SUSTAINABLE BUILDINGS PILOT PROJECT

Phase 1

Workshop 2

June 2, 2005

Synopsis

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ACKNOWLEDGMENTS

The City of Kelowna wishes to acknowledge its Community Action on Energy Efficiency (CAEE) partners for the development of the Sustainable Building Program. This workshop was sponsored in part by CAEE, a pilot program funded by Natural Resources Canada's Office of Energy Efficiency and the BC Ministry of Energy and Mines. Additional support from FortisBC and Terasen Gas is also gratefully acknowledged.

Walter Grey, Mayor – *City of Kelowna*
Neil McLeod, *Natural Resources Canada*
Mary Lyne Tremblay, *Natural Resources Canada*
Dan Green, *Ministry of Energy and Mines*
Andrew Pape-Salmon, *Ministry of Energy and Mines*
Brian Parent, *FortisBC PowerSense*
Ruth Sulentich, *Terasen Gas*

FOREWORD

The Community Action on Energy Efficiency (CAEE) program is providing the incremental resources needed to complete two major start-up steps in the City's *Interim Sustainable Building Action Plan (Action Plan).*

The relationship between environmental stewardship and energy conservation and the impacts of selected activities on the management and improvement of air quality and greenhouse gas emissions reduction is the focus of the City's strategy guiding long-term planning. The City is committed to providing a livable community for its citizens.

BACKGROUND

Building structures shape areas beyond their immediate footprint, affecting air and watershed quality and transportation patterns of communities. They also consume a significant amount of resources during their construction and occupancy. For several years the building and construction industry have benefited from ongoing efficiency and design improvement programs offered through the City and its CAEE partners[1]

The City has become increasingly aware of the importance of sustainable building efforts in the overall scheme of environmental stewardship. The relationship between energy conservation and greenhouse gas (GHG) reduction is a major issue. Air quality improvement through energy conservation is high on the priority list for citizens, health professionals and air quality specialists. In Kelowna and the Central Okanagan Regional District, there is strong interest to improve air quality and energy conservation and to promote sustainable living.

WORKSHOP 2 APPROACH

Participation in workshop 2 (June 2, 2005) of the Sustainable Building Pilot Project included workshop 1 attendees and other members of the building industry. The room organization was eight to ten people at several round tables, with plenary presentations followed by audience questions, table discussion and group discussion.

Approximately 35 attendees, along with CAEE partners, from academic, private sector, and municipal government backgrounds met to achieve the Workshop objectives:

- Updated on the City of Kelowna's actions since workshop 1 (March 2005), the strategic plan update and development application checking procedures;
- Familiarized with the Commercial Building Improvement Program (CBIP) (NRCan) analysis for a typical new multi-unit residential building (MURB). The exercise was interactive and allowed participants to preview the CBIP evaluation results and to monitor results from altered assumptions and building characteristics keyed into the software model;
- Identified impacts of installed geoexchange systems, including system reliability, system backup, cross-connection issues for City water service, and groundwater regulations.
- Reviewed existing federal and provincial programs that offer incentives to improve energy and/or environmental performance of buildings.

SUMMARY OF RESULTS

Group discussion highlights

Participants were asked to provide comment and initial feedback about what they had heard and been presented regarding the ***City's overall strategic plan and the new development and permitting checking procedures***.

[1] CAEE Program Partners include BC Ministry of Energy and Mines, City of Kelowna, FortisBC, Natural Resources Canada and Terasen Gas.

- New procedures must expedite the permitting process and not add another layer of delay for developers;
- New "project facilitator/scoper" staff position needs to serve primarily a communication role;
- Preliminary scoping meeting between City and development team will minimize costly delays and optimize City's sustainability goal.

Participants were then asked to comment on the City's ***GHG Emissions Management Plan:***

- Emphasis should be placed on transportation alternatives;
- City should expand its community GHG inventory and include an inventory for the Regional District.

Roundtable participants were asked to discuss ***geoexchange issues and groundwater regulation, considering the growing number of installations of geoexchange systems in Kelowna:***

- Geoexchange systems are being installed on properties that take municipal water service. Depending on the use and location of the geoexchange system on the property, cross-connection issues need to be addressed by the City's inspection and possibly permitting processes.
- Geoexchange system installations are unregulated in BC, although drilling and groundwater regulations, particularly that all drilling must be done by certified drillers, are applicable to geoexchange systems.
- The industry association, Geoexchange BC, has relied on its members to meet standards and regulations on their own volition.
- BC Groundwater Association has assisted the provincial government with preparation of the Groundwater Protection Regulation (July 2004), which has an impact on the drilling and loop installation for geoexchange systems.

NOTE: COMPLETE SESSION NOTES HAVE BEEN INCLUDED IN THIS SYNOPSIS REPORT. ROUNDTABLE FEEDBACK FROM THE PARTICIPANTS IS HIGHLIGHTED IN BLUE.

OUTCOME AND FUTURE ACTIONS

City of Kelowna

1. Communicate the benefits of sustainable building to the citizens of Kelowna as an element in what may become a broad social marketing campaign.
2. Establish a Water Protection Plan.
3. Host a Building Advisory Committee comprising volunteer members of the building industry in Kelowna, organized by the Energy Management Committee, to meet regularly with City staff so that all parties can stay informed and address any emerging issues as they arise.

Partners and Participants

1. Local developers, architects, engineers and construction industry leaders to volunteer as members of a soon-to-be-formed Building Advisory Committee. The group will provide ongoing dialogue with The City on its planning process and development industry issues.
2. BC Ministry of Energy and Mines to investigate requirements (curricula and resources) to develop geoexchange training courses and standards.

