



**Concordia Lutheran Church**  
2501 Woodland Avenue  
Duluth, MN

**ELECTRIC & NATURAL GAS ENERGY ANALYSIS**  
**November 7, 2013**



Prepared By:  
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## Customer Information

### Facility Information:

Business Name: Concordia Lutheran Church  
Service Address: 2501 Woodland Avenue, Duluth, MN 55803  
Account(s): 411056010 **(ELECTRIC)**  
270510645-001 **(GAS)**  
Customer Contact: Delores Grunwald  
Customer Phone #: 218-349-8403  
  
Date of Analysis: November 7, 2013  
Date of Report: December 20, 2013  
Annual Energy Usage: 283 kW; 36,080 kWh **(ELECTRIC)**  
10,624 CCF/Year or Therms/Year **(GAS)**  
Building/Business Type: Church

### Auditor(s):

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## Executive Summary

An Energy Analysis is the first step toward identifying opportunities to keep operating costs low, remain competitive in the marketplace, and start saving energy and money. This report contains specific recommendations to reduce energy usage, many of which are low or no cost opportunities. Some of these recommendations may qualify for a Rebate to help reduce your initial equipment costs and provide a faster payback on your energy investment.

Concordia Lutheran Church is located in the Woodland area of Duluth, MN. The church was officially organized in 1942 and has been in several locations since. The current building was dedicated in September 1962. The church has 2 main levels – ground floor and the basement. There are some small offices and miscellaneous rooms on the 3<sup>rd</sup> floor. The building has several offices, which are located on all 3 levels. There is also a kitchen and large dining/common area and classrooms. The sanctuary is on the main level. The church operates about 15 hours per week and already has ample natural light in some places. In October of 2013, Minnesota Power and Comfort Systems received a request for a combined electric and gas analysis from Delores Grunwald, an energy efficiency advocate for the church. On November 7<sup>th</sup> 2013, Peter Gephart and Charlotte Currier of Energy Insight Inc. visited the site to conduct the analysis. The main areas for improvement are lighting throughout the facility as well as upgrades and maintenance of the natural gas equipment. Detailed recommendations can be found under the Summary of Opportunities section starting on page 8.

