

**New Construction Program  
Study Report - Sample**



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Power Smart ENGINEERING

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## Preliminary Energy Study for *ABC High School*

The purpose of this document is to provide guidance to consultants participating in the BC Hydro New Construction Program in how to interpret the energy study requirements. The sample building and associated analysis has been fabricated to a certain extent, but is derived from past BC Hydro Design Assistance projects. Highlighted paragraphs provide detail as to the required content of the various sections, and the section content provides an example of level of detail required. Note that when your actual energy study is submitted, it must be stamped by either a professional engineer or registered architect who is an approved BC Hydro consultant.

### **Executive Summary**

Use this section to provide an overview of study results, including a synopsis of all studied measures, the group / bundle of measures that will be incorporated into the building design and the group / bundle of measures that will be used to request a BC Hydro incentive. Also include the incentive amount. Please show the expected electrical energy savings, capital and maintenance costs, and simple payback for each measure and bundle.

This energy study was conducted to review various alternative design strategies for ABC High School, in order to assist the design team in designing a cost effective and energy efficient building, while also helping SD#1 obtain the project energy use objectives. A detailed lighting study preceded this study, and is appended as Appendix A.

The following table outlines the energy conservation measures (ECMs) studied. The measures are ranked according to ascending simple payback.

Table 1: Summary of ECMs

Measure Name	Annual Savings		Capital Cost	Life Expectancy	Payback		NPV	IRR	AIRR
	\$	Maint. \$			Simple	Discounted			
6. Efficient Lighting Design	\$ 3,556	\$ 3,000	\$ 5,000	15	0.8	0.8	\$ 63,502	135.7%	12.8%
8. Fluorescent lighting in gym	\$ 711	\$ 200	\$ 1,200	15	1.3	1.4	\$ 8,319	79.4%	11.5%
2. Increase 1" Roof Insulation by 1"	\$ 4,508	\$ -	\$ 16,350	15	3.6	4.0	\$ 30,753	29.3%	9.3%
9. Occupancy controls in gym	\$ 277	\$ (20)	\$ 1,000	5	3.9	4.4	\$ 116	11.2%	7.2%
7. Occupancy controls in classrooms and offices	\$ 2,963	\$ (300)	\$ 15,000	5	5.6	6.6	\$ (3,439)	-1.9%	6.4%
1. Increase 2" Roof Insulation by 1"	\$ 1,349	\$ -	\$ 16,350	15	12.1	18.2	\$ (2,255)	4.8%	6.7%
4. Increase Wall Insulation (exterior)	\$ 1,183	\$ -	\$ 15,000	15	12.7	19.6	\$ (2,639)	4.2%	6.6%
5. Install Low-e Windows	\$ 1,271	\$ (200)	\$ 21,700	15	20.3	-	\$ (10,509)	-1.6%	5.6%
3. Increase Wall Insulation (sheathing)	\$ 784	\$ -	\$ 18,700	15	23.9	-	\$ (10,508)	-3.4%	5.2%
12. Boiler efficiency	\$ 1,157	\$ (450)	\$ 22,500	15	31.8	-	\$ (15,113)	-6.4%	4.6%
10. Heating pump VSDs	\$ 105	\$ (50)	\$ 2,500	15	45.5	-	\$ (1,925)	#NUM!	3.9%
11. Chiller COP	\$ 47	\$ -	\$ 10,000	15	212.8	-	\$ (9,509)	#DIV/0!	0.7%

### **BC Hydro Incentive Measures**

The following bundle of measures is recommended for a BC Hydro Power Smart incentive of \$3,530:

- ECM #6: Efficient lighting design
- ECM #7: Occupancy controls
- ECM #8: Fluorescent lighting in gym
- ECM #9: Occupancy controls in gym

Table 2: Summary of Bundles of Measures

Annual Savings					Cost	Life Expectancy	Payback		NPV	IRR	AIRR
kWh	kW	GJ	\$	Maint. \$			Simple	Discounted			
177,797	69.0	(466)	\$ 6,455	\$ 2,880	\$ 22,200	15	2.4	2.6	\$ 75,339	44.7%	10.2%

## LEED Analysis (Optional)

Analysis shows that the project, with implemented design measures bundle above, would obtain 2 LEED credits under the Energy & Atmosphere Credit 1 – Optimize Energy Performance.

