

**MANITOBA HYDRO
Power Smart
Load Displacement Program**

**Engineering Cost Estimate Study Guide
(Version 3)**

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I. OVERVIEW

This guide is for Professional Engineers and technical experts completing a Engineering Cost Estimate Study (study) for clients participating in Manitoba Hydro's Power Smart Load Displacement Program (program).

The purpose of the study is to accurately define the capital and operating costs for a specified level of project definition. Engineering studies shall pertain to a customer-sited Load Displacement Self-Generation System previously identified in a Load Displacement Program Feasibility Study submitted and approved by Manitoba Hydro.

Engineering Cost Studies are eligible for financial incentives of up to 50% of the eligible study cost under Manitoba Hydro's Power Smart Load Displacement Program. The amount of any incentive provided by Manitoba Hydro is determined through examination of the study application and study proposal, along with an interview with the Professional Engineers and technical experts selected by the customer to complete the study. Terms of incentive payment are 30 days after Manitoba Hydro approval of final report. Progress payments may be negotiated on a case-by-case basis at the discretion of Manitoba Hydro.

Clear project definition and cost accuracy information are key aspects for the assessment of Manitoba Hydro's incentive contribution. ASTM Standard E2516-11 (Standard Classification for Cost Estimate Classification System) or equivalent shall be referenced when preparing the study proposal.

Project implementation incentives are based upon the eligible capital and operating costs; contracted annual electrical energy and peak winter and summer capacity provisions. Implementation incentives are negotiated with Manitoba Hydro and involve the signing of a Load Displacement Generation Agreement. These features shall be kept in context and view within the study.

II. KEY CONSIDERATIONS

- The study must specify the project capital and operating cost within a predefined level of project definition and cost accuracy. Estimate classifications provided within ASTM Standard E2516-11 (Standard Classification for Cost Estimate Classification System) or equivalent shall be referenced when specifying project definition and accuracy of cost estimates.
- The study report must contain adequate information for the client and Manitoba Hydro to make a decision on whether to move forward towards project implementation.
- The study must provide a thorough estimate of the capital and operating costs associated with the project. Potential items to include are fuel source, conversion technology, environmental mitigation, operational issues, including licensing and permitting, and maintenance aspects, along with an outline of the associated costs and benefits and appropriate financial analysis.
- If financial incentives will be requested for project implementation:
 - ✓ biomass fuel(s) must meet the ASTM E 1705 definition of biomass and biomass fuel, as well as, Manitoba Hydro's definition of sustainable biomass;
 - ✓ electrical energy generated or recovered must be used within the customer's operation to serve the client's electrical loads;
 - ✓ If excess electrical energy is generated and sold to Manitoba Hydro through a power purchase agreement, that portion of project costs associated with the power purchase will not be eligible for implementation incentives through the program;
 - ✓ energy generated or recovered must be measured with revenue grade metering, which will be provided by Manitoba Hydro under the Load Displacement Program;
 - ✓ requirements for permitting, testing, monitoring, reporting, operating, and maintaining the equipment must be specified; and
 - ✓ certain expenses may not be eligible for implementation incentives, including expenses for auxiliary equipment and services, land and building purchases, contingencies, taxes, warranties, training and commissioning, and operating and maintenance.
- The Manitoba Hydro Program Leader shall be contacted to answer any questions.

III. GENERAL REQUIREMENTS

Language, Grammar, and Style:

The report must be written in the English language, be grammatically correct and free of spelling errors. The written text shall be clear, concise, and understandable for all readers. Page formatting shall include headers, footers, margins and page numbering.

Units:

All costs must be quoted in Canadian currency. Cost quotations in USA or other foreign currencies must be converted to Canadian currency and the currency exchange rate used clearly specified.

Electrical energy load reduction savings must be quoted in kilowatt-hours (kWh) or mega-watt-hours (MWh). Electrical power load reduction savings must be quoted in kilowatts (kW) or megawatts (MW). Other applicable units associated with the study must adhere to a common base of measure, preferably SI units.

Equipment capacities ratings must be clearly referenced as an input or output rating.

Engineering Calculations:

Manual and software based engineering calculation methods must be transparent and traceable to permit technical review by third parties. All assumptions and variables must be clearly stated and properly documented. Modeling results must be realistic when tested against simple manual check methods. All calculations must be checked for mathematical accuracy and values must be consistent when repeated in the report.

Documentation:

Energy consumption profiles, equipment performance specifications, analytical test results, engineering calculations, cost estimates, and assumptions must be properly documented and referenced in the report. Copies of supporting information such as engineering calculation methods, field energy measurements, meter readings, logged data, computer models, quotations, etc. must be included in the appendix. Tables, charts, photographs and other diagrams included in the report must be referenced and properly labeled. The degree of project definition and level of accuracy associated with project cost estimates must be specified. Costs sensitive to specific conditions, such as time, must be clearly identified.

DEFINITIONS

Biomass: (ASTM E1705 definition) any material, excluding fossil fuels, which is or was a living organism that can be used as a fuel directly or after a conversion process. Peat is not a biomass.

