

# Smart Business Service REPORT for

## Holy Cross Parish

685 Walkley Rd.

Ottawa, ON

**envirocentre**

### **Date**

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**EnviroCentre** is pleased to present this electricity and energy audit of the Holy Cross Parish on Walkley Rd. This report includes the results of your estimated baseline electricity use, load profile, billing analysis, potential savings, and recommendations for reducing your heating and electricity bills.

Your cost for heating and for electricity is almost \$17,000 per year. Of this total 54% is for natural gas.

Our review of your electricity consumption indicates that half of your electricity is used for the mechanical fans and pumps, and one third for lighting. The greatest potential for savings on your bills therefore lies in these areas.

The major recommendations and their potential savings are summarized below:

<b>Recommendation</b>	<b>% Savings of Total Bills</b>	<b>Estimated Savings per Year</b>	<b>Estimated Upgrade Cost</b>	<b>Payback (Years)</b>
Cycle ventilation and install variable frequency fans	11%	\$1,786	\$5,300	3.0
Install efficient lighting	7%	\$1,123	\$6,301	5.6
<b>TOTAL</b>	<b>17%</b>	<b>\$2,909</b>	<b>\$11,601</b>	<b>4.0</b>

If you just completed the top two recommendations indicated above; improve lighting and mechanical systems efficiency, your current annual electricity and gas bills **could be reduced \$2,909 per year**. This represents **17% savings** and means that the improvements could **pay for themselves in about four years!**

The other potential upgrades and their estimated savings are outlined in the recommendations section.

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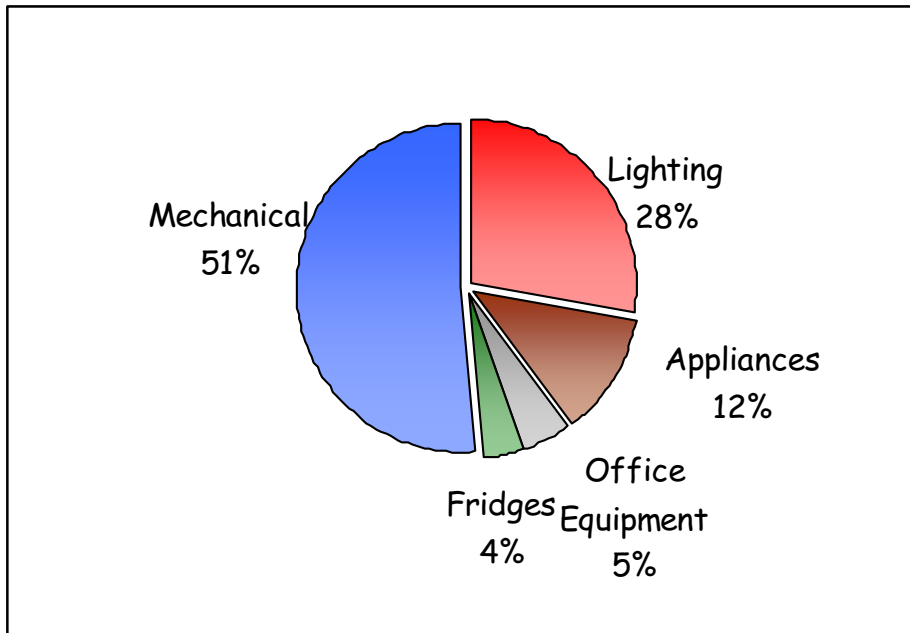
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## BREAKDOWN OF ELECTRICITY USE

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As previously mentioned you are using most of your electricity for mechanical systems and lighting. Mechanical systems include all ventilation fans, air conditioning, as well as heating and hot water pumps. The rest is being used by the kitchen, office equipment and fridges. You can see this, as well as your other consumption clearly below in Figure 1.



**Figure 1: Components of Electricity Use**

One half is used for the mechanical systems. Most of this is because of the ventilation fans that run all winter, and the air conditioning in the summer. About one third (28%) of your electricity consumption is for the lighting. This is mostly used to light the basement and the chapel; both are large rooms with many fixtures. The large outside lights are consuming a lot as well. The rest is divided up between the appliances, the office equipment, and the fridges.

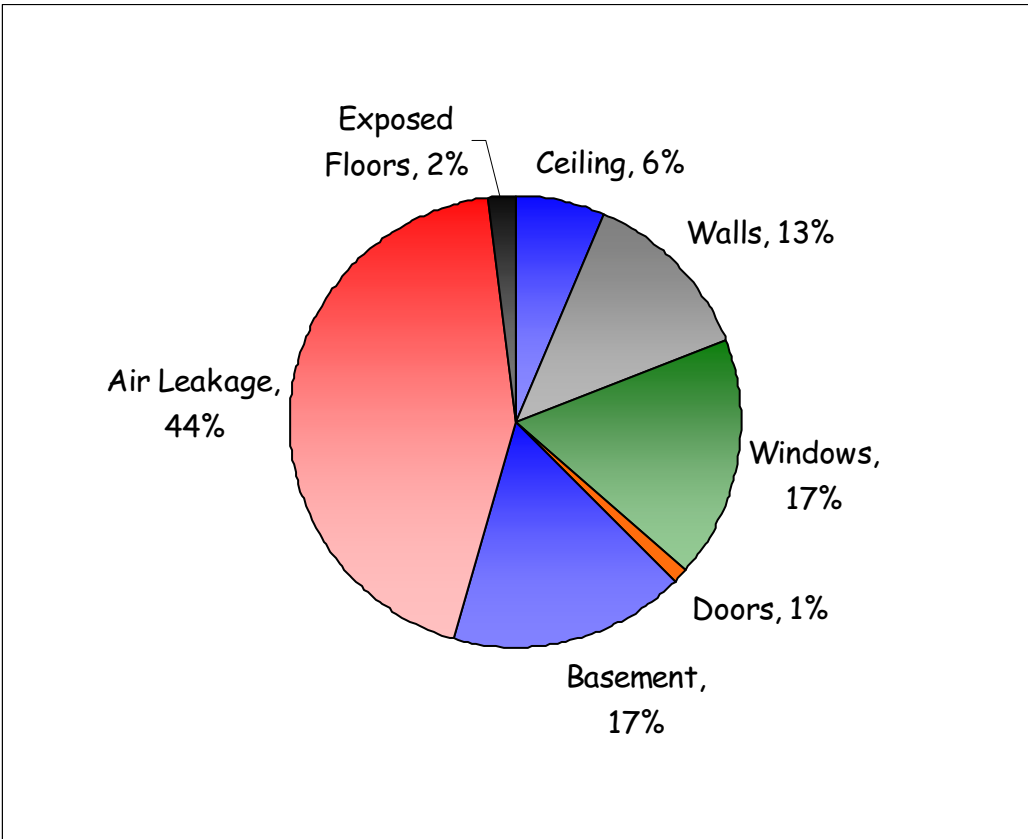
Please remember that following recommendations can have effects on the comfort of the building in different ways. For example, by switching to more efficient lighting or fridges

you may keep the building cooler in the summer because they won't be generating as much heat. This could lower your air conditioning costs as well.