## Utility Rates

Use this section to outline the utility rates used in the analysis. Annual energy cost savings should be calculated using the full rate structure or the appropriate trailing step, not the average cost.

### Electric Rate: *BC Hydro Rate 1200*

Monthly charge: \$4.45

#### Energy

First 14800 kWh per month @ 6.96 ¢/kWh

All additional kWh per month @ 3.35 ¢/kWh

#### Demand

First 35 kW of billing demand per month Nil

Next 115 kW of billing demand per month @ \$3.56 per kW

All additional kW of billing demand per month @ \$6.83 per kW

### Gas Rate: *Terasen Rate 3 (Large Commercial Service)*

Monthly charge: \$120.40

Delivery charge per GJ \$2.136

Midstream charge per GJ \$0.537

Cost of gas per GJ \$6.938

## Study Methodology

Use this section to outline the tools and approach to your energy analysis.

The schematic energy modelling has been completed using the eQuest software. This model calculates energy consumption on an hourly basis, based on a detailed set of inputs that includes the following:

- Climate
- Building orientation
- Building configuration
- Glass to wall ratio
- Type of glazing
- Type of building materials and construction
- Internal and external shading
- Internal lighting types
- Heating and cooling loads
- Zone temperature set point

Climate data for BC Climate Region A (Greater Vancouver) is used for this analysis. This data describes a typical meteorological year and includes hourly values for many parameters including the following:

- Dry bulb temperature
- Dew point temperature
- Relative Humidity
- Solar Radiation

- Wind speed and direction
- Cloud cover

Results from the energy simulations are only applicable for design assistance. These calculations are not predictions of actual energy consumption or operating costs of the building after construction. Actual energy usage will differ from these calculations due to a number of variables. These variables may include variations in occupancy, building operations schedules, weather, energy use for equipment not included in the simulations or not covered by the applicable energy code, changes in energy costs from the design of the building to occupancy, and the precision of the simulation and calculation tools used.

### Baseline Building

The first step in this analysis was to create an energy model to represent the typical “market building” convention venue: the building and systems that would be designed if no energy optimisation study had been conducted. Using this energy model, the building was characterised by:

- Electricity consumption
- Peak electricity demand
- Gas Consumption
- Total Energy Consumption / Cost

### Energy Conservation Measures

After the baseline was established, a series of Energy Conservation Measures (ECMs) were examined to determine the impact of each measure independently. The annual energy and cost savings were determined for each measure. The capital and maintenance cost premiums or savings were identified and a life cycle cost analysis was performed for each ECM.

Finally, a bundle of measures was selected and analysed collectively to determine the energy performance of the proposed design, taking into account the interactions between the individual measures.

### **Baseline and Proposed Building Description**

Use this section to provide information on the baseline and proposed building. The baseline building is the building and systems that would have been designed if no energy study had been conducted. It represents good design practice. This section is split into three major components: building envelope, mechanical systems, and electrical systems. Depending on the project, you can use either Metric or Imperial units, but use them consistently throughout the report. The baseline and proposed building description format shown below is just an option. Consultants can arrange information as per their personal preferences. However, the preferred BC Hydro format would be tabular, side by side format, showing baseline and proposed building information in one table.

The baseline building is a 124,000 ft<sup>2</sup> 2-storey high school to be built at 123 Elm Street, Vancouver.

