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PERFORMANCE OPTIMIZATION PROGRAM
Feasibility Study Guide

I. INTRODUCTION

This guide has been written to assist you 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.

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.

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II. GENERAL REQUIREMENTS

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

Documentation:
- Electrical savings shall be quoted in kW (demand) and kWh (energy). Natural gas savings shall be quoted in cubic meters (m³) (energy). Note that BTU or other thermal units can be used throughout the report, but final savings shall be converted to m³.
- All numbers related to the energy savings results must be supported by engineering calculations, equipment performance data sheets, etc. indicating how they were derived and all relevant assumptions should be clearly stated. This applies to equipment and installation costs and payback calculations as well.
- When quoting equipment capacities, clearly indicate whether input or output.
- Engineering calculations, equipment performance data sheets, cost estimate quotations, etc. must be included in an Appendix.

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.
III. DEFINITIONS - BASE CASE / ENERGY EFFICIENT CASE

For all projects, there will always be a lower cost, less efficient option and a higher cost, more efficient option.

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

The **Energy Efficient Case** is defined as the higher 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 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 Performance Optimization Program personnel for assistance.

IV. ENERGY CONVERSION FACTORS

<table>
<thead>
<tr>
<th>Electricity</th>
<th>Natural Gas</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 HP = 0.746 kW</td>
<td>1 m³ = 35,310 BTU*</td>
<td>1 m³ = 35.31 ft³</td>
</tr>
<tr>
<td>1 kW = 3412 BTU / hr</td>
<td>1 therm = 100,000 BTU</td>
<td>1 boiler HP** = 33,480 BTU</td>
</tr>
<tr>
<td></td>
<td>1 CCF = 100,000 BTU</td>
<td>1 boiler HP** = 34.5 lb/hr</td>
</tr>
<tr>
<td></td>
<td>1 MCF = 1,000,000 BTU</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 GJ = 948,210 BTU</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 MMBTU = 1,000,000 BTU</td>
<td></td>
</tr>
</tbody>
</table>

* based on 1000 BTU per ft³
** from and at 212F
V. **FEASIBILITY STUDY PROPOSAL OUTLINE**

The Feasibility Study Proposal should include all of the following sections, and should normally be no more than two to three pages in length. The recommended proposal format is as follows. A sample Feasibility Study Proposal is included at the end of this document as Example 1.

**TITLE PAGE**
- Feasibility Study Proposal Title
- Client name and facility location
- Consultant name
- Date

**1.0 PROJECT DESCRIPTION**

**1.1 Application/Process Description** – i.e., describe the application or process to be studied including equipment type, size and condition/age. Provide a basic single line process schematic showing major pieces of equipment.

**1.2 Current Operating Situation** – i.e., describe how the current system, called the base case, is operating including hours of operation, loading conditions and control schemes. This will establish the duty cycle for the base case system. Electrical or natural gas usage for the base case will be compared to the electrical or natural gas usage for the energy efficient case to establish the potential energy savings.

**1.3 Potential for Energy Savings** – i.e., identify the efficiency measures for the energy efficient case that will be assessed and describe how energy savings will be achieved for each measure. Consider all portions of the system including end uses, distribution network, supply equipment and controls for optimization. For each measure, provide an estimate of possible electrical demand and annual electrical or natural gas energy savings in terms of base case energy usage.

Note: It is expected that some pre-feasibility evaluation has been completed that indicates the potential cost savings associated with the efficiency measures are attractive enough to justify the cost of performing this feasibility study.

**1.4 Other Project Benefits** – i.e., identify other quantifiable project non-energy benefits such as reductions in water or sewer charges, solid waste or air emissions as well as reduced maintenance, increased reliability, increased productivity, less raw material, etc. that might be realized as a result of system optimization.

**1.5 Scope of Work** – i.e., identify the study tasks and describe the work to be done in each task. Include a basic schedule for completion of the study tasks.

**2.0 STUDY TEAM**
Identify the proposed engineering consultant, technical specialist or other personnel who will be involved in the study.

