Opportunity Assessment for Colwood

Introduction

Green Buildings BC for Local Governments is an initiative of Shared Services BC and the Province of BC, delivered by the Community Energy Association. The program provides support to local governments to undertake comprehensive energy efficiency retrofits of their facilities in order to reduce energy costs and greenhouse gas (GHG) emissions. The services offered to local governments, at no charge, include workshops, case studies, model contract documents, a how-to guide, and opportunity assessments. This report summarizes the results of the opportunity assessment performed for Colwood under the Green Buildings BC program.

An opportunity assessment is an initial survey of facilities and their energy bills in order to determine the potential scope of a comprehensive energy efficiency retrofit. The opportunity assessment includes a review of the energy bills, a short walk-through of key facilities, and discussions with staff. From the information gathered, broad estimates of potential energy savings and project costs are made, and a financial analysis is performed.

The purpose of the opportunity assessment is to indicate to staff and council/board the potential benefits, both financial and otherwise, from undertaking a comprehensive energy efficiency project. It should be understood that an opportunity assessment is NOT a comprehensive energy audit or study, and does not take the place of an engineering study by qualified professionals. Rather, the opportunity assessment allows local governments to make informed decisions about if and how to proceed with more detailed assessments.

Energy efficiency retrofits projects provide a number of benefits to local governments. In addition to the savings in utility expenditures, there are potential benefits from improved occupant comfort, replacement of aging equipment, and reduced maintenance expenditures. There is also the opportunity to show leadership within the community in taking action on climate change, as well as working towards the City's carbon neutral commitment under the Climate Action Charter.

Facilities Description

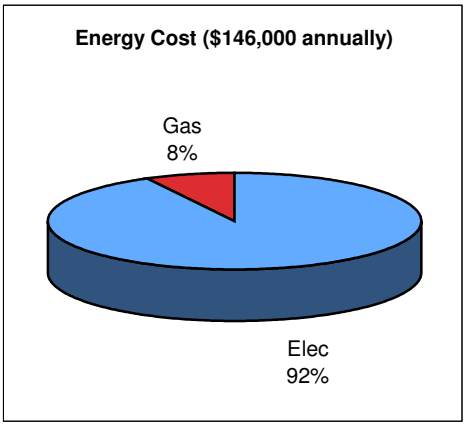
This opportunity assessment examined utility data for all of Colwood's facilities, including buildings, streetlights, and lift stations. Site visits were done for the three largest buildings – City Hall, the Public Works workshop, and the Firehall. The facilities are summarized below:

Colwood Facilities		
	Area (ft²)	Annual Energy Cost
City Hall	13,665	$ 15,048
PW office	1,345	$ 1,806
PW workshop	5,649	$ 6,814
Firehall	6,780	$ 21,605
St. John's Church		$ 895
Lift stations - 8		$ 12,395
Streetlights - ornamental		$ 12,286
Streetlights - overhead		$ 74,357
Traffic lights		$ 229
Other – 3 accounts		$ 780

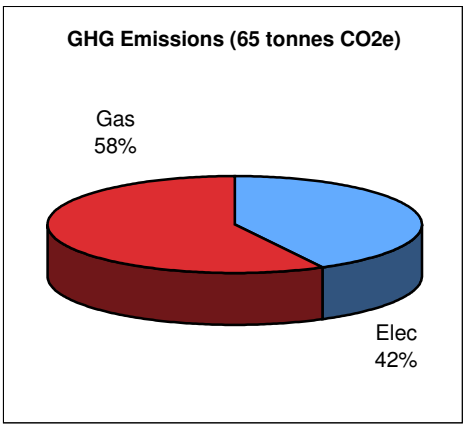
The buildings are fairly small and less than 20 years old. They are generally in good condition and well maintained. The PW Office was not examined on site as it is expected to be replaced in the near future. Only one building, the Firehall, has natural gas service. The rest are heated with electricity.

Current Energy Consumption and GHG Emissions

Total energy consumption for the facilities is 4,860 GJ and $146,000 annually (2007). Electricity consumption is 1,145,000 kWh and $134,900, while fuel is 737 GJ and $11,300. Average electricity cost is $0.068/kWh, excluding the streetlight rental charge from BC Hydro (see below). Average natural gas cost is $15.37/GJ. Total GHGs are 65 tonnes CO2e, with more than half from natural gas.



The largest bill is for the streetlights, which account for more than half of utility charges. However, much of this is due to the fixed rental charge as the streetlights consume about one third of the total energy. The largest single energy consumer is the Firehall, accounting for about one quarter of the total. The Firehall is also the largest source of GHG emissions by far, accounting for 60% of the total. Other significant consumers of energy are the City Hall and the lift stations.