## AREAS OF HEAT LOSS

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The energy audit has revealed where you are losing heat. The Holy Cross Parish is a relatively modern building; being built in the late 1960's. There is insulation present in most areas other than the floor over the garage. There are a lot of windows to lose heat through and low insulation levels in the basement and chapel walls. The breakdown of the heat loss can be seen below in Figure 2.



**Figure 2: Components of Heat Loss**

Most of the heat is being lost through air leaks, the windows, the basement, and the walls. Most of the recommendations to reduce heating costs will focus on these areas, as well as

others that can be upgraded. Although the air leakage seems like a large portion of your heat loss (44%), the blower door tests indicated that qualitatively speaking it is not that great. This will be explained further in the recommendations.

## ELECTRICITY METERING RESULTS

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We had a certified electrician measure the consumption at your main meter. This tells us how much electricity you are using and when. It takes a reading every 15 minutes, 24 hours per day for one week. The total power consumed at the time of a reading along with the time it was recorded allows us to determine your consumption rate and peak periods. We've compiled the information into Figure 3. This is your load profile over a one-week period which means how many kilowatts (kW) you are using at each 15 minute sample over the 7 days. kW is the total power consumption at any given time. For example if you have ten, 100 W light bulbs on you would be consuming:

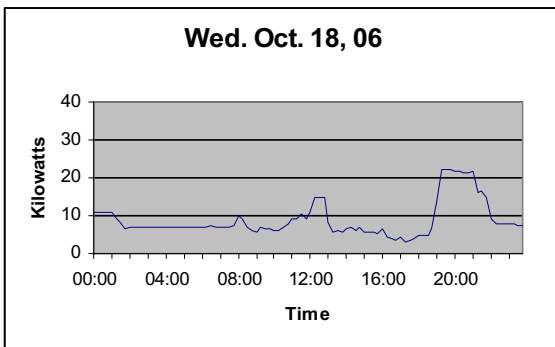
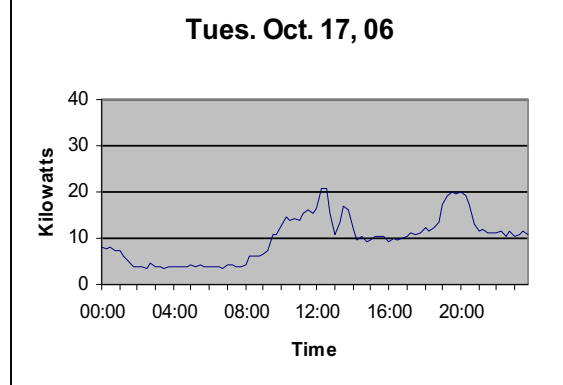
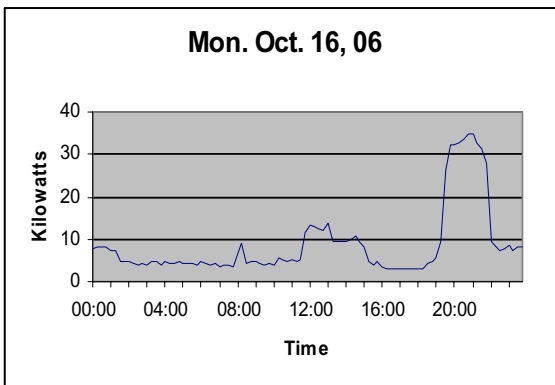
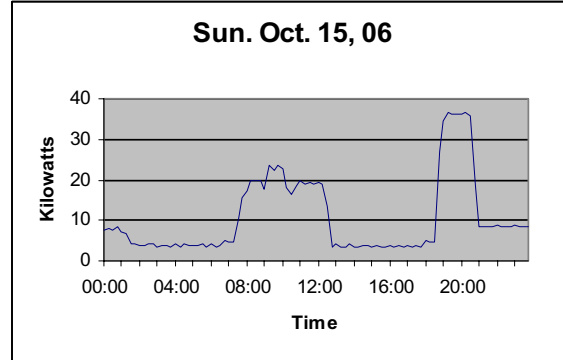
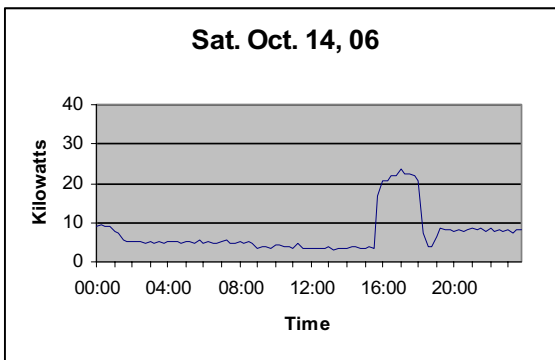
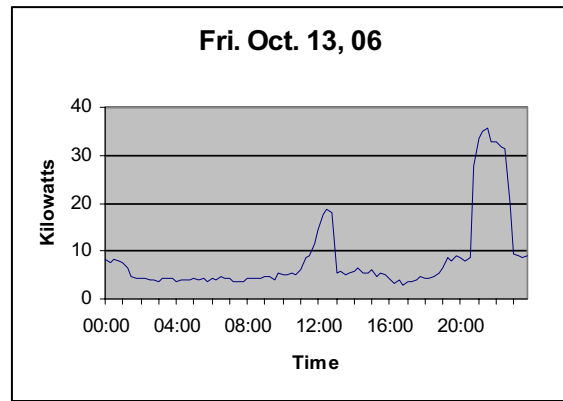
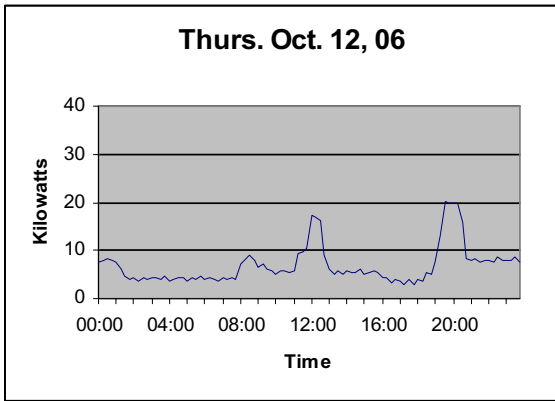
$$10 * 100W = 1,000W = 1kW \text{ of electricity at any given time}$$

This is not what you are charged for. You pay for kWh, which is how many kW's you are using, multiplied by how long you used them for. If you had those bulbs on all day you would be using:

$$1kW * 24h/day = 24kWh/day$$

This is recorded by your hydro meter, and you are billed for the kWh you use each billing period. More details about this will be discussed in the section, "Billing Analysis".

