

FEASIBILITY STUDY GUIDE FOR ELECTRICAL AND NATURAL GAS ENERGY EFFICIENCY PROJECTS IN COMMERCIAL AND INSTITUTIONAL BUILDINGS

SECTION 1

INTRODUCTION

This guide has been written to assist Registered Professional Engineers or Architects with the preparation of the Feasibility Study Proposal and the Feasibility Study Report.

The purpose of the Feasibility Study Proposal is to define the scope and cost of the study and provide a pre-feasibility analysis of potential measures and options.

The purpose of the Feasibility Study Report is to present the results of the study in a common format.

To be eligible for a Feasibility Study incentive, the study proposal along with a Feasibility Study Application form must be approved by Manitoba Hydro prior to initiating the actual study.

SECTION 2

GENERAL REQUIREMENTS

Grammar and Style: The proposal and report should be grammatically correct. The language should be clear, concise and understandable by all readers.

Engineering Calculation Methods:

- Manual, spreadsheet, modeling or calculation software will be acceptable only if the calculation methods are transparent and traceable for Manitoba Hydro technical review. All assumptions, inputs and outputs must be documented for each individual measure and option. Modeling results must be realistic when tested against simple manual check methods.
- Electrical energy savings shall be quoted in kilowatt-hours (kWh). Natural gas energy savings shall be quoted in cubic meters (m³). Other energy units (Btu, GJ or kWh equivalents) may also be used as long as cubic meters and kWh are also stated.
- Weather related measures must utilize degree day, bin temperature data or hourly weather data for the closest weather station to normalize the saving calculations.

Documentation:

- Supporting energy usage histories, equipment performance data, load calculations, detailed cost estimates and assumptions that were used in the calculations and estimates must be documented and included in the report. The rationale for all relevant assumptions should be clearly stated. For retrofit projects, saving calculations are also expected to be supported by logged, trended, metered or spot instantaneous field measurements.
- Engineering calculations, field energy measurement results, meter readings, data logging results and equipment performance data sheets, cost estimate quotations, etc. must be included in an Appendix. Electronic model or spreadsheet files shall also be provided upon request.
- When quoting equipment capacities, clearly indicate whether input or output.

Mathematical Accuracy and Consistency: All calculations should be checked for mathematical accuracy and values should be consistent when repeated more than once.

Illustrations: Tables, charts and other diagrams should be properly labeled. Duplication of similar information in varying forms is not generally necessary.

SECTION 3

DEFINITIONS – BASE CASE / ENERGY EFFICIENT CASE

In order for a project to be considered for eligibility, there must be a lower cost, less efficient option and a higher cost, more efficient option to study. Projects where the more efficient option is the lower cost will not be eligible for incentives.

The **Base Case** is defined as the lower capital cost, less efficient option.

The **Energy Efficient Case** is defined as the higher capital cost, more efficient option.

For **existing facilities**, lost opportunity projects and resource acquisition projects must be defined.

- **Lost opportunity projects** are defined as those where the original equipment has failed or is at the end of its life and must be either repaired or replaced. If there is only one more efficient option, the Base Case would be either repair or replacement with similar equipment and the Energy Efficient Case would be the more efficient piece of equipment. If there are numerous more efficient options, the Base Case could be any one of these options and the Energy Efficient Case would be any other higher cost, more efficient option.
- **Resource acquisition projects** are defined as those where the original equipment has remaining equipment life and could remain in operation and there is at least one more efficient option available. For these types of projects, the Base Case could be either to do nothing or it could be one of the more efficient options. The Energy Efficient Case would be any other higher cost, more efficient option.

For **new facilities**, the Base Case would be defined as the lower cost, less efficient system that would normally be installed in the absence of Power Smart incentive programs. The Energy Efficient Case would be defined as any higher cost, more efficient option.

If in doubt as to what the Base Case and Energy Efficient Case options should be for a particular project, contact any Manitoba Hydro Commercial Custom Measure Program technical staff for assistance.