Energy intensity, in terms of consumption per unit area, is a useful way of comparing building to other similar facilities (although not applicable to all building types). The most energy intensive building is the Firehall, which is

significantly higher than would normally be expected for this type of building. (However, there is some uncertainty about the floor area of the Firehall, which may mean its energy intensity is not as high as indicated). The City Hall and PW Office have average energy intensity, while the PW Workshop is lower than would be expected.

Energy Efficiency Measures

Most of the Colwood's facilities do not have particularly high energy consumption, and there are limited opportunities for savings. The exception is the Firehall.

City Hall

The City Hall has lower than average energy consumption and efficient technologies installed. There may some opportunities to install occupancy sensors and/or daylight sensors to turn off lights in rooms that are not in use or which have adequate daylight. The programmable thermostats used to control the heat pumps should also be checked to ensure that schedules are optimal and temperatures are set back when the building is not in use.

PW Workshop

The workshop has lower than average energy consumption and few opportunities. The thermostat setpoints are kept low by staff manually, and it is likely not worthwhile to install programmable thermostats. The HPS lighting in the work bays could be converted to T8 fluorescent, which would improve efficiency and allow lights to be more easily switched on and off. Weatherstripping and seals at doors and windows should be checked and replaced where necessary.

Firehall

The firehall has very high energy use. This is largely due to the installation of a new 100% outside air unit in the new vehicle bays. This unit is also the primary heating source, which means that when heating is required, it runs at full outside air volume even when that amount of ventilation is not needed. There are several possibilities for improving the efficiency of this system, including installation of a secondary heat source such as unit heaters, installation of heat recovery, or use a of a variable speed drive to reduce air volumes. A proper engineering assessment would need to be done, and care should be taken to ensure measures don't conflict with applicable ventilation codes.

There are some remaining areas of the building that still use older T12 fluorescent lamps. These should be replaced with T8 lamps and electronic ballasts. Any remaining incandescent lamps can be replaced with compact fluorescents. Occupancy sensors can be used in rooms to turn off lights when unoccupied.

The programmable thermostats used to control rooftop units should be checked to ensure their schedules are appropriate, and temperatures are set back during unoccupied periods. Weatherstripping and seals around windows and doors should be checked and replaced if necessary.

The adjacent firehall museum is a separate building and may not belong to the municipality, but was examined during the site visit. It uses all incandescent lighting, which should be converted to compact fluorescent.

Streetlights
Most of the streetlights are overhead and are owned by BC Hydro. The decorative streetlights are owned by the municipality. Replacing streetlights cannot usually be justified on energy savings alone. But there are opportunities to improve the operation of streetlights. The City has been in discussions with a local company, Streetlight Intelligence, and this is an opportunity that should be investigated further. The City my want to research high efficiency streetlights and develop a policy for new streetlights being purchased. Some municipalities have installed solar powered streetlights, which are gaining in popularity.

Lift Stations
The lift stations were not looked at during the site visit. They are generally small energy consumers, costing a few hundred dollars annually to operate, although the Metchosin Road and Ocean Boulevard stations are a bit larger. Lift stations are fairly simple in operation, and savings generally come from installing a smaller pump for use during light loads. However, the small size of these stations would likely mean adding a pump is not cost effective.

Potential Savings and Recommendations

There may be savings of 5 – 10% in most of the buildings from minor improvements and changes in operation, as described above. The cost for these improvements would be minimal and can be done from a maintenance budget, using staff time for the most part. Some of these items, such as checking programmable thermostat schedules and setpoints, should be incorporated into regular maintenance routines.

The Firehall should have significant savings potential if the operation of the 100% outside air unit can be addressed. Potential savings may be in the 20 – 30% range, or $4,000 - $6,000 annually. GHG emissions would also be reduced significantly, since the majority of GHG emissions are due to natural gas use in the Firehall. Costs would need to be determined through an engineering study, but a retrofit would likely pay back in a few years. It is recommended that an engineer with expertise in energy efficiency projects be retained to look at the building and recommend options. It is probably not necessary to get a detailed energy savings analysis performed but rather to move directly into design and construction.

The City should continue to investigate the potential of improving streetlight operating efficiency with Streetlight Intelligence. Potential savings of 30 – 40%, or $3,500 - $4,500, may exist in the ornamental lighting, according to information from Streetlight Intelligence.

Although cost effective retrofits are unlikely, the City could have an engineer look at the larger lift stations and assess them for potential upgrades, perhaps while engaged in other work for the City (such as the Firehall).

