PORT of vancouver

Project & Environmental Review

Guidelines – Project Energy Study

May 2016

Canada

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1. INTRODUCTION

The Project Energy Study guidelines are intended to assist applicants of projects on lands and waters managed by Vancouver Fraser Port Authority when determining equipment and operational practices selection for proposed works and activities (referred to herein as "projects"). The guidelines are to be used by both tenants and qualified energy consulting professionals who may be hired to assist with technical aspects of equipment and operational practices selection, as well as preparation of a Project Energy Study as required.

Category A and B reviews that meet the Applicability criteria outlined in Section 3.1 of this guideline need to provide information about the energy conservation measures considered for the project.

Category C and D reviews that meet the Applicability criteria outlined in Section 3.2 of this guideline need to provide a Project Energy Study of relevant complexity, and demonstrate energy efficient purchase and/or operational practices.

2. OVERVIEW

Vancouver Fraser Port Authority ("VFPA") is planning for the future and recognizes that our customers require reliable, clean and competitive energy to continue to grow their business. VFPA has an interest in becoming one of the most energy efficient ports in the world, and we have developed expertise to assist project applicants in achieving this goal through the Project and Environmental Review ("PER") process.

If a Project Energy Study is required as part of the Project and Environmental Review process it should include an assessment of how the proposed development will affect electrical energy consumption levels and is intended to assist project managers in selecting the most energy efficient equipment and operational practices for the projects that takes place on lands and waters managed by VFPA.

3. APPLICABILITY

3.1 CATEGORY A AND B REVIEWS

For all Category A and B reviews that include the installation of any electrically powered equipment, buildings, and/or lights, information about energy conservation measures considered for the project must be submitted as part of a complete application.

3.2 CATEGORY C AND D REVIEWS

The requirement for a Project Energy Study applies to all Category C and D reviews that include the installation of any electrically powered equipment, buildings, and/or lights. Confirmation of the study scope for Category C and D reviews should be established during the preliminary review stage.

4. GUIDELINES

CATEGORY A AND B INFORMATION REQUIRED

For qualifying Category A and B reviews, information about energy conservation measures must be submitted as part of a complete application. This includes a basic calculation of the energy consumption difference between existing and proposed equipment/lights or between a conventional industry standard and energy efficient option. The application information should include justification of the equipment selection. Appendix A provides examples of simple energy calculations required for a Category A or B review.

CATEGORY C AND D PROJECT ENERGY STUDY

The following components are required for a typical **Project Energy Study** of a new system design as required by qualifying Category C and D reviews. It is understood that some projects may require a modified approach and some components will not be relevant to every project. The project applicant and/or their consultant should adopt an approach that is logical and transparent and include all information that supports the assumptions and conclusions, as well as any information that will facilitate the review by VFPA and potentially by BC Hydro if the study and/or project qualifies for BC Hydro incentives. These guidelines are intended to educate, but not necessarily to prescribe methods, scope or report format.

4.1 TYPICAL ENERGY STUDY PROCEDURE

A typical Project Energy Study should follow the procedures outlined below.

a) Identify and describe the system being assessed. For example, describe the ship loader, dry bulk conveying system, dust collection system, maintenance building, outdoor / indoor lighting, etc. Create a diagram of the system, showing a system boundary and indicating all energy and product flows across the boundary
b) Identify all locations within the system where significant potential energy savings may exist.
c) Formulate theoretical energy conservation measures that have the potential to save energy while meeting critical operation requirements. The ideas should come from new unbiased observation as well as any previous studies or BC Hydro funded studies (for example, end-use-assessment, plant-wide energy audit, customer site inspection, etc.)