Natural Resources Canada (NRCan)

1. Opportunities to hold CBIP training sessions in Kelowna to model and prepare "winning" proposals for submission to the program.
2. Training workshops on the Model National Energy Code.

MORNING SESSION - POLICY INITIATIVES

Don Degen, City of Kelowna
Rod Carle, City of Kelowna
Corey Davis, City of Kelowna

City has made corporate commitment with Council Resolution

1 Council Report Recommended:

1. Regular council updates from the Sustainable Building Pilot
2. Environmental action items
    - Lean Green City Government
    - Active Transportation
    - Healthy Environment
    - Environment Design

2 Five Urban Centres Identified by Official Community Plan

- Planning Department has many incentives for developers (e.g. Parking)
- City is developing communication plan/strategy to inform public
    - Phase 1 – Newsletter/Brochure circulated
    - Phase 2 – Newspaper/Shaw cable
- City's New Strategic plan is integrating environmental matters focus
- Message: Success comes through social marketing and education
- Still to come: Sustainable Action Plan

3 Pre-Screening Program: Updated Process for Plans and Permits:

- Full Implementation planned for January 2006
- Department wants to be more proactive
- Increased Interaction beginning with City/project developer kick-off meetings
- City divided in planning zones
- Each zone has a dedicated plan checker
- Plan checker is gateway for all residential and commercial development projects in their zone.
- Quicker process for developers
- Additional plan checkers are needed and will require training

4 GHG Emissions Study

Working on Partners for Climate Protection (PCP) program from the Federation of Canadian Municipalities

Milestone 1: Community GHG Inventory for City of Kelowna

A community inventory includes residential, institutional, commercial, industrial, transportation, and
- solid waste sectors.
- Using 2002 as a base year, collect data to determine:
    - Electricity and fossil fuel energy use;
    - Transportation (such as vehicle kilometers travelled, fleet composition and fuel(s) consumed); and
    - The quantity and composition of waste and disposal methods
- Forecast energy use for the next 10 to 20 years
- GHG reduction target is 20% over next 10 years
- Also needed is a Community GHG Inventory for the Regional District and a Corporate inventory
- A corporate inventory: municipal government facilities and operations, including buildings, street lighting, water and wastewater treatment, municipal fleet, and corporate and/or community solid waste

5 **Eco-Efficiency Study Guidelines -** see Appendix

MORNING SESSION - POLICY INITIATIVES

Participant Roundtable Input

Concept of Zones and "Urban Zones" for plan administration and checking
Role and Scope of New Plan Checking Procedures

TABLE FEEDBACK

- Facilitator at City to meet with to discuss initial concept
- Reduces/eliminates "wasted drawings"
- Process is evaluated on preliminary basis
- Ideal opportunity to inform developer regarding incentives
- Eg: Project facilitator staff at City of Vancouver: more of a communication piece, not a plan checker
- Initial scoper
- Mandatory letter of assurance at initial stage
- City involved from very beginning to optimize
- City already facilitates but needs to be more comprehensive
- Need for incentives that would be less onerous for city (ex. Tax incentive if building is Lead
- Not sure if training is necessary
- Plan checking & early involvement do not account for commissioning stage
- From developer's perspective, adding consultants is not ideal
- Add fees for inefficient "Bad" development
- Coordinator/Facilitator staff
- Is Kelowna considering LEED
- Eco efficiency study
- Sustain aspects: siting/landscape
- Zones
- Administrative division
- Better to have expertise in different building types
- Use of incentives & market education

Synopsis

- Project Facilitator or Scoper at the City to meet with developer team (developer, architect, engineer) to discuss initial concept, reducing or eliminating "wasted drawings" and evaluate the project on a preliminary basis. Preliminary meeting is ideal opportunity to inform developer about energy efficiency, available incentives and any other City requirements.
  E.g. City of Vancouver staffs a project facilitator whose role is more that of communication rather than plan checking.
- The Pre-screen stage is to discuss concepts & new ideas – early in development and should involve the all parties, including all relevant City Departments
- Green Building Incentives, if any are to be used, should be less onerous for City (e.g. Tax incentive if building is LEED).
- City of Kelowna should require a mandatory letter of assurance at initial stage from a licensed professional.
- The concept of Urban Zones has merit but should not be adopted at the expense of expertise in different building types.
- Plan checking & early involvement do not eliminate poor or absent commissioning.
- Measurement/Performance incentive – From Standards (LEED)
- Energy expertise – may need to outsource
- Use programs that are in place (Federal and Utility) CBIP
- Know when you are there: MEV needed
- Building permit rebate
- Watch developer's process & cost impacts!

MORNING SESSION - POLICY INITIATIVES

Participant Roundtable Input

GHG Management Plan

TABLE FEEDBACK

- Adoption of existing programs (R2000, ENERGuide for Homes) to ease implementation
- Minimize peak energy use
- Use of passive design (Siting).
- Parking spaces sold separately
- Option to buy parking spaces
- Vancouver uses parking spaces as "credits"

SYNOPSIS

City of Kelowna could pilot the following transportation measure as per City of Vancouver's example:

- Use of parking spaces as development application credits
- Parking spaces not linked to units sold and this sold separately
- Parking rebates for hybrid cars

Scope of Eco-Feasibility Study

TABLE FEEDBACK

- 5% voluntary "Green" purchasing for materials and services to construct
- Possibility of small pilot project
- Should city incorporate study in its process?
- Pilot neighbourhood to gather data
- Advertising vs. real projects – customers need to see the house
- Study is too detailed

SYNOPSIS

- The City may consider implementing the Eco-Feasibility study in a pilot neighbourhood to collect data before incorporating it in the application process.
- The study as described is too detailed
- Advertising vs. real projects – customers need to see the house

MORNING SESSION – COMMERCIAL BUILDING IMPROVEMENT PROGRAM BUILDING SIMULATION

Curt Hepting, EnerSys Analytics Inc.