**3.0 STUDY COST**
i.e., provide the total estimated cost for the study including labour, disbursements and PST.

End.
VI. **FEASIBILITY STUDY REPORT OUTLINE**

The Feasibility Study Report should include all of the following sections. Sample Feasibility Study Reports are included at the end of this document as Example 2 for electricity savings and Example 3 for natural gas savings.

**TITLE PAGE**
- Feasibility Study Report Title
- Client name and facility location
- Consultant name
- Date

**1.0 PROJECT DESCRIPTION**
- Describe the manufacturing operation or process in general terms.
- Identify if the project is for a production capacity change, or a retrofit to maintain the same production capacity.
- Describe the Base Case and Energy Efficient Case options that have been evaluated.
- Confirm that proven reliable technology, with expected equipment life of 10 years or greater will be used for the Energy Efficient Case.
- Include a basic single line process schematic showing the Base Case and Energy Efficient Case options.

**2.0 PROJECT ASSESSMENT**

**2.1 Energy Savings Estimate**
- State the electrical or natural gas usage for both the base case and energy efficient case. Calculate the savings for kW demand reduction (electricity only), and kWh or m3 annual energy reduction. Clarify if savings occur in winter months (Nov - Apr) and / or summer months (May - Oct). Present the energy savings, along with the corresponding cost savings, in tabular form as shown in Examples 2 and 3. Include applicable taxes such as PST and City tax as appropriate.
- Explain how the energy savings estimates were determined (e.g. engineering calculations, manufacturer’s equipment performance datasheets, etc.) and include all calculations in an Appendix.

**2.2 Other Project Benefits**
- For quantifiable project non-energy benefits, provide description of how the other project benefits were determined (e.g. maintenance records, calculations, manufacturer’s data, etc.). Include applicable taxes such as PST and City tax as appropriate.

**2.3 Project Costs**
- Provide breakdown of project costs, in tabular form as shown in Examples 2 and 3, for both 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.
- 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.

2.4 Simple Payback And Incentive Calculation

• Simple payback is determined using the incremental project costs and electrical or natural gas benefits and other process benefit savings 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 or natural gas savings, the total project benefits and the cost of the project. The amount of the incentive is determined as the lesser of three values: a value based on electrical or 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 projects and $100,000 for natural gas projects.
• The Incentive Calculation Sheet (Excel spreadsheet) automatically calculates the project payback and eligible incentive amounts. (Available for download from Manitoba Hydro website located as www.hydro.mb.ca under Energy Efficiency for Business/Performance Optimization Program.)

2.5 Recommendations And Summary
• Indicate the option recommended for implementation and the reason for its selection.

3.0 MEASUREMENT AND VERIFICATION OF SAVINGS
• The Program follows the principles described in the International Performance Measurement and Verification Protocol -Volume 1 (March 2002) 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.

4.0 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.

APPENDIX A
Incentive Calculation Sheet

APPENDIX B
Engineering calculations for energy savings, single line schematics, manufacturer equipment performance data sheets, cost quotations, and other information as necessary to support this incentive application report.
End.
VII. EXAMPLE 1 - FEASIBILITY STUDY PROPOSAL

PROCESS WATER SYSTEM FEASIBILITY STUDY
XYZ Manufacturing, Winnipeg, Manitoba
Consultant Name
November 2006

1.0 PROJECT DESCRIPTION

1.1 Application/Process Description
The existing process water system consists of two 300 USGPM centrifugal pumps each equipped with 50 HP motors operating on a duty/standby basis, a control valve and distribution piping to several areas of the plant. The existing pumps and motors are over 20 years old and the system has been expanded several times since its original installation. Process water is drawn from an onsite storage reservoir. A single line process schematic is shown in Figure 1.

1.2 Current Operating Situation
The system operates for roughly 4000 hrs per year (2 shift basis, five days per week). The pumps are manually started at the beginning of each day and run continuously, recirculating water back to the reservoir when there is no plant demand.