SECTION 4

ENERGY CONVERSION FACTORS

Electricity	Natural Gas	Other
1 HP = 0.746 kW	1 m ³ = 35,310 BTU*	1 m ³ = 35.31 ft ³
1 kW = 3412 BTU / hr	1 therm = 100,000 BTU	1 boiler HP** = 33,480 BTU
	1 CCF = 100,000 BTU	1 boiler HP** = 34.5 lb/hr
	1 MCF = 1,000,000 BTU	
	1 GJ = 948,210 BTU	
	1 MMBTU = 1,000,000 BTU	

* based on 1000 BTU per ft³

** from and at 212°F

SECTION 5

FEASIBILITY STUDY PROPOSAL OUTLINE

The Feasibility Study Proposal should include all of the following sections, and should normally be no more than three or four pages in length. The recommended proposal format is as follows:

TITLE PAGE

- Feasibility Study Proposal Title
- Customer Name, Building Name and Building Address
- Consulting Firm Name and names of proposed report author(s).
- Proposal Submission Date

1. PROJECT DESCRIPTION

1.1 Building Description

- Use and space function(s).
- Year of construction of original building and any major additions.
- Total heated and unheated floor areas in square metres or square feet.
- Number of storeys, full or partial basement or crawlspace, or floor slab.
- Summary of total annual costs and energy usage of natural gas and electricity.
- A list of all natural gas and electricity utility and customer or tenant owned sub meters.
- List of parties responsible for paying each utility bill.
- Names of building owner, property manager and tenants

1.2 Proposed Energy Efficient (EE) System or Measure Option(s):

- Describe briefly each EE system or measure option to be studied and identify the building service they provide.
- Explain how each option achieves energy savings. (i.e. through improved conversion efficiency, reduced run times, waste energy recovery, improved control, etc.)
- Proposed new system/equipment type(s) and approximate size(s).
- Estimate of the annual electricity consumption and natural gas consumption of each proposed system or measure option.
- Preliminary cost estimate to install each option.

1.3 Base Case Option (Basis of Comparison):

- Explain whether this is a lost opportunity project (system at or near end of life) or a resource acquisition project (system has substantial remaining life).
- Describe how the existing system operates or will operate including estimate of annual hours of operation, loading conditions and control schemes.
- Preliminary cost estimate to repair, refurbish or replace existing equipment and system to continue with the existing system.
- Preliminary cost estimate to install the new Base Case Option.
- Estimate of annual electricity and natural gas consumption of the base case option.
- System/equipment type(s) and approximate size(s).
- Expected operating conditions and schedules.

2. PRE-FEASIBILITY COST BENEFIT ASSESSMENT

At this early stage of the feasibility study process, it is expected that all cost and savings will be approximate order of magnitude estimates sufficiently accurate and attractive to justify the cost of performing the study. One purpose of the study is to refine the accuracy of these preliminary estimates using better methods.

2.1 Potential for Energy Savings of each EE Option

- Estimate of electrical energy savings in kWh.
- Estimate of natural gas savings m³.
- Identify all interactive effects of the measure(s) to be evaluated in the study, which could cause an increase in electricity or natural gas usage by other systems.

2.2 Estimate of the Cost Saving Benefits of each EE Option

- Annual electric billing cost savings. For “Demand Rate” electric customers only, include an estimate of the total annual electric demand charge cost savings.
- Annual natural gas billing cost savings.
- Other energy billing cost savings potentially affected by the EE measures.
- Water/sewer utility savings (quantity and \$ value).
- Maintenance and repair cost savings.
- Other quantifiable project non-energy benefits.

2.3 Simple Payback of each EE Option

- Estimated total annual cost savings.
- Best approximation of incremental cost of implementing the proposed system/measures.
- Estimated conditional Hydro Incentive.
- Simple payback of each measure or option with and without Hydro incentive and other government program funding or incentives.
- Customer’s acceptable investment assessment criteria i.e. simple payback, return on investment or life cycle cost.