SYNOPSIS

A simulation of a typical new multi-unit residential building, see *Archetype Key Building Characteristics* (next page), was prepared using the EE4 energy performance CBIP compliance program, along with a front-end program to quickly present the model's results. This allowed the workshop session attendees to interactively query the base case and learn results immediately.

Multiunit Residential Building (MURB): Archetype Key Building Characteristics[2]

The MURB archetype, including variations within this building type, are listed below. The following listing provides the key building characteristics, including requirements for the MNECB and ASHRAE 90.1-1999 energy codes for new construction. In many cases, information for certain characteristics are the same between the Reference models, but we provide information since it is unique to the building type and/or of significance to the energy performance.

Note the characteristics are generally based on professional experience and observation from actual site data, but are not statistically valid.

Item	Proposed Baseline	MNECB+CBIP Reference		Discussion/Issues
BUILDING CONFIGURATION				
Floor Area (sf)	135,000	N/A - Same geometry as for Proposed		Interpreted from limited information provided on proposed project (e.g., no areas provided), and supplemented with prototype information from BC Hydro, CMHC and professional experience.
Floors	20			
Suites	90			
Surface vs. Floor Area	0.60			
Wall Area per Floor (sf)				
North/South	1,068			Both sources indicated long axis typically favours a N-S orientation.
East/West	789			
EXTERIOR SURFACES				
Wall Overall R-Value	R-15.9 (RSI-2.8) based on 5.5" steel studs at 24" o.c. with batts	Electric Heat Source	Gas / Heat Pump	ASHRAE also requires R-7.5 continuous insulation for metal construction. Mix of metal and wood frame construction in market.
Okanagan		15.3	**12.6**	
Roof Overall R-Value	Overall R-32.7 (RSI-5.7) for concrete roof with 4" continuous polyisocyanurate insulation	Electric Heat Source	Gas / Heat Pump	Typical flat roofs with continuous insulation (i.e., "Type III" for MNECB) at 4" of polystyrene or better and per Vancouver By-Law No. 6871, Tables 6.4.1 (R-20 req't)
Okanagan		**19.6**	**12.1**	
Exposed Floor R-Value	R-14 (RSI-2.5) based on concrete floor with spray applied insulation	Electric Heat Source	Gas / Heat Pump	Typical "Type II" floor corresponds to "mass" type for ASHRAE for concrete deck, with polystyrene or spray-applied foam/fibre; mainly applies above parkade.
Okanagan		22.1	17.6	
GLAZING				
Glazing Percent	60%	Same as Proposed up to **40% max**		From the BC Hydro "High- and Low-Rise Apartment Building Audit and Simulation Study" (October 1994), the average percent window area for new buildings was about 50%, which is a significant increase over *existing bldg* info from BC Hydro and NRCan (at about half). Further, window percentages have been increasing.
Window U-value	Overall U-0.46 (USI-2.6) for clear double pane low-e windows with air space and aluminum thermally broken frames	Electric Heat Source	Gas / Heat Pump	Operable windows are prevalent in MURBs, but most windows are still fixed. Input is for overall values with framing and air films.
Okanagan		**0.36**	**0.58**	

[2] Prepared by EnerSys Analytics Inc.

Multiunit Residential Building (MURB): Archetype Key Building Characteristics

Window SC	0.60	0.74 or same as Proposed, whichever is of most benefit	High efficiency may be a misnomer since it typically is associated with lower values, which can *increase* energy use in non-cooled MURBs.
SPACE CONDITIONS			
Schedules	Typical from calibration	Default Schedules (Type A primarily)	Calibrations for overall CMHC archetype proved reasonable indicator.
Infiltration	Same as Reference	Dictate at 0.05 cfm/ft² of exterior wall area	Infiltration 24 hours/day.
Interior Lighting Density	0.84 W/ft² in suites* / 0.86 W/ft² non-suites	0.84 W/ft² in suites* / 0.86 W/ft² non-suites	Only common areas are regulated by Standards. *CBIP now provides credit for suite lighting, *if desired*, compared against a 1.1 W/ft² suite lighting reference.
Equipment Density	0.50 W/ft² overall with Suites at 0.63 W/ft², including added "process load" for facilitating CBIP appliance credit	Same as Proposed, although EE4 sets too low	Default for CBIP indicated, including incremental major appliances treated as *process loads* per CBIP procedures for obtaining possible credit. Fireplace load approximated with a 40% efficiency and 680 MBtu annual energy use for a typical unit with pilot light.
Parkade Lighting Density	0.3 W/ft²	0.3 W/ft²	Lighting based on ASHRAE/IES lighting power allowance. Not included in CBIP unless credit optionally applied for.
HVAC SYSTEM TYPE			
Air Handling	(1) Central gas-fired make-up air unit (MAU) serving electric resistance	Terminal fan units with outside air heated by gas, remaining heating served with electric resistance	Conventional practice with electric baseboards in suites and outside air delivered to pressurized corridors. CBIP currently revising reference modelling approach since present provision is inappropriate.
Cooling Source	DX via package terminal air conditioners (PTACs)	DX via package terminal air conditioners (PTACs)	Change to hydronic cooling not only affect cooling source, but the fan energy and cooling efficiency for the CBIP reference.
FAN SYSTEM			
Fan Power	MAU at 1.2" static w/45% efficient fans; PTACs at 0.5" static w/25% efficient fans	Suites: 0.5"/25% supply, no return Common areas with DX cooling: 1.3"/40% supply, no return	MNECB default total static pressures and fan efficiencies have typically aligned with most proposed designs, including cases with DX cooling. Reference case setting if hydronic cooling applies: 2.0"/50% supply, 0.6"/25% return
Outside Air	0.063 cfm/ft² (0.35 ACH standard, plus 20% overage allowance)	Same as Proposed, limited to a *maximum of 1.2x recognized Standard*	Outside air provided by MAU via corridor pressurization. ASHRAE 62 cited as default Standard for establishing maximum reference ventilation allowance; must obtain permission to use another Standard (other than MNECB).
Minimum Supply Flow	N/A - based on required fan size, plus 30% sizing factor	0.40 cfm/ft²	
Exhaust Heat Reclaim	None	N/A	

