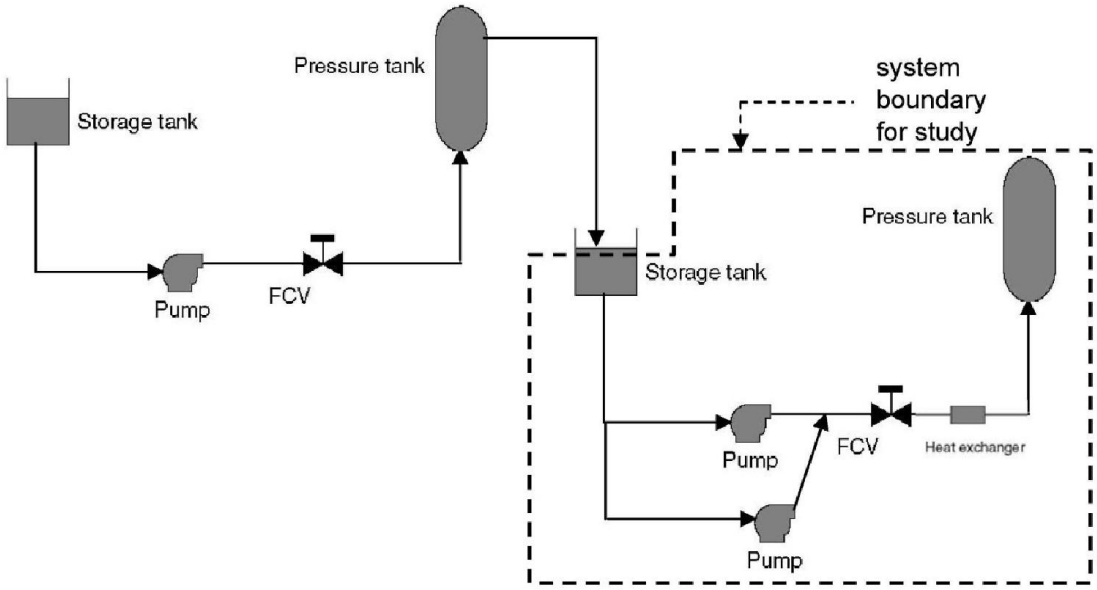
## Introduction

This document outlines methodology and report items for a typical Energy Efficiency Feasibility Study ("Energy Study") of an existing system or a new system design. It is understood that some projects may require a modified methodology and some report items will not be relevant to every project. The consultant should adopt an approach that is logical and transparent and include all report items that support his assumptions and conclusions, as well as any information that will facilitate the review by Power Smart Engineering and BC Hydro's customer. These guidelines are intended to educate, but not necessarily to prescribe methodology, scope or report format.

The primary purpose of an Energy Efficiency Feasibility Study is to enable BC Hydro and its customers to make decisions to invest in Energy Conservation Measures.

## 1. Typical Energy Study Procedure

1.1. Identify and describe the system being assessed. Make a diagram of it, showing a system boundary and indicating all energy and product flows across the boundary. Sample diagram:




1.2. Identify all locations within the system where significant potential energy savings may exist. Formulate theoretical energy conservation measures that have the potential to save energy while meeting critical production requirements pertaining to product quality, operation and maintenance.

1.3. The ideas should come from new unbiased observation as well as any previous end use assessment, plant-wide energy audit, customer site inspection or special request by the

customer. Additional measures, when identified, should be added at any subsequent phase of the study.

1.4. For each Energy Conservation Measure,

1.4.1. Identify a baseline for the evaluation of the energy conservation measures. The baseline describes the condition of the plant that the customer would operate in the absence of any BC Hydro influence or assistance. Initially, the baseline is the current condition or the current conceptual design and its associated power (kW or kVA) and energy consumption (kWh).

1.4.2. Identify any equipment that is the subject of an energy conservation measure that is at end-of-life or in need of major overhaul.

1.4.3. Develop a theoretical baseline of power demand and energy consumption that represents the system after the worn out equipment has been repaired or replaced with equipment that is similar or represents current basic technology.

1.4.4. If the customer needs to increase the flow rate of the system to accommodate increased production or end-use demands, adjust the theoretical baseline to include the addition of essential equipment that is similar to the existing equipment, or the replacement of the existing equipment with similar equipment that has larger capacity.

1.4.5. Determine the power (kW or kVA) and energy consumption (kWh) of the theoretical baseline.

1.4.6. Determine the baseline cost (the cost to achieve the theoretical baseline from the current condition) to the degree of accuracy prescribed by AACEI Class 3 (excluding taxes).

1.4.7. Determine the power and energy consumption of the system.

1.4.8. Determine the demand reduction, energy consumption savings and energy cost savings compared with the baseline, within a confidence interval of ±10%. Include the rate rider but no taxes.

1.4.9. Determine the project cost (cost of implementation) to the degree of accuracy prescribed by AACEI Class 3 (excluding taxes).

1.4.10. Determine the incremental cost (cost of implementation in excess of the baseline cost). Calculate the simple payback (incremental cost/savings) in years.