The load profiles are showing your electricity use for each day, from Thursday October 12<sup>th</sup> to Wednesday October 18<sup>th</sup>. You can clearly see when you are using a lot of power, and when the building is unoccupied and the consumption is lower.



**Figure 3: Load Profiles from Thurs. to Wed..**

Above in Figure 3, the consumption profile for each day can be seen. The church is always using at least 4,000W worth of electricity (4 Kilowatts). This baseline is equivalent to 40, 100 W light bulbs being left on all the time. This baseline must be attributed to the lighting and ventilation. You should really try to determine what else is being left on overnight and in the early mornings and turn it off if possible. **This 4kW demand all the time is costing you approximately \$3,500 per year.**

The main times of use seem to be around noon on Sundays and Tuesdays, and around 8pm every day. These daily evening spikes go as high as 37kW, equivalent to 370, 100W light bulbs. This is most likely due to basement, chapel, and outside lights, and perhaps the ventilation or heating fans all coming on at once. Without using these lights or ventilation at a different time (i.e. off peak hours) your best option is to reduce your demand overall by using the most efficient lighting and motors. Otherwise you will have to consider lowering the baseline (ie. Shut things off in the evening).

**Smart Meters**

The Government of Ontario has already started rolling out smart meters to residents and businesses. They intend to have 800,000 installed by December 2007 with the intention of completing the installation by the end of 2010. Smart meters will measure not only how much electricity you use, but when you use it as well. You will then be billed more for electricity you use at certain times of the day, which are the peak times. The schedule of anticipated electricity prices will be:

**Summer (May 1<sup>st</sup> to October 31<sup>st</sup>)**

<b>7 am to 11 am.....</b>	<b>7.1 cents/kWh</b>
<b>11 am to 5 pm.....</b>	<b>9.7 cents/kWh</b>
<b>5 pm to 10 pm.....</b>	<b>7.1 cents/kWh</b>
<b>10 pm to 7 am.....</b>	<b>3.4 cents/kWh</b>
<b>Weekends.....</b>	<b>3.4 cents/kWh</b>

**Winter (November 1<sup>st</sup> to April 30<sup>th</sup>)**

<b>7 am to 11 am.....</b>	<b>9.7 cents/kWh</b>
<b>11 am to 5 pm.....</b>	<b>7.1 cents/kWh</b>
<b>5 pm to 8 pm.....</b>	<b>9.7 cents/kWh</b>
<b>8 pm to 10 am.....</b>	<b>7.1 cents/kWh</b>
<b>10 pm to 7 am.....</b>	<b>3.4 cents/kWh</b>
<b>Weekends.....</b>	<b>3.4 cents/kWh</b>

Smart meters will allow you to reduce your costs for electricity if you shift your loads to the lower rate times: the morning, afternoon, and most importantly the evening and weekends. You should avoid using electricity between 11am and 5pm all year, and between 5pm and 8pm in the winter once you have a Smart Meter and are being charged the time of day rates. Your estimated bill, once the Smart Meter is installed, is discussed in the Billing Analysis section below.

The current costs for the electricity in Ontario are 5.5 cents per kWh up to 600 kWh per month, and 6.4 cents for any consumption above that. This second threshold is expected to be increased to 1,000 kWh per month in the winter. **This is the cost of electricity only.** It does not include the transmission, delivery, regulatory and debt retirement charges, which are all based on consumption as well. So the more you use, the more you pay for these other charges as well.

The current costs for these other factors are:

<b>Delivery Charges .....</b>	<b>1.95 cents/kWh</b>
<b>Regulatory Charges.....</b>	<b>0.62 cents/kWh</b>
<b>Debt Retirement Charge.....</b>	<b>0.694 cents/kWh</b>
<b>Transmission Charge.....</b>	<b>0.95 cents/kWh</b>
<b>Total.....</b>	<b>4.214 cents/kWh</b>

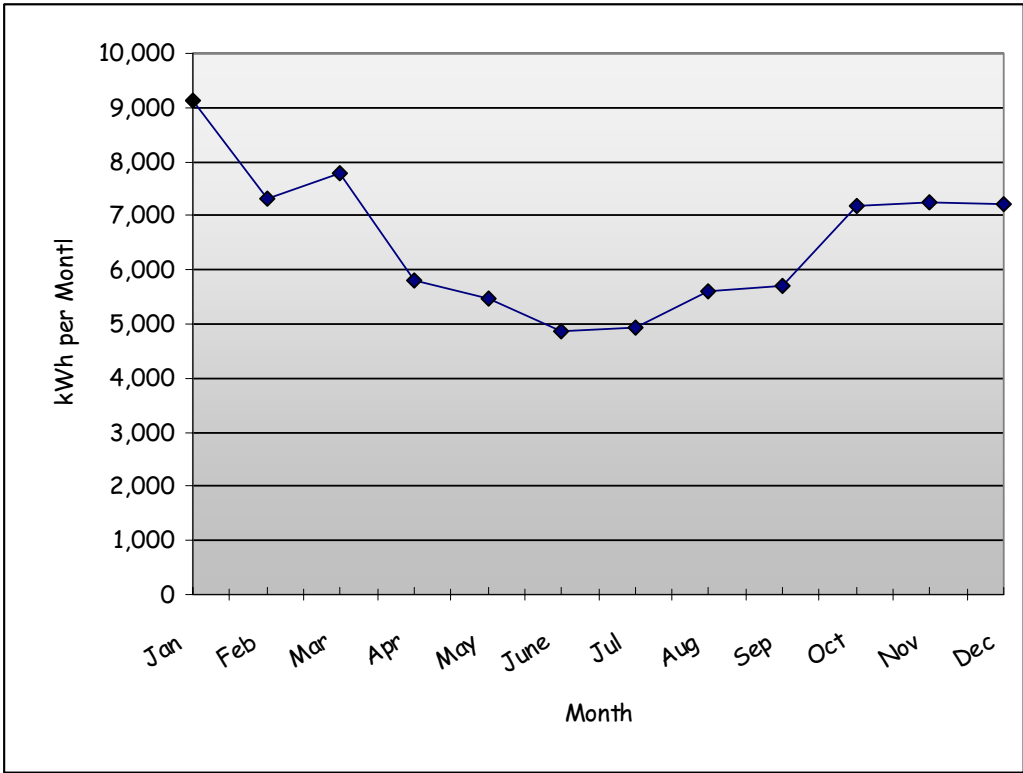
There is one more charge you should be aware of, which is the fixed charge. You pay this fee every month, even if you use no electricity. The current fixed rate for you is **\$7.88 per month**. All of the above rates are quoted as of October 30, 2006 and can be found at [https://www.hydroottawa.com/residential/index.cfm?lang=e&template\\_id=118](https://www.hydroottawa.com/residential/index.cfm?lang=e&template_id=118)

## BILLING ANALYSIS

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### *Electricity*

Based on the consumption of electricity indicated in your bills you are using on average **214 kWh per day**, for a total of **78,269 kWh per year**. This is costing you approximately **\$7,701 per year**. Your electricity consumption over one year can be seen below in Figure 4. You are using slightly more in the winter than in the summer, this is probably because of your heating system and ventilation fans are running more, and the increased lighting.



