

# Plant Wide Audit 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 where 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 Plant Wide Audit offer eligibility

The primary eligibility criteria for the Industrial Optimization Program Plant Wide Audit 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 Plant Wide Audit terms and conditions for the full list of eligibility criteria.

## 3.0 Purpose of the Plant Wide Audit

The purpose of the Plant Wide Audit is to enable customers to identify a range of opportunities to use natural gas more efficiently at their facility. The findings of the Plant Wide Audit will be presented in a report that details cost and savings estimates at a +/-50% uncertainty level. The report will help customers to understand how natural gas is consumed across their facility, to implement no-cost and low-cost measures identified in the audit quickly and easily and to prioritize larger capital projects that will require detailed feasibility studies.

For facilities in our Shared Service Territory where FortisBC provides both electricity and natural gas, where applicable, the audit will focus on both natural gas and electricity usage. For all other FortisBC customers, the audit will focus only on natural gas usage.

## 4.0 Purpose of the guide

This guide has been developed to assist program participants and their appointed consultants with preparing a Plant Wide Audit proposal (the “Proposal”) and a Plant Wide Audit 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 Plant Wide Audit incentive.

To qualify for consideration, the Plant Wide Audit 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](mailto:IndustrialRebates@fortisbc.com) or **1-866-884-8833** for more information.

The Plant Wide Audit requires the consultant to generate two documents:

1. **Plant Wide Audit proposal:** The Proposal shall define the scope and cost of the Plant Wide Audit and provide a contextual overview of the facility's process and production, energy consumption profile and potential ECMs.
2. **Plant Wide Audit report:** The Report shall present a high-level analysis of a facility's process and production, historical energy consumption breakdown, viable ECMs and the associated saving and cost estimates (+/- 50% uncertainty level).

This guide outlines the requirements for assessing natural gas ECMs. If there is an opportunity to conduct a Plant Wide Audit that identifies both natural gas and electricity ECMs and the audit 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 Plant Wide Audit proposal requirements

The Proposal shall clearly define the scope and cost of the Plant Wide Audit. It must include:

1. a brief description of the facility, including location, site contact and an overview of operations
2. potential natural gas end-uses that will be investigated as a part of the study
3. the name of the lead individual who will be responsible for conducting the Plant Wide Audit and completing the Plant Wide Audit report
4. the 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)
5. a list of data required to complete the Plant Wide Audit and expected limitations on the scope of study

### 5.1 Application

The Plant Wide Audit proposal is an integral component of the application to the Plant Wide Audit offer. You are welcome to submit a draft version of a proposal in advance of the application; however, a final draft of a Plant Wide Audit proposal must be submitted along with a completed Plant Wide Audit 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 of requirements and deliverables by all parties. 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 Plant Wide Audit 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 (kW or kVA), as applicable.
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<sup>3</sup> 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 <sup>3</sup> = 35.31 ft <sup>3</sup>
1 GJ = 26 m <sup>3</sup> of natural gas	1 kW = 3,412 Btu/hr	1 boiler HP <sup>1</sup> = 33,480 Btu
1 GJ = 947,817 Btu		1 boiler HP <sup>1</sup> = 34.5 lb/hr
1 GJ = 9.47817 therms		
1 m <sup>3</sup> = 35,310 Btu <sup>2</sup>		

<sup>1</sup>From and at 100 °C <sup>2</sup>Based on 1,000 Btu per ft<sup>3</sup> <sup>3</sup>Cost and savings estimates should target a +/- 50% uncertainty level

## 6.3 Plant Wide Audit 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 Plant Wide Audit reports.

### Title page

1. Plant Wide Audit 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

### Executive summary

The executive summary provides a high-level understanding of the opportunities identified through the Plant Wide Audit. It should include:

1. facility name and location
2. brief description of facility's use and annual natural gas consumption
3. date of the plant wide audit
4. a summary table for all ECMs<sup>3</sup> identified in the Plant Wide Audit, as depicted below (Note: 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									