4.2 INFORMATION REQUIREMENT FOR EACH ENERGY CONSERVATION MEASURE

For each energy conservation measure the following information must be provided:

a) Identify a baseline for the evaluation of the energy conservation measures. The baseline describes the condition of the terminal / plant / system that the project applicant would operate in the absence of energy efficient equipment consideration. Initially, the baseline is the current condition or the current conceptual design, using current basic technology, and its associated power expressed in kilowatt or kilovolt-ampere (kW or kVA) and energy consumption expressed in kilo-watt-hours (kWh).
b) Identify any equipment that is the subject of an energy conservation measure that is at end-of-life or in need of major overhaul.

c) 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.

d) If the project applicant 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.

e) Determine the power in kilowatts (kW) or kilovolt-amperes (kVA) and energy consumption in kilo-watt-hours (kWh) of the theoretical baseline.

4.3 PREPARE THE REPORT

Once the theoretical baseline is determined for each energy conservation measure, the information must be summarized in a Project Energy Study report. The contents of a typical report are as follows.

1. *Executive Summary:*

   In the Executive Summary, include the information listed below.

   - Identify any equipment that is the subject of an energy conservation measure that is at end-of-life or in need of major overhaul.
   - Describe the feasible Energy Conservation Measures (ECM)
   - The following completed table:

ECM #	*ECM Name*	*Demand Reduction (kW or kVA)*	*Energy Savings (kWh)*

2. *Background Information:*

   It is important to include detailed background information and descriptions of potential energy conservation measures in this section. Provide information and details on the following:

   - Site name and location.
   - Type of industry and process
   - Descriptions of the feasible Energy Conservation Measures

3. *Energy Supply:*

   Include information on the energy data from the previous year (or previous 12 months) in tabular form using the following example. Include comments on seasonal or periodic patterns of the electrical consumption.

   Energy Data from Previous Year (or previous 12 months):

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

4. *Description of Studied System*

   This section should include:

   - Relevant production / operational data
   - Definition of the system boundary for the subject of the study, with a diagram
   - Description of all significant equipment in the system
   - List of sources of electrical data
   - Process data, correlated with power measurements
   - Equipment annual operating hours
   - Control system and operational strategy
   - Maintenance issues that affect electricity consumption

5. *Baseline – unified or per Energy Conservation Measure, as appropriate*

   This section should include a description of the baseline, either consolidated (unified) or per Energy Conservation Measure, as appropriate.

   - Description of the baseline condition
   - Baseline electrical energy consumption (kWh/year) and demand (kW) for the systems studied

6. *Calculations – per Energy Conservation Measure*

   Include in this section the calculations for each Energy Conservation Measure

   - Savings (the difference between the system upgraded with the Energy Conservation Measure and the baseline), including:
     - Demand reduction in kW or kVA
     - Energy savings in kWh/year
     - A description of the analytical methodology and assumptions used to calculate savings
     - Descriptions of all data collected and used in the analysis, and instruments used

5. IMPLEMENTATION STRATEGY – ENERGY CONSERVATION MEASURE

This section must include the implementation strategy, including considerations, for each Energy Conservation Measure for the proposed project. A key component of the Project Energy Study is implementation and there must be demonstration that energy conservation efforts do not end at performing the Project Energy Study, but there is commitment to implement the most viable, energy efficient equipment and operational strategy, or a rationale for selecting less efficient options.

6. RESOURCE LIST

Resource	*Where found*
BC Hydro rate schedules and electrical billing history	www.bchydro.com / customer Hydro bill
Energy Consulting Companies	BC Hydro Alliance list / VFPA Energy Management Specialist
Energy Savings Calculation tools (i.e. lighting calculator)	BC Hydro / VFPA Energy Management Specialist / Lighting Vendor
Industrial (energy efficient) Equipment Reference Guide	www.bchydro.com/powersmart/business/resources/reference-guides.html
Energy Efficient Industrial Operations	Practical Power Efficiency – Port Industrial Terminals (VFPA)

7. SUPPLEMENTAL INFORMATION - BC HYDRO INDUSTRIAL STUDY AND PROJECT INCENTIVES

Energy conservation measures proposed through a project permit application might qualify for BC Hydro incentives. The incentives are available for the study and the equipment procurement and installation. Refer to the list below for the list of BC Hydro Industrial Programs and incentives eligibility.

