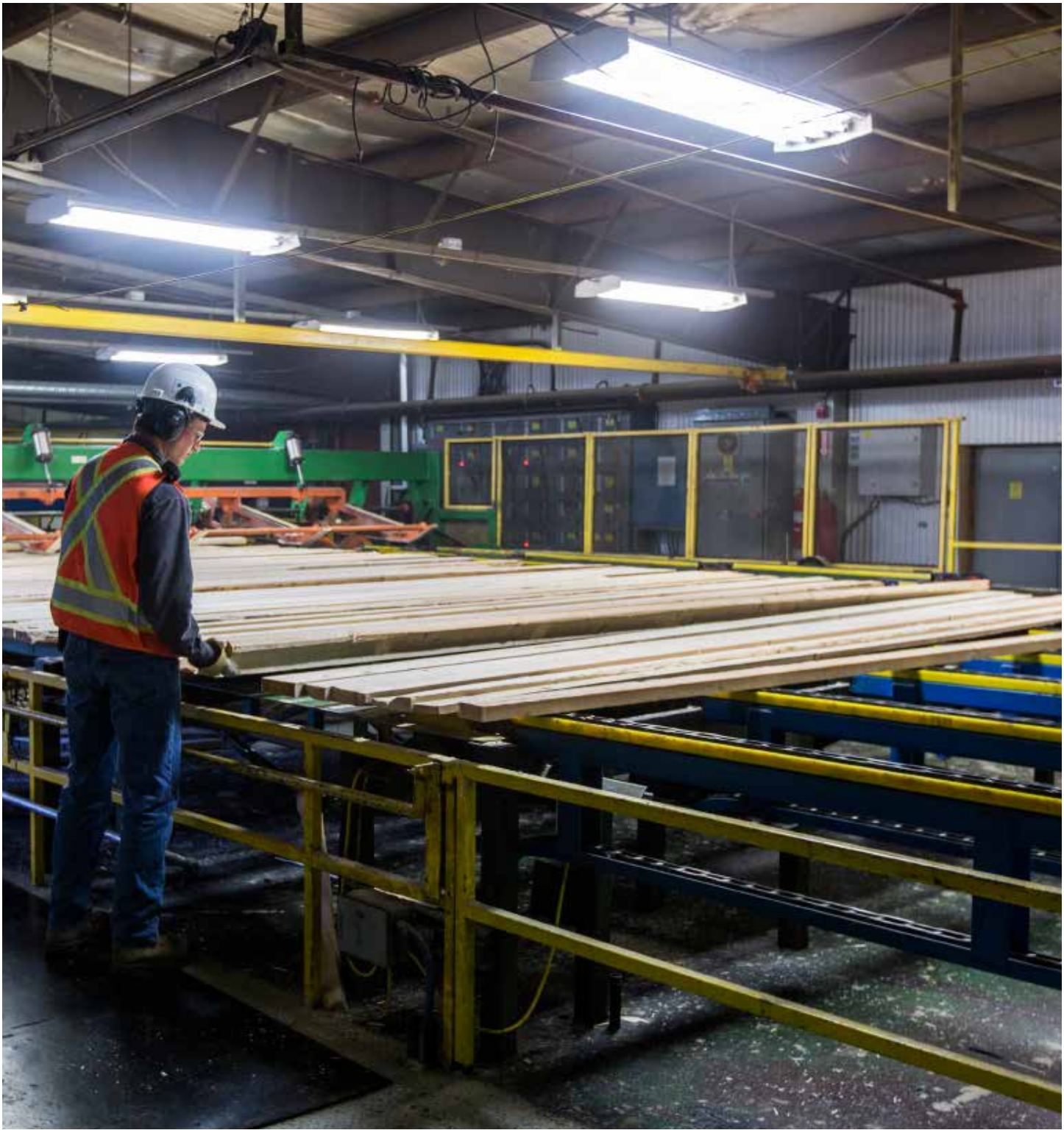
FORTIS BC™

Feasibility Study Proposal & Report Guide

Industrial Optimization Program



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1.0 Industrial Optimization Program overview