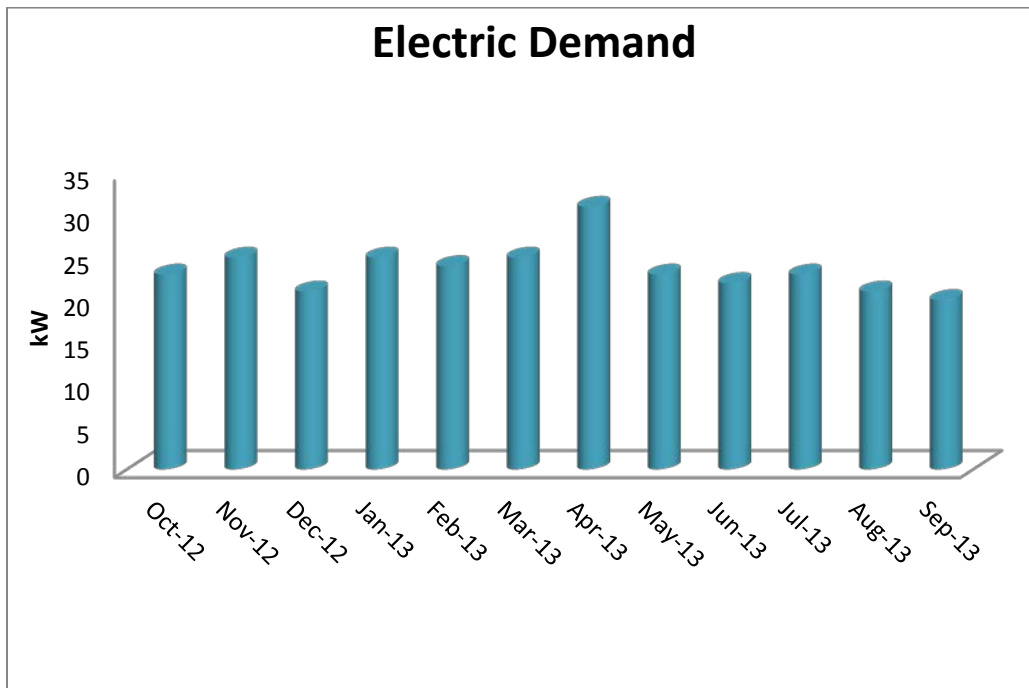
### **Safety Issues:**

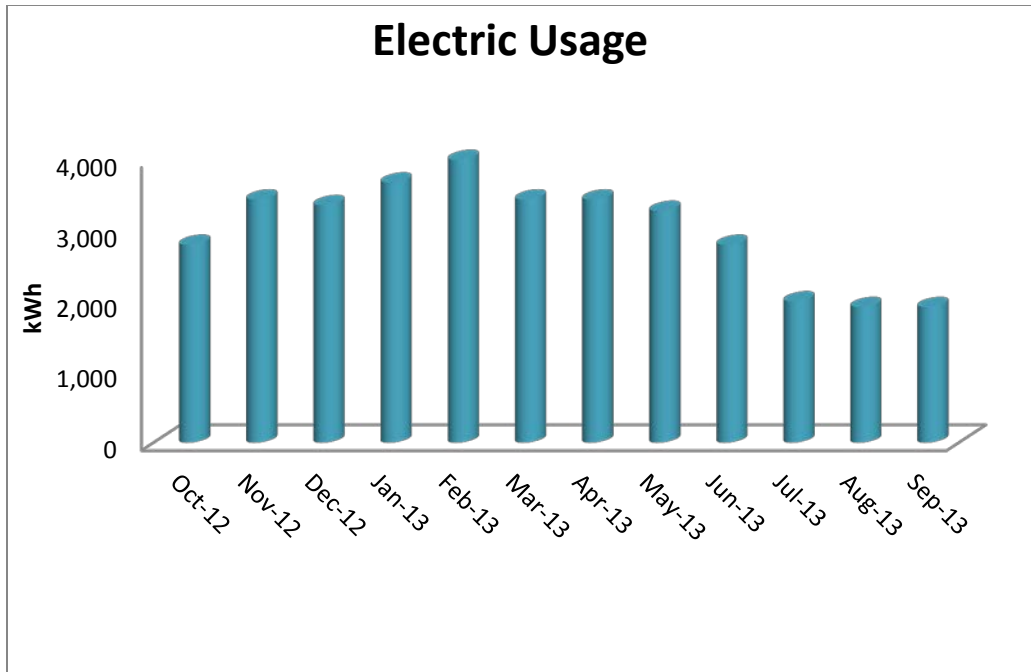
- During the walkthrough, a box of broken CFL bulbs was discovered in the basement storage closet. These contain mercury, which is a health and environmental hazard, so they should be properly disposed of.

## Energy Usage and Equipment

**(ELECTRIC)** The building uses various electric appliances/equipment that result in a peak demand of 31 kW. Some of these major users of electricity are lights, air conditioners, and kitchen equipment. Below are tabular and graphical representations of energy usage over the last year:

Month	Demand	Usage	Cost
Oct-12	23	2,800	\$345.63
Nov-12	25	3,440	\$396.79
Dec-12	21	3,360	\$373.87
Jan-13	25	3,680	\$431.38
Feb-13	24	4,000	\$438.60
Mar-13	25	3,440	\$406.94
Apr-13	31	3,440	\$439.05
May-13	23	3,280	\$375.54
Jun-13	22	2,800	\$340.39
Jul-13	23	2,000	\$290.94
Aug-13	21	1,920	\$271.00
Sep-13	20	1,920	\$265.03
<b>TOTAL</b>	<b>31</b>	<b>36,080</b>	<b>\$4,375.16</b>
<b>AVERAGE</b>	<b>24</b>	<b>3,007</b>	<b>\$364.60</b>

