



EM&I Engineering

Guideline – Social Housing Energy Savings Program (SH-ESP)
Opportunity Assessment

June 13, 2025

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List of Acronyms

ASHRAE – American Society of Heating, Refrigerating and Air-Conditioning Engineers
DR – Demand Response
EE – Energy Efficiency
EM&I Engineering – Energy Management and Innovation Engineering
FS - Feasibility Study
GHG – Greenhouse Gas
HP – Heat Pump
LD – Load Displacement
LCE – Low Carbon Electrification
SH-ESP – Social Housing Energy Savings Program
LCE – Low Carbon Electrification
OA – Opportunity Assessment

1. Introduction.

This guideline is intended to support Service Providers to deliver an Opportunity Assessment (OA) under the Social Housing Energy Savings Program (SH-ESP).

2. Purpose.

The OA is designed to provide a high-level plan to help customer through:

- A profile of the building's energy consumption, breakdown of energy use and greenhouse gas emissions.
- A high-level assessment of the building's electrical service and available capacity.
- Identification and assessment of energy efficiency (EE) and low carbon electrification (LCE) measures¹, as well as solar and battery opportunities, summarized in an Opportunity Register including:
 - impact to energy consumption and utility costs.
 - impact greenhouse gas emissions.
 - order of magnitude estimates for implementation costs.
 - identification of priority retrofits; and,
 - identification of next steps for accessing rebate or custom rebates, and feasibility study (if required).
- Reporting that supports customer and BC Hydro decision making.

3. Scope of Work.

The OA scope of work must meet the minimum requirements outlined in this guideline.

The consultant must deliver the following:

- An Opportunity Assessment Report with contents per Section 6.
- Completed SH-ESP Opportunity Assessment Workbook.

Note that the work must:

- Only begin after the customer has signed and returned a copy of the SH-ESP Opportunity Assessment Funding Agreement.
- Be performed by a BC Hydro Alliance energy audit consultant ("Service Provider") or by BC Housing or BC Non-Profit Housing Association's energy or asset managers.
- Follow industry accepted energy engineering practices.
- Be complete within 90 days of the SH-ESP Opportunity Assessment Funding Agreement signing date.
- Boundary of the OA includes the entire building (suite and common areas, including parkade), excluding commercial spaces in mixed-use building.

¹ EV Charging is considered a LCE measure under the end-use LCE-transportation.

4. Methodology.

The OA service provider is expected to adopt a logical and transparent approach and document all assumptions and conclusions. Some facilities may require a modified methodology. If there is uncertainty in how best to proceed, please discuss any proposed modifications with EM&I Engineering before proceeding. The default methodology for an OA is presented in Figure 1 and the sections below.

Figure 1: Default Opportunity Assessment Methodology



4.1 Describe the Facility.

Work with the customer representative and walk through the facility to develop an understanding of the building systems, as well as its energy use and operating profiles. The Service Provider should consider both the current state and planned changes.

The Facility Description must include:

- The location of the building.
- The total floor area, building age, number of floors, number of suites, the building's overall condition, as well as whether there is parking or commercial spaces onsite.
- A description of major systems: lighting, ventilation, space heating, space cooling, domestic hot water, and other energy intensive equipment, distinguishing between in-suite and common areas where applicable.
- Contact information for the customer representative.
- Other relevant information.

The customer should, as available, provide previous energy audits, end use assessments, condition assessments and detailed energy studies.

4.2 Conduct High-Level Electrical Capacity Check

A high-level electrical service capacity check estimates the maximum electrical capacity of a building's existing electrical service. This check will provide a conservative estimate of a building's existing capacity and identify if new loads can be added with or without electrical service upgrades. This service can be conducted by the consultant offering the Opportunity Assessment or can be subcontracted to a company with experience determining building electrical capacity. The scope of the electrical service upgrade includes:

- Determine the building's existing electrical service size and transformer size which feeds the property.
 - This would include data collection and taking photographs of all the existing electrical distribution systems. If available electrical drawings (single-line diagrams) can also be collected.