FortisBC Energy Inc. ("FortisBC") works with owners and long-term lease holders of industrial facilities in British Columbia to encourage greater energy efficiency. The Industrial Optimization Program (the "Program") provides funding to help identify and implement energy conservation measures (ECMs) that reduce the intensity of natural gas consumption for manufacturing and/or transformative processes in which raw materials are transformed into finished goods for the purpose of resale with the use of machines, tools and labour. The Program consists of three offers:

1. **Plant Wide Audit:** Funding towards a high-level, whole facility audit to identify opportunities to use natural gas more efficiently. A report will be developed recommending energy conservation measures with cost and savings estimates presented at a +/-50% uncertainty level.
2. **Feasibility Study:** Funding towards a detailed study of a specific system or process within a facility to fully investigate an opportunity to use natural gas more efficiently. A report will be developed to present cost and savings estimates of the energy conservation measure(s) at a +/-10% uncertainty level. The Feasibility Study is the basis for determining eligibility for the Technology Implementation offer.
3. **Technology Implementation:** Funding towards the installation of high-efficiency equipment as a retrofit, new construction or facility expansion project which will result in more efficient consumption of natural gas compared to standard practice.

2.0 Feasibility Study offer eligibility

The primary eligibility criteria for the Industrial Optimization Program Feasibility Study are as follows:

1. The facility consumes a minimum of 10,000 gigajoules of natural gas annually.
2. The facility uses natural gas as an input to a manufacturing or transformative process where raw materials are transformed into finished goods for the purpose of resale (industrial production) with the use of machines, tools and labour.
3. The facility is owned or leased long-term by the applicant.

Refer to the Industrial Optimization Program Feasibility Study terms and conditions for the full list of eligibility criteria.

3.0 Purpose of the Feasibility Study

The primary purpose of a Feasibility Study is to enable our customers to make investment decisions on recommended ECMs. The cost and savings estimates for each ECM must be presented at an uncertainty level of not more than +/- 10% and supported by vendor pricing.

4.0 Purpose of the guide

This guide has been developed to assist program participants and their appointed consultants with the preparation of a Feasibility Study proposal (the "Proposal") and a Feasibility Study report (the "Report"). If this guide is not followed, FortisBC will not be able to approve the Proposal or Report and will not be able to offer a Feasibility Study incentive.

To qualify for consideration, the Feasibility Study Proposal and Report must be conducted and prepared by a consultant included in our approved consultant list. Consultants can apply to become a FortisBC approved consultant by completing and submitting an application and providing all other required information related to skills, qualifications and experience. We will confirm in writing within 30 days of receipt of all necessary information whether or not the consultant is accepted. Contact the Industrial Rebates team at IndustrialRebates@fortisbc.com or **1-866-884-8833** for more information.

The Feasibility Study requires the consultant to generate two documents:

1. **Feasibility Study proposal:** The Proposal shall define the scope and cost of the Feasibility Study and provide a contextual overview of the facility's process, production, energy consumption profile and ECM(s) that will be studied.
2. **Feasibility Study report:** The Report shall present detailed analysis of the ECM(s) that have been approved as part of the proposal and application process. The ECM(s) and associated cost and savings estimates must be presented at an uncertainty level not more than +/- 10%.

This guide outlines the requirements for assessing natural gas ECMs. If there is an opportunity to conduct a Feasibility Study that incorporates both natural gas and electricity ECMs and the study is eligible to receive a rebate under our electricity demand side management programs, refer to Appendix A for additional requirements associated with identifying and assessing electricity ECMs.

5.0 Feasibility Study proposal requirements

The Proposal shall clearly define the scope and cost of the Feasibility Study. It must include:

1. a brief description of the facility, including location, site contact and an overview of operations
2. the system(s) or process(es) to be studied
3. the proportion of the facility's natural gas consumption that each system or process being studied consumes
4. the ECM(s) that will be studied
5. pre-study estimates of the ECM cost and energy savings
6. the methods used to estimate, or model, energy savings
7. reference to any previous studies or work that has identified the ECM(s) as an opportunity to enhance the energy efficiency of the facility
8. the name of the lead individual who will be responsible for conducting the Feasibility Study and completing the Feasibility Study report
9. total proposed cost including itemized costing broken down by job role, named individual, hourly rate, anticipated number of hours and budgeted expenses (e.g. travel)
10. a list of data and metering points required to complete the Feasibility Study and expected limitations on the scope of study

5.1 Application

The Feasibility Study proposal is an integral component of the application to the Feasibility Study offer. You are welcome to submit a draft version of a proposal in advance of the application; however, a final draft of a Feasibility Study proposal must be submitted along with a completed Feasibility Study application form for review and approval.