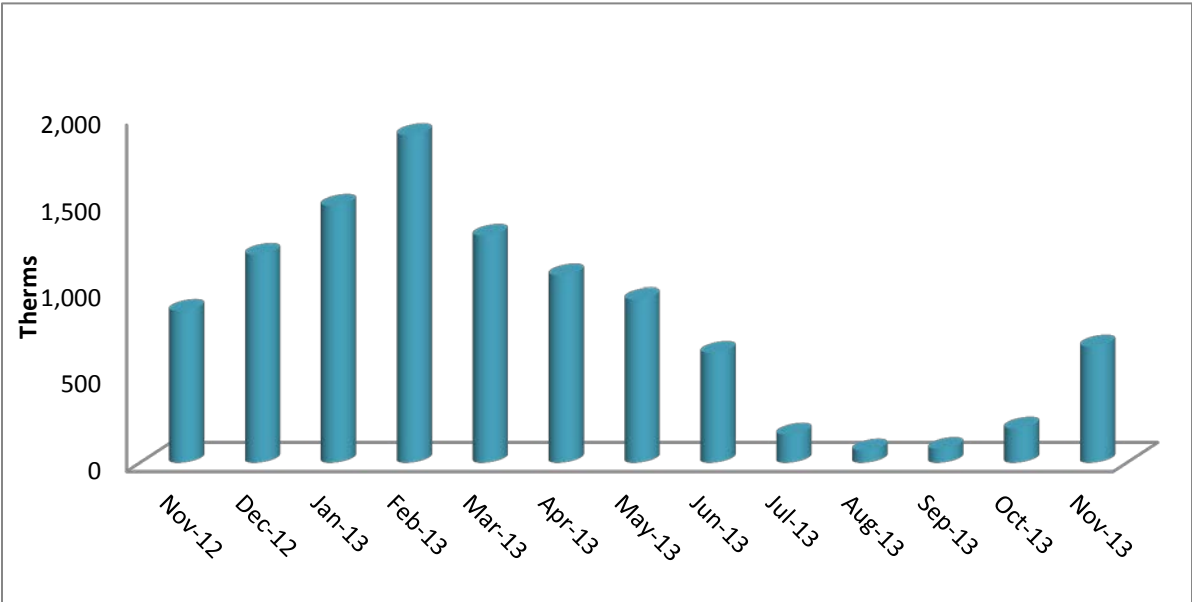


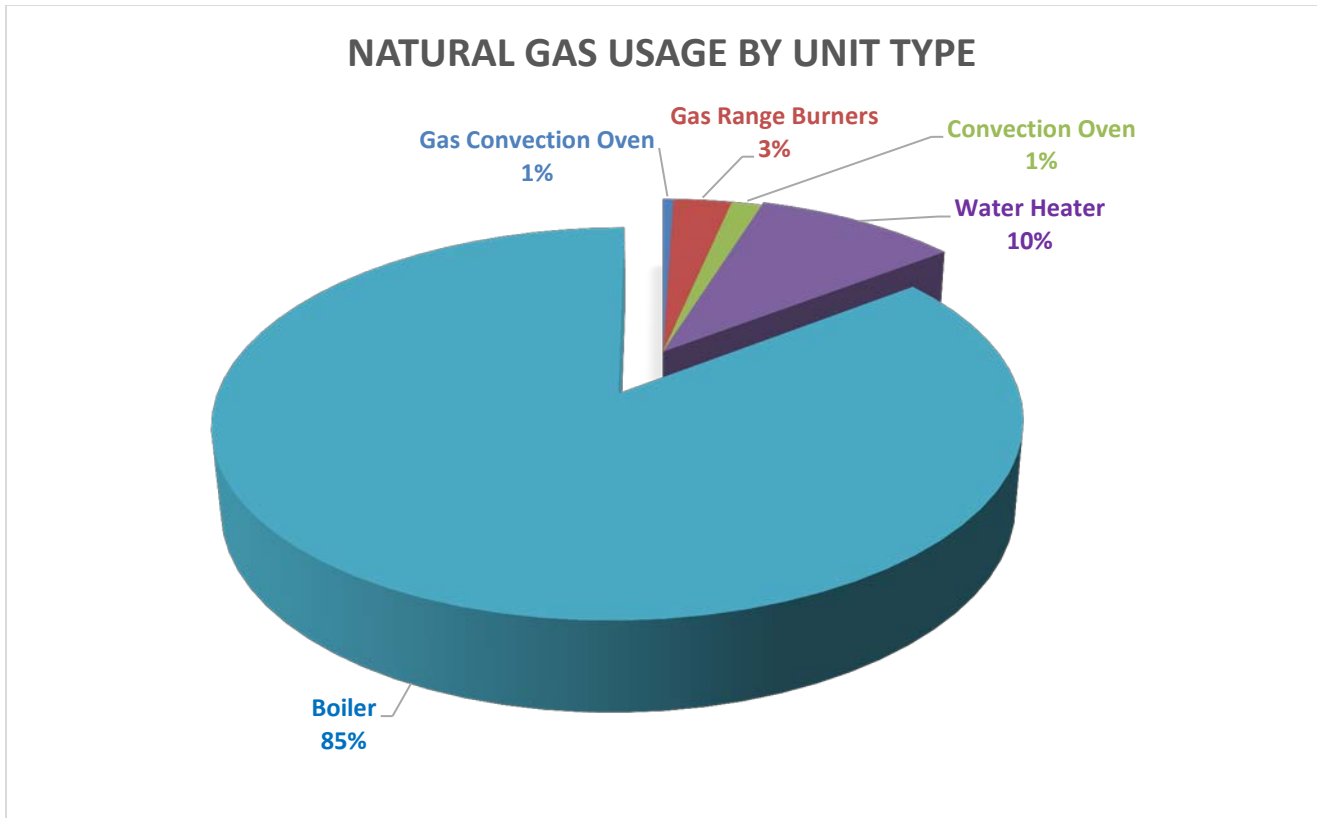


**(GAS)** The heating system is comprised of 2 condensing hot water boilers rated at 399,000 BTU/Hr each. There is one heater for domestic hot water rated at 75,100 BTU/Hr. There is also kitchen equipment that makes up a portion of the natural gas consumption. The 6 burners on the gas range are rated at approximately 32,000 BTU/Hr each. The convection oven and gas oven make up the remainder of the gas usage. The convection oven is rated at 100,000 BTU/Hr and the gas oven is rated at 35,000 BTU/Hr. A detailed breakdown of this equipment can be seen below.

Location	DESCRIPTION	Quantity	BTU/Hour	Efficiency	Hours/Year	Load Factor	Therms/Year
Boiler Room	AO Smith Water Heater	1	75,100	80%	1,382	100%	1,038
Boiler Room	Munchkin Condensing Boilers	2	399,000	93%	1,896	60%	9,076
Kitchen	Gas Range Burners	6	32,000	75%	156	100%	300
Kitchen	Convection Oven	1	100,000	75%	156	100%	156
Kitchen	Gas Oven	1	35,000	75%	156	100%	55
<b>Total</b>			<b>1,200,100</b>				<b>10,624</b>

Month	Total Usage (Therms)
Nov-12	880
Dec-12	1,201
Jan-13	1,484
Feb-13	1,893
Mar-13	1,311
Apr-13	1,082
May-13	946
Jun-13	637
Jul-13	164
Aug-13	72
Sep-13	81
Oct-13	199
Nov-13	674
<b>TOTAL</b>	<b>10,624</b>





## Summary of Opportunities

The recommendations in this report are based on an analysis of conditions observed at the time of the survey, information provided to the auditors, and costs based on experience of similar projects. Estimated savings are calculated on the basis of research by government agencies, product literature, and engineering associations. Actual savings will depend on several factors including conservation measures implemented, seasonal weather variations, fuel price increases, and specific energy use practices of the facility's occupants and workers. Performance guidelines provided in the report are for informational purposes only and are not to be construed as a design document. This report is written for energy saving purposes only and should not be used for bid specifications. Installation costs are estimates only and the customer is responsible for obtaining quoted prices from vendors and contractors.