1.3 Potential for Energy Savings
The installation of a variable frequency drive is expected to result in both electrical demand and energy savings in excess of 20% of current values. Primary focus of this study will be on confirming actual plant process water flows and estimating potential electrical demand and energy savings.

1.4 Other Project Benefits
There will be some reduced maintenance costs resulting from upgrading the pumps however actual cost savings are expected to be minor.

1.5 Scope of Work
The main work activities will include:
• initial site visit to XYZ Manufacturing
• gather site and equipment related data, i.e. pump curves, water consumption records, etc.
• analysis of options for energy savings
• preparation of Feasibility Study Report
• estimated time to complete the work is 4 weeks following approval to proceed.

2.0 STUDY TEAM
The will be completed by Mr. Joe Consultant, P.Eng., a Senior Mechanical Engineer with 20 years of experience in pumping systems. Other staff, including technical and clerical personnel, will assist Mr. Consultant in carrying out the work.

3.0 STUDY COST
Total costs for the work are estimated to be $5000 including disbursements and PST.

End.
VIII. EXAMPLE 2 - FEASIBILITY STUDY REPORT FOR ELECTRICITY SAVINGS

EXHAUST FAN REPLACEMENT STUDY
XYZ Manufacturing – Winnipeg, Manitoba
Consultant Name
November, 2006

Note that the energy savings and project costs used in the example are for illustrative purposes only.

1.0 PROJECT DESCRIPTION

XYZ Manufacturing operates a wood furniture manufacturing facility in Winnipeg, Manitoba. They are currently a General Service Large electricity customer for Manitoba Hydro with demand costs of $7.089 per kVA and energy costs of $0.02284 per kWh.

The plant presently has a large dust collection system consisting of 10 major exhaust fans and 2 dust collectors with total airflows in excess of 200,000 cfm and connected horsepower of approximately 750 HP. Wood dust is collected from the various manufacturing processes within the plant and conveyed to the dust collectors where it is transferred to the cyclone and eventually into silo storage for disposal. A single line process schematic is shown in Figure 1 in Appendix B.

At this time, XYZ Manufacturing is planning to replace an existing exhaust fan that serves work cell #5 and discharges to dust collector #1. The existing fan, rated at 8500 cfm and equipped with a 40 HP motor, is roughly 20 years old. The new fan will have a rated capacity of 15,000 cfm and be equipped with a 50HP motor. The new fan will be connected to the existing control system that operates the plant wide dust collection system.

When new exhaust fans are purchased, XYZ Manufacturing uses fan operating costs as one of their evaluation criteria for selecting new exhaust fans. Where possible, they evaluate fan operating efficiencies as part of the evaluation process. In this case, they have considered the purchase of two different fans, one with an efficiency of 72% and the other with an efficiency of 62%. It is XYZ Manufacturing’s intention to purchase the more efficient fan, and they are now applying for a project incentive to help offset the higher cost for the more efficient unit. Equipment data sheets for the two fans are included in Appendix B.

2.0 PROJECT ASSESSMENT

2.1 Electrical Savings Estimate

It is estimated that the exhaust fan replacement will result in demand savings of 5 kW and annual energy savings of 30,000 kWh, on the basis of operating 6000 hours per year. The estimated annual electrical cost savings are $1133 as shown in the Incentive Calculation Sheet in Appendix A.

The electrical savings were calculated as the difference between the fan power requirements at the specified operating conditions of 15,000 cfm and 13” W.G. As per the manufacturers’ specifications, included in Appendix B, the horsepower requirements are 42.6 bhp and 49.3 bhp respectively for the two different fans.

<table>
<thead>
<tr>
<th></th>
<th>Demand (kW)</th>
<th>Energy (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Case Usage</td>
<td>36.8</td>
<td>220,800</td>
</tr>
<tr>
<td>EE Case Usage</td>
<td>31.8</td>
<td>190,800</td>
</tr>
<tr>
<td>EE Case Savings</td>
<td>5.0</td>
<td>30,000</td>
</tr>
</tbody>
</table>
2.2 Other Project Benefits
The new fan has been selected to provide additional exhaust capacity to support increased production requirements. Selecting a new fan that will operate very close to its best efficiency point on its operating curve will increase reliability and therefore reduce maintenance costs. An allowance of $400 per year based on ten hours of labour at $40 per hour has been provided for reduced maintenance costs.