5.2 Application review meeting

We will review the information submitted in the application and proposal. If the proposed ECM(s) are eligible for the Program, an application review meeting will be scheduled. The application review meeting may occur in person or over the phone. During this meeting, a FortisBC program representative will review the project with you and your consultant to ensure there is a good understanding by all parties of the ECM(s) that will be analyzed, the requirements of the Feasibility Study deliverables and the importance of the findings to assess eligibility for the Technology Implementation offer. Please note that, after this meeting, we may request either for the proposal to be amended or for you to obtain a second proposal.

5.3 Application decision

We will notify you of the decision to approve or reject the application in writing. Upon this written approval, you may raise a purchase order for the consultant's services.

6.0 Feasibility Study report requirements

6.1 General

1. You shall submit the Report to FortisBC for review and approval within six (6) months of application approval.
2. The Report shall be grammatically correct. The language should be clear, concise and understandable to all readers, including non-technical readers.
3. All abbreviations must be defined.
4. Any figures (charts, graphs and schematics) must use easily distinguishable colour schemes.
5. All assumptions and limitations must be clearly defined.
6. Where references are used, they should be properly attributed and cited.
7. Tables and figures shall be numbered and titled.
8. Pages of the report shall be numbered.
9. Version control, such as the word "draft" or "final" should be printed at the header or footer of each page.
10. Implementation costs must be quoted in Canadian dollars ($).
11. Natural gas energy savings must be quoted in gigajoules per year (GJ/yr).
12. Natural gas cost savings must be quoted in Canadian dollars per year ($/yr).
13. Electricity energy savings must be quoted in kilowatt hours per year (kWh/yr).
14. Electricity demand savings must be quoted in kilowatts or kilovolt-amps, as applicable (kW or kVA).
15. Electricity cost savings must be quoted in Canadian dollars per year ($/yr).
16. Other fuel energy savings must be quoted in gigajoules equivalent per year (GJe/yr).
17. Other fuel cost savings must be quoted in Canadian dollars per year ($/yr).
18. Other energy units (Btu, m^3 or kWh equivalents) may also be used as long as gigajoules and kilowatt hours are also stated.
19. The study must consider the combined and interactive effects of all projects or measures, both individually and when bundled together, on the consumption, demand and cost of all energy sources and utilities.

6.2 Mathematical accuracy and consistency

All calculations should be checked for mathematical accuracy, and values should be consistent when repeated more than once. Standard conversion factors as provided below shall be used in the analysis.

Natural gas	Electricity	Other
1 GJ = 277.78 kWh	1 HP = 0.746 kW	1 m^3 = 35.31 ft^3
1 GJ = 26 m^3 of natural gas	1 kW = 3,412 Btu/hr	1 boiler HP[1] = 33,480 Btu
1 GJ = 947,817 Btu		1 boiler HP[1] = 34.5 lb/hr
1 GJ = 9.47817 therms		
1 m^3= 35,310 Btu[2]		

6.3 Feasibility Study report structure

The Report should include details pertaining to all sections as described below. While we do not necessarily want to impose a standard format on all firms, we do wish to ensure consistency across Feasibility Study reports.

Title page

1. Feasibility Study report title
2. customer's company name, facility name and facility address
3. consultant company's name
4. report completion date

Document control

1. version control:
    a. title
    b. version number
    c. date
    d. author
    e. consultant's signature
2. key contacts information:
    a. customer contact
        i. name
        ii. job title
        iii. office address
        iv. phone number(s)
        v. email address
    b. consultant contact
        i. consultant name
        ii. job title
        iii. office address
        iv. phone number(s)
        v. email address

[1]*From and at 100 °C*
[2]*Based on 1,000 Btu per ft^3*

Executive summary

The executive summary provides a high-level understanding of the opportunities identified through the Feasibility Study. It should include:

1. facility name and location
2. a brief description of facility's use and annual natural gas consumption
3. date of the feasibility study
4. a brief description of the ECM(s) that have been studied
5. a summary table for the ECM(s)[3] approved by FortisBC during the Feasibility Study application process outlining full costs and savings associated with the ECM(s) (Note: If more than one ECM has been approved to be studied, identify the characteristics of each ECM as well as a total of all ECMs combined. Where there are increases in consumption of an energy source as a result of implementing an ECM, savings should be identified as a negative number.)