7.1 PROJECT INCENTIVE OFFERS

BC Hydro Project Incentives are offered to reduce the financial barriers preventing a customer from implementing an energy-efficiency project. The offer varies depending on the rate class that your business belongs to, whether you are retrofitting an existing facility, building a new one, or looking to investigate a new technology. The financial incentives are subject to change in the future, and as of May 2016, they included:

1. **Self-Serve Incentive Program (SIP):** Online application for specific end-use technologies.
2. **Transmission Project Incentives:** Hard-wired projects for Transmission Service Rate customers.
3. **Distribution Project Incentives:** Hard-wired projects for Large General Service customers.
4. **Industrial New Plant Design Project Incentives:** New construction or plant expansions.
5. **Program Enabled Savings:** Customer-funded projects that count towards Power Smart savings.
6. **Green Motor Rewind**: A rebate to encourage customers to use qualified green-rewind vendors.

7.2 INDUSTRIAL PROGRAM INCENTIVES

Program	*Minimum Eligibility*	*Description*
Customer Site Investigation (CSI)	Industrial customer site that consumes between 2 GWh and 20 GWh per year of electricity	A Customer Site Investigation (CSI) is a 1-day walkthrough of a customer facility to analyze their energy use and find opportunities to be more energy efficient. The CSI is an ideal starting point for a customer who does not know where to start saving electricity. Energy savings estimates from a CSI are accurate to +/-50% and there are no estimates for implementation costs.
Plant-Wide Energy Audit (Energy Audit)	Industrial customers that consume more than 10 GWh/yr of electricity	An energy audit is an ideal starting point for a customer wishing to save energy. It takes a plant-wide look at all energy using systems and serves three primary purposes: • quantify where energy is used within a facility • identify O&M opportunities the customers can implement immediately • prioritize systems that offer the greatest opportunity for further study
End Use Assessments (Scoping Study)	Industrial systems that consume more than 1 GWh/year of electricity (Equal to one fully loaded 200 hp motor running 6000 hr/yr)	End Use Assessments (EUA) are a high-level low-cost investigation on an end-use system that is used to decide if a detailed Energy Efficiency Feasibility Study is worthwhile. Energy savings and implementation cost estimates to +/-50%. EUAs are often referred to in industry as a Level 1 assessment, scoping study or pre-feasibility study.
Energy Efficiency Feasibility Study (Energy Study)	Industrial Transmission Service Rate (TSR) or Industrial Large General Service (LGS) rate customers. Industrial systems must consume more than 1 GWh per year of electricity. The energy saving opportunity is expected to save at least 300 MWh per year of electricity.	An electrical Energy Efficiency Feasibility Study (Energy Study) builds a business case for an energy efficiency project.
Industrial New Plant Design Studies	Future or current Industrial Transmission Service Rate (TSR) or Industrial Large General Service (LGS) rate customers. Customer is planning either a new facility or expanding an existing facility enough to increase the power load by at least five per cent. The proposed facility has an estimated savings potential of more than 300 MWh annually.	An industrial new plant design study is for customers looking to build efficiency into new or expanding facilities. This study will help customers understand their design options by developing a theoretical baseline and comparing it to other, more energy-efficient options.

8. NOTES/LINKS TO OTHER DOCUMENTS

BC Hydro incentive documents provided on their website may assist project applicants in responding to these Guidelines. The pages housing the most up to date guidelines are:

- Industrial Programs:
  www.bchydro.com/powersmart/alliance/program/psp-industrial.html
- New Plant Design:
  www.bchydro.com/powersmart/alliance/program/npd.html

9. UPDATES

This Guideline will be updated as required to reflect best practice.

These guidelines are available for viewing and downloading from our website (www.portvancouver.com). Please reference the guideline version date clearly indicated on the front page to help track the use current documents.

APPENDIX A

SUPPORTING INFORMATION FOR CATEGORY A AND B REVIEWS

The following are two examples of a simple calculation that can be submitted as part of energy conservation measure information for Category A and B reviews.