**Figure 4: Monthly Electricity Consumption**

Based on the data gathered and the electricity audit conducted most of your electricity is consumed by the mechanical systems. The breakdown of each component can be seen graphically in Figure 1 on Page 2, and in a table form below in Table 1.

<b>Electricity Use</b>	<b>kWh / Year</b>	<b>Yearly % Of Bill</b>	<b>Cost / Year</b>
Lighting	21,797	28%	\$2,145
Appliances	9,260	12%	\$911
Office Equipment	3,866	5%	\$380
Fridges	3,181	4%	\$313
Mechanical	40,161	51%	\$3,952
<b>Totals</b>	<b>78,269</b>	<b>100%</b>	<b>\$7,701</b>

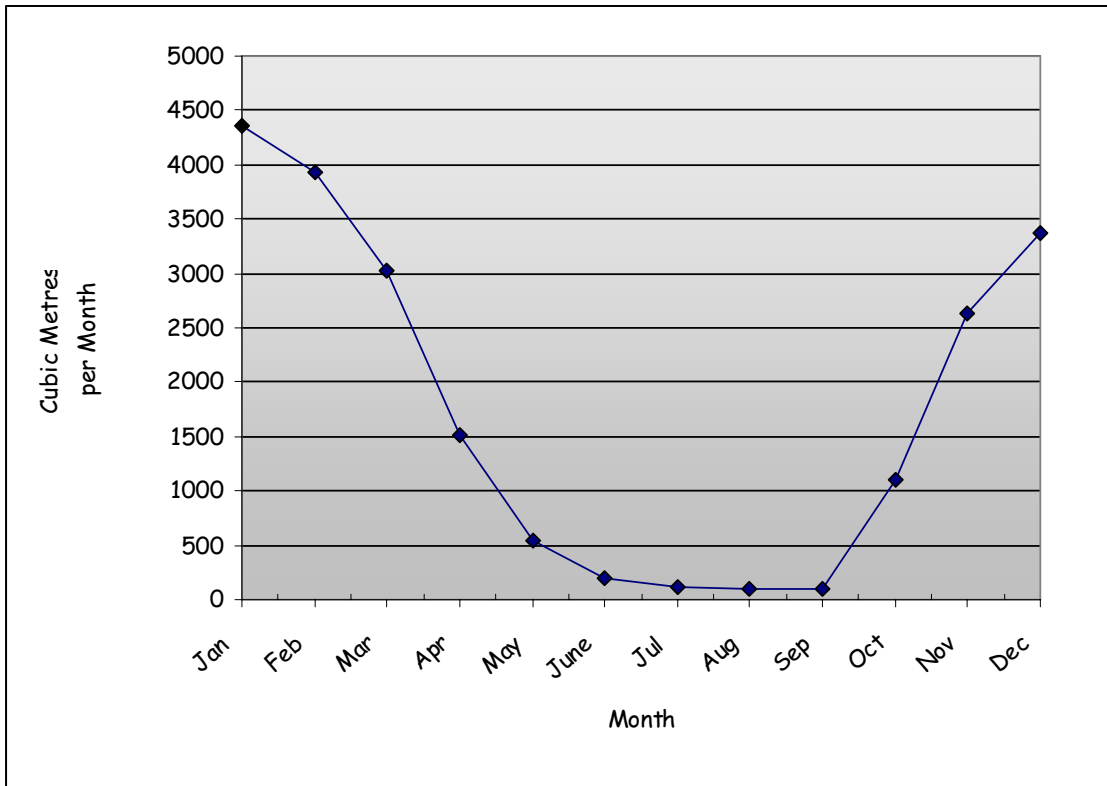
**Table 1 : Annual Electrical Consumption**

If you had a smart meter and were being charged the different rates at different times of the year right now **you would be paying about \$851 more per year**. This is an increase of about 11%. The best way to keep this from increasing is to change when you use lighting and appliances, and to reduce your overall consumption by increasing the efficiency. To accomplish this you should follow all the electricity recommendations in this report, notably the ones to do with the mechanical and lighting. If you do, your overall consumption **would be lowered from the current amount of 6,522 kWh per month to 3,786 kWh per month**. This means even with a Smart Meter, the new higher rates, and time of day premiums you would be paying less than you are now.

Please see the recommendations for the best ways to reduce consumption during peak periods, as well as overall.

## Natural Gas

Based on your bills provided you are using on average **21,001 m<sup>3</sup> of natural gas per year**. This ranges from a minimum of 101 m<sup>3</sup> for September up to 4,366 m<sup>3</sup> in January. The gas that you use for heating and hot water is costing you approximately **\$9,018 per year**. A graph of your consumption over the year can be seen below in Figure 5.



**Figure 5 : Monthly Natural Gas Consumption**

You are using only about 5% of your natural gas to heat the hot water. This is costing you about \$471 per year. That explains why your consumption is so much higher in the winter; you are using most of your gas to heat the building.

## POTENTIAL SAVINGS

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The written recommendations below are specific to Holy Cross Parish. They are ordered from ones that will save you the most, to ones that will save you the least. We have **estimated the capital cost of materials and the labour cost** for each recommendation to the best of our knowledge. You should speak to your service company, a mechanical contractor, or the appropriate professional that can give you the most accurate estimate of the cost to complete the work. A list of potential contacts is included with this report in Appendix 2. To make sure the work gets done professionally and with minimal worry consider contacting **Energy Ottawa**, they are available to manage the entire project; including pricing contractors, scheduling and completing the work, and making sure all the upgrades are completed properly. There may also be funding opportunities that we encourage you to take advantage of. Please contact “Natural Resources Canada” and ask about the “EnerGuide for Existing Buildings” program.

A summary of the potential savings has been provided below in Tables 3, and. Detailed recommendations are outlined below the tables.