Table 3: Building Description

Model Parameter	Baseline Building	Proposed Building
<b>Envelope Performance</b>		
Net Floor Area	124,000 ft <sup>2</sup>	
Overall Roof R-value	R-26	ECM #1: Increased roof insulation by 1” (R-7)
Overall Wall R-value	First floor: R-15 Second Floor: R-12 Gymnasium: R-16	ECM #3: Wall insulation net reduction of R-2.6 ECM #4: Wall insulation net increase of R-7
Glazing Properties	Double pane, aluminium thermally broken frame, non-operable windows:	ECM #5: Same as baseline with reduced U value (low-e windows) by 28%

	Overall U-value = 0.51 BTU/h ft <sup>2</sup> F Shading Coefficient = 0.76 Windows percentage (window / wall ratio): North 11.2 % East 10.9 % South 9.2 % West 8.3 % Total 10 %	
<b>Shading</b>	No Shading	
<b><u>Internal Loads</u></b>		
<b>Lighting Power Density</b>	Overall interior LPD: 1.1 W/ft <sup>2</sup> Interior lighting description: - classrooms and offices: T8 with el. ballasts - gymnasium: T5/T8 with el. ballasts Exterior lighting connected load: 8.6 kW (with photocell over-ride)	ECM #6: Reduced interior LPD by 27% by providing recessed luminaires with 3 lamps and double switching ability in classrooms and offices.  ECM #8: Use suspended T8/T5 high-bay fixtures in the gym Exterior lighting connected load: Same as baseline
<b>Lighting Controls</b>	Code Minimum	ECM #7: Occupancy controls in classrooms and offices  ECM #9: Occupancy controls in gym
<b>Plug Loads</b>	Overall building plug load density: 0.35 W/ft <sup>2</sup>	
<b><u>Operating Conditions</u></b>		
<b>Indoor Design Temperatures</b>	Heating setpoint / setback: 70 °F / 56°F Cooling setpoint / setback: 76 °F / 99°F	
<b>Indoor Humidity Levels</b>	No Control	
<b>Minimum Outside Air</b>	Classrooms: 15 cfm/person Offices 20 cfm/person Halls 0.5 cfm/ft <sup>2</sup> minimum	
<b><u>Mechanical Systems</u></b>		
<b>Heating/Cooling/Ventilation System</b>	4-pipe fan coil system with gas-fired make-up air units	
<b>DHW System</b>	Dedicated Natural Gas Unit with 80% Efficiency	
<b><u>Central Plant</u></b>		
<b>Cooling System</b>	Air Cooled Chiller	ECM #11: High Efficiency Air Cooled Chiller
<b>Cooling efficiency</b>	COP = 3.6	ECM #11: COP = 4
<b>Heating System</b>	Gas Fired Boilers with Modulating Burners	ECM #12: Condensing Boilers
<b>Heating efficiency</b>	85%	ECM #12: 95%
<b>Pumps</b>	Single speed	ECM # 10 – Variable Frequency Drives on the Heating Water Pumps

### **Baseline Building Energy Use**

Use this section to provide an overview of the resulting baseline annual energy use (kWh, GJ, and ekWh) of the baseline building. The information must include the standard end uses shown in the following table (cooling, heating, lighting, etc.). Provide separate costs for energy and demand if appropriate for the utility rate structure (e.g. electricity). Also, provide a benchmark by dividing the energy use by the building size.

Table 4 provides the annual energy consumption for the baseline building. Table 5 provides more detail on the breakdown of energy consumption in equivalent kilowatt hours. A breakdown of the energy end-use is shown in Graph 1.

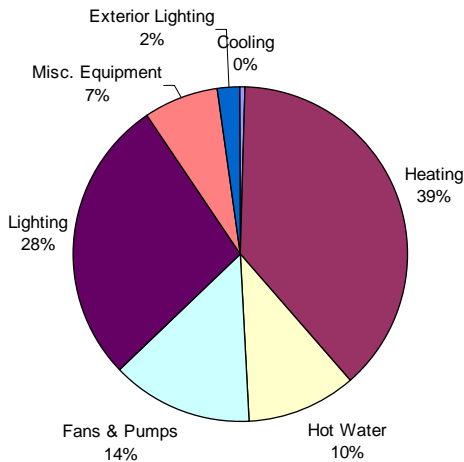
Table 4: Annual Energy Use for the Baseline Building