ECM ID #	ECM name	Full project cost ($)	Natural gas savings (GJ/yr)	Electricity savings (kWh/yr)	Electricity demand reduction (kVA)	Other fuel savings (GJe/yr)	Total savings ($/yr)	Simple payback (years)	Measure life (years)
1									
2									
...									
Total									

6. the consultant's recommended next steps

Company and facility description

The Report shall provide a general overview of the following:

1. company information:
    a. legal name of company
    b. overview of company including sector and business description
    c. location(s) of operations
2. facility information:
    a. location
    b. description of operations
    c. facility production profile (e.g. production by month) and/or operating profile (e.g. weekly and annual operating schedule)
    d. number of years operating the facility
    e. planned changes to the facility or operations in next five years
    f. energy efficiency goals for the facility and any ECMs that have been recently identified and implemented
    g. description of the level of metering and submetering installed in the focus area of the study
    h. description of previous energy studies conducted at the facility

[3]*Cost and savings estimates are not to exceed an uncertainty level of more than +/-10%.*

Energy use analysis

The Report shall provide energy consumption history for all fuel types, including the following:

1. facility-level historical energy use for the most recent three-year period:
    a. natural gas
    b. electricity
    c. other fuel(s)
2. facility-level historical energy spending for the most recent three-year period (excluding PST and GST):
    a. natural gas
    b. electricity
    c. other fuel(s)
3. current unit and demand charge costs for natural gas, electricity and other fuel(s) (excluding PST and GST):
    a. unit and demand charges
    b. delivery charges
    c. service and connection charges
    d. power factor charges
    e. other charges, as applicable

Recommended energy conservation measure(s)

The Report shall detail the ECM(s) comprehensively, with costs and energy saving estimates provided at no more than a +/- 10% uncertainty level. Each ECM must include the following:

Existing system or process description

1. Include a schematic of the existing system or process.
2. Describe the system or process for which the ECM has been identified, including:
    a. operational requirements
    b. process flow
    c. process boundary
    d. energy and mass flows across the boundaries
3. Provide a description of the existing equipment:
    a. unique identifier
    b. make and model
    c. rated capacity, efficiency and average loading
    d. age, condition and estimated remaining life
    e. the residual monetary value associated with the remaining life of the equipment
4. Provide the current annual natural gas, electricity and other fuel consumption for the system or process for a period of two or three years. Please indicate the source of this data record.
5. Indicate whether the system or process is or has the capability to be fuelled by two or more sources. Where such cases exist, please describe the historical consumption splits between natural gas and the other fuel(s) and the technical and/or economic drivers behind the decision to use natural gas versus the other fuel(s).
6. Identify major energy use drivers (e.g. production, operating hours, outside temperature) for the system(s) or process(es) being analyzed. Trend energy drivers versus energy consumption.
7. Include pictures of the existing system or process (can be issued in an appendix).