<b>Electricity Use</b>	<b>Savings (kWh/Year)</b>	<b>Savings (GJ/Year)</b>	<b>Savings (\$)</b>	<b>Cost (\$)</b>	<b>Payback (Years)</b>
Lighting	11,411	41.1	\$1,123	\$6,301	5.6
Appliances	588	2.1	\$58	\$1,600	27.7
Office Equipment	1,754	6.3	\$173	\$1,000	5.8
Fridges	930	3.3	\$92	\$800	8.7
Mechanical	18,150	65.3	\$1,786	\$5,300	3.0
<b>Total</b>	<b>32,833</b>	<b>118.2</b>	<b>\$3,231</b>	<b>\$15,001</b>	<b>4.6</b>

*Table 2: Potential Annual Electricity Savings*

<b>Upgrade</b>	<b>Savings (GJ)</b>	<b>Savings (\$)</b>	<b>Cost (\$)</b>	<b>Payback (years)</b>
Insulate Flat Ceilings	42	\$482	\$7,205	15.0
Insulate Chapel Walls	57	\$651	\$8,200	12.6
Insulate Foundation	80	\$917	\$33,516	36.5
Reduce Air Leaks	18	\$203	\$2,500	12.3
High Efficiency Boiler(s)	96	\$1,108	\$20,000	18.1
Insulate Exposed Floors	16	\$189	\$1,061	5.6
	7	\$83	\$2,500	30.1
Instant Gas HW	7	\$83	\$3,750	45.2
Doors	24	\$279	\$1,676	6.0
<b>TOTAL</b>	<b>328</b>	<b>\$3,785</b>	<b>\$74,982</b>	<b>19.8</b>

**Table 3: Potential Heating and Hot Water Savings**

# RECOMMENDATIONS

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## **1. Mechanical Systems**

*Estimated Savings = \$1,786 per year*

*Payback Period = 3.0 years*

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Your mechanical systems are the biggest use of electricity by far. The mechanical systems include bathroom and other exhaust fans, table top and ceiling fans, the hot water and boiler system pumps, the elevator, the air conditioning, and the ventilation and heating fans which are using the most electricity.

The easiest way to save here is to make sure that all fans and pumps are turned off when you don't need them. Firstly the hot water circulation pump is wasting a lot of electricity because it's running all the time. It pumps hot water continuously around the building so that it will be available quickly whenever someone turns on a tap. We recommend that you turn this pump OFF when hot water is not immediately needed (ie. when the building is unoccupied). Installing a timer will turn the pump on and off as needed automatically. Even when the pump is turned off hot water will still be available but it may take a while for it to get to the tap. This could save you about \$580 per year.

We recommend that you reduce the time that the ventilation and heating fans are on. According to André at Francis HVAC Services the fans are running 24 hours per day from September to approximately May. If possible these fans should only be on when heat is required in the building. If the system requires them to be on all the time you should consider installing variable frequency drives on at least the larger fan motors (3 and 5 h.p.). These drives allow you to program the system to reduce the speed of the fans as needed, thereby saving electricity. The variable frequency drives on the four ventilation fans could save you approximately \$374 per year. You should see if the boiler pumps can be turned off as well when heat is not required in the building.

The air conditioning system could be made more efficient by installing an economizer. This would allow variable amounts of outside air to be used to cool the building, instead of using the compressor when the outside air is cooler. This has the potential to save you approximately \$309 per year. I'm not sure if you can retrofit your system with this, please ask your heating and cooling contractor.

The compressor pump motor for he controls cycles on and off all the time. It is a very old compressor. You should look into installing a more efficient motor for this.

According to André the system is programmed to reduce the set point for heat at night. You should definitely confirm this and make sure it's set to increase the temperature when the air conditioning is being used as well. Reducing the temperature at night by 2 degrees Celsius can have a significant impact on heating bills. For air conditioning it should really be turned off at night, and programmed to come on an hour or so before the building is to be occupied.

You should continue to make an effort to get in touch with whoever is in charge of the boiler and ventilation schedule, then ask them about making these efficiency improvements.

## **2. Lighting**

*Estimated Savings = \$1,123 per year*

*Payback Period = 5.6 years*

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Lighting is the second biggest use of electricity. We recommend that you continue to replace incandescent lighting with compact fluorescent light bulbs (cfl's) everywhere that is possible. This includes the recessed lighting, the offices, the hallways, and outside. Make sure to at least replace bulbs that are on more than 4 hours per day.

If you are not satisfied with an equivalent compact fluorescent or if you need to dim the bulbs consider new fixtures on multiple circuits; instead of dimmers consider installing

only half the bulbs on one circuit, and the other half on another. This will allow you to turn on only some of the lights when you don't require full brightness. Your lighting controls may allow you to do this already, please take advantage of it if this is the case. There are also now compact fluorescents designed specifically for halogen fixtures.

The T12 lighting in the basement should definitely be replaced. Each of those fixtures uses 168W when turned on. If replaced with T8 fixtures and high output electronic ballasts this can be reduced to 112W. This may not seem like a huge amount but when you multiply that by 27 fixtures it increases to 1500W savings when all of the fixtures are on. The same goes for all T12 fixtures throughout the church. If the bulbs have 32W or 40W on them you know they are T12's. T8 fixtures with electronic ballast will also reduce humming, flickering, and waiting time when you hit the switch.

Your large parking lot lights outside (300W) are using a lot of electricity (Figure 6). We suggest you reduce the amount of time that these lights are on. Perhaps turn them on at dusk and off at 2am, instead of leaving them on all night. They are currently costing you about \$262 per year to operate.



**Figure 6: Exterior Lighting**

Your exit light bulbs should be replaced with LED bulbs with equivalent sockets. These only use about 2W when on instead of 25W.

To replace lights and fixtures you may have to invest up front, but the savings will pay for the cost within a few years. Generally all 60, 100, 150, and 200W incandescents should be replaced with compact fluorescents of equivalent light output, 14, 23, 39, and two 23W respectively. We are not aware of a compact fluorescent that can put out 250W worth of incandescent light, but are recommending that you use a fixture with 2 x 23W cfl's instead. This will give you lots of light by will require the fixture to be changed as well.

### **3. Install High Efficiency Heating System**

*Estimated Savings = \$1,108 per year*

*Payback Period = 18.1 years*

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Your natural gas use for heating makes up about 51% of your total bills for the year. To use your gas more efficiently we recommend 90% efficient or more gas boilers. Your current boilers run at a steady state efficiency of about 85%. This means you are wasting up the chimney 15% of the heat that you are paying for. This may not be a cost effective option at the moment but please keep it in mind when the boilers need replacing.

The size you need is determined by the heat load for the building. The current heat load is **526,2321 btu/hr**. If you were to complete all the building envelope upgrades that we have recommended (including all insulation and air leakage) you would only need a heating system with a total output heat capacity of **390,961 btu/hr** plus a minimum 10% safety factor. You should really complete the building upgrades first, so you won't have to invest in as large of a heating system. The current capacity of your heating system now is  $198,000 \times 3 = \mathbf{594,000 \text{ btu/hr}}$ .

**You should also have your heating and ventilation system serviced on a regular basis to make sure it is running at optimum efficiency.**

### **4. Add Insulation to Foundation**

*Estimated Savings = \$917 per year*

*Payback Period = 36.5 years*

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The foundation has 1" of expanded polystyrene Styrofoam insulation installed on the interior. This only adds about R4 to the walls. You are losing the same amount of heat through the foundation above the ground as you are below the ground. For this reason we are recommending you add insulation to both. This will increase the R value of these walls to almost R20.