Electrical Annual Consumption (kWh)	Electrical Peak Demand (kW)	Natural Gas Annual Consumption (GJ)	Annual Energy Cost
689,935	221	2,238	\$66,016

Table 5: Breakdown of Energy Usage for the Baseline Building by End-Use

Energy Use Breakdown			
End Use	Electricity	Gas	Total
	kWh/year	GJ/year	e-kWh/ft <sup>2</sup> /year
Cooling	6,349		0.05
Heating	16,888	1,745	4.04
Hot Water		493	1.11
Fans & Pumps	178,222		1.44
Lighting	364,801		2.95
Misc. Equipment	101,900		0.75
Exterior Lighting	30,875		0.25
Refrigeration			
Elevators			
Cooking			
<b>Total</b>	<b>689,935</b>	<b>2,238</b>	<b>10.57</b>

Graph 1: Breakdown of Annual Energy Usage for the Baseline Building



## Energy Conservation Measure Analysis

### Mechanical System Selection

It is often necessary to first select the mechanical system before proceeding with further analysis. If necessary, provide information on how the mechanical system was selected.

Two mechanical systems were reviewed for possible selection. The first system under consideration was a geexchange heat pump system, which would use a horizontal loop installed in the playing fields. The heat pump system would serve the distributed hydronic system for individual classrooms, as well as the heating coils in the air handling units. The second system under consideration was a conventional fan coil system, with boilers and air cooled chiller. A life cycle costing (LCC) exercise was conducted to select the mechanical system. The economic variables used were a discount rate of 5%, and a study length of 40 years. Natural gas and electricity rates were assumed to escalate at 1% per year. The following table shows the result.

	Geexchange	Fan Coil
Capital Cost	\$ 1,950,000	\$ 1,650,000
Annual Cost		
Energy	\$ 59,000	\$ 63,000
Maintenance	\$ 60,000	\$ 30,000
Total Annual Costs	\$ 119,000	\$ 93,000
NPV of Annual Costs	\$ 1,400,000	\$ 1,065,000
Life Cycle Cost	\$ 3,350,000	\$ 2,715,000

The reduced energy use of the geexchange system was not sufficient to overcome the assumed incremental maintenance cost. As a result, the fan coil system was selected for this project.

### Energy Conservation Measure (ECM) Analysis

Use this section to provide the detailed analysis of each measure. Show the analysis for each measure included in the proposal. The analysis for each measure must include a description of the measure, the incremental capital cost of the measure (including installation), the annual energy cost savings (or increase), the annual maintenance savings (or increase), and the associated economic analysis. The economic analysis must include the simple payback at a minimum, although it is recommended to also include the discounted payback and return on investment. In the following, the spreadsheet supplied by BC Hydro for this purpose has been used.

It is legitimate to review measures which increase energy use while reducing capital cost (e.g. reducing roof insulation as below), however the economic analysis must be done from the perspective of decreasing energy use, or else the BC Hydro spreadsheet will not produce the correct values.

#### ECM #1: Increase 2" Roof Insulation by 1"

**Description:** Add 1" of polyisocyanurate (R-7) to the baseline 2" (R-26). Capital cost is estimated at \$2/m<sup>2</sup> per inch.

Annual Savings					Capital	Life	Payback		NPV	IRR	AIRR
kWh	kW	GJ	\$	Maint. \$	Cost	Expectancy	Simple	Discounted			
2,844	-	116	\$ 1,349	\$ -	\$ 16,350	15	12.1	18.2	\$ (2,255)	4.8%	6.7%

**Discussion:** The economic analysis was done from the perspective of adding insulation. Adding R-7 to the R-26 roof at a cost of \$16,350 to save \$1,349 per year is not cost effective. Therefore, 2" of insulation is more cost effective than 3".

#### ECM #2: Increase 1" Roof Insulation by 1"

**Description:** Add an additional 1" of polyisocyanurate (R-7) to the 1" (R-26). Capital cost is estimated at \$2/m<sup>2</sup> per inch.