Multiunit Residential Building (MURB): Archetype Key Building Characteristics

HVAC CONTROL			
Heating and Cooling Setpoints	Occupied: 70°/76°F; Setback: 67°/76°F; 60°F min in corridors	Same as Proposed	*Average* heating setback is modest.
Economizer	None, with limited natural ventilation via operable windows	N/A	Little effect on heating, although operable windows tend to increase heating.
HEATING PLANT			
Central Heating Efficiency	Gas-fired MAU at 80% efficiency; If applicable, **2-stage boiler** at 80% efficiency	On/off gas-fired heating equipment at 80% efficiency	Typical MAU represents on/off unit with 80% combustion efficiency (ce). Two-stage boiler equivalent to having 2 boilers.
Hot Water Flow	Constant flow, if applicable	Constant flow, if applicable	Default CBIP models set at 40' head.
COOLING			
Cooling Efficiency	DX cooling with EER at 11 (BC Housing)	DX cooling with **EER at 8.5** (note ASHRAE at 9.7)	If hydronic cooling applies, the Reference employs a reciprocating chiller at 3.8 COP with heat rejection to a 2-cell cooling tower, feeding a chilled water loop with a 10ºF temperature rise and same head as for the proposed case (40' is the default).
DOMESTIC HOT WATER (DHW)			
Heating Efficiency	80% combustion efficiency	80% combustion efficiency	Indications from meeting are that losses should be included here, although they are not with CBIP (or EE4). Losses significantly reduced with low-temperature in-suite configuration.
Avg. Load (Btu/suite/day)	26.0	26.0	Load based on end-use data published by Lawrence Berkeley Labs for new homes (LBL-35475) which indicates 51 gallons/day; conservatively assuming data is for homes w/50% more occupants than apts., avg. daily load equates to 26 Btu/apt/day. Note that MNECB defaults equate to 18.3 Btu/ft²/day, which is low compared to load research information on existing MURBs.
UTILITY RATES			
Electricity	Blended price for electricity based on FortisBC residential tariff at 6.5 ¢/kWh, including GST (since non-refundable)	Same as Proposed	Fixed bi-monthly charge of $19.35 also applies to each residential account, but is unavoidable and total cost would vary based on number suites (i.e., accounts). Also, main meter likely on a different rate tariff.
Natural Gas	Terasen Inland Rate 3 (>2000 GJ) at $9.57/GJ (not including GST since refundable)	Same as Proposed	If annual gas use drops below 2000 GJ/year Rate 2 applies, which increases the unit cost by $0.56/GJ, although the fixed monthly charge decreases from $119.83/month to $22.46/month.

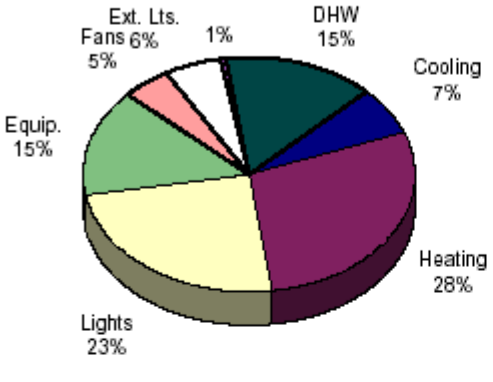
RESULTS

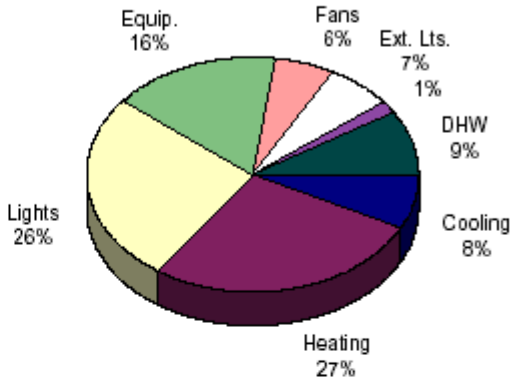
Summary simulation results for 3 heating, ventilation and air conditioning cases are shown below.