*Prior to moving forward with any of the below recommendations, please connect with Comfort Systems and MN Power for associated savings and rebates.*

### Electric Efficiency Recommendations:

- 🔗 **32 Watt T8 fluorescent lighting to 28 Watt T8** – A large portion of lighting in the facility consists of 32 watt T-8 lamps. Consider replacing these with lower wattage 28 watt T8 lamps. The lower wattage saves energy and still provides ample light for the space. There is also one T12 fixture in the kitchen. T12 lamps are being phased out because they are inefficient and have poor light



output. Consider changing this out to a 28 watt T8 as well. The existing magnetic ballast for this will have to be replaced with an electronic ballast, but the fixture is able to remain in place. Implementing this measure saves approximately \$303 per year and yields a rebate of \$575.

- ② **Incandescent lamps to LED** – There is incandescent lighting scattered throughout the facility. This consists of 60, 100, and 250 watt lamps as well as exit signs. Replacing this lighting with LED will significantly lower demand. Furthermore LED lamps are rated to last at least 50,000 hours, meaning that they won't have to be replaced for many years. Replacing all incandescent lamps in the facility with LED bulbs would save approximately \$911 per year and yield a rebate of \$1,565. Consider asking several suppliers for LED samples to determine whether this measure would suit the needs of your congregation.
- ② **Outdoor lighting to LED** – Existing high pressure sodium (HPS) and incandescent flood lights on the exterior of the building can be replaced with energy efficient LED fixtures. In particular, the 250 watt HPS fixtures in the parking lot and playground area can be replaced with LED that use around 90 watts, and the awning lights can be replaced with LED screw-in bulbs that use approximately 8 watts each. Also consider adding photo sensors on these fixtures that will turn the lights off when sufficient daylight is available. To replace all exterior lighting with LED would result in a cost savings of about \$313 per year and yield a rebate of \$247.
- ② **Lighting Controls** – Install lighting controls such as motion sensors in the areas that are not occupied all the time. This will prevent lights from being left on when they don't need to be. Implementing this measure will save about \$12 annually and yield a rebate of \$8.
- ② **De-stratification Fans** – Consider installing commercial fans in the sanctuary to circulate the air. De-stratification fans work by equalizing the air in a space by circulating hotter air down to the floor to balance temperature in both hot and cold seasons. They reduce energy use and help prevent heat loss through the ceiling.
- ② **Computer Equipment Schedule** – During the walk-through, it was noticed that some computers were not in use but still on. Even though a computer is in sleep or hibernate mode, it still draws significantly more power than when completely shut down. Shutting off computers and any other electronic devices when not in use results in energy savings.
- ② **Insulate around the Window Air Conditioner** – At the time of the site visit, it was noted that the window air conditioning unit in the front office had gaps between the unit and the window, which suggests that outside air is infiltrating the conditioned space. Consider adding insulation around the unit to seal up gaps and eliminate unwanted drafts from entering the conditioned space. This will result in heating and cooling savings. When the unit needs to be replaced, consider units with a high Seasonal Energy Efficiency (SEER) rating. Currently, any unit with a SEER rating greater than 13 can qualify for a rebate through Minnesota Power.

#### **Natural Gas Efficiency Recommendations:**

- ② **Install Controls on Hot Water Circulation Pumps** – There is one 1/2 horsepower hot water circulation pump for each of the 2 boilers. These pumps circulate hot water throughout the building. Installing an Electrically Commutated Motor (ECM) on each of these pumps to reduce the flow rate of the boiler system will allow the boiler to heat up less mass during operating

hours while still providing the required heat to the building. This measure would result in gas and electric savings and may qualify for rebates through both utilities.

- ① **Install Setback Thermostats** – Look for web-based products that are capable of being controlled via computer or smartphone and can be set back. One benefit of these is being able to set back temperature during times when certain areas of the church are not being used. Implementing this measure will result in electric and gas savings due to reduced run time of the boilers and air conditioners.
- ① **Perform Regular Boiler Tune-Ups** – A professional boiler tune-up can enhance the performance, safety, and efficiency of boilers. Consider doing this every other year to maintain the high efficiency of the boilers.
- ① **Install Energy Efficient Water Heaters** – Replace the existing hot water heater with a condensing water heater. The recommendation is applicable when the unit needs to be replaced anyway.
- ① **Replace Gas Igniters on the Stove with an Electronic Ignition** – The current gas pilot lights are always on. Each standing pilot light uses an estimated 17 Therms per year. Consider replacing these with an electronic ignition to turn the burners on only as needed and save approximately \$75 in avoided costs each year.
- ① **Replace Existing Faucets** – Consider replacing existing restroom and kitchen faucets with low flow (0.5 gallons/minute) faucets. This recommendation will reduce hot water consumption as well as general water and sewer consumption. The potential annual savings from implementing this measure is approximately 1,000 gallons of water, roughly 8 Therms, and about \$26.00.