Annual Savings					Capital	Life	Payback		NPV	IRR	AIRR
kWh	kW	GJ	\$	Maint. \$	Cost	Expectancy	Simple	Discounted			
8,785	-	357	\$ 4,508	\$ -	\$ 16,350	15	3.6	4.0	\$ 30,753	29.3%	9.3%

**Discussion:** The economic analysis was done from the perspective of adding insulation. Adding R-7 to the R-19 roof at a cost of \$16,350 to save \$4,508 per year is cost effective. Therefore, 2" of insulation is more cost effective than 1".

### ECM #3: Reduce Wall Insulation

**Description:** Replace wall sheathing with gypsum, for a net reduction of R-2.6.

Annual Savings					Capital	Life	Payback		NPV	IRR	AIRR
kWh	kW	GJ	\$	Maint. \$	Cost	Expectancy	Simple	Discounted			
1,449	-	65	\$ 784	\$ -	\$ 18,700	15	23.9	-	\$ (10,508)	-3.4%	5.2%

**Discussion:** The economic analysis was done from the perspective of replacing gypsum with wall sheathing. Gypsum is shown to be cost effective.

### ECM #4: Increase Wall Insulation

**Description:** Add 1" rigid insulation on exterior for a net increase of R-7.

Annual Savings					Capital	Life	Payback		NPV	IRR	AIRR
kWh	kW	GJ	\$	Maint. \$	Cost	Expectancy	Simple	Discounted			
2,198	-	99	\$ 1,183	\$ -	\$ 15,000	15	12.7	19.6	\$ (2,639)	4.2%	6.6%

**Discussion:** The baseline wall insulation is shown to be cost effective.

### ECM #5: Install Low-e Windows

**Description:** Install low-e windows, reducing window U-values by 28%.

Annual Savings					Capital	Life	Payback		NPV	IRR	AIRR
kWh	kW	GJ	\$	Maint. \$	Cost	Expectancy	Simple	Discounted			
1,406	-	110	\$ 1,271	\$ (200)	\$ 21,700	15	20.3	-	\$ (10,509)	-1.6%	5.6%

**Discussion:** Increased maintenance costs are estimated based on known breakage rates.

### ECM #6: Efficient Lighting Design

**Description:** Provide recessed luminaires with 3 lamps and double switching ability in classrooms, offices, and labs.

Annual Savings					Capital	Life	Payback		NPV	IRR	AIRR
kWh	kW	GJ	\$	Maint. \$	Cost	Expectancy	Simple	Discounted			
97,910	40	(257)	\$ 3,556	\$ 3,000	\$ 5,000	15	0.8	0.8	\$ 63,502	135.7%	12.8%

**Discussion:** This was modelled with an overall LPD reduction of 27% according to the detailed lighting study.

### ECM #7: Occupancy controls in classrooms and offices

**Description:** Ceiling mounted occupancy sensors in classrooms; wall mounted sensors/ switch combinations for small offices.

Annual Savings					Capital	Life	Payback		NPV	IRR	AIRR
kWh	kW	GJ	\$	Maint. \$	Cost	Expectancy	Simple	Discounted			
81,592	33	(214)	\$ 2,963	\$ (300)	\$ 15,000	5	5.6	6.6	\$ (3,439)	-1.9%	6.4%

**Discussion:** The ASHRAE LPD reduction for occupancy sensors is 30%, pro-rated to the appropriate area (classrooms and offices) for a net reduction of 22.5% of overall LPD.

### ECM #8: Fluorescent lighting in gym

**Description:** Use suspended T8/T5 high-bay fixtures in the gym.

Annual Savings					Capital	Life	Payback		NPV	IRR	AIRR
kWh	kW	GJ	\$	Maint. \$	Cost	Expectancy	Simple	Discounted			
20,000	-	-	\$ 711	\$ 200	\$ 1,200	15	1.3	1.4	\$ 8,319	79.4%	11.5%