Energy Simulation Results *ProAC1*

High-Rise MURB, PTACs w/Electric Resistance - Energy Efficiency Case
Kelowna, BC

Combo A: Minimum CBIP Scenario
ENERGY BILL: $95,209, RESULTING IN SAVINGS OF $34,817 (26.8%)





Energy Use: 36,600 Btu/ft² (115 kWhe/m²)

Energy Costs: $0.71/ft² ($7.59/m²)

Legend	END-USE	Electricity $	Electricity Savings	Natural Gas $	Natural Gas Savings	Central Steam $	Central Steam Savings	TOTAL COSTS $	TOTAL COSTS Svgs	ANNUAL ENERGY GJ	ANNUAL ENERGY Svgs
	Cooling	7,262	16.8%					7,262	16.8%	341	**18.2%**
	Heating	19,479	44.9%	6,211	47.9%			25,691	45.7%	1,505	**47.8%**
	Lights	25,072	14.4%					25,072	14.4%	1,263	**14.8%**
	Equip.	15,531	19.9%					15,531	19.9%	769	**20.6%**
	Fans	5,496	-11.3%					5,496	-11.3%	250	**-13.1%**
	Refrig							0		0	
	Ext. Lts	6,217	0.0%					6,217	0.0%	287	**0.0%**
	Elev.	1,369	0.0%					1,369	0.0%	36	**0.0%**
	DHW			8,571	33.1%			8,571	33.1%	762	**35.3%**
	Cook							0		0	
	TOTAL	**80,426**	23.6%	14,783	40.3%			**95,209**	26.8%	**5,212**	30.2%
	Total $ Savings	$24,848		$9,969				$34,817		2,259.8	
	Fuel Savings:	357.3 MWh		974 GJ		0 Mlbs					

Maximum HVAC Contribution During Peak*

HVAC END-USE	Demand Base	Demand ECM	Peak Load Reduction
Fossil Heat (kBtuh out)	470	284	185.7 (39.5%)
Steam Heat (kBtuh out)	0	0	0.0 (0.0%)
Electric Heat (kBtuh out)	1,626	1,140	486.1 (29.9%)
Cooling (tons output)	158.5	172.9	-14.4 -(9.1%)
Fans & Pumps (hp)	49	58	-9.0 -(18.5%)

*Coincident with building; thus, values do not necessarily reflect absolute maximums.

Ref. CBIP Savings - GJ:	1,652 (25.3%)	Incent:	$44,361
LEED Credit 1 Points -	Canada: 0	90.1:	n/a

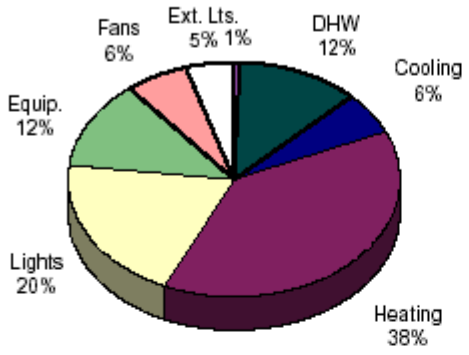
Economic Analysis

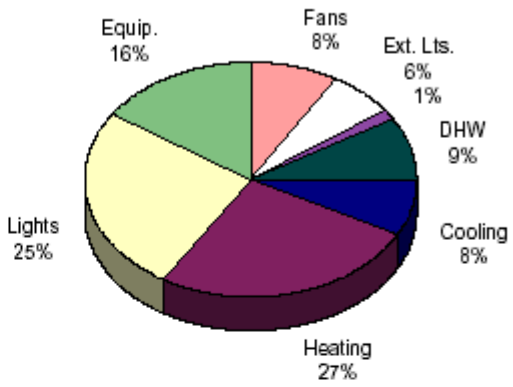
Incremental Costs ($)*	
Equip. & Labor	-$25,000
Annual O&M	$0 /year
Cooling System**	$500 /ton
Heating System**	$5 /kBtuh
Fans & Pumps**	$0 /hp
Net Savings/Year	*$34,817*
Net Capital Cost	*-$21,152*
Payback @ 5.0%	*Instantaneous*

*Costs are very rough and unverified.

High-Rise MURB, PTACs w/Gas Heating - Energy Efficiency Case
Kelowna, BC

Combo B: Minimum CBIP Scenario
ENERGY BILL: $99,275, RESULTING IN SAVINGS OF $28,132 (22.1%)





Energy Use: 44,400 Btu/ft² (140 kWhe/m²)

Energy Costs: $0.74/ft² ($7.92/m²)

Legend	END-USE	Electricity $	Electricity Savings	Natural Gas $	Natural Gas Savings	Central Steam $	Central Steam Savings	TOTAL COSTS $	TOTAL COSTS Svgs	ANNUAL ENERGY GJ	ANNUAL ENERGY Svgs
	Cooling	7,783	11.7%					7,783	11.7%	362	**12.9%**
	Heating			25,939	30.9%			25,939	30.9%	2,458	**31.5%**
	Lights	25,185	14.4%					25,185	14.4%	1,263	**14.8%**
	Equip.	15,643	19.8%					15,643	19.8%	769	**20.6%**
	Fans	8,343	27.6%					8,343	27.6%	391	**29.7%**
	Refrig							0		0	
	Ext. Lts	6,329	0.0%					6,329	0.0%	287	**0.0%**
	Elev.	1,482	0.0%					1,482	0.0%	36	**0.0%**
	DHW			8,571	33.1%			8,571	33.1%	762	**35.3%**
	Cook							0		0	
	TOTAL	**64,764**	16.0%	34,511	31.5%			**99,275**	22.1%	**6,328**	25.6%
	Total $ Savings	$12,298		$15,834				$28,132		2,182.9	
	Fuel Savings:	176.8 MWh		1,546 GJ		0 Mlbs					

Maximum HVAC Contribution During Peak*

HVAC END-USE	Demand Base	Demand ECM	Peak Load Reduction
Fossil Heat (kBtuh out)	2,688	2,164	524.7 (19.5%)
Steam Heat (kBtuh out)	0	0	0.0 (0.0%)
Electric Heat (kBtuh out)	0	0	0.0 (0.0%)
Cooling (tons output)	158.5	153.9	4.6 (2.9%)
Fans & Pumps (hp)	61	62	-0.7 -(1.2%)

*Coincident with building; thus, values do not necessarily reflect absolute maximums.