Lighting retrofit

Existing fixtures: 4 x 1000 W = 4000 W (or 4 kW) Metal-Halide; annual operating hours 3650h; annual energy consumed 4kW x 3650h = 14,600 kWh

Proposed fixtures: 4 x 300W (LED) = 1200 W (or 1.2 kW); annual operating hours 3650; annual energy consumed 1.2 kWh x 3650 h = 4,380 kWh

Project energy savings: 14,600 kWh – 4,380 kWh = 10,220 kWh

LED lights were selected for this project resulting in an expected 10,220 kWh energy savings annually.

Demolition of an existing storage building and replacement with a parking lot

Annual building energy use estimated from BC Hydro bills – 10 MWh/year

Proposed parking lot energy consumption: 4 LED lamps x 120W = 480 W. Annual consumption 480W x 10 hours/day x 365 days = 1.752 MWh/year

Energy savings: 10 MWh/y – 1.77752 MWh/y = 8.25 MWh/y

Maintenance / Repair / Retrofit	
Existing System Energy Consumption	X kWh / year
Proposed System Energy Consumption	Y kWh / year
Energy Savings	(X – Y) kWh/year

New Installations	
Acceptable Industry Standard Energy Consumption	X kWh / year
Proposed Energy Efficient Equipment Energy Consumption	Y kWh / year
Energy Savings	(X – Y) kWh/year

PROJECT ENERGY STUDY FOR CATEGORY C AND D REVIEWS

The following is an example of a Project Energy Study for projects that include lighting retrofit / new installation as the only electrically powered equipment component. The calculation shown below satisfies the requirement for a Project Energy Study in the Project Permit application.

Lighting retrofit or new installation

Provide calculation of the annual energy consumption of the proposed system as compared to the existing system or to an industry standard*

Project data

	Demand (kW)	Energy (kWh)
Existing system	15.3	55,809
Proposed system	3.0	10,884

	Demand (kW)		Energy (kWh)	
	Site	BC Hydro Peak	Site	Potentially incentable
Projected savings	**12.3**	**12.3**	**44,924**	**44,924**

Existing Luminaire Schedule

BC Hydro Power Smart ES Lighting Calculator, version 6.0 - 2014.07.01

Customer: ***PIRET*** Project: ***Outdoor Lighting Retrofit***

Luminaire type	Lamp technology	Lamp length, ft	Lamp nominal wattage, W	# of lamps	Ballast type	Ballast factor	# of ballasts	Wattage per luminaire, W	Reference wattage, W	# of luminaires	Lamp/ Luminaire Model # or Comments
Outdoor	MH		440					440	440	15	
Under conopy	MH		110					110	110	79	
									0	-	

New Luminaire Schedule

BC Hydro Power Smart ES Lighting Calculator, version 6.0 - 2014.07.01

Customer: ***PIRET*** Project: ***Outdoor Lighting Retrofit***

Luminaire type	Lamp technology	Lamp length, ft	Lamp nominal wattage, W	# of lamps	Ballast type	Ballast factor	# of ballasts	Luminaire W (also high power for bi-level/adaptive)	# of luminaires	Lamp/ Luminaire Model # or Comments
RC WP LED wall pack	LED		104					104	15	RC WP LED wall pack
RC SLIM LED wall pack	LED		18					18	79	RC SLIM LED wall pack

The calculation should be performed using the latest version of the BC Hydro Lighting Calculator.

** example of an industry standard for high mast lighting is High Pressure Sodium or Metal Halide (HID). If you're installing new lighting poles and planning to use LED lighting, provide calculation of energy consumption difference between LED and HID standard using one-for-one replacement ratio.*

Demonstration of Energy Efficient equipment selection.

Provide a written statement that includes the rationale behind project equipment selection. The statement might include life cycle cost analysis of energy efficient option vs. currently acceptable industry standard. Use BC Hydro Industrial Equipment Reference Guide (Section 5. Resource List) as a resource for energy efficient equipment options.