## Electric Measures Summary by Payback

ECM #	Description	Annual Cost Saved	Annual kW Saved	Annual kWh Saved	Estimated Project Cost	Estimated Rebate	Estimated Cost After Rebate	Simple Payback	% Electric Reduced
1	28 Watt T8	\$303	2.9	1913	\$527	\$575	(\$48)	(0.2)	5.3%
2	LED Exit	\$104	0.2	1699	\$94	\$59	\$34	0.3	4.7%
3	LED A-19 (60W equivalent)	\$290	2.1	2705	\$1,666	\$418	\$1,248	4.3	7.5%
4	LED PAR20	\$12	0.1	58	\$300	\$25	\$275	23.5	0.2%
5	LED PAR38	\$636	5.7	4446	\$7,170	\$1,140	\$6,030	9.5	12.3%
6	LED A-19 (100W equivalent)	\$0	0.0	2	\$50	\$1	\$49	128.1	0.0%
7	LED A-19 (40W equivalent)	\$15	0.1	219	\$111	\$10	\$101	6.7	0.6%
8	LED A-19 (75W equivalent)	\$45	0.3	381	\$539	\$70	\$469	10.5	1.1%
9	LED Area Light 78W	\$123	0.4	1787	\$1,038	\$82	\$956	7.8	5.0%
10	Lighting Controls	\$12	0.0	231	\$220	\$8	\$212	17.4	0.6%
<b>Total</b>		<b>\$1,540</b>	<b>11.8</b>	<b>13,441</b>	<b>\$11,713</b>	<b>\$2,387</b>	<b>\$9,326</b>	<b>6.1</b>	<b>37.3%</b>

## Gas Measures Summary by Payback

Measure #	Description	Annual Cost Saved	Annual Therms Saved	Annual kWh Saved	Estimated Project Cost	Simple Payback	% Gas Reduced
1	Condensing Water Heater	\$122.31	166	0	\$1,989.99	2.5	14.0%
2	Hot Water Boiler Flow Reduction	\$209.93	103	397	\$378.99	1.8	1.1%
3	Boiler Tune Up	\$133.74	182	0	\$600	3.4	2.0%
4	Setback Thermostat	\$1,470.06	593	8,359	\$1,350.00	0.9	6.5%
5	Faucet Aerators	\$25.52	8	0	\$19.75	0.8	0.1%
<b>Total</b>		<b>\$1,962</b>	<b>1,051</b>	<b>8,757</b>	<b>\$4,339</b>	<b>2.2</b>	<b>23.7%</b>

## Next Steps

**Step 1** – You’ve already taken steps to reduce energy bills and increase efficiency by having this Electric and Natural Gas Energy Analysis, which has identified energy and cost saving opportunities for your facility.

**Step 2** – Use this report as a guide to obtain bids from multiple qualified contractors and/or suppliers for the equipment you wish to retrofit or replace with new, higher efficiency equipment or to implement other recommendations suggested by the auditor.

## Appendix 1: Calculations

### ENERGY EFFICIENT LIGHTING MEASURES

**PROJECT DETAILS:** Replace inefficient lighting with more efficient fluorescent and LED lighting.

**MP Rate:** 25A      **Demand:** \$5.86 per kW      **Rebate:** \$200 per kW  
**On-Peak:** \$0.05288 per kWh      **Off-Peak:** \$0.035 per kWh