2.3 Project Costs
The incremental project cost is estimated to be $8000 and is based on costs provided by XYZ Manufacturing as follows:

<table>
<thead>
<tr>
<th></th>
<th>EE Case ($)</th>
<th>Base Case ($)</th>
<th>Incremental Project Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td>18,500</td>
<td>12,000</td>
<td>6,500</td>
</tr>
<tr>
<td>Installation</td>
<td>2,500</td>
<td>1,500</td>
<td>1000</td>
</tr>
<tr>
<td>Engineering</td>
<td>1,000</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td><strong>22,000</strong></td>
<td><strong>14,000</strong></td>
<td><strong>8,000</strong></td>
</tr>
</tbody>
</table>

Copies of equipment cost estimates and other cost data are provided in Appendix B.

2.4 Simple Payback and Incentive Calculation
Simple payback and incentive calculations based on the above estimates are shown on the Incentive Calculation Sheet included in Appendix A. Payback calculates to 2.0 years with an incentive of $5000 from the Manitoba Hydro Performance Optimization Program.

2.5 Recommendations and Summary
It is recommended that XYZ Manufacturing proceed with the purchase and installation of the more efficient fan.

3.0 MEASUREMENT AND VERIFICATION OF SAVINGS
Savings will be verified by using data loggers that will be installed for a period of seven days after the new fan is installed to capture electrical demand and energy usage and run-time hours. This will be compared to the estimated base case fan demand and energy usage to establish verified savings.

4.0 IMPLEMENTATION SCHEDULE
Installation is scheduled for summer of 2007.

APPENDIX A
Incentive Calculation Sheet

APPENDIX B
Equipment performance data sheets, cost quotations, single line process schematics and other report supporting information.

End.
## PERFORMANCE OPTIMIZATION PROGRAM

### Incentive Calculation Sheet - Electricity/Natural Gas

**PROJECT:** Exam ple 2: Exhaust Fan Replacement - Elect ricity Savings

### Energy Savings Summary

<table>
<thead>
<tr>
<th>Energy Rate:</th>
<th>Winter (Nov - Apr)</th>
<th>Summer (May - Oct)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity per kWh</td>
<td>15,000</td>
<td>15,000</td>
<td>30,000</td>
</tr>
<tr>
<td>Natural Gas per m3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### Project Cost & Benefit Summary

<table>
<thead>
<tr>
<th></th>
<th>Electricity</th>
<th>Natural Gas</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Installed Project Cost - High Efficiency Case</td>
<td>$8,000</td>
<td>$0</td>
<td>$8,000</td>
</tr>
<tr>
<td>Total Installed Project Cost - Base Efficiency Case</td>
<td>$14,000</td>
<td>$0</td>
<td>$14,000</td>
</tr>
<tr>
<td>Annual Energy Benefit</td>
<td>$400</td>
<td>$0</td>
<td>$400</td>
</tr>
<tr>
<td>Annual Non-Energy Benefits</td>
<td>$1,533</td>
<td>$0</td>
<td>$1,533</td>
</tr>
</tbody>
</table>

### Incentive Calculation Summary

<table>
<thead>
<tr>
<th></th>
<th>Electricity</th>
<th>Natural Gas</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>$200/kW, w/tereduction</td>
<td>1,000</td>
<td>0</td>
<td>1,000</td>
</tr>
<tr>
<td>$200/kW, w/erducedlo</td>
<td>1,000</td>
<td>0</td>
<td>1,000</td>
</tr>
<tr>
<td>$0.10/kWh, w/er saved per year</td>
<td>3,000</td>
<td>0</td>
<td>3,000</td>
</tr>
<tr>
<td>$0.30/m3, w/ereduction</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>50% of total installed project cost</td>
<td>11,000</td>
<td>0</td>
<td>11,000</td>
</tr>
<tr>
<td>100% Amount to reduced use payack to 1.0 years</td>
<td>6,467</td>
<td>0</td>
<td>6,467</td>
</tr>
</tbody>
</table>