Biomass Fuel: fuel derived from biomass.

Combined Heat and Power (CHP): The simultaneous production of heat and power from a fuel source in order to achieve a high rate of fuel conversion efficiency.

Contingency Biomass: Crop residues and dedicated energy crops procured from agricultural producers in Manitoba and/or biomass fuels purchased from biomass fuel manufacturers.

Customer-Sited Load Displacement Generation: On-site electrical energy generation that supplies part or all of the customer's own capacity and energy needs.

Firm Capacity: The capability to deliver electrical energy when required by the customer's energy consuming load(s).

Implementation Incentive Agreement: A contract between Manitoba Hydro and the customer that outlines the performance requirements for the customer-sited load displacement generation and the associated incentive payment.

Load Displacement Generation: The capacity and quantity of electrical energy displaced by the customer-sited load displacement generation.

Other Renewable Energy Sources: Solar, wind, hydro and tidal.

Sustainable Biomass: (Manitoba Hydro definition) Fuels derived from biomass sources that do not aggravate global warming. The biomass carbon functions in a short cycle such that re-growth is balanced with emissions and adoption of sustainable land use practices. Biomass currently disposed of via landfilling, land application and/or incineration is considered eligible.

Waste and Byproduct Streams: Materials generated as the result of a process that are deemed to have little or no value, and represent a cost for disposal and/or an environmental liability, and are potential fuel sources for the production of useful energy.

IV. DETAILED ENGINEERING COST STUDY PROPOSAL OUTLINE

The study proposal must adhere to the following format unless otherwise approved by the client and Manitoba Hydro in writing.

1. COVER PAGE

- Study proposal title
- Client's name and study site
- Name of firm to complete study
- Proposal submission date

2. DESCRIPTION

A brief description of the proposed project to be studied must be provided in this section.

3. SCOPE

A brief description of the scope of work for the study must be provided in this section.

4. TEAM

The names, credentials and contributions of individuals and sub-contractors involved with the study must be listed in this section.

- Name of contact(s) for the study
- Telephone number(s)
- Fax number(s)
- Email address(s)

5. SCHEDULE

A brief schedule outlining the major tasks and milestones associated with the study must be listed in this section. Expected start and completion dates must be included.

6. COST

A cost breakdown to complete the study must be listed in this section. Any additional sources of public sector agency funding for the study must be listed.

V. DETAILED ENGINEERING COST STUDY REPORT OUTLINE

The study report must adhere to the following format unless otherwise approved by the client and Manitoba Hydro in writing.

1. TITLE PAGE

- Study report project title
- Name of client and proposed project site
- Name of firm and name(s) of author(s)
- Report completion date

2. EXECUTIVE SUMMARY

A brief summary of the project and the major findings of the study must be provided in this section.

3. TABLE OF CONTENTS

List the major sections of the report and their page numbers.

4. LIST OF FIGURES, CHARTS AND TABLES

List the figures, charts and tables referenced in the report and their page numbers.

5. INTRODUCTION

This section must include a detailed description of the project and cost estimation classification employed.

6. MAIN BODY

This section must include a detailed explanation of the capital and operating cost estimates for the project. The discussion shall lead to a clear indication of the type of decisions that can be made from the cost estimates. As determination of the available project implementation incentives are based upon the estimated capital and operating costs, along with the annual electrical winter and summer capacity and annual energy provisions, these features shall be kept in prominence.

6.1. Degree Of Project Definition

This section must include a thorough description of the cost estimate. The degree of project definition must be clearly identified. Discussion points include project scope, documentation and other related information.

Key items to confirm:

- Completeness of the design
- Quality of the design

6.2. End Usage For Estimate

This section must include a thorough description of the end use for the estimate that has been prepared. Discussion points include the progression of the degree of project definition and the confidence that can be placed on the estimate.

Key items to confirm:

- Specify the end use
- Specify level of confidence

6.3. Estimating Methodology

This section must include a thorough description of the estimating methodology employed. Discussion points include how estimates were determined and how these estimates achieve the outcome specified in the study proposal.

Key items to confirm:

- Amount of stochastic estimating
- Amount of deterministic estimating

6.4. Expected Accuracy Range

This section must include a thorough description of the degree to which the final cost outcome could vary from the cost estimate. Discussion points include technology maturity, project complexity, and assumptions to prepare estimate.

Key items to confirm:

- Technology maturity and project complexity
- Specify accuracy range

6.5. Effort To Prepare Estimate

This section must include a thorough description of the level of effort employed to prepare the estimate. Discussion points include the cost, time and resources.

Key items to confirm:

- Study cost as a percentage of the total estimated project cost
- Information gathered to supply project definition

7. CONCLUSIONS

This section must highlight the findings of the study.

8. RECOMMENDATIONS

This section must recommend what the next step shall be in order to proceed forward towards implementation.

9. APPENDICES

The appendices must include all supporting information related to the study.