AREA DESCRIPTION:	Existing System							Proposed System							Energy Savings						
	Lighting Type	Lighting Size	Ballast Factor	# of Fixtures	Lamps/Fixture	Watts/Lamp	Fixture Watt	Lighting Type	Lighting Size	Ballast Factor	# of Fixtures	Lamps/Fixture	Watts/Lamp	Fixture Watt	Hours of Operation	kWh Reduced	kWh Reduced	Cost Saved	Rebate	Cost	Payback
Library	T8 Lighting	F32T8 4' 32W		4	4	32	113	T8 Lighting	F28T8 4' 28W		4	4	28	98	469	0.06	27	\$5.57	\$11.71	\$37.12	
Dining Room	T8 Lighting	F32T8 4' 32W		18	4	32	113	T8 Lighting	F28T8 4' 28W		18	4	28	98	469	0.26	124	\$25.07	\$52.70	\$167.04	
Dining Room	Exit	Inc. Exit		3	1	40	40	Exit	LED Exit		3	1	1	1	8,760	0.12	1,020	\$62.11	\$35.69	\$56.25	
Storage	T8 Lighting	F32T8 4' 32W		1	4	32	113	T8 Lighting	F28T8 4' 28W		1	4	28	98	26	0.01	0	\$1.05	\$2.93	\$9.28	
Kitchen	T8 Lighting	F32T8 4' 32W		6	2	32	56	T8 Lighting	F28T8 4' 28W		6	2	28	49	469	0.04	21	\$4.18	\$8.78	\$27.84	
Kitchen	T12 Lighting	F40T12 4' 40W		1	1	40	51	T8 Lighting	F28T8 4' 28W		1	1	28	25	469	0.03	12	\$2.47	\$5.20	\$2.32	
Kitchen	Incandescent	I60		1	1	60	60	LED	LED A-19 (60W)		1	1	12	12	469	0.05	23	\$4.57	\$9.60	\$33.32	
Basement Hallway	T8 Lighting	F32T8 4' 32W		1	4	32	113	T8 Lighting	F28T8 4' 28W		1	4	28	98	469	0.01	7	\$1.39	\$2.93	\$9.28	
Womens Restroom	T8 Lighting	F32T8 4' 32W		2	4	32	113	T8 Lighting	F28T8 4' 28W		2	4	28	98	469	0.03	14	\$2.79	\$5.86	\$18.56	
Mens Restroom	T8 Lighting	F32T8 4' 32W		4	1	32	28	T8 Lighting	F28T8 4' 28W		4	1	28	25	469	0.01	6	\$1.20	\$2.53	\$9.28	
Hallway	T8 Lighting	F32T8 4' 32W		2	1	32	28	T8 Lighting	F28T8 4' 28W		2	1	28	25	469	0.01	3	\$0.60	\$1.26	\$4.64	
Custodial	CFL	Compact 13		1	1	13	13	LED	LED A-19 (60W)		1	1	12	12	26	0.00	0	\$0.07	\$0.20	\$33.32	
Chair Storage	T8 Lighting	F32T8 4' 32W		1	4	32	113	T8 Lighting	F28T8 4' 28W		1	4	28	98	26	0.01	0	\$1.05	\$2.93	\$9.28	
Entry	Incandescent	I60		9	1	60	60	LED	LED A-19 (60W)		9	1	12	12	469	0.43	203	\$41.10	\$86.40	\$299.88	
Entry	CFL	Compact 13		4	2	13	26	LED	LED A-19 (60W)		4	2	12	24	469	0.01	4	\$0.76	\$1.60	\$266.56	
Entry	Flood Lamps	Halogen 50 PAR		3	1	50	50	LED	LED PAR20		3	1	9	9	469	0.12	58	\$11.70	\$24.60	\$299.97	
Sanctuary	Incandescent	I60		14	1	60	60	LED	LED A-19 (60W)		14	1	12	12	780	0.67	524	\$74.97	\$134.40	\$466.48	
Sanctuary	Incandescent	I250		30	1	250	250	LED	LED PAR38		30	1	60	60	780	5.70	4,446	\$635.93	\$1,140.00	\$7,170	
Sanctuary	Exit	Inc. Exit		1	1	40	40	Exit	LED Exit		1	1	1	1	8,760	0.04	340	\$20.70	\$11.90	\$18.75	
Sanctuary Perimeter	T8 Lighting	F32T8 4' 32W		8	1	32	28	T8 Lighting	F28T8 4' 28W		8	1	28	25	780	0.03	20	\$2.82	\$5.06	\$18.56	
Mezzanine	Incandescent	I250		8	1	250	250	T8 Lighting	F28T8 4' 28W		8	1	28	25	780	1.80	1,404	\$200.82	\$360.00	\$18.56	
Upper Room	T8 Lighting	F32T8 4' 32W		6	2	32	56	T8 Lighting	F28T8 4' 28W		6	2	28	49	469	0.04	21	\$4.18	\$8.78	\$27.84	
Attic	Incandescent	I60		1	1	60	60	LED	LED A-19 (60W)		1	1	12	12	26	0.05	1	\$3.44	\$9.60	\$33.32	
Office	T12 Lighting	F40T12 4' 40W		5	2	40	97	T8 Lighting	F28T8 4' 28W		2	4	28	98	469	0.29	136	\$27.49	\$57.80	\$18.56	
Office	T8 Lighting	F32T8 4' 32W		3	2	32	56	T8 Lighting	F28T8 4' 28W		3	2	28	49	469	0.02	10	\$2.09	\$4.39	\$13.92	
Office	T8 Lighting	F32T8 4' 32W		2	2	32	56	T8 Lighting	F28T8 4' 28W		2	2	28	49	469	0.01	7	\$1.39	\$2.93	\$9.28	
Entry Restroom	T8 Lighting	F32T8 4' 32W		2	2	32	56	T8 Lighting	F28T8 4' 28W		2	2	28	49	780	0.01	11	\$1.63	\$2.93	\$9.28	
Pastor's Office	T8 Lighting	F32T8 4' 32W		4	2	32	56	T8 Lighting	F28T8 4' 28W		4	2	28	49	469	0.03	14	\$2.79	\$5.86	\$18.56	
Breakroom	T8 Lighting	F32T8 4' 32W		4	2	32	56	T8 Lighting	F28T8 4' 28W		4	2	28	49	469	0.03	14	\$2.79	\$5.86	\$18.56	
Downstairs Hallway	T8 Lighting	F32T8 4' 32W		1	1	32	28	T8 Lighting	F28T8 4' 28W		1	1	28	25	469	0.00	1	\$0.30	\$0.63	\$2.32	
Downstairs Hallway	CFL	Compact 26		1	1	26	26	LED	LED A-19 (100W)		1	1	22	22	469	0.00	2	\$0.38	\$0.80	\$49.53	
Downstairs Hallway	Exit	Inc. Exit		1	1	40	40	Exit	LED Exit		1	1	1	1	8,760	0.04	340	\$20.70	\$11.90	\$18.75	
Education Office	Incandescent	I60		2	1	60	60	LED	LED A-19 (60W)		2	1	12	12	469	0.10	45	\$9.13	\$19.20	\$66.64	
Nursery	T8 Lighting	F32T8 4' 32W		3	4	32	113	T8 Lighting	F28T8 4' 28W		3	4	28	98	469	0.04	21	\$4.18	\$8.78	\$27.84	
Nursery Closet	T8 Lighting	F32T8 4' 32W		1	1	32	28	T8 Lighting	F28T8 4' 28W		1	1	28	25	469	0.00	1	\$0.30	\$0.63	\$2.32	
Voice Studio	T8 Lighting	F32T8 4' 32W		4	4	32	113	T8 Lighting	F28T8 4' 28W		4	4	28	98	469	0.06	27	\$5.57	\$11.71	\$37.12	
Reception	T8 Lighting	F32T8 4' 32W		1	4	32	113	T8 Lighting	F28T8 4' 28W		1	4	28	98	780	0.01	11	\$1.63	\$2.93	\$9.28	
Outdoor Awning	CFL	Compact 13		10	1	13	13	LED	LED A-19 (40W)		10	1	8	8	4,380	0.05	219	\$15.10	\$10.00	\$110.80	
Security Lights	Incandescent	I75		3	2	75	150	LED	LED A-19 (75W)		3	2	17	34	1,095	0.35	381	\$44.62	\$69.60	\$58.50	
Building Perimeter	Incandescent	I60		9	1	60	60	LED	LED A-19 (60W)		9	1	12	12	4,380	0.43	1,892	\$130.44	\$86.40	\$299.88	
Basement Entrance	CFL	Compact 13		1	1	13	13	LED	LED A-19 (60W)		1	1	12	12	4,380	0.00	4	\$0.30	\$0.20	\$33.32	
Playground Area	HPS	HPS250		1	1	250	295	LED	LED Area Light 78W		1	1	78	91	4,380	0.20	894	\$61.59	\$40.80	\$519.00	
Parking Lot	HPS	HPS250		1	1	250	295	LED	LED Area Light 78W		1	1	78	91	4,380	0.20	894	\$61.59	\$40.80	\$519.00	
Boiler Room	Incandescent	I100		4	1	100	100	LED	LED A-19 (60W)		4	1	12	12	26	0.35	9	\$25.24	\$70.40	\$133.28	