### Project Economics Summary

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple Payback (To total Benefit s)</td>
<td>5.2 years</td>
<td>50.2%</td>
</tr>
</tbody>
</table>

### Environmental Benefits Summary

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GHG Savings</td>
<td>30,000 kWh annually 0.75 kg CO2e/kWh 22,500 kg CO2e</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>0 m3 annually 1.90 kg CO2e/m3 0 kg CO2e</td>
</tr>
<tr>
<td>Other Fuel (sp ecfy)</td>
<td>0 m3 annually 0.00 kg CO2e/m3 0 kg CO2e</td>
</tr>
<tr>
<td>Water Savings</td>
<td>0 m3 annually 0 m3</td>
</tr>
</tbody>
</table>
IX. EXAMPLE 3 - FEASIBILITY STUDY REPORT FOR NATURAL GAS SAVINGS

STEAM GENERATION EQUIPMENT UPGRADE
XYZ Manufacturing – Winnipeg, Manitoba
Consultant Name
November, 2006

Note that the energy savings and project costs used in the example are for illustrative purposes only.

1.0 PROJECT DESCRIPTION

XYZ Manufacturing operates a flooring products manufacturing facility in Winnipeg, Manitoba. They are a Large General Service natural gas customer for Manitoba Hydro with a rebundled energy cost of $0.3433 per cubic meter (m³). The rebundled energy cost is as listed in the November 2006 issue of Manitoba Hydro’s Energy Market Comment email newsletter.

The plant presently has a steam boiler that provides process steam for a number of plant uses. A single line process schematic is shown in Figure 1 in Appendix B.

At this time, XYZ Manufacturing is planning to add a new process line that can be supplied with steam off the current system or it can be supplied from a new steam generator. When making purchase decisions, XYZ uses steam operating costs as one of their evaluation criteria for selecting new equipment. In this case, they are considering a steam generator that has a rated fuel-to-steam efficiency of 85%.

Equipment data and performance sheets for the proposed steam generator are provided in Appendix B. The existing boiler was recently tested and found to have an efficiency of 81%. Copies of the combustion test results are also included in Appendix B. Allowing for a 2% loss due to radiation and convection, the existing boiler has an estimated fuel-to-steam efficiency of 79%.

2.0 PROJECT ASSESSMENT

2.1 Natural Gas Savings Estimate

It is estimated that the new process load would have consumed 250,000 m³ per year based on the existing boiler (Base Case) operating 6000 hours per year. The estimated annual natural gas savings from using the more efficient steam generator (EE Case) are 17,750 m³ per year. The estimated annual natural gas cost savings are $6094 as shown in the Incentive Calculation Spreadsheet in Appendix A.

The natural gas savings were calculated using the fuel-to-steam efficiencies of the two different technologies to determine the efficiency saving factor and then multiplying by the estimated annual usage.

<table>
<thead>
<tr>
<th>Technology</th>
<th>Fuel-to-Steam Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Case</td>
<td>Existing Boiler</td>
</tr>
<tr>
<td>EE Case</td>
<td>Steam Generator</td>
</tr>
</tbody>
</table>

Efficiency Saving Factor = 1 - (lower efficiency/higher efficiency), or
= 1 – (0.79/0.85) or
= 0.071

Therefore, the estimated annual natural gas savings are 250,000 m³/year x 0.071 = 17,750 m³/year.
2.2 Other Project Benefits
The steam generator is expected to use less water and chemicals with an estimated annual cost savings of $750 including PST.