**Discussion:** Estimated 20,000 kWh savings for 2 gyms @ 4,000 ft<sup>2</sup> each. Refer to detailed lighting study.

**ECM #9: Occupancy controls in gym**

**Description:** Use wall mounted occupancy sensors to automatically control lights.

Annual Savings					Capital	Life	Payback		NPV	IRR	AIRR
kWh	kW	GJ	\$	Maint. \$	Cost	Expectancy	Simple	Discounted			
7,615	-	-	\$ 277	\$ (20)	\$ 1,000	5	1.3	1.4	\$ 8,319	79.4%	11.5%

**Discussion:** Estimated savings for 2 gyms @ 4,000 ft<sup>2</sup> each. Refer to detailed lighting study.

**ECM #10: Heating pump VSDs**

**Description:** Install variable speed drives on the heating water pumps. Assume a single 7.5 hp primary pump, 75% loaded, 3,000 annual hours of operation, and 25% savings = 3,150 kWh (\$105).

Annual Savings					Capital	Life	Payback		NPV	IRR	AIRR
kWh	kW	GJ	\$	Maint. \$	Cost	Expectancy	Simple	Discounted			
3,150	-	-	\$ 105	\$ (50)	\$ 2,500	15	45.5	-	\$ (1,925)	#NUM!	3.9%

**Discussion:** The VSD would be installed on only the lead pump. There would be a second pump for backup, with no VSD.

**ECM #11: Chiller COP**

**Description:** The baseline chiller is at ASHRAE 90.1 level. Investigate a 10% increase in efficiency.

Annual Savings					Capital	Life	Payback		NPV	IRR	AIRR
kWh	kW	GJ	\$	Maint. \$	Cost	Expectancy	Simple	Discounted			
559	-	-	\$ 47	\$ -	\$ 10,000	15	212.8	-	\$ (9,509)	#DIV/0!	0.7%

**Discussion:** Cooling energy use is too small to warrant further investment in efficiency.

**ECM #12: Boiler efficiency**

**Description:** Replace the lead boiler, representing 50% of installed capacity, with a condensing boiler.

Annual Savings					Capital	Life	Payback		NPV	IRR	AIRR
kWh	kW	GJ	\$	Maint. \$	Cost	Expectancy	Simple	Discounted			
-	-	112	\$ 1,157	\$ (450)	\$ 22,500	15	31.8	-	\$ (15,113)	-6.4%	4.6%

**Discussion:** Analysis shows the lead boiler will serve approximately 90% of the heating hours.

**Bundle of Recommended Measures**

Use this section to report on the bundle of measures that will be incorporated into the building, and if different, the bundle that will be submitted to BC Hydro for a capital incentive. There is no right or wrong way to assemble the bundle, and it is not necessary to use only economic criteria to include or exclude any particular measure, as decisions often include issues other than energy based economics. In particular, the incentive bundle may contain any combination of measures. Make sure that the final energy analysis of each bundle of measures is run as a group, so that interactive measures are incorporated. In this example, the savings from efficient lighting design and occupancy controls will not be additive, and both measures will impact the lighting end use as well as the heating and cooling end uses.

A bundle will be eligible to receive a capital incentive from BC Hydro if the bundle exceeds a 2 year simple payback. The capital incentive will be that amount that “pays down” the bundle incremental cost to achieve a 2 year simple payback.

Capital incentives can be also calculated as follows:

**The total electrical energy savings over the life of the measures (to a 10 year maximum) x ~3.07 ¢/kWh<sup>1</sup>, to a maximum of that required to reduce the payback to 2 years.**

A spreadsheet has been provided to assist with the economic calculations.

**Bundle #1 (design bundle)**

The following bundle #1 incorporates all measures that have a simple payback of less than 7 years. This is the recommended bundle to be included in the building design:

- ECM #1: Increase 2” roof insulation by 1”
- ECM #6: Efficient lighting design
- ECM #7: Occupancy controls
- ECM #8: Fluorescent lighting in gym
- ECM #9: Occupancy controls in gym

The economic analysis and energy savings (relative to the baseline) of the bundle, incorporating interactive effects is shown below:

Annual Savings					Cost	Life	Payback		NPV	IRR	AIRR
kWh	kW	GJ	\$	Maint. \$	\$	Expectancy	Simple	Discounted			
174,946	68.0	(582)	\$ 5,105	\$ 2,880	\$ 5,850	15	0.7	0.8	\$ 77,584	141.2%	12.8%

Because this bundle is under a 2 year simple payback, it is not eligible for a BC Hydro capital incentive.