**11.79    13,210    \$1,527.81    \$2,379.20    \$11,493    5.97**

**AC or Refrigeration Savings?** Yes  
**Demand Saved =** 9.00 kW  
**Btu Saved =** 30,727 Btu/Hr  
**Tons of Cooling Saved =** 2.56 Tons  
**Cooling Months =** 4  
**Cooling Hours =** 499 Hr/Yr      *Estimated EER:* 10  
**AC or Refrigeration kWh Savings =** 1,534 kWh  
**AC or Refrigeration kW Savings =** 0.77 kW  
**AC or Refrigeration Cost Savings =** \$99.12 per Year

<b>Total kW saved =</b>	<b>12.56</b>	<b>kW</b>
<b>Total kWh Saved =</b>	<b>14,744</b>	<b>kWh/Year</b>
<b>Total Cost Savings =</b>	<b>\$1,626.93</b>	
<b>Total Rebate =</b>	<b>\$2,432.89</b>	
<b>Incremental Cost =</b>	<b>\$11,493.19</b>	
<b>Payback without Rebate =</b>	<b>7.06</b>	<b>Years</b>
<b>Payback with Rebate =</b>	<b>5.57</b>	<b>Years</b>

Disclaimer: All values are estimates based on information provided at the time. These values are not to be taken as fact and proof of installation is needed for rebates to be issued.

Please contact us at (218) 355-2217.



## LIGHT OCCUPANCY SENSORS

**PROJECT DETAILS:**

Install occupancy sensors in several areas of the church.

**MP Rate:** 25A     
 **Demand:** \$5.86 per kW     
 **Rebate:** \$200 per kW  
**On-Peak:** \$0.05288 per kWh     
 \$0.035 per kWh

PROPOSED SYSTEM														ENERGY SAVINGS				
AREA DESCRIPTION:	Lighting Type	Lighting Size	Ballast Factor	# of Fixtures	Lamps/ Fixture	Fixture Watt	# Sensors	Days per Week	Hours Operating per Day	Hours of Operation	Hours Occupied per Day	Occupied Hours	Unoccupied Hours	kWh Reduced	Cost Saved	Rebate	Cost	Payback
Womens Restroom	T8_Lighting	F28T8 4' 28W		2	4	98	1	3	3	469	0.5	78	391	77	\$4.05	\$2.68	\$55	
Mens Restroom	T8_Lighting	F28T8 4' 28W		4	1	25	1	3	3	469	0.5	78	391	39	\$2.07	\$1.37	\$55	
Entry Restroom	T8_Lighting	F28T8 4' 28W		2	2	49	1	3	3	469	0.5	78	391	38	\$2.03	\$1.34	\$55	
Breakroom	T8_Lighting	F28T8 4' 28W		4	2	49	1	3	3	469	0.5	78	391	77	\$4.05	\$2.68	\$55	
														231	\$12.20	\$8.08	\$220	17.37

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Please contact us at (218) 355-2217.