The following is an example of information on energy efficient equipment the proponent might consider for their project:

TITLE	DOCUMENT TYPE/SIZE	PLANT, SYSTEM, EQUIPMENT TYPE	TYPE	DESCRIPTION
Energy Efficiency Guide for Variable Frequency Drives (VFDs)	PDF, 969 KB	VFDs	Reference	Overview of VFD technology and operations.
Pump System Basic Assessment Guide	PDF, 219 KB	Pumps	Assessment	Pump Assessment Guide
Pump Systems Reference Guide	PDF, 1.9 MB	Pumps	Reference	Energy-efficiency methods and practices involving pump systems.
Lighting Reference Guide	PDF, 10.0 MB	Lighting	Reference	Information on lighting technolog.
Fans and Blowers Reference Guide	PDF, 1.4 MB	Fans & Blowers	Reference	Iinformation about energy efficient fan and blower systems.
Fan Optimization Checklist	PDF, 52 KB	Fans	Checklist	This checklist helps you determine if you have energy saving opportunities in your fan system.
Electric Motors Reference Guide	PDF, 944 KB	Electric Motors	Reference	Overview of the major types of electric motors available and advanced motor technologies.
The Compressed Air Handbook	PDF, 853 KB	Compressed Air	Reference	Improving energy-efficiency in compressed air systems.

The following is an example of information on operational efficiency the proponent might consider for the project:

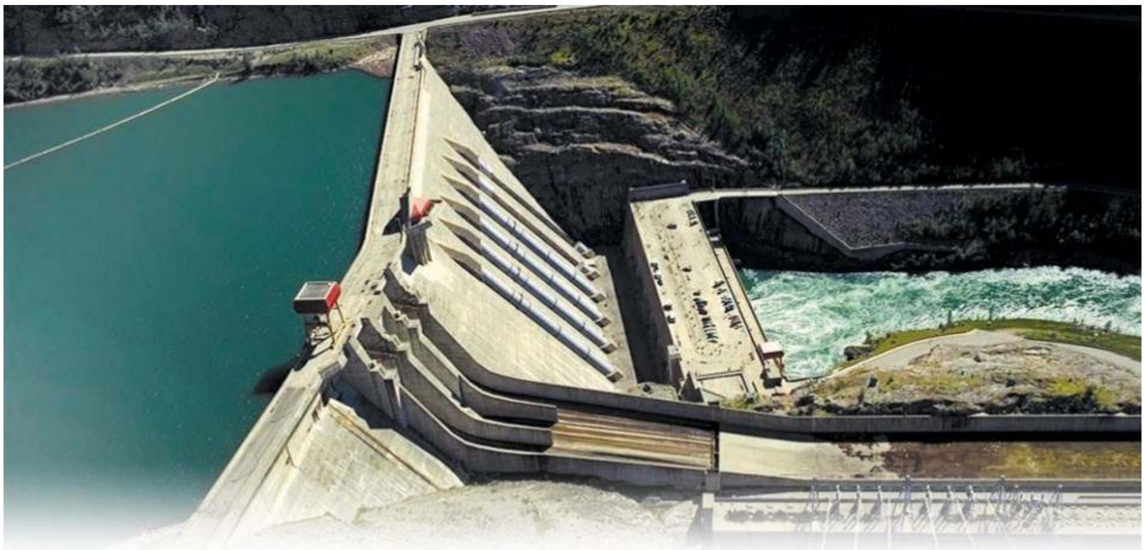
Demonstration of Energy Efficient Operational Practices:

Provide written description of your proposed operations highlighting aspects that contribute to energy efficiency. Examples:

1. Installation of 'Real Time Monitoring (equipment, system, site-wide)' and Energy Management Information System
2. Description of Equipment Automation and/or Standard Operating Procedures outlining proposed reduction of equipment idling time

APPENDIX B

PRACTICAL POWER EFFICIENCY – PORT INDUSTRIAL TERMINALS



Practical Power Efficiency – Port Industrial Terminals

VFPA Energy Action Initiative

Energy Conservation = Do More With Less

Strategic approach to energy will support port growth, provide enhanced customer value and further position Port of Vancouver as a leader in port sustainability