We recommend that you add 1.5” of extruded polystyrene on the **exterior of the above grade foundation**. This will involve strapping the wall, installing the foam, and then finishing the exterior with stucco or another exterior finish. You will also have to add flashing around the doors and windows. It shouldn’t be too difficult to do as your above grade foundation is easily accessible.

As long as you don’t have any water coming inside through the foundation you can safely insulate the interior of the basement as well. If you are not worried about losing floor area just add the insulation over top of the existing wall. If you’d prefer you can remove the finish there now and add 2.5” of extruded polystyrene to the walls, then recover with drywall. The drywall is needed in order to comply with the fire code. This insulation isn’t any more flammable than others but it does release toxic smoke when it burns.

## ***5. Insulate the Walls of the Chapel***

*Estimated Savings = \$651 per year*

*Payback Period = 12.6 years*

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The walls of the chapel have little insulation, only about 1” of expanded polystyrene. We recommend you add 2” of extruded polystyrene on the interior walls; increasing the insulation value to almost R 20. You would then have to add a layer of drywall to comply with the fire code. You may also have to add strapping and more flashing around the windows and doors. This can be done on the exterior of the building instead if you ever decide that you would prefer to change the brick on the building. When adding extruded polystyrene to the exterior of the building do not add more than 1.5” thickness. Any amount thicker than this may start to function like a vapour barrier and trap moisture inside of the wall.

We recommend that you add insulation to the office portion of the building as well. The added cost shouldn’t be too much and it will reduce heat loss and improve comfort in this area.

## **6. Add Insulation to Flat Ceilings**

*Estimated Savings = \$482 per year*

*Payback Period = 15 years*

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The flat attics include the attic above the offices, and the flat attic in the chapel. Above the offices there is about R10 of fibreglass insulation and above the chapel there is about R14. You should upgrade these to R44 in both cases. This would involve having cellulose insulation blown into the cavities, at least 10 inches above the chapel and 11” above the offices.

The sloped ceilings above the chapel have already been upgraded and have almost R30 worth of insulation.

## **7. Upgrade Windows**

*Estimated Savings = \$279 per year*

*Payback Period = 6.0 years*

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We are recommending that you replace, or upgrade your worst windows. In this case we mean the single paned windows in the southeast entrance door, the southwest stained glass window and a window in the northeast wall of the offices.

The minimum you need to do with your windows is make sure they are sealed up properly in the winter. If they are single paned windows they really could benefit from a storm window installed on the exterior. Before installing these exterior storms you **MUST** make sure that the windows are air sealed from the inside. This will make sure that no moisture gets trapped between the two panes. You can proceed to install plexiglass storms on the exterior of the single paned windows. The preferable distance between the two panes is about ½ inch. This will minimize the conductive and convective heat loss through the windows.

We are making this recommendation under the assumption that you don't want to replace your windows, because of the cost. If this is not true by all means replace your windows with new ones with the following energy efficient features:

- Vinyl frames
- Low-e coating
- Insulated spacers
- Double panes
- Argon gas filled panes
- Fixed or casement windows

You should expect to pay about \$75 per square foot for windows with these features, and \$100 per square foot for the most efficient triple paned insulated fibreglass or wood frames. The plexiglass storms would cost about \$5 per square foot. That is why we recommend first improving the efficiency of the windows by decreasing air leakage through them and adding storms.

## **8. Reduce Air Leakage**

*Estimated Savings = \$203 per year*

*Payback Period = 12.3 years*

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The reason that the air leakage makes up such a large percentage of your heat loss but is not that bad overall is because of the size of the building. The surface area of the outside walls and ceilings of the church is so large that multiple small leaks really add up. The height of the ceilings in the chapel also greatly increase the 'stack effect', which causes warm air to escape, and more cold air to be sucked into the building. As the air inside is heated in the winter, it rises and escapes through leaks in the upper part of the building. Since air is escaping it must be replaced by fresh air to balance the pressure in the building. This movement of air will draw cold outside air in from the lower part of the building (basement).

The blower door test was used to find out where the air leaks are in the building. Cold air can leak in, and warm air that you have paid to heat can leak out around doors, windows, and other areas.

**We recommend you reduce the air leakage in order to improve comfort in drafty areas, and save on your heating costs. Follow the guide below and please take a look at “Keeping the Heat In”, included with this report for details on materials, and methods for effective insulation and air sealing. It can also be viewed online at:**

[http://oee.nrcan.gc.ca/publications/infosource/pdfs/heat\\_in.pdf](http://oee.nrcan.gc.ca/publications/infosource/pdfs/heat_in.pdf)

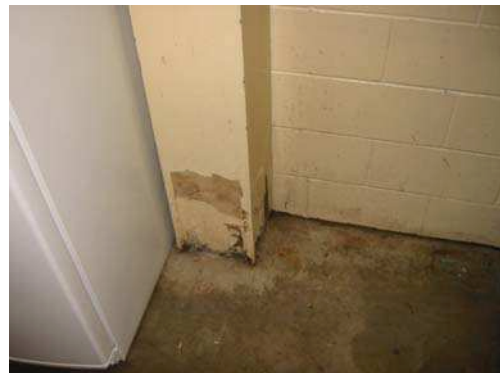
## **Basement**

The main concerns on this floor were:

- The elevator shaft,
- The workshop,
- The basement windows, especially the kitchen,
- The duct in the bar room ,
- The old washroom vent,
- The side doors in the hall.

The elevator shaft should be investigated for leaks to the outside. Because the shaft goes from one floor to the other it is probably open to the interior of walls and floors that have holes to the outside. Make sure the elevator is off and have a professional access the area and seal any gaps or cracks to the outside. Another option would be to weatherstrip the elevator doors; I’m not sure if a product is made for this but contact an air sealing professional to find out.

There was **not** a lot of leakage in the workshop; this is the problem. There were quite a few cans of paints and other chemicals stored here. This room should be better ventilated with a vent to the outside or an exhaust fan.



***Figure 7: Leak in Bar Room***

The windows should be properly latched and closed

during the heating season. Any gaps around the trim or frame should be sealed with removable caulking or plastic. The most leaks were noticed around the kitchen window.

The duct in the bar room (Figure 7) and the old washroom vent were leaking air. The warm air may be leaking out in two ways. Either there is a gap around the vent housing and the wall, or the leakage is coming up through the vent because the damper is not working properly. Make sure to seal between the metal of the vent and the wall, on the inside and the outside. You should also make sure the damper is closing tightly and replace it if it isn't. If these vents aren't needed anymore just remove them and seal up the hole properly.

These doors were especially leaky where the frame meets the wall and where the door closes on the middle support. Around the frame should be caulked. Any exterior doors should be checked to make sure that they have updated weatherstripping and threshold seals (for the bottom of the door). For weatherstripping we recommend the v-type. It is made from foam coated in vinyl and provides a very good flexible seal, even in cold weather. One particular brand is known as Zerodraft.