**Bundle #2 (incentive bundle)**

The following bundle #2 incorporates all electrical measures (i.e. lighting) that have a simple payback of less than 7 years. This is equivalent to bundle #1, but the roof insulation measure has been removed:

- ECM #6: Efficient lighting design
- ECM #7: Occupancy controls
- ECM #8: Fluorescent lighting in gym
- ECM #9: Occupancy controls in gym

Table 6: Annual Energy Use for the Proposed Building

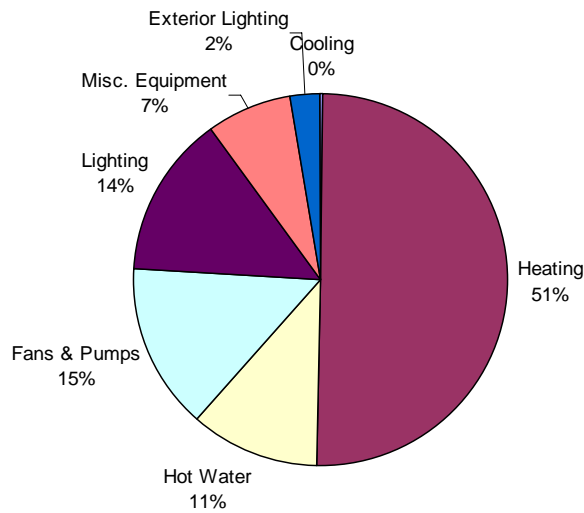
Electrical Annual Consumption (kWh)	Electrical Peak Demand (kW)	Natural Gas Annual Consumption (GJ)	Annual Energy Cost
689,935	221	2,238	\$66,016

<sup>1</sup> Only measure bundles with electrical savings greater than 50,000 kWh will be eligible for capital incentives.

Table 7: Breakdown of Energy Usage for the Proposed Building by End-Use

Energy Use Breakdown				
End Use	Electricity	Gas	Total	Total Savings
	kWh/year	GJ/year	e-kWh/ft <sup>2</sup> /year	
Cooling	3,333		0.026	42.6%
Heating	19,725	2,181	5.04	-25.8%
Hot Water		493	1.11	0.0%
Fans & Pumps	179,470		1.45	-0.7%
Lighting	178,752		1.44	49%
Misc. Equipment	101,900		0.75	0%
Exterior Lighting	30,875		0.25	0%
Refrigeration				
Elevators				
Cooking				
<b>Total</b>	<b>512,138</b>	<b>2,704</b>	<b>10.2</b>	<b>3.7%</b>

Graph 2: Breakdown of Annual Energy Usage for the Proposed Building



The economic analysis and energy savings (relative to the baseline) of the bundle, incorporating interactive effects is shown below:

Annual Savings					Cost	Life	Payback		NPV	IRR	AIRR
kWh	kW	GJ	\$	Maint. \$	\$	Expectancy	Simple	Discounted			
177,797	69.0	(466)	\$ 6,455	\$ 2,880	\$ 22,200	15	2.4	2.6	\$ 75,339	44.7%	10.2%

In order to obtain a 2 year simple payback for this bundle, a capital incentive of \$3,530 is required.

### Non-Energy Benefits

Use this section to identify any non-energy benefits of identified energy-savings opportunities (e.g. production/performance, occupant comfort, re-sale value, construction cost reduction and environmental benefits such as reduced emissions, air quality, water conservation etc.)

## LEED Analysis (Optional)

Analysis shows that project would obtain 2 LEED credits under the Energy & Atmosphere Credit 1 – Optimize Energy Performance.

## APPENDIX

Please attach the most recent of either schematic design or design development reports and drawings, and other information that will be helpful to the understanding of the project and energy study report.