3. SCOPE OF CONSULTING SERVICES

3.1 Study Methodology.

- Identify the study tasks and describe the work to be done in each task.
- Description of the engineering calculation methods to be used.
- Description of field measurements, logged, trended or metered data to be used as the basis and support for the final savings calculations.

3.2 Study Team

- Identify the responsible Manitoba registered professional engineer or architect.
- Identify the technical specialists or other personnel who will be involved in the study.
- Identify all sub consultants involved in the project.
- Attach resumes of all key personnel.

3.3 Study Schedule

- Include a basic schedule for completion of the study tasks.
- Expected start and completion dates.

3.4 Study Cost

- Total quoted cost for the study including labour, disbursements and PST. Provide labour and material costs separately.
- Total cost of study after payment of the requested Manitoba Hydro study incentive and any other government program funding.

SECTION 6

FEASIBILITY STUDY REPORT OUTLINE

The Feasibility Study Report should include all of the following sections.

TITLE PAGE

Feasibility Study Report Title

Customer Name, Building Name and Building Address

Consulting Firm Name, Certificate of Authorization, and names of the report author(s).

Registered Engineer's or Architect's Seal (responsible architect's or engineer's stamp, dated and signed)

Report Completion Date

1. PROJECT DESCRIPTION

- Description of the building: age, floor area, number of storeys, building function and hours of usage, primary tenant(s).
- Describe each building system studied in general terms.
- Describe the motivating factors for considering each energy saving measure. For example: Are maintenance costs increasing as the equipment nears end of life or is the project motivated entirely by the energy cost reduction potential? Are potential improvements in human comfort or environmental stewardship motivating factors?
- Describe each Base Case and Energy Efficient (EE) Case option that has been evaluated. Justify and rationalize the Base Case presented in the study. Base Case will often not be the existing "As-Is" system. Typically, Base Case will be the refurbishment or replacement of an existing system with similar components if they are still available. If similar components are not available the new base case may be a more efficient version of the existing system and equipment.
- Confirm that each Energy Efficient (EE) Case evaluated will utilize proven reliable technology, with an expected equipment life of 10 years or greater. Research & Development projects are not eligible.
- Include a basic single line schematic drawing showing each Base Case and Energy Efficient Case options.

2. COST BENEFIT ASSESSMENT

Note: The study must consider the combined and interactive effects of all measures both individually and when bundled together, on the consumption, demand and cost of all energy sources and utilities. This shall include propane, fuel oil, wood, coal, used motor oil, biomass, water, sewer and any others. Any increases or decreases in consumption of any other utilities or energy sources by incorporating each measure shall be evaluated and broken out where applicable.

2.1 Energy Savings Estimate

- For existing buildings, summarize the monthly energy consumptions, demands and costs of all energy sources potentially affected by the measures studied for a recent typical year.
- Tabulate the annual energy consumption estimates for each energy source for each Base Case and EE Case. Normalize all consumption estimates to 30 year normal weather and typical operating conditions. Use units of kilowatt hours (kWh) for electricity and cubic meters (m³) for natural gas. Subtract the EE Case energy consumption from the Base Case Energy consumption to determine savings of each EE Case Measure.
- Explain how the energy saving estimates were derived (e.g. field measurements, engineering calculations, manufacturer's equipment performance datasheets, etc.) and include all detailed calculations in an Appendix.
- Describe the source and time period of all field measurements; instantaneous, logged, trended or metered that were used as the basis and support for the savings calculations performed.