## **Offices and Chapel**

The main concerns in this area were:

- The side door and window frames,
- The front doors,
- The side door opposite the office,
- The doors on the left of sanctuary,
- The office door to outside,
- The door to the garage,
- The laundry room door,
- The stained glass windows,
- The front bath fan,
- The vault room,
- The radiator penetrations in exterior walls,

- The administrators office,
- Above the fan in the laundry room,
- The ductwork between laundry room and the kitchen,
- The smoke detectors.

Any exterior doors should be checked to make sure that they have updated weatherstripping and threshold seals (for the bottom of the door). For weatherstripping we recommend the v-type. There was a large gap found in the weatherstripping of the laundry room door and you can see where air has been leaking in; it's left marks from the dirt in the air (Figure 8).



**Figure 8: Laundry Room Door**

The windows mentioned can be sealed temporarily if you need to open them again in the spring; use either removable caulking or plastic film. If they don't need to be opened or are fixed windows use regular caulking that will match their colour to seal them up.

The exhaust fan in the front bathroom was not leaking air, but it wasn't working either. You should make sure that the damper isn't sealed shut and that the motor is working properly. If it's not needed just remove the fan and seal up the two holes.

There were a few leaks in the vault room around the ducts for the combustion air supply. Since these ducts bring in outside air and are passing through a heated space they should really be sealed and insulated. Use duct or foil tape to seal all the joints in the ductwork, and then cover with fibreglass or bubble insulation. You should also make sure that any gaps around where the ducts penetrate to outside are sealed; from the inside and the outside.

Any holes around the radiator pipes where they go through the floor should be sealed with expanding foam or caulking.

In the administrators office leaks were noticed around the exterior outlets and cover plates (Figure 9). These should be sealed with foam gaskets, caulking, and safety plugs, as in “Keeping the Heat In” pages 35 and 50.

There was definitely some leakage above the fan in the laundry room and in the drop ceiling surrounding the ducts for the air conditioner. The source of this leakage could not be pinpointed. You should take off the ceiling tiles and investigate and gaps to the outside. Some possibilities are: gaps around the fan, gaps between the two building at the ceiling, or holes into the attic.



**Figure 9: Administrators Office**

The smoke detectors need to be sealed from the attic. If you can get above the smoke detectors remove any insulation surrounding them, seal all gaps with expanding foam, and then replace the insulation.

## **9. Insulate Exposed/Overhanging Floors**

*Estimated Savings = \$189 per year*

*Payback Period =5.6 years*

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The overhanging floors under the office (above the garage) don't appear to have any insulation. The easiest way to add insulation here is from the outside. You should first install a layer of 2.5" extruded polystyrene, and then hold these in place with 2x4's. Fill these with R12-14 Roxul batts, and then hold them in place with vapour barrier, and finish however desired. This has the potential to save you a bit and also make the areas above much warmer in the winter.

## **10. Office Equipment**

*Estimated Savings = \$173 per year*

*Payback Period =5.8 years*

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Office equipment includes the computers, monitors, stereo, the fax machine, printer, copier, and the organ. There is not much you can do with most appliances other than making sure they are shut off at night. In all cases this will save more than leaving them on all the time. This is true for the copier and printers as well. In some cases you should even shut them off at a power bar to make sure they aren't drawing any 'phantom' loads. If any appliances have digital clocks or coloured lights even when they are turned off at the switch they are still drawing power. This is true for anything that has a transformer on the plug too. A transformer is a heavy box attached to the plug, or elsewhere on the power cord.

The monitors should all be replaced with LCD monitors. These only cost about \$250 each and use 20W instead of 70W that the older style cathode ray tube monitors use.

## **11. Fridges and Freezers**

*Estimated Savings = \$92 per year*

*Payback Period =8.7 years*

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Your fridges and freezers use between 330 and 1,000 kWh per year. You should consider replacing them all, but the best payback will be achieved by replacing the oldest fridge; the one in the Knights of Columbus room. Anything over 15 years old should definitely be replaced with an Energy Star fridge that uses about 4-500 kWh per year. Each one will cost you about \$800 but has the potential to save you about \$30 per year. If any fridges or freezers are not being used or are partially full you should unplug them until needed again (after moving what's inside of course).

## **12. Instantaneous Hot Water Heater**

*Estimated Savings = \$83 per year*

*Payback Period = 30.1 years*

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This is another option to reduce your energy required for hot water. An instantaneous hot water heater only heats the water when you need it, so there is no tank to lose heat from. Because there is no tank, you don't run out of hot water. Make sure to size the on demand water heater properly (match its output in gallons per minute to your maximum requirement). Instantaneous hot water heaters either run on electricity or natural gas.

You may want to consider point of use instantaneous heaters instead. These are small heaters that don't supply the whole building, just one area. For example installing one for the washrooms and one for the kitchen may work.

**At the minimum consider insulating your hot water tank with a fibreglass, or radiant heat blanket (available from EnviroCentre) and the exposed hot water pipes coming from the heater. These two actions will save you at least \$15 per year, and should only cost about \$30 for materials.**

## **13. Doors**

*Estimated Savings = \$83 per year*

*Payback Period = 45.2 years*

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Air sealing around your doors with new weatherstripping is the most cost effective option to improve door efficiency. To further decrease heat loss through the doors you should consider installing steel doors insulated with foam. These will have a better insulating value than wooden doors; R 5 instead of R 2. The \$83 saving only represents decreased heat loss by replacing the doors with steel insulated ones, not the reduced air leakage around the doors.

## **14. Appliances**

*Estimated Savings = \$58 per year*

*Payback Period = 27.7 years*

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This category includes all the kitchen appliances as well as the washer and dryer. The best appliance to replace is your washing machine. You should get a front loading washer.

These save in three ways: they use less electricity per load, they use much less water (hot or cold), and they get more water out during the spin so that the clothes dry faster in the dryer.

With most of your appliances there aren't more efficient models available. Your best bet here is to use the electricity wisely by turning them off when they are not in use. You can also save by:

- Using the microwave more than the oven.
- Boiling water in a kettle instead of the stove, and only boil as much water as you need.
- Making sure to use a pot that fits the burner.
- Using a lid on pots as much as possible.
- Hanging out your clothes to dry (the dryer cost you about 50¢ per hour to operate).

## CONCLUSION

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Holy Cross Parish is consuming about **78,269 kWh per year**, which is costing you **\$7,701 for electricity**. You are also consuming about **2,101 m<sup>3</sup> of natural gas per year**, costing you an additional **\$9,018 for heat and hot water**. This makes your **total annual bills for one year about \$16,720**. You are using **1064 GJ of energy** per year.

**By following ALL the recommendations in this report you could cut your costs by 42% allowing you to reinvest about \$7,016 back into the church each year. The cost of all these recommendations may be close to \$90,000 but will pay for themselves in 13 years if they are all implemented. The payback period for all the electrical upgrades is much better at than 5 years.**

To really save money, you should invest all or a portion of your energy savings in additional efficiency upgrades, saving you even more money in the future. Perhaps just start with something that has a quick payback, like the mechanical systems and lighting. Take the money saved from this and invest, or save it for a few years. You will then have even more to spend on a new heating system or more insulation. This concept will eventually allow you to have the most efficient building possible, reducing your expenses for years to come. Remember as well that as electricity and gas prices go up, you will be saving even more every year after the improvements have been completed.