Ref. CBIP Savings - GJ:	2,179 (26.6%)	Incent: $55,994
LEED Credit 1 Points -	Canada: 1 –	90.1: n/a

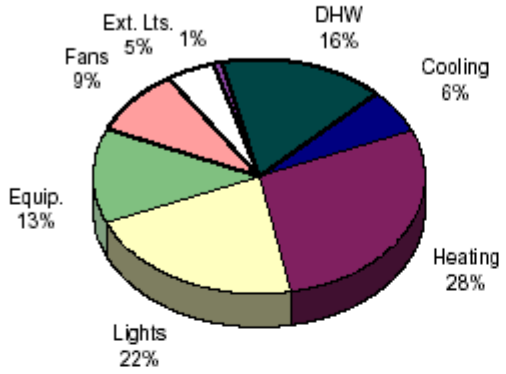
Economic Analysis

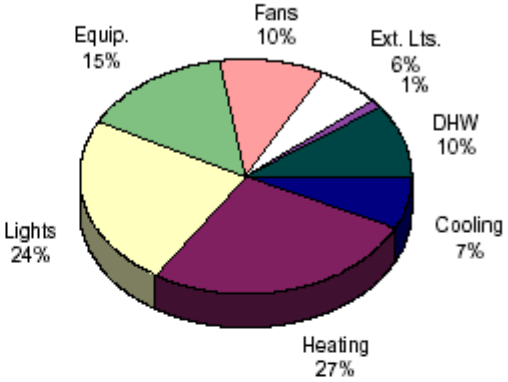
Incremental Costs ($)*	
Equip. & Labor	$105,000
Annual O&M	$0 /year
Cooling System**	$500 /ton
Heating System**	$15 /kBtuh
Fans & Pumps**	$0 /hp
Net Savings/Year	*$28,132*
Net Capital Cost	*$94,815*
Payback @ 5.0%	*3.7 years*

*Costs are very rough and unverified.

High-Rise MURB, 50% GSHP w/Gas Boiler Backup - Energy Efficiency Case
Kelowna, BC

Combo B: Minimum CBIP Scenario
ENERGY BILL: $105,234, RESULTING IN SAVINGS OF $24,792 (19.1%)





Energy Use: 40,900 Btu/ft² (129 kWhe/m²)

Energy Costs: $0.78/ft² ($8.39/m²)

Legend	END-USE	Electricity $	Electricity Savings	Natural Gas $	Natural Gas Savings	Central Steam $	Central Steam Savings	TOTAL COSTS $	TOTAL COSTS Svgs	ANNUAL ENERGY GJ	ANNUAL ENERGY Svgs
	Cooling	7,602	12.9%					7,602	12.9%	359	**13.9%**
	Heating	21,791	38.3%	6,425	46.2%			28,216	40.3%	1,645	**43.0%**
	Lights	25,072	14.4%					25,072	14.4%	1,263	**14.8%**
	Equip.	15,531	19.9%					15,531	19.9%	769	**20.6%**
	Fans	10,795	-118.7%					10,795	-118.7%	524	**-137.5%**
	Refrig							0		0	
	Ext. Lts	6,217	0.0%					6,217	0.0%	287	**0.0%**
	Elev.	1,369	0.0%					1,369	0.0%	36	**0.0%**
	DHW			10,432	18.6%			10,432	18.6%	944	**19.8%**
	Cook							0		0	
	TOTAL	**88,377**	16.1%	16,857	31.9%			**105,234**	19.1%	**5,826**	22.0%
	Total $ Savings	$16,897		$7,896				$24,792		1,645.7	
	Fuel Savings:	242.9 MWh		771 GJ		0 Mlbs					

Maximum HVAC Contribution During Peak*

HVAC END-USE	Demand Base	Demand ECM	Peak Load Reduction
Fossil Heat (kBtuh out)	470	1,509	-1,038.8 ######
Steam Heat (kBtuh out)	0	0	0.0 (0.0%)
Electric Heat (kBtuh out)	1,626	567	1,059.1 (65.1%)
Cooling (tons output)	208.0	168.4	39.7 (19.1%)
Fans & Pumps (hp)	49	54	-5.5 -(11.2%)

*Coincident with building; thus, values do not necessarily reflect absolute maximums.

Ref. CBIP Savings - GJ:	2,682 (32.8%)	Incent: $43,626
LEED Credit 1 Points -	Canada: 0	90.1: n/a

Economic Analysis

Incremental Costs ($)*	
Equip. & Labor	$386,000
Annual O&M	$0 /year
Cooling System**	$500 /ton
Heating System**	$0 /kBtuh
Fans & Pumps**	$0 /hp
Net Savings/Year	*$24,792*
Net Capital Cost	*$366,166*
Payback @ 5.0%	*22.6 years*

*Costs are very rough and unverified.