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- Collect the building's electrical usage history through BC Hydro's online form [Request building usage history \(bchydro.com\)](#) or provided by BC Hydro for program participants².
 - Report annual peak demand from utility bills.
 - Estimate the building's available spare capacity by comparing the building service size.

The following building electrical system information will need to be collected and included in the Opportunities Assessment Workbook.

- Main switch size (Amps)
- Voltage (Volts)
- Phase
- Main switch capacity (kW)
- Total connected load (kW)
- Spare capacity (kW)
- Additional comments and recommendations

4.3 Conduct an Energy Breakdown

An energy breakdown is a deconstruction of the building's annual consumption via utility bills and known information of the existing systems. The service provider must conduct utility analysis against local weather data to estimate and isolate weather dependent components for heating and cooling consumption from base building loads (lighting, plug loads, domestic hot water, etc.). The purpose is to understand how the building uses energy and, through this process, identify uncharacteristic energy consumption. Furthermore, the breakdown consumption can be used to facilitate and constrain the calculated energy impacts of proposed measures, see Section 4.4. The breakdown is reported in the Opportunities Assessment Workbook with the energy use categories listed here:

- Domestic hot water – this can be estimated based on rule of thumb metrics for consumption per suite; for gas heated systems, this can be determined from the weather independent portion of the gas consumption.
- Suite and common area heating and cooling – estimated based on weather dependent portion of gas or electricity bills. Breakdown between suite and common area consumption can be estimated based on approximate floor area and hours of operation.
- Ventilation heating – estimated based on make-up air unit actual (or approximated) flow rate and thermal energy required to heat the outdoor air from weather data.
- Baseloads (lighting, plug loads, misc. equipment, and others) – remaining electrical consumption after accounting for the above end-uses.

² Where building electrical usage data or information is not readily available, estimates can be made based on reasonable engineering judgement.

Where possible, energy breakdown should be compared with similar facilities or general energy use breakdowns for multi-family buildings or multi-unit residential buildings. Any irregularities should be reported and discussed with the customer.

4.4 List and Describe the Opportunities

Identify the energy, emissions, and demand opportunities³. Each opportunity must be categorized by initiative: energy efficiency (EE), low carbon electrification (LCE), and/or Solar and Battery. EV Charging is considered an LCE measure, under the transportation end-use (LCE-transportation). Opportunities shall be provided based on the following:

- Provide opportunities that are deemed feasible options. For example, no opportunities for an in-suite mini-split heat pump should be made if there is no space to install the outdoor unit in a high-rise building (no deck space or other suitable location within maximum refrigerant line length).
- Make recommendation that comply with the rebate requirements, where applicable.
- Recommendations can be provided for equipment and retrofits for which there is no rebates available. For example, gas fireplace can include fireplace decommissioning or upgrading to an electric fireplace.
- Multiple different options can be provided, for example, the space heating can provide both an in-suite heat pump and a central building heat pump option.

For each opportunity considered, the service provider must:

- Note the location within the system.
- Describe existing and proposed end uses, energy source, and equipment details.
- Define operating characteristics and conditions used to develop load profiles.
- Describe system requirements and control requirements (interlocks).
- Document relevant observations and comments.
- Provide order of magnitude energy impact calculations for electricity and fuel consumption.
- Develop an order of magnitude estimate for baseline (like-for-like replacement) and implementation costs.
- Identify and describe potential barriers to implementation and recommend methods to overcome e.g., location, hazardous materials, maintenance, equipment availability, operating risk etc.
- Describe any non-energy benefits and impacts.
- Where applicable, identify other potential incentives or tax credits.

Service provider must fully reference any previous work used.

³ Opportunities should meet all minimum codes and standards as applicable, must not affect safety, comfort, or health of occupants, and must not affect the quality of the products or the reliability of equipment and systems.