2.3 Project Cost
The incremental project cost is estimated to be $20,000 and is based on costs provided by XYZ Manufacturing as follows:

<table>
<thead>
<tr>
<th></th>
<th>EE Case ($)</th>
<th>Base Case ($)</th>
<th>Incremental Project Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td>40,000</td>
<td>25,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Installation</td>
<td>20,000</td>
<td>15,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Engineering</td>
<td>5,000</td>
<td>5,000</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td><strong>65,000</strong></td>
<td><strong>45,000</strong></td>
<td><strong>20,000</strong></td>
</tr>
</tbody>
</table>

Copies of equipment, installation and engineering cost estimates are provided in Appendix B.

2.4 Simple Payback and Incentive Calculation
Simple payback and incentive calculations based on the above estimates are shown on the Incentive Calculation Sheet included in Appendix A. Payback calculates to 2.1 years with an incentive of $5325 from the Manitoba Hydro Performance Optimization Program.

2.5 Recommendation and Summary
It is recommended that XYZ Manufacturing proceed with the purchase and installation of the more efficient steam generator.

3.0 MEASUREMENT AND VERIFICATION OF SAVINGS
The fuel-to-steam efficiency of the new steam generator will be determined from a stack combustion analysis to be completed after the equipment is installed and operating. Final savings values will be determined using the actual efficiency values from the stack combustion analysis.

4.0 IMPLEMENTATION SCHEDULE
Installation is scheduled for the summer of 2007.

APPENDIX A
Incentive Calculation Sheet

APPENDIX B
Equipment performance data sheets, cost quotations, single line process schematics and other report supporting information.

End.
### Incentive Calculation Sheet - Electricity/Natural Gas

#### Energy Savings Summary

<table>
<thead>
<tr>
<th>Energy Rate:</th>
<th>Winter (Nov - Apr)</th>
<th>Summer (May - Oct)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric (\text{kWa} \times \text{Power Factor} ) per (\text{kWh})</td>
<td>(0.000 \times 1.00%)</td>
<td>(0.000 \times 0.0%)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Annual Energy (\text{kWh})</td>
<td>(0)</td>
<td>(0)</td>
<td>(0)</td>
</tr>
<tr>
<td>Annual Energy (\text{m}^3)</td>
<td>(8,875)</td>
<td>(8,875)</td>
<td>(17,750)</td>
</tr>
</tbody>
</table>

#### Income & Benefits Summary

<table>
<thead>
<tr>
<th></th>
<th>Total Installed Project Cost - Incremental</th>
<th>Total Energy Benefits</th>
<th>Total Non-Energy Benefits</th>
<th>Total Project Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>($0) * ($20,000) = ($20,000)</td>
<td>($0) * ($45,000) = ($45,000)</td>
<td>($0) * ($6,844) = ($6,844)</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>($0) * ($65,000) = ($65,000)</td>
<td>($0) * ($100,000)</td>
<td>($0) * ($100,000)</td>
<td>($65,000)</td>
</tr>
</tbody>
</table>

#### Incentive Calculation Summary

1. \(\$200 \times \text{Winter saved kWh}\) = \(\$0\)
2. \(\$200 \times \text{Summer saved kWh}\) = \(\$0\)
3. \(\$0.10 \times \text{Summer saved kWh}\) = \(\$0\)
4. \(\$0.30 \times \text{Annual Energy m}^3\) = \(\$5,325\)
5. \(50\% \times \text{Total Project Cost}\) = \(\$32,500\)
6. \(100\% \times \text{Electricity Savings}\) = \(\$13,156\)

Eligible Incentive:

- \(\$0\)
- \(\$5,325\)
- \(\$5,325\)

#### Project Economics Summary

Simple Payback (Total Benefits) = \(2.9\) years
Simple Payback (Total Benefits + Incent) = \(2.1\) years
IRR on Incremental Project Cost = \(45.5\%\)

### Environmental Benefits Summary

- **GHG Savings**
  - Electricity: 17,750 m\(^3\) annually
  - Natural Gas: \(0.75\) kg CO\(_2\)e/kWh
  - Other Fuel: \(1.90\) kg CO\(_2\)e/m\(^3\)

- **Water Savings**
  - 0 m\(^3\) annually

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Notation: IRR is based on 10 years of operation and is expressed for comparison purposes only.