2016-05-20

Monitor Power Consumption

You Can Only Control What You Can Measure

Prerequisite:
Teamwork - Electrical Maintenance, Systems and Operations

Actions:
Measurement Requirements:

1) Install meters for each system/area & main motors
2) Link meters to DCS & HMI for best control of power
3) Identify equipment covered by each meter
   a. Study electrical distribution diagram
   b. Use formulas to divide meter readings if areas are inter-mixed due to proximity of sub-stations or addition of equipment

Tracking Consumption:

1) Check power consumption regularly* and analyze trends
2) Establish and monitor targets for:
   a. Operation at nominal capacity - full-load baseline consumption
   b. System/area power consumption with no product in the system - set no-load baseline consumption
   c. Operation in different modes - i.e. reduced capacity, different products
3) Reconcile total of consumption for all shops/areas with monthly power bill

** Depending on complexity of operations, system / terminal energy intensity (kWh/t of incoming / outgoing material, kWh/total container moves, kWh/ft2, etc.) should become part of daily operating meetings in more complex operations or reviewed weekly at less complex terminals*

Manage Equipment Idling

A loaded, unused motor is inarguably a very inefficient motor. Generally speaking, turning off a motor for one hour a day is the equivalent of upgrading from a standard efficient motor to a NEMA Premium®

Prerequisite:
Teamwork - Operations and Maintenance

Actions:

1) Measure area/subsystem power consumption (kWh) at nominal capacity
2) Measure area power consumption (kWh) during outages
   a. Online or manual metering - monitor stoppage from product off to product on
   b. Identify running equipment, question if it's required. Ideally, automate equipment, stop while not under load

Establish load factors = kWh during outage / kWh at nominal capacity (%) and demonstrate diminishing trend

3) Identify specific power consumption (*kWh/t of incoming / outgoing material, kWh/total container moves, kWh/ft2, etc.*) targets for each subsystem
   a. Maximize equipment output at all times to minimize energy intensity!
4) Work to reduce unplanned stops. Accidental - stops & starts increase power consumption significantly
   a. Set Reliability Factor targets for major equipment and subsystems (Reliability Factor = Equipment (system) actual operating hours / planned operating hours)
5) Optimize 'pre-start' and 'purge' times of equipment
   a. Review shutdown sequences to minimize equipment 'purge' time (Mainly concerns fans, transport equipment (conveyors, pumps) and filters but also check compressed air purging sequence)
   b. Review system start up SOPs to minimize equipment pre-start up times

Poor reliability and not maximizing equipment output = the highest contributors to energy waste

Minimize Compressed Air Usage

Typical compressed air efficiency 10-15% - use it wisely

Energy providers (e.g. BC Hydro) incentives exist for Compressed Air audits and equipment optimization. However, operations benefit only if you implement the study recommendations.

Prerequisite:
Teamwork - Mechanical and Electrical Maintenance, Systems and Operations
Actions:

1) Reduce operating pressure
   a. Identify equipment that limits terminal air pressure and if significantly higher than all other requirements consider installing small designated compressor and reduce existing terminal air pressure to approximately 80 psi
   b. Consider installation of air flow meters (pressure is not sufficient to seriously evaluate air consumption)
2) Reduce demand
   a. Eliminate inappropriate usage of compressed air - avoid 'temporary' cooling of overheated motors and/or bearings; unplugging chutes, etc.
3) Maintenance & Operations
   a. Change filters regularly - the most common maintenance issue seen in the compressed air systems is not maintaining separators and filters (typical pressure drops between the compressor discharge and dryer receiver should be less than 10psi)
   b. Conduct regular system inspection including leak detection & repair
      - For plants with load/unload compressors calculate: Leakage (%) = ((T x 100)/(T + t)) T = on-load time in minutes t = off-load time in minutes
      - Use ultrasonic leak detectors
   a. Ensure proper operation of compressors if in a network
      - Only one compressor should be partly loaded. All others are either fully loaded or shut down (this is important because the power draw of an unloaded compressor is approximately 50% of the amps at full load, but it is producing no air).
4) Reduce demand side fluctuations (large air receivers)