Colwood Utility Data

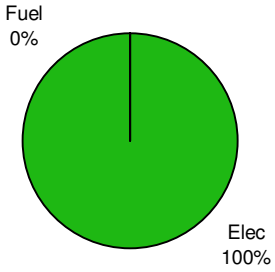
Building name	Area	Energy Consumption			Energy Cost			BEPI (ekWh/ft²)			GHGs (tonnes CO2eq)		
		Elec (kWh)	Fuel (GJ)	Total (GJ)	Elec	Fuel	Total	Elec	Fuel	Total	Elec	Fuel	Total
City Hall	13,665	230,560	-	830	$ 15,048	$ -	$ 15,048	16.9	-	16.9	5.5	-	5.5
PW office	1,345	25,382	-	91	$ 1,806	$ -	$ 1,806	18.9	-	18.9	0.6	-	0.6
PW workshop	5,649	96,420	-	347	$ 6,814	$ -	$ 6,814	17.1	-	17.1	2.3	-	2.3
Firehall	6,780	147,540	737	1,268	$ 10,277	$ 11,328	$ 21,605	21.8	30.2	52.0	3.5	37.4	40.9
St. John's Church	-	13,836	-	50	$ 895	$ -	$ 895				0.3	-	0.3
Lift stations - 8	-	159,841	-	575	$ 12,395	$ -	$ 12,395				3.8	-	3.8
Streetlights - ornament	-	195,171	-	703	$ 12,286	$ -	$ 12,286				4.6	-	4.6
Streetlights - overhead	-	264,841	-	953	$ 74,357	$ -	$ 74,357				6.3	-	6.3
Traffic lights	-	2,716	-	10	$ 229	$ -	$ 229				0.1	-	0.1
Other - 3 accounts	-	8,952	-	32	$ 780	$ -	$ 780				0.2	-	0.2
Total	**27,439**	**1,145,259**	**737**	**4,860**	**$ 134,887**	**$ 11,328**	**$ 146,215**				**27.3**	**37.4**	**64.6**

Building: **City Hall**
Area: 13,665 ft²

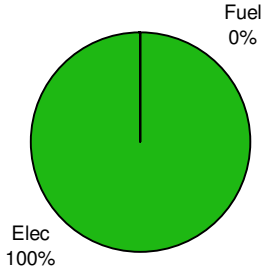
Consumption Data

Elec	230,560	kWh	$ 15,048	5.5	tonnes CO2e
Fuel	-	GJ	$ -	-	tonnes CO2e
Total	830	GJ	$ 15,048	5.5	tonnes CO2e

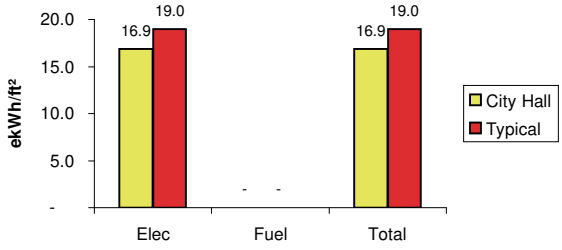
	City Hall		*Typical*	
Elec	16.9	ekWh/ft	19.0	ekWh/ft
Fuel	-	ekWh/ft	-	ekWh/ft
Total	16.9	ekWh/ft	19.0	ekWh/ft



Annual Energy Cost



GHG Emissions



Energy per ft² - City Hall vs Typical

Building description

The City Hall was constructed in 1989, and is a one storey wood frame building.It generally appears to be in good condition, with lower than average energy consumption. It is the primary workplace for municpal staff as well as the location for council meetings.

Hours of use: M-F 8am to 5pm. Council meetings and other meetings held evenings. Generally no weekend use.

Lighting
Lighting throughout the building is T8 with electronic ballasts. Light levels are generally appropriate. Exit lights are LED. Exterior lighting is HPS with photocell control.

HVAC
Heating and cooling is provided by a number of air source heat pumps located on the roof, controlled by programmable zone thermostats. This is an efficient source of electric heat. DHW is provided by a single electric hot water tank.

Potential Measures

Lighting Strategies
* Install occupant sensor controls to turn off lights when not required.
* Install daylight dimming systems to reduce lighting energy use when daylighting permits it.

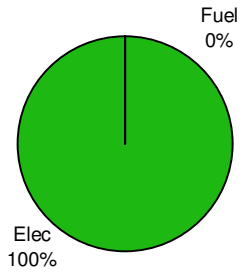
Other
* Tighten schedules on programmable t'stats and check on a regular basis.

Building: **PW workshop**
Area: 5,649 ft²

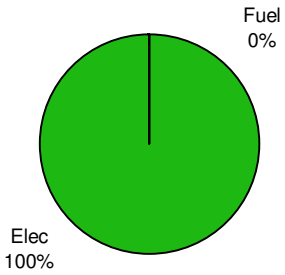
Consumption Data

Elec	96,420	kWh	$ 6,814	2.3	tonnes CO2e
Fuel	-	GJ	$ -	-	tonnes CO2e
Total	347	GJ	$ 6,814	2.3	tonnes CO2e