**APPENDIX 1 – SBO GENERAL TIPS**

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# SMART BUSINESS



## OTTAWA (SBO)

A viable energy management strategy for businesses

### Energy Savings Tips for Your Business

In addition to your customized written report, here are some steps you can take on your own to further reduce energy consumption while continuing to provide a comfortable and cost effective environment for yourself, your customers and your employees.

#### LIGHTING TIPS:

- ✓ Keep the bulbs and lighting fixture clean and reduce lighting where possible.
- ✓ Turn off lights in unoccupied areas, remove excess lighting, and turn off signage and other lights not necessary for security and safety.
- ✓ Install a carbon monoxide (CO) sensor in underground parking lots to save electricity needed to run exhaust fans and to also increase safety and security.

#### HVAC TIPS:

- ✓ Install programmable thermostats to automatically control room temperature settings and install an adjustable speed drive (ASD) to match the operation of your HVAC equipment to your

building's needs, avoiding energy waste.

#### Air conditioning

- ✓ Adjust the thermostat up in the summer.
- ✓ Air conditioning thermostats should be set no cooler than 25.5°C (78° F). Each degree setting below 26°C will increase your energy consumption by approx 8%.
- ✓ If you haven't already done so, request an **SBO** assessment of your air conditioning system.
- ✓ Ensure peak performance by frequently changing the filters that get extremely dirty and quickly in restaurant settings.

#### Heating

- ✓ In the winter, adjust the thermostats down –no warmer than 22°C (71°F).

#### REFRIGERATION TIPS:

- ✓ Each month, clean condenser coils and check for the proper amount of refrigerant. Also check the seals, gaskets and latches on doors to make sure they form an airtight seal when closed.
- ✓ Consider adding strip curtains to walk-in coolers to reduce the amount of energy lost to the surrounding air. Your system will use less energy and won't work as hard, cutting maintenance costs. As an added bonus, these curtains repel windborne

contaminants like dust and pollutants.

- ✓ Keep the temperature at the manufacturer's recommended optimal setting. Better yet, consider installing variable speed drives, which automatically adjust the level of refrigeration and can be used on the motors of all kinds of refrigeration units.

#### OFFICE EQUIPMENT TIPS:

- ✓ Choose ENERGY STAR products when upgrading or adding new equipment. These products meet federal standards for energy efficiency and are often available at the same cost as less efficient models. And since most ENERGY STAR equipment powers down during periods of inactivity, you'll save even more.
- ✓ Turn off or set office equipment to power down when not in use. Turning off one computer and monitor nightly and on weekends can save up to \$50 a year. And setting PCs, monitors and copiers to use sleep mode when not in use can help cut office electricity costs by up to 50%.

For energy efficient products and services, or to book your SBO audit, contact **envirocentre**

**580-2582 or visit us on-line**  
[www.envirocentre.ca](http://www.envirocentre.ca)

## **APPENDIX 2 – SERVICES AND CONTRACTORS**

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### **PROJECT MANAGEMENT**

Energy Ottawa  
613 225-0418 x7212

Franklin Menendez  
One Quarter Saw  
613 612-5729  
[www.onequartersaw.com](http://www.onequartersaw.com)

### **AIR SEALING AND INSULATION**

A. Mackay and Sons Insulation  
Ottawa  
613-821-2373

Warmth Insulation (Spray Foam only)  
Perth  
1-800-363-7280

Wooly Insulation  
1-888-749-6659

### **FURNACE CONTRACTORS**

Holmes Heating  
Kanata  
613 592-8170

Ideal Combustion  
Gloucester  
613 747-8454

JC Robinson  
Ottawa  
613 733-2481

Parent Heating and Cooling  
Ottawa  
613 739-4515

# APPENDIX 3 – ENERGY SAVINGS CALCULATOR

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# Energy Savings Calculator Results

	Total Energy (Mil. BTU)	Energy Cost (\$)	Savings (Mil. BTU)	EGH Rating (Diff)	Savings (\$)	Upgrade Cost (\$)	Payback (Yr)
Base Case	1009.3	17251.05	0.0	0.0	0.0	0.00	N/A
Flat or Cathedral Ceiling	969.7	16732.92	39.6	0.0	518.13	0.00	0.0
Wall	955.7	16588.83	53.6	0.0	662.22	0.00	0.0
Foundation	933.8	16267.54	75.5	0.0	983.51	0.00	0.0
Floor	993.7	17063.47	15.5	0.0	187.58	0.00	0.0
Southeast Window	999.7	17132.94	9.5	0.0	118.11	0.00	0.0
Northeast Window	1003.5	17182.09	5.7	0.0	68.96	0.00	0.0
Southwest Window	1001.3	17153.27	7.9	0.0	97.78	0.00	0.0
All Windows	986.3	16964.08	22.9	0.0	286.97	0.00	0.0
Air Tightness	992.6	17040.13	16.7	0.0	210.92	0.00	0.0
Door	1002.4	17167.86	6.8	0.0	83.20	0.00	0.0
Heating System	918.2	16099.28	91.1	0.0	1151.78	0.00	0.0
Domestic Hot Water	1002.4	17164.59	6.8	0.0	86.46	0.00	0.0
All Upgrades	698.0	13290.98	311.3	0.0	3960.07	0.00	0.0

## APPENDIX 4 – GRANT OPPORTUNITIES

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To help pay for the cost of this audit and any work you might do please consult with NRCan and the EnerGuide for Existing Buildings program:

<http://oee.nrcan.gc.ca/commercial/financial-assistance/existing/retrofits/index.cfm?attr=20>

EnviroCentre is working with Faith and the Common Good in Ottawa to help religious buildings gain access to these grants from NRCan. For the most up to date information on this please contact Kristina Inrig at:

[ottawa@faith-commongood.net](mailto:ottawa@faith-commongood.net)  
(613) 889-8576

An application form under the REDI program to pay up to 25% of solar domestic hot water heating systems can be found here:

<http://www2.nrcan.gc.ca/es/erb/erb/english/View.asp?x=647&oid=973>

More info about REDI can be found here:

**Renewable Energy Deployment Initiative**

Renewable and Electrical Energy Division

Natural Resources Canada

615 Booth Street, Room 150

Ottawa, Ontario K1A 0E9

Email: [redi.penser@nrcan.gc.ca](mailto:redi.penser@nrcan.gc.ca)

Telephone: 1-877-722-6600 (Toll Free)

Fax: (613) 943-6517

Also check out the Canadian Solar Industries Association for information on incentives for installing solar systems:

<http://cansia.ca/government.asp>