Control Your Lighting

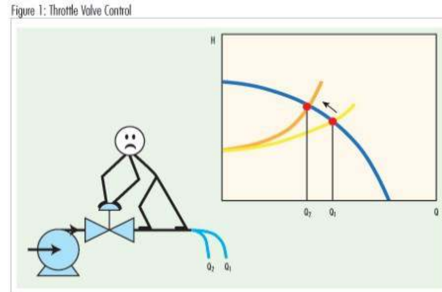
Lighting can consume up to 50% of total container terminal electrical energy
Warehouse lighting is a major energy user at most distribution centers
Lighting is recognized as a major area for economic energy savings!

Prerequisite:
Teamwork – Engineering, Electrical Maintenance, Purchasing and Operations

Actions:

1. Purchasing:
    a. Develop purchasing policy that requires progressive replacement of incandescent and fluorescent lights with the most energy efficient technologies (i.e. LED)
2. Engineering and Electrical Maintenance
    a. The objective of a 'quality' lighting is to provide safe and productive environment
        - Verify minimum lighting levels requirements with applicable safety regulations and avoid significant over-lighting while providing appropriate quality and quantity of light for the users of the space, at the lowest operating and maintenance cost
    b. Implement an automated control system with dimmers and occupancy sensors to make adjustments based on conditions such as occupancy or daylight availability
    c. Add tsk lighting instead of over-lighting an entire space
3. Operations
    a. Identify / verify lighting requirements
    b. Develop culture of turning off unnecessary lights if automation not sufficient

Optimize Major Fan / Pump Efficiency



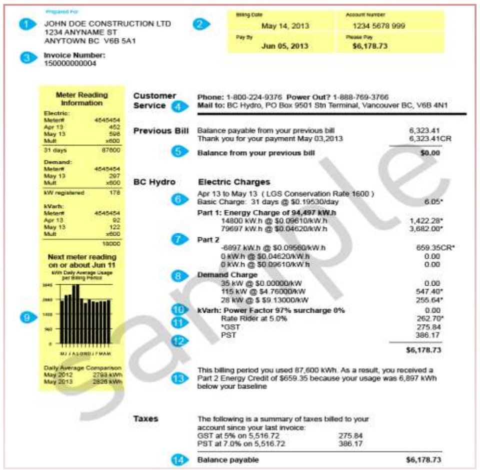
Aim for fan / pump efficiency >75%; Consider Variable Frequency Drives wherever feasible

Prerequisite:
Teamwork - Engineering/Process and Maintenance

Actions:

1) Locate design data for the gas / liquid handling system
   a. Fan / pump & system design data / drawings / performance curve / damper details
2) Check fan / pump performance, efficiency and system by on-site testing
   a. Determine fan / pump efficiency and compare with fan / pump curve (Does the measurement lie on the curve? Is the fan / pump operating on the part of highest efficiency?)
   b. Look for excessive pressure change due to:
      i. Ductwork / piping - excessive velocity, sharp bends, branches, changes in duct / piping section, build up
      ii. Filter / baghouse cleaning - evaluate cycles
      iii. Damper / throttling valve - poor calibration, misalignment
      iv. False air / leaks
3) Plan inspection of fans / pumps, dampers, control valves & other issues
   a. Inspect major fans / pumps at minimum once per year
   b. Inspect for build-ups, wear, wheel alignment, excessive gaps, cut-off

Understand Your Power Contract



Prepared For
1 JOHN DOE CONSTRUCTION LTD
1234 ANYNAME ST
ANYTOWN BC V6B 5A1
3 **Invoice Number:**
150000000004