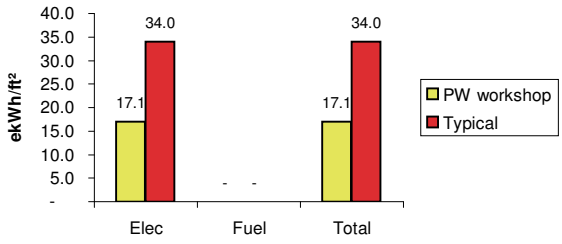
	PW workshop		*Typical*	
Elec	17.1	ekWh/ft	34.0	ekWh/ft
Fuel	-	ekWh/ft	-	ekWh/ft
Total	17.1	ekWh/ft	34.0	ekWh/ft



Annual Energy Cost



GHG Emissions



Energy per ft² - PW workshop vs Typical

Building description

The Public Works buildings is a wood frame structure of similar age to the City Hall. It is used for general storage and repair, as well as working on equipment and vehicles. The building has very low energy use, particularly considering there are some small outlying buildings and equipment on the same electrical meter.

Hours of use: Most areas are open 8-4:30 weekdays, with one area open at 6am. However, use is sporadic throughout the day.

Lighting

Most of the building is lit with HPS, with the remainder T8 fluorescent with electronic ballasts. Exterior lights are HPS with photocell control.

HVAC

Heating is by electric unit heaters controlled by zone thermostats. Themostats are set quite low, and UHs do not operate in summer. There is a clothes drying room with an exhaust fan and heater controlled by t'stat and relative humidity.

Potential Measures

Building Envelope

* Install weather stripping, caulk around windows and doorways, check seals

Other

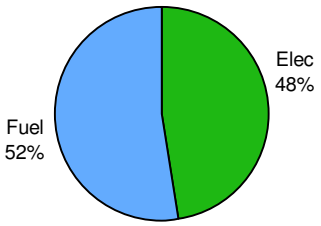
* Convert HPS indoor lighting to fluorescent to allow manual switching without restrike time.

Building: **Firehall**
Area: 6,780 ft²

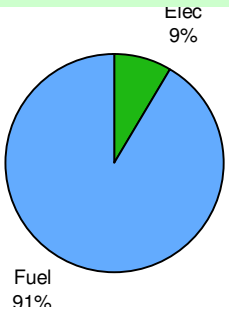
Consumption Data

Elec	147,540	kWh	$ 10,277	3.5	tonnes CO2e
Fuel	737	GJ	$ 11,328	37.4	tonnes CO2e
Total	1,268	GJ	$ 21,605	40.9	tonnes CO2e

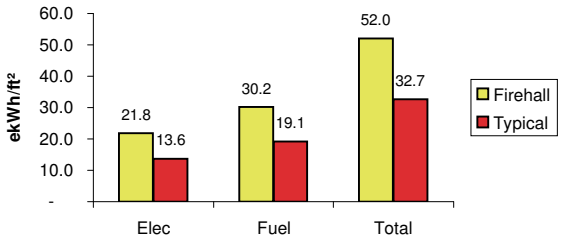
	Firehall		*Typical*	
Elec	21.8	ekWh/ft	13.6	ekWh/ft
Fuel	30.2	ekWh/ft	19.1	ekWh/ft
Total	52.0	ekWh/ft	32.7	ekWh/ft



Annual Energy Cost



GHG Emissions



Energy per ft² - Firehall vs Typical

Building description

The firehall is a two storey wood frame building originally built in 1972, but with a major upgrade and expansion in 2006. Energy consumption appears to be quite high, but this may not be correct as floor area may be incorrect.

Hours of use: 8:30-4:30, 7 days a week. Occasional evening/nighttime use on emergency calls.

Lighting
Lighting in the new sections, and most of the older sections is T8 with electronic ballasts. There is some older T12 fluorescent with magnetic ballasts remaining, and a small amount of incandescent. Exit lights are LED, and exterior lights re controlled by photocell. All lights are manually turned off by staff with a sweep at the end of the day.

HVAC
A large 100% outside air system was installed as part of the 2006 addition. This unit serves the vehicle bays and much of the building. Although primarily intended to address carbon monoxide concerns from vehicles, it is also the only heating system for these areas, and therefore runs at 100% fresh air on any call for heat. There are also some rooftop unoits that provide heating and cooling for some of the older areas, with programmable t'stats.

Potential Measures

Lighting Strategies
* Install T8 fluorescent lamps.
* Replace magnetic ballasts with electronic ballasts.
* Install compact fluorescent lamps to replace incandescent.
* Install occupant sensor controls to turn off lights when not required.

HVAC Energy Cost Savings Strategies
* Heat recovery should be adopted on larger fan systems and 70% or more minimum outside air.
* Convert constant volume systems to variable air volume where possible

Building Envelope
* Install weather stripping, caulk around windows and doorways, check seals

Other
* Investigate possibilities for reduced airflow or supplemental heating to avoid running 100% outside air unit at all times.