1.5. Prepare the report.

## 2. Resource List

| RESOURCE | WHERE FOUND |
|---|---|
| BC Hydro rate schedules | www.bchydro.com |
| electrical billing history | customer |
| equipment layout diagrams | customer |
| process flow charts | customer |
| name plate data | on equipment or in customer's files |
| equipment specs (including curves) | customer or manufacturer |
| Power Smart Engineering Guidelines | BC Hydro Key Account Manager |
| distributed control system data | customer |
| production records | customer |
| specific measurements | site visit or customer's technician |
| operating hours | customer |
| maintenance records & issues | customer |
| Association for the Advancement of Cost Engineering International Recommended Practice No. 18R-97 Class 3 | www.aacei.org/technical/rps/18r-97.pdf |

## 3. Contents of a Typical Report

### 3.1. Executive Summary

3.1.1. Dates of site visits.
3.1.2. Descriptions of the feasible Energy Conservation Measures.
3.1.3. The following table, completed:

Energy Conservation Measures

| ECM # | ECM Name | Demand Reduction (kW or kVA) | Energy Savings (kWh) | Electricity Cost ($) Savings | Project Cost ($) | Incremental Cost ($) | Simple Payback (years) |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| Total | | | | | | | |

3.1.4. Comments on non-electrical benefits and impacts, with a rough estimate of total value in $/year.

### 3.2. Background Information

3.2.1. Site name and location.
3.2.2. Type of industry and process.
3.2.3. Reasons for the energy study.
3.2.4. Identification of any previous end use assessment or energy study of the same system.
3.2.5. Name and contact data of:

3.2.5.1. Customer's technical representative
3.2.5.2. Author of the report.
3.2.5.3. BC Hydro Key Account Manager

3.2.6. Report revision number, reviser and revision date.

### 3.3. Energy Supply

3.3.1. The following table, completed:

Customer Data from Last Year

| Year* | Rate Schedule | Highest Demand (kW or kVA) | Electricity Consumed (kWh) |
|---|---|---|---|
| | | | |

*Calendar year for Distribution Service customers (Rate Schedule 12xx),
Fiscal year for Transmission Service customers (Rate Schedule18xx);
(F2012 = 2011, April 1 – 2012, March 31 or nearest billing dates)

3.3.2. Comments on seasonal or periodic patterns of the electrical consumption.

### 3.4. Description of Plant Process and System Studied

3.4.1. Descriptions of major process systems and production lines.
3.4.2. Process and instrument diagrams.
3.4.3. Relevant production data.
3.4.4. Definition of the system boundary for the subject of the study, with a diagram.
3.4.5. Description of all significant connected equipment within the system.
3.4.6. List of sources of electrical data.
3.4.7. Process data, correlated with power measurements.
3.4.8. Equipment annual operating hours.
3.4.9. Estimates or measurements of equipment and system efficiencies.
3.4.10. Equipment nameplate data.
3.4.11. Control system and operation strategy.
3.4.12. Maintenance issues that affect electricity consumption.

### 3.5. Baseline – unified or per Energy Conservation Measure, as appropriate

3.5.1. Description of the baseline condition.
3.5.2. Theoretical Baseline production rate of all major products, and assumptions about product type or product quality.
3.5.3. Baseline electrical energy consumption (kWh/yr) and demand (kW) for the systems studied.

### 3.6. Calculations – per Energy Conservation Measure

3.6.1. Savings (the difference between the system upgraded with the Energy Conservation Measure and the baseline) within a confidence interval of ±10%, including:

3.6.1.1. Demand reduction in kW or kVA
3.6.1.2. Energy savings in kWh/yr
3.6.1.3. Electricity cost savings in $ using Tier 2 of the customer's rate schedule and any applicable rider.

3.6.2. A description of the analytical methodology and assumptions used to calculate savings.
3.6.3. Descriptions of all data collected and used in the analysis, and instruments used.
3.6.4. Suggested methods of Measurement and Verification.

### 3.7. Cost Estimates – per Energy Conservation Measure).

3.7.1. Baseline cost estimate (zero if the baseline is the current condition).
3.7.2. Project cost estimate.
3.7.3. Incremental cost (project cost minus baseline cost).
3.7.4. Simple payback period in years (Incremental cost / Savings).

### 3.8. Non-Electrical Benefits and Impacts – per Energy Conservation Measure

3.8.1. Estimated savings in other fuels (±50%)
3.8.2. Comments on improvements in quality, reliability, serviceability or production capacity.
3.8.3. Comments on changes in environmental emissions and waste products.
3.8.4. Comments on improvements in safety, comfort, ease of operation or labour intensity.
3.8.5. Estimated value of non-electrical benefits and impacts (±50%)

### 3.9. Implementation Strategy and Schedule – per Energy Conservation Measure

3.9.1. Implementation strategy.
3.9.2. A hypothetical schedule of major tasks.

### 3.10. Exclusions

3.10.1. The report must not contain any reference to a manufacturer or vendor of equipment or services, unless:

3.10.1.1. the customer has requested a quotation from a specific vendor or manufacturer, or

3.10.1.2. an energy conservation measure requires equipment or service that can only be provided by one source.

3.10.2. The details of an energy conservation measure must not be so specific that they exclude all vendors and manufacturers but one, unless the measure requires a new technology that is only available from one source.

## 4. Power Smart Engineering Review

The energy study report will be reviewed by the Power Smart Engineering Industrial team, who will look for reasonable assumptions, appropriate methodology and results that are consistent with sound engineering judgement and previous similar experience. If gross errors are discovered the consultant will be informed and given every opportunity to revise the report, but the Power Smart team may not analyse the report in enough detail to verify all calculations. The consultant will retain responsibility for the content of the report.

## 5. Additional Data Requirements for New Plant Design Energy Studies

For a New Plant Design EEFS (an energy study performed on the design of any part of a new plant or on a plant that is undergoing expansion or improvement that will lead to a production increase) the form “Supplementary Data for New Plant Design Projects” must be completed and submitted along with the energy study.