Base case system description

1. Each ECM must be evaluated against a base case. We will refer to the base case to determine the incremental costs and energy savings of the proposed ECM. The base case may be the existing equipment installed or may be new, standard-efficiency equipment if the existing equipment installed is deemed to be at end of life. The following scenarios describe base case determination:
    a. If the ECM is adding to or modifying existing equipment setup (i.e. adding heat recovery or eliminating waste streams) then the base case is the current operating condition. For these scenarios, the full cost of the ECM would represent the incremental cost, and the incremental energy savings would be assessed against the current energy consumption.
    b. If the ECM is replacing existing low-efficiency equipment in good condition that can continue to operate effectively through regular maintenance activity, then the base case is the equipment or condition currently in place. A condition assessment must be performed by a third party to determine an estimate of the remaining life of the equipment, which typically goes beyond annual routine inspection. For these scenarios, the full cost of the ECM plus the residual value of existing equipment would represent the incremental cost, and the incremental energy savings would be assessed against the current energy consumption.
    c. If the ECM is for a new construction project or replacing end-of-life equipment requiring necessary upgrades or replacement, then the base case is defined as the equipment and operation that would have been specified in accordance with current energy efficiency codes and standards. If the particular equipment or system is not confined by or mandated to meet the energy efficiency requirements per any current codes and standards, common industry practices may be considered. For these scenarios, the difference in cost between the ECM and the standard efficiency equivalent would represent the incremental cost, and the incremental energy savings would be the difference between the energy consumption of standard efficiency equipment and the energy consumption with the ECM.
2. The ECM is defined as the higher capital cost, more efficient option than the base case.
3. If the ECM is a lower cost option than the base case, then the project will not be eligible for consideration or incentives under the program.

Energy conservation measure description

1. Describe each ECM and the work required to accomplish implementation.
2. Clearly indicate the affected area within the facility.
3. Provide a schematic of the proposed ECM integrated within the system or process.
4. Explain the methodology of how the energy savings were derived (e.g. field measurements, engineering calculations, manufacturer's equipment performance datasheets, etc.).
5. Describe any assumptions that were fundamental in developing the recommendations. References, industry specific standards or process documentation shall also be provided if they support assumptions.
6. The proposed ECM must specify the use of products and/or equipment that are new and comply with any laws, regulations or bylaws regarding permits, codes, or standards.

Energy and cost savings estimate

1. The ECM(s) and associated cost and savings estimates must be presented at an uncertainty level of not more than +/- 10%. Provide the characteristics for each proposed ECM as described below. Where there are increases in consumption of an energy source as a result of implementing an ECM, savings should be identified as a negative number.

ECM ID #	ECM name	Full project cost ($)	Natural gas savings (GJ/yr)	Electricity savings (kWh/yr)	Electricity demand reduction (kVA)	Other fuel savings (GJe/yr)	Total savings ($/yr)	Simple payback (years)	Measure life (years)
1									

2. Identify the base case and detail the base case characteristics in the Report's appendix. Please see the report appendices section for a table outlining the required fields.

3. The Feasibility Study report must consider the combined and interactive effects of all ECMs in terms of consumption, demand and cost of all energy sources and utilities. Double counting of energy savings is not acceptable.
4. Energy saving estimates must be reasonable when compared against simplified calculation methods.
5. A risk analysis briefly describing the potential obstacles to the realization of the energy savings must be provided. Describe and quantify the potential impact on the projected energy savings and discuss the likelihood that the obstacles identified will materialize.

Measurement and verification considerations

If the recommended natural gas ECM(s) is assessed to be cost effective and an Industrial Optimization Program Technology Implementation funding offer is accepted by the participant, the project may need to be supported by measurement and verification (M&V) activity to determine the actual natural gas savings after the ECM has been implemented. The Feasibility Study report must document the metering that will be used to verify the energy savings:

1. list of facility level meters
2. list of existing submeters and sensors for the system(s) or process(es) being studied
3. frequency and method of data collection (e.g. automatic data collection or manual readings)
4. length of historical data record for each meter or sensor
5. identify where data is stored and whether this data record is accessible for M&V requirements
6. schematic with boundary outlining meters and sensors associated with the system or process being studied

Conclusions and recommendations

The Report should include recommended next steps that the facility can undertake to progress towards achieving their energy efficiency goals.

Report appendices

1. To ascertain whether the ECMs are eligible for the Technology Implementation incentive offers of the Industrial Optimization Program, additional information is required related to the project costs and energy consumption of the existing conditions (current case), the base case and the ECM. Please complete the following table and include it in the Report as an appendix. Where there are increases in consumption of an energy source as a result of implementing an ECM, savings should be identified as a negative number.