4.5 Complete the Opportunity Register

The Opportunity Register provides a standard template for opportunities identified during an OA. This register summarizes the key information to support decision making by the customer and other stakeholders. An excerpt of the Opportunity Register has been included as Appendix III – Opportunity Register Excerpt

The service provider must complete the Opportunity Register Workbook Basic Info and Opportunity Register tabs. The “Instructions” tab provides information for each tab and required field. A color scheme facilitates instructions and data entry.

- The “Basic Info” tab captures preliminary information gathered during the OA.
- The “Opportunity Register” tab summarizes the following information for each opportunity:
 - Utility costs and emissions reductions of opportunities identified, determined based on estimated energy impacts.
 - Priority (High, Medium or Low) of the opportunity based on, but not limited to:
 - information provided by the building owner such as planned end-of-life replacements or replacement due to ongoing issues,
 - interest in accessing financial rebate for equipment replacement, or other priorities, for example interest in upgrading to reduce energy consumption or greenhouse gas emissions, improving occupant comfort, or pre-emptively comply with pending regulatory requirements (i.e., Highest Efficiency Equipment Standard).
 - Service Provider’s recommended next steps based on measure type (rebate or custom, see Appendix II – Pathways Based on Measure Type) and complexity of proposed measure. Applicable next steps include:
 - For rebate measures:
 - Rebate workbook to rebate application (recommended for measures with straight forward implementation not requiring additional engineering analysis)
 - Feasibility study of rebate measures to rebate application (recommended for measure with more complex or unique implementation requiring further engineering analysis)
 - For custom measures:
 - Feasibility study of custom measures to rebate application
 - Complete custom workbook to rebate application (if measure was previously studied in last 2 years)
 - Not recommended for implementation
 - Note: Solar panel, battery storage and EV charging measures will apply for rebates through the respective rebate programs.
- The Implementation Summary table in the “Opportunity Register” tab presents a summary of the opportunities by initiative categories.

4.6 Report Out

The consultant must develop a SH-ESP Opportunity Assessment Report and complete the SH-ESP Opportunity Assessment Workbook using the methodology in section 4 to report out. The OA report does not need to duplicate data provided in the OA workbook. It shall contain the following sections:

- Executive Summary
 - Include the Implementation Summary table from the “Opportunity Register”.
- Background Information
 - Include the contact information for the customer’s technical representative, Author of the report, Service Provider, and BC Hydro Key Account Manager.
- Facility Description
- High-Level Electrical Capacity Check
- Description of Opportunities

5 Accuracy.

The expected accuracy for electrical energy impacts and GHG emissions impacts is (+/-50%) and implementation costs is (-50% to +100%). Implementation costs can be estimated based on rule of thumb costs while providing high-level adjustments for factors such as economies of scale, accessibility, available space, potential structural concerns, observed remediation needs, etc. If meeting the accuracy requirements outlined above is not feasible, the report should provide supporting information and rationale.

6 BC Hydro EM&I Engineering Review.

The OA Report will be reviewed by the BC Hydro EM&I Engineering team. The reviewer will look for reasonable assumptions, appropriate methodology and results that are consistent with sound engineering judgement and similar project experience. If opportunities for significant improvement come to light the consultant will be informed and given every opportunity to revise the report.

EM&I Engineering will not analyse reported results in enough detail to verify all calculations.

The consultant retains all responsibility for the analysis and report.

Appendix I – Definitions

Energy Efficiency (EE) is the use of less energy to perform the same task or produce the same result.

Load Displacement (LD) describes generation that is owned by an electric utility customer and is used to supply part, or all the customer's electricity needs. (e.g., Photovoltaic (PV), micro-hydro, waste-heat, wind).

Low Carbon Electrification (LCE) is the reduction of GHG emissions using clean electricity instead of GHG emitting forms of energy such as natural gas, diesel, propane, and gasoline.