2.2 Cost Saving Benefits to the Customer

- State the costs of electricity consumption, natural gas consumption, electricity demand and natural gas demand (only if applicable) separately for each Base Case and EE Case Measure. Cost savings shall be attributable to each measure considered from the customer's perspective at their current or expected new utility rate classification.
- The customer's reduction in electrical demand charges shall be based on the kilo-volt amps (kVA) charge reduction expected over a typical 12 month period and consider any changes affecting the "minimum monthly ratchet charges" where applicable. Present each energy and demand cost saving separately, in tabular form. Applicable total tax savings shall also be shown separately. Identify all tax rates used.
- State all other quantifiable project savings (water, sewer, propane, fuel oil, maintenance or other cost savings) and provide descriptions of how these other project benefits were determined (e.g. maintenance records, calculations, manufacturer's data, etc.). Applicable total tax savings shall also be shown separately. Identify all tax rates used.

2.3 Project Cost Estimates

- Provide a breakdown of project costs, in tabular form for all Energy Efficient and Base Cases in terms of equipment, installation and engineering cost components. The Incremental Project Cost is the difference between the Energy Efficient Case Cost and the Base Case Cost and shall be shown separately for each EE Measure.
- Itemize and subtract incentives or rebates available through other Hydro and Government programs from the Incremental Project Cost for each EE Measure.
- Installation costs of up to 85% of the equipment costs, and engineering costs of up to 10% of the equipment costs are eligible under the program.
- When installation costs include internal labour, provide the estimated number of hours. Note that a standard labour rate of \$40 per hour will be used for all internal labour costs.
- State equipment sizes, model numbers, quantities and associated costs of each item.
- Include copies of written quotes from suppliers and contractors to justify equipment, installation and engineering project costs.
- Note that Contingency, GST, Spare Parts, and Warranty Maintenance Plans are not eligible under the Program. Provincial Sales Tax is eligible for equipment that is not tax exempt.
- Attach all detailed cost estimates in an Appendix.

2.4 Simple Payback And Incentive Calculation

- Simple payback is determined using the incremental project costs and electrical or natural gas benefits and other customer cost saving benefits that have been previously calculated. Projects with simple paybacks less than 1.0 years are not eligible for incentives under this Program.
- The eligible incentive amount is related to the estimated amount of electrical and natural gas savings, the total project incremental costs and benefits and the total installed cost of the project. The amount of the incentive is determined as the lesser of three values: a value based on electrical and natural gas savings, a value of 50% of total installed project cost, or a value that is the amount required to reduce the project simple payback to 1.0 years. The maximum eligible incentive is \$250,000 for electrical measures, and \$100,000 for natural gas measures.

- The simple payback(s) and incentive amount(s) shall be calculated separately for each measure and as a bundle or bundles of recommended measures. Individual measures which do not pass Manitoba Hydro's internal economic tests may not be eligible for incentive at our sole discretion.

2.5 Recommendations and Summary

- Indicate the EE Measure(s) recommended for implementation and the reason for their selection.
- Summarize all savings, costs, paybacks and incentives (from all sources) of the recommended individual measures and/or bundle of measures taking into account interactive effects.

3. MEASUREMENT AND VERIFICATION OF SAVINGS

- The Program follows the principles described in the International Performance Measurement and Verification Protocol – Volume 1 (April 2007) that requires actual electrical or natural gas measurements both before and after efficiency measures are implemented. It is the responsibility of the project proponent to develop an appropriate measurement and verification plan. The customer and Manitoba Hydro must agree in advance how the energy savings will be measured and verified.
- Briefly describe how and when the energy savings verification will be accomplished.
- Describe test instrumentation, measurement points, and duration of testing for the purpose of savings verification.

4. IMPLEMENTATION SCHEDULE

- Provide an implementation schedule showing major project milestones, and expected completion date. Note that projects must be completed within one year of incentive approval unless agreed otherwise.

APPENDICES

Engineering calculations for energy savings, single line schematics, manufacturer equipment performance data sheets, cost quotations, cost estimates, field energy measurement results, meter readings, data logging, monthly billing histories, weather normalization calculations and other information as necessary to support this incentive application report.