5. the consultant's recommended next steps

<sup>3</sup>Cost and savings estimates should target a +/- 50% uncertainty level

## 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 at the facility
  - h. description of previous energy studies conducted at the facility

## 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 costs for natural gas, electricity and other fuel(s) (excluding PST and GST), including:
  - a. unit and demand charges
  - b. delivery charges
  - c. service and connection charges
  - d. power factor charges
  - e. other charges, as applicable
4. End-use breakdown (e.g. spacing heating, process heating) on an annual basis to identify natural gas consumption for all major end uses (>10% of the facility's natural gas consumption). Please indicate whether these are estimated or actual values and the source of this information.
5. Indicate whether any process or system is or has the capability to be fuelled by two or more sources. Where such cases exist, please outline 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) at a facility level and process or system level for the processes or systems being analyzed. Trend major energy drivers versus energy consumption. Compare the facility performance with that of a similar facility, if possible.

## Recommended energy conservation measures

The Report shall identify and describe the energy conservation measures that could be implemented at the facility and provide estimated cost and energy savings at a high level (+/- 50% uncertainty level). In addition to capital

upgrade projects, the ECMs should include low-cost or no-cost measures that can be implemented quickly and easily. Each ECM should include the following:

1. Describe the existing system or process:
  - a. a brief description, including the performance/capacity, age and condition
  - b. equipment details, including a unique identifier (if it exists), make, model, rated capacity, efficiency and average loading
  - c. estimated operating hours per year
  - d. a brief description of the operating profile, conditions and control strategy
  - e. estimated annual natural gas consumption by equipment or process, as available
2. For each proposed ECM:
  - a. describe in general terms and the work required to accomplish implementation
  - b. clearly indicate the affected area within the facility
  - c. specify the use of products and/or equipment that are new and ensure they comply with any laws, regulations or bylaws regarding permits, codes or standards
3. Energy and cost savings estimate<sup>4</sup>:
  - a. Provide the characteristics of each proposed ECM, including the following. 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									

- b. List general assumptions that have been used to determine ECM savings and costs. ECMs where limited consumption data is available and/or savings estimation is infeasible, areas of uncertainty should be documented.
- c. Outline any obvious constraints or considerations associated with implementing the ECM.
- d. The 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.

### Conclusions and recommendations

The Report should provide recommended next steps that the facility can undertake to progress towards achieving their energy efficiency goals. A list of ECMs for which further study may be required through the Industrial Optimization Program Feasibility Study offer should be detailed.

## 6.4 Plant Wide Audit report supporting documentation required

1. All engineering analysis/calculations and supporting documentation associated with the Plant Wide Audit 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.

<sup>4</sup>Cost and savings estimates should target a +/- 50% uncertainty level



# 7.0 Appendix A – Joint natural gas and electricity focused Plant Wide Audits

If there is an opportunity to conduct a Plant Wide Audit that identifies both natural gas and electricity energy conservation measures that can be supported by FortisBC's electricity demand side management programs, the following additional requirements must be adhered to.

## Plant Wide Audit proposal

1. Provide potential electricity end-uses that will be investigated as a part of the study.
2. Identify the rebate program the customer wishes the electricity component of the Plant Wide Audit to be supported and reviewed by.

## Plant Wide Audit report

### Executive summary

1. Include a brief description of the facility's annual electricity consumption.

### Energy use analysis

1. End-use breakdown on an annual basis to identify electricity consumption for all major end uses (>10% of the facility's electricity consumption). Please indicate whether these are estimated or actual values and the source of this information.
2. A description of the facility's power factor. For facilities with multiple meters, the power factor for each meter should be included.
3. An overview of a facility's self-generation profile, if present, including backup generation and other load-connected and stand-alone generation systems. The overview should include an estimate of annual self-generation and provide additional information on the operating schedule of self-generation equipment.

### Recommended energy conservation measures

1. For proposed ECMs that include an electrical component, please include:
  - a. electrical equipment details, including a unique identifier (if it exists), make, model, rated capacity, motor sizes, RPM, nominal efficiency and average loading
  - b. estimated 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)