Appendix II – Pathways Based on Measure Type

Rebate Pathway

The rebate pathway is a streamlined approach to rebates suitable for equipment additions or replacements without significant re-design. A SH-ESP Rebate Workbook is to be populated with basic information on the existing system and proposed measures, upon which eligible rebate amounts and associated energy impacts are immediately calculated. Custom energy impact calculations are not required. Rebate measure can apply for rebates without a Feasibility Study; However, measures can still be studied at the customer's discretion.

A list of qualified Rebate Measures are listed below:

1. Domestic Hot Water
 - 1.1. Central air source HP water heater, NEEA Tier 2 or 3**
 - 1.2. In-suite all-in-one air source HP water heater with supplemental electricity*
2. HVAC
 - 2.1. Cold climate packaged terminal heat pump or single packaged vertical heat pump*
 - 2.2. Cold climate air source HP (mini-split)*
 - 2.3. Cold climate air source HP (multi-split)*
 - 2.4. Central cold climate air source HP (multi-split or variable refrigerant flow, outdoor unit located in common area serving multiple suites)
 - 2.5. Rooftop HP MUA with supplemental electric heating
 - 2.6. Low ambient rooftop HP MUA with electric preheat (HP operational down to -12°C with electric preheat)
3. Envelope
 - 3.1. Glazing (for electrically heated building, existing system must be single glazed or double glazed with non thermally broken frames)
4. Mechanical
 - 4.1. Parkade CO - HVAC controls
 - 4.2. Variable speed drive for motors
5. Lighting
 - 5.1. Like-for-like lighting replacements
 - 5.2. Lighting controls
6. In-suite
 - 6.1. In-suite lighting*
 - 6.2. In-suite fridge*

* Must cover a substantial portion of the building suites. This offer is not for individual, in-suite upgrades.

** Central heat pump water heating systems with supplemental gas-fired heating are not accepted.

Custom Pathway

The custom pathway is reserved for complex measures in which a Feasibility Study (or previous study) will need to be completed first to define the project scope, energy impacts and costs prior to rebate application. Measures pursued through this pathway will require custom engineering calculations. Measure(s) are custom if they are not a rebate measure. In general, custom measures may meet any of the following criteria:

1. Any building envelope upgrades other than glazing-only retrofits.
2. Central hydronic or domestic hot water heat pumps with custom supplemental electrical resistance heating (supplemental gas fired heating is not accepted).
3. Central heat recovery: Includes heat recovery from sewage or wastewater or exhaust air heat recovery.
4. Central hydronic or domestic hot water heating that is electric resistance only.
5. Heat pumps that aren't air-to-air systems, i.e. they're water-to-air, air-to-water, or water-to-water.
6. Lighting redesign that includes changes to the light quantity and/or mounting locations, or projects that add a networked lighting control system.

Appendix III – Opportunity Register Excerpt

Implementation Summary	Electricity Savings Estimate (kWh/y)	Fuel Savings Estimate (GJ/y)	Baseline Cost Estimate (\$)	Implementation Cost Estimate (\$)	Annual Cost Savings Total (\$/y)	GHG Savings (tCO ₂ e/y)
Energy Efficiency	-	-	\$ -	\$ -	\$ -	-
Low Carbon Electrification	-	-	\$ -	\$ -	\$ -	-
Solar and Battery	-	-	\$ -	\$ -	\$ -	-

Opportunity Register

No.	Initiative Type	End Use	Opportunity Description	Energy Measure	Measure Type	Electricity Savings Estimate (kWh/y)	Fuel Savings Estimate (GJ/y)	Baseline Cost Estimate (\$)	Implementation Cost Estimate (\$)	Annual Cost Savings Total (\$/y)	GHG Savings (tCO ₂ e/y)	Priority	Recommended Next Steps	Notes:
1										INA	0.0			
2										INA	0.0			
3										INA	0.0			
4										INA	0.0			
5										INA	0.0			
6										INA	0.0			
7										INA	0.0			
8										INA	0.0			
9										INA	0.0			
10										INA	0.0			

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