ECM ID #	ECM name	Implementation costs		Incremental costs	Natural gas consumption			Incremental natural gas savings	Electricity consumption			Incremental electricity savings	Electricity demand			Incremental electricity demand savings	Other fuel consumption			Incremental other fuel savings
		Base case	ECM		Current case	Base case	ECM		Current case	Base case	ECM		Current case	Base case	ECM		Current case	Base case	ECM	
		$	$	$	GJ/yr	GJ/yr	GJ/yr	GJ/yr	kWh/yr	kWh/yr	kWh/yr	kWh/yr	kVA	kVA	kVA	kVA	GJe/yr	GJe/yr	GJe/yr	GJe/yr
1																				
2																				
...																				
Total																				

2. Quotes from vendors outlining removal of existing equipment, new equipment, installation commissioning costs, etc. must be included in an appendix. These should clearly identify the costs of the proposed ECM and a base case where applicable. Where multiple quotes exist, provide a summary table that identifies the total cost along with each task and associated cost.

6.4 Feasibility Study report supporting documentation required

1. All engineering analysis/calculations and supporting documentation associated with the Feasibility Study must be provided in a fully annotated and accessible Excel spreadsheet. The Excel spreadsheet must:
    a. be in an unprotected format (e.g. cells with formulas showing calculations)
    b. provide transparent and traceable calculations for technical review
    c. include supporting energy usage histories, equipment performance data, load calculations and cost estimates that are used in the calculations and estimates
    d. include all assumptions, inputs and outputs of the engineering analysis/calculations for each individual ECM. The values, units, sources of information and rationale for all relevant assumptions should be clearly stated.
2. If field measurement data or equipment performance data from the facility was used during the analysis then the data shall also be provided to FortisBC.
3. Quotes from vendors outlining removal of existing equipment, new equipment, installation commissioning costs, etc. must be included in an appendix. These should clearly identify the costs of the proposed ECM and a base case where applicable. Where multiple quotes exist, provide a summary table that identifies the total cost along with each task and associated cost.
4. If the existing system or process equipment is beyond the published measure life and the consultant believes the equipment is not at its end of life, evidence must be provided that validates and justifies the remaining life estimates.
5. References, industry-specific standards or process documentation shall also be provided if they support assumptions.
6. Include equipment cut sheets and specifications as available for existing equipment and applicable for proposed new equipment.
7. Include any audit reports, feasibility studies, etc. that have been conducted historically on the ECM(s) that are identified in the Feasibility Study.

7.0 Appendix 1 – Joint natural gas and electricity focused Feasibility Studies

If an energy conservation measure identified in the Feasibility Study proposal has an electricity energy savings component that can be supported by FortisBC's electricity demand side management programs, the following additional requirements must be adhered to.

Feasibility Study proposal

1. Identify the pre-study estimates costs and savings associated with ECMs relating to electricity.
2. Identify the rebate program the customer wishes to attract financial support from for the electricity component of the ECM and whether it is intended that Feasibility Study is joint funded.

Feasibility Study report

Executive summary

1. Include a brief description of the facility's annual electricity consumption.
2. Identify the rebate program the customer wishes the electricity component of the Feasibility Study to be supported and reviewed by.

Proposed energy conservation measures

1. Extend the description of the existing system or process to incorporate the electrical components.
2. Describe the existing equipment, as available and applicable, including:
    a. unique identifier
    b. equipment make, model, RPM, rated capacity, efficiency and average loading
    c. motor make, model, frame, size, RPM, nominal efficiency and type of driver
    d. age, condition and estimated remaining life
3. Estimate annual electricity consumption and electrical demand by equipment or process, as available. Units to express electrical demand should be consistent with those being used for billing.

Measurement and verification considerations

For ECMs related to electricity savings, if the recommended ECM(s) is assessed to be cost effective and a FortisBC funding offer is accepted by the participant, the project may need to be supported by measurement and verification (M&V) activity to determine the actual electricity savings after the ECM has been implemented. The Feasibility Study report must document the electricity metering that will be used to verify the electricity savings:

1. list of facility-level meters
2. list of existing submeters and sensors for the system(s) or process(es) that are being studied
3. frequency and method of data collection (e.g. automatic data collection or manual readings)
4. length of historical data record for each meter or sensor
5. identify where data is stored and whether this data record is accessible for M&V requirements
6. schematic with boundary outlining meters and sensors associated with the system or process being studied