created by the Service Provider following project implementation, and submitted to Efficiency Nova Scotia as a part of the implementation requirements for the Program. 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.

2.2.2.1 Data Collection Time Period:

The data collection time period that is used to establish a baseline of energy usage and verify energy savings should:

- Span over a full operating cycle, from minimum to maximum energy use;
- Be representative of operating conditions of a typical operating cycle;
- Correspond with the periods immediately preceding and following project implementation.

For measures that impact systems that have consistent energy usage week-to-week and are not impacted by weather conditions, a short term data collection period of one week may be sufficient.

For measures that impact systems with energy usage that is highly dependent on weather conditions, a continuous data collection period of one cooling or heating season may be more suitable.

2.2.2.2 M&V Methods

The acceptable measurement and verification methods for this Program are based on the International Performance for Measurement and Verification Protocol (IPMVP). The IPMVP is available for download from Efficiency Valuation Organization at www.evo-world.org and can be used as a reference should there be any uncertainty as to which M&V methods are suited to a particular measure or project. The IPMVP offers several different M&V methods that are summarized in the table below.

Table 3: Measurement and Verification Methods

Measurement Methodology	Verification of Energy Savings	Application Example
<p>A. Retrofit Isolation: Key Parameter Adjustment Measurement</p> <p>Energy savings are quantified through field measurements of key performance parameters. Parameters that are not measured are estimated with historical data, engineering judgment, and manufacturers' specifications.</p>	<p>Energy Savings are verified with engineering calculations of energy usage from the measurements and estimated values. Routine and non-routine adjustments are made as necessary.</p>	<p>The operation schedule of a single speed ventilation fan is optimized, where:</p> <ol style="list-style-type: none"> 1) Power draw is measured over a one week period and 2) Fan operating hours are estimated based on building occupancy schedules.
<p>B. Retrofit Isolation: All Parameter Measurement</p> <p>Energy savings are quantified through field measurements of the energy usage of the system affected by the implemented measures.</p>	<p>Energy Savings are verified with engineering calculations of energy usage from the measurements. Routine and non-routine adjustments are made as necessary.</p>	<p>The set points on a chilled water system are adjusted to increase the efficiency of the system. The electric power of the chiller and associated pumps are measured with a kW meter and portable data loggers. The operating hours and conditions of the system are gathered from trend data from the building automation system.</p>
<p>C. Whole Facility</p> <p>Energy savings are quantified by continuous measurements of the energy usage of a whole building or sub-building. Most suitable for projects where energy savings are expected to be greater than 10% of the building's total electrical or fuel usage.</p>	<p>Energy savings are verified with utility data. Routine adjustments as required, using simple comparison or a regression analysis. Non-routine adjustments as required.</p>	<p>The optimization of multiple systems in a building. Baseline energy usage is quantified with utility meter data over a one year period, followed by another year of meter data collection for the verification of energy savings.</p>
<p>D. Calibrated Simulation</p> <p>Energy savings are quantified through the simulation of energy usage of the whole building or sub-building. The methodology behind the simulation is explained. This option takes considerable skills in energy modelling. Most suitable for projects where energy savings are expected to be greater than 10% of the building's total electrical or fuel usage.</p>	<p>Energy savings are verified through simulations, adjusted with hourly and monthly utility billing data.</p>	<p>The optimization of multiple systems in a building, where there is no baseline measurement period. Once installed, utility meter measurements can be used to adjust simulations.</p>

Some examples of key parameters that should be quantified for the measurement and verification of energy savings, based on the system type that a measure is affecting, are listed below. This data can be collected through various activities, including: visual inspection; sample spot measurements; short-term testing; and building automation system

control logic and/or trending.

This table serves as a guide only as each project or measure has a unique set of characteristics. Efficiency Nova Scotia can provide data logging equipment to assist with the measurement of some of the parameters that are listed at no charge. With the Customer’s written permission, Nova Scotia Power can also provide Efficiency Nova Scotia and other third parties with a billing and meter reading history for the account(s) involved in a particular project.

Table 4: M&V Implementation Methodology Examples

System Type	Stage	Key Parameters
HVAC and Building Automation Systems	Pre	<ul style="list-style-type: none"> 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. <p>For the equipment that will be affected by the measure, include :</p> <ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Weather data; Revised equipment and control sequences, set points, operating schedule and load changes, as applicable; Revised equipment power usage(s).
Lighting Systems	Pre	<ul style="list-style-type: none"> Baseline system and/or equipment power usage(s); Equipment count and their respective wattages from industry references; Description of lamp/ballast types; Operating conditions and schedule.
	Post	<ul style="list-style-type: none"> Replacement equipment wattage from manufacturer’s data sheets and/or industry references, if applicable; Revised operating conditions and schedule; Revised system and/or equipment power usage(s).
Plug and Process Loads	Pre	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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).

2.2.2.3 M&V for Electrical Demand and Non-Electric Savings

In cases where projects achieve electrical demand savings and/or non-electric savings, these savings are to be measured and verified using the methods that are listed in this Guide.

Although these types of savings do not impact incentive amounts offered by Efficiency Nova Scotia, they can have a large impact on the cost-benefit analyses and feasibility of a project and should therefore be documented and incorporated into the *Measurement & Verification Report*.

Measures that achieve electrical demand savings effectively reduce the peak electrical usage over a one month period. Recommissioning measures that reduce electrical demand are limited, but may include: staging of equipment; and alterations to control sequences for thermal storage or heat recovery systems.

Non-electric savings include reductions in fuel and water usage, as well as lowered maintenance and repair costs. Recommissioning measures impacting heating or hot water systems may reduce fuel and/or water usage.

Recommissioning measures that lower maintenance and repair costs may include: revisions to filter sequences to include less expensive filters with lower filtration ratings; and cleaning of heat exchangers to prevent fouling. Lowered maintenance and repair costs may be difficult to quantify using traditional measurement and verification methods. These savings may be quantified by comparing statements from service and maintenance calls from year-to-year.

3. Additional Resources

Additional program resources can be found on the [Efficiency Nova Scotia website](#). Requests for additional resources can be made using the contact information listed in section 4.

4. Contact Information

All questions regarding the Building Optimization Program are to be directed to Efficiency Nova Scotia (ENS) using one of the following methods:

Phone: 1-877-999-6035

Email: cicustom@efficiencyns.ca

Internet: <https://efficiencyns.ca/service/building-optimization/>