2 Billing Date: May 14, 2013 | Account Number: 1234 5678 999
Pay By: Jun 05, 2013 | Please Pay: $6,178.73

Meter Reading Information
Electric:
Meter# 4545454
Apr 13 452
May 13 598
Mult x600
31 days 87600
Demand:
Meter# 4545454
May 13 297
Mult x600
kW registered 178
kVarh:
Meter# 4545454
Apr 13 92
May 13 122
Mult x600
18000
Next meter reading on or about Jun 11
kWh Daily Average Usage per Billing Period
9
Daily Average Comparison
May 2012 2793 kWh
May 2013 2826 kWh

Customer Service 4
Phone: 1-800-224-9376 **Power Out?** 1-888-769-3766
Mail to: BC Hydro, PO Box 9501 Stn Terminal, Vancouver BC, V6B 4N1

Previous Bill
Balance payable from your previous bill 6,323.41
Thank you for your payment May 03,2013 6,323.41CR
5 **Balance from your previous bill** **$0.00**

BC Hydro **Electric Charges**
Apr 13 to May 13 (LGS Conservation Rate 1600)
6 Basic Charge: 31 days @ $0.19530/day 6.05*
Part 1: Energy Charge of 94,497 kW.h
14800 kW.h @ $0.09610/kW.h 1,422.28*
79697 kW.h @ $0.04620/kW.h 3,682.00*
7 **Part 2**
-6897 kW.h @ $0.09560/kW.h 659.35CR*
0 kW.h @ $0.04620/kW.h 0.00
0 kW.h @ $0.09610/kW.h 0.00
8 **Demand Charge**
35 kW @ $0.00000/kW 0.00
115 kW @ $4.76000/kW 547.40*
28 kW @ $ $9.13000/kW 255.64*
10 **kVarh: Power Factor 97% surcharge 0%** 0.00
11 Rate Rider at 5.0% 262.70*
*GST 275.84
12 PST 386.17
$6,178.73

13 This billing period you used 87,600 kWh. As a result, you received a Part 2 Energy Credit of $659.35 because your usage was 6,897 kWh below your baseline

Taxes
The following is a summary of taxes billed to your account since your last invoice:
GST at 5% on 5,516.72 275.84
PST at 7.0% on 5,516.72 386.17
14 **Balance payable** **$6,178.73**

Sample

Know your maximum demand targets and keep them in mind when scheduling operations.

Prerequisite:
Teamwork – Operations and Controller

Actions:

1) Detailed understanding of power contract clauses / power bill
2) Avoid exceeding maximum demand
3) Stagger systems start up to avoid excessive power peaks

    Note: Before delaying shop start up make sure you do not get penalized by rail or vessel demurrage!

4) Use BC Hydro Forecaster

November	1,088,441	1,056,628	1,088,441	1,108,211	1,088,441
December	1,172,497	1,099,699	1,172,497	1,160,431	1,172,497
Total Annual Energy Use (kWh)	12,720,237	12,376,597	12,720,237	12,996,346	12,720,237
Net Change From Prior Year (including all edits)			0.00%		0.00%
Load Factor[b]	38%		45 %		50 %
Estimated Annual Cost[c]	$1,060,507		$999,112		$935,870

Refresh | 2012 Report | 2013 Report | 2014 Report

Example: Distribution (Large General Service) terminals can save on demand charges by increasing their load factor. Load Factor is average demand divided by peak demand, during a period of time (usually 15 min). Average demand is the average rate at which energy is used while peak demand is the highest rate at which energy is used. A higher Load Factor means your energy usage is more efficient (LGS accounts typical between 45 - 55%). You can save money by managing your demand

Establish energy conservation targets and monitor monthly

Energy related KPIs

1) **Energy Intensity**

   A. Grain, coal, sulfur, metal concentrate, agricultural products:

      - kWh/tonne train unloads (tonnes of incoming material) or kWh/tonne of combined shipments (tonnes of outgoing material)

   B. Container or breakbulk:

      - kWh / vessel calls or cargo tonnes
      - kWh / total terminal container moves

   C. Warehouses:

      - kWh/ft2

2) **Load factor = kWh during area outages as % load at nominal capacity**
3) **Accuracy factor = (Sum of terminal power meters kWh / power bill kWh) [%]**