AFTERNOON SESSION - GEOXCHANGE AND PLUMBING

Remi Allard, BC Ground Water Association
Gordon Horbay, GeoTility Systems
Cam Moody, City of Kelowna

Participant Roundtable Input

TABLE FEEDBACK

- Open versus closed loop systems (closed more common)
- Local governments can take lead to protect aquifers/water drinking supplies
- Can sensitive areas be defined?
- Prominent aquifers in province have been mapped. (online)
- Is there concern about changing water temperature?
- No quantitative studies
- There doesn't seem to be a logging process who has jurisdiction
- BC regulatory is not as developed as other areas.
- There has been progress
- Government has put onus on stakeholders of aquifers to collect data
- Collected/Coordinated by Ministry of Environment
- Geotility services – providing maps
- Manitoba has 9o F limitation on temperature, BC does not have this
- Recommendation: Utility or Municipality requires drill log from contractors
- Industry as a whole is improving although there still is no standard.
- Recommendation: Regulating/Licensing body and training
- MEM prepared to invest in Training
- CSA may offer program
- Ground Water Association
- Need assurances that system going in have integrity
- Most systems are closed loop
- Geotility does + 120,000 lt/year
- What about insurance?
- Liability insurance
- Insurance for geothermal for 25yrs.
- Loops & hole guaranteed for 25 yrs.
- Not required to have hydrogeologist
- Closed loop systems minimize environmental impact (methanol/Non O3 Depleting)
- Loops need to be sized appropriately for heat pumps each house
- Geotility keeps log books.
- Recommendation: Clearinghouse of info-useful for developer.
- Recommendation: Standards/Inspection Needed
- Geothermal Resources Act – Being amended right now; could include geoexchange
- BC Groundwater Association focus is on getting workers certified

CROSS-CONNECTION

- BC Plumbing Code takes it one step further
- Concerns in geoexchange systems:
- Alternative designs
- Design where city distribution system acts as sink
- High likelihood for cross connections
- No guidelines and/or codes to help city inspectors (liability concerns)
- Lack of reporting procedures
- Open loop systems may become more common
- City issues gas permits but not heating system permits
- Important to have backflow preventer
- New buildings do have assess & approve plumbing systems
- Often city isn't aware of geoexchange (small res. Units)
- AB has systems putting refrigerant down copper tubes
- Additional maintenance cost of open systems
- Kelowna requires a full back-up system or Eng. signs off responsibility

AFTERNOON SESSION - GEOXCHANGE AND PLUMBING

Participant Roundtable Input

SYNOPSIS

The BC regulatory environment is not as developed as other jurisdictions. Recent high profile cases such as Walkerton have pushed groundwater issues to the forefront and its regulatory body, the BC Groundwater Association (BCGA), has been in the process on integrating geoexchange systems with the groundwater Protection Act/Regulation. The geoexchange industry has improved in the last decade, with many the proliferation on many responsible businesses but there still are no overriding practice installation standards. BCGA's main focus has been as follows:

- Certification of qualified professionals
- Registration of drilled holes and grandfathering of registration
- Updating the online mapping of prominent aquifers in BC
- Amendment of Geothermal Resources Act to geoexchange systems
- Shift onus to stakeholders of aquifers to collect data
- Clearinghouse of useful information for developers

The majority of geoexchange systems in BC are closed loop systems to minimize environmental impact (methanol/Non O3 Depleting) and heat pumps need to be sized appropriately for each house.

GeoTility of Kelowna BC designs, installs, and services over 120,000 lt/year of geothermal heating and cooling systems. Design and installation staff is fully certified by heat pump manufacturers and the International Ground Source Heat Pump Association, and our drilling division is overseen by knowledgeable and experienced drillers. GeoTility keeps detailed logbooks and offers aquifer mapping services.

Insurance liability is a large concern for Geotility who would benefit from industry wide standards. Current Insurance is as follows:

- Insurance for geothermal for 25yrs
- Loops & hole guaranteed for 25 yrs

Municipalities and utilities can partner to require drill log from contractors and to offer/organize licensing and training courses. Canadian Standards Association may have done some of this work.

As the industry has boomed, the following concerns have emerged:

- Alternative designs
- Design where city distribution system acts as sink
- Systems with higher likelihood for cross connections
- Lack of guidelines and/or codes to help city inspectors with ensuing liability concerns
- Lack of reporting procedures
- Open loop systems becoming more common
- City issues gas permits but not heating system permits
- Important to have backflow prevented
- City often unaware of geoexchange installation in small residential units
- AB has systems putting refrigerant down copper tubes
- Additional maintenance cost of open systems
- City of Kelowna requires a full back up system

In addition to the concerns, the City has concerns about geoexchange systems cross connection with the City's potable water supply.

GROUP RECOMMENDATIONS:

- BC Ministry of Energy and Mines is prepared to invest in continuing training and certification of qualified professionals
- Industry stakeholders to self-monitor
- Non municipal advisory group to help guide the City
- Call to people in the group to volunteer at advisory group

ENERGY EFFICIENT INCENTIVES

Jim Clark, Natural Resources Canada

SUMMARY

The Incentives offered by the Canadian Federal Government are as follows:

EXISTING INCENTIVES

	Max. Incentive Amount
Energy Innovators Initiative (EII)	$ 250,500
Equipment (boiler)	$ 40,000
Renewable Energy Deployment Initiative (REDI)	$ 80,000
	$ 370,000

NEW INCENTIVES

	Max. Incentive Amount
Commercial Building Incentive Program (CBIP)	$ 60,000
Equipment (boiler)	$ 40,000
Aboriginal and Northern Community Action Program (ANCAP)	$ 10,000
Renewable Energy Deployment Initiative (REDI)	$ 80,000
	$ 190,000

LINKS

City of Kelowna	http://www.kelowna.ca/CM/Page887.aspx
FortisBC	http://www.fortisbc.com/
Terasen Gas	http://www.terasen.com/inc/default.htm
BC Ministry of Enery and Mines	http://www.gov.bc.ca/bvprd/bc/home.do
Natural Resources Canada - CBIP	http://oee.nrcan.gc.ca/commercial/financial-assistance/new-buildings/index.cfm?attr=20
BC Ground Water Association	http://www.bcgwa.org/
Canadian Standards Association	http://www.csa.ca/
GeoExchange BC	http://www.geoexchangebc.ca/
BC Aquifer Map	http://wlapwww.gov.bc.ca/wat/aquifers/index.html
Dockside Green (Victoria)	http://www.docksidegreen.ca/

APPENDIX: ECO-EFFICIENCY FEASIBILITY STUDY

The components of an "Eco-Efficiency Feasibility Study" are listed below. The City of Kelowna may consider requiring the completion of such a study as part of all development project proposals submitted to the City.

Executive summary

- A brief summary of the energy audit results and findings, the list of discovered energy saving opportunities and proposed measures.
- Baseline consumption of all utilities and the time of use pattern
- A summary of no-cost and low-cost measures identified.
- The expected annual savings in units and in value of bill reduction - in absolute units and in relative – per square foot. Specification may be divided for winter and summer time operation.
- An estimate of the recommended investment.
- Simple payback period and net present value for each measure.
- Expected return on investment.
- Benefit/cost ratio.

Utility billing history and resource use

Start with brief history of the facility, reflecting:

- Facility address, contact names and addresses of management and operations staff.
- Date of first construction and dates of all major upgrades, changes and retrofits, significant recent changes in building structure, systems
- Facility's square footage and its changes (if any) during upgrades.
- Service Consultants – mechanical, electrical, controls – contact data
- Asbestos and PCB status
- PRC user attendance (preferably for several last years, showing relevant changes) + planned capacity.
- Occupancy pattern
- Briefly describe the energy-efficiency related equipment
- Heating
- Lighting
- Air conditioning
- Air handling /ventilation
- Water supply / Hot water supply
- Envelope, roof
- Building automation system (BAS)
- Other
- Describe zones into which the facility shall be broke down for analysis
- Describe facility's utility meters (if multiple meters for one utility – how they are grouped)
- Describe availability of floor plans, technical drawings, utility schemes – mechanical, electrical, BAS net, etc.
- Include floor plans with indicated zones. (Floor plans may be moved to appendix. It is preferable that all drawings are supplied in electronic (ACAD, etc.) form).

Capital Investment Plans (if any):

Briefly describe any energy-efficiency – related investment plans which the City may already have.

Utility bill analysis

- Detailed billing history for each utility, including consumption by month, applicable rate schedules, taxes, and monthly bill amounts.
- Description of assumptions made and explanation of any unexpected patterns.
- Monthly consumption, demand and costs charts.

Recommended measures

For each system *status description / proposal for recommended measures* provide the following:

- The existing system and conditions. Include drawings and schematics.
- For each identified measure, provide its:
- Description, application for PRC, and impact on consumption, demand, and maintenance, along with cost reductions.
- Provide a list of non-resource benefits
- Implementation cost and payback period

Please present a summary of measures by payback period.

For each of addressed topics, the included proposal has to be split into three levels:

The following is an overview of efficiency measure details to be included. For each room and/or zone, summarize the existing conditions, identify efficiency measures and expected savings and costs.

- Lighting
- Lighting status summary detailed electric circuit diagrams, room by room, including Information on: Floor/zone, Room #, Room task (gym, storage), room size,
- LIGHTING LEVELS measured at working positions! – Indication of enough/ over/under, color of lighting. Recommendations - color of walls, etc.
- Analysis of average expected annual purchase savings on lamps and ballasts, on maintenance, detailed, room by room; Lamp cost savings over time , ballast, total cost savings
- Final summary of retrofit profitability for the whole building
- Lighting
- Hours of operation a description of the room, its use and fenestration, the type of ceiling, a description of the existing luminar (type, quantity, number of lamps per luminar, the type of lens, and the voltage), the light levels
- Heating / Air Conditioning
- Including Heating plan scheme, annual schedule, Details on heating system, - boiler, pumps,
- Measured temperatures, air flows, draughts, etc.
- Water supply / Hot water supply
- Hot water or steam heating plant (including temperatures of supply water, water in tank, state of insulation, control equipment
- Envelope, roof
- Building Envelope; walls; External Doors type, weather stripping, frame gaps;
- AHU / ventilation
- Details on interior AHU – air handling units – all technical data, horsepower, flows, controls,
- By zone. Exhaust fans; Location; Motor type; Area serviced; Scheduling; Controls.
- BAS

- BAS system, type, transducers and actuators point list availability
- Equipment schedule; Thermostats connected to BAS?
- Recommendations for programming update
- Other relevant measures.

Implementation plan / issues

- Present a proposed implementation plan with timing schedules
- Provide a breakdown to show the components of implementation costs, including applicable taxes, and engineering project management fee,
- Comment on recommended specific types of equipment

Details to be provide in the Appendices are:
- Floor plans
- Utility bill analysis
- Technical information
- Lighting summary
- Saving opportunities

For each savings opportunity:
- Estimation of savings opportunities, including:
- For each proposed opportunity:
- Price estimate
- Engineering and project management fee
- Promised utility bill savings
- Simple payback and NPV
- Expected useful lifetime
- Return on investment