## BOILER TUNE UP

### RECOMMENDATION:

A professional boiler tune-up can enhance the performance, safety and efficiency of the boilers.

### ENERGY COSTS:

\$0.737 /Therm

Operating Hours:

1,896 hours/year

### Current Operating Characteristics:

Number of Boilers:

2

Boiler Load Factor:

60%

Current Boiler Therms Used:

9,076

Boiler Efficiency:

93%

### SAVINGS

Percent Savings:

2%

Fuel Saved =

182 Therm/Year

Annual Savings =

\$134 /Year

### FULL INSTALL COST

Tune Up Cost =

\$600

Payback =

3.4 Years

Disclaimer: All values are estimates based on information provided at the time and are not to be taken as fact. Custom projects must be pre-approved in order to qualify for rebates.

## CONDENSING WATER HEATER

**RECOMMENDATION:**

Replace the existing hot water heater with a condensing water heater. The recommendation is applicable when the unit needs to be replaced anyway.

**ENERGY COSTS:**

\$0.737 /Therm

**Assumptions:**

Heating Hours per Year =  
Annual Fuel Usage =

1,581  
1,188 Therms/Year

**Existing Equipment**

**Proposed Equipment**

System Efficiency (%)  
Heating Unit Input  
Number of Units

80%  
75,100 BTU/Hr  
10

93%  
75,100 BTU/Hr  
1

Proposed Input:  
Proposed Output:

75,100 BTU/Hr  
69,843 BTU/Hr

**ENERGY SAVINGS:**

166 Therm/Year

**COST SAVINGS:**

\$122.31 /Year

**O&M SAVINGS:**

\$150.00

**INCREMENTAL COST:**

Equipment/Labor Cost =  
Standard Equipment Cost =  
Incremental Cost =  
Payback Before Incentive =

\$1,990  
\$1,680  
\$310.00  
2.5 Years

Disclaimer: All values are estimates based on information provided at the time. These values are not to be taken as fact and proof of purchase and equipment efficiency is needed for rebates to be issued.



## HOT WATER BOILER FLOW REDUCTION

**RECOMMENDATION:**

Using an ECM to reduce the flow rate of the boiler system will allow the boiler to not have to heat up as much mass during operating hours. This reduction in mass is proportional to a reduction in BTUs.

**ENERGY COSTS:**

\$0.737 /Therm

Number of Boilers:

2

Boiler Efficiency = 93%

**Equipment Specifications:**

Specific Weight of Fluid: 8.2048 lbm per Gal

Water Temperature: 165 °F

Specific Heat of Fluid: 1.02 BTU/lbm °F

Boiler Operation Hours: 1,896

Diversity Factor: 60%

System Rated Flow	Operating	Flow Rate (GPM)	BTU/Hour Saved	Hours of Operation	Therms/Year Saved
0%	0%	-	-	-	-
20%	0%	0.2	-	-	-
25%	0%	0.3	-	-	-
30%	0%	0.3	-	-	-
35%	0%	0.4	-	-	-
40%	0%	0.5	-	-	-
45%	0%	0.5	-	-	-
50%	0%	0.6	-	-	-
55%	0%	0.6	-	-	-
60%	0%	0.7	-	-	-
65%	0%	0.7	-	-	-
70%	10%	0.8	23,302	190	44
75%	20%	0.8	18,642	379	71
80%	10%	0.9	13,981	190	27
85%	10%	1.0	9,321	190	18
90%	0%	1.0	-	-	-
95%	50%	1.1	-	948	-
100%	0%	1.1	-	-	-

**ENERGY SAVINGS:**

103 Therms/Year

397 kWh/Year

**COST SAVINGS:**

\$209.93 /Year

**INCREMENTAL COST:**

Equipment Cost = \$379

Labor Cost = \$0.00

Total Cost = \$379

Payback = 1.8 Years

Disclaimer: All values are estimates based on information provided at the time and are not to be taken as fact. Custom projects must be pre-approved in order to qualify for rebates.

## SETBACK THERMOSTAT

### RECOMMENDATION:

Install digital thermostats that are capable of programming a schedule to setback the temperature during the times that the areas are unoccupied.

Location:

Duluth

Number of Thermostats =

6

Cost per Thermostat =

\$225.00

Natural Gas Cost =

\$0.737 /Therm

Electric Cost =

\$0.124 /kWh

### Heating

Annual Energy Usage =

9,076 Therms

Degree Days =

9,662 HDD\_65F

Degree Hours =

231,888 F-Hours/Yr

Total Setback Hours =

1,703 Hours/Yr

Temperature Setback =

8 Degrees F

System Efficiency =

90%

### Cooling

17,520 kWh

442 CDD\_65F

10,608 F-Hours/Yr

633 Hours/Yr

8 Degrees F

### ENERGY SAVINGS:

Total Natural Gas Saved:

593 Therms/Year

Total Electric Saved:

8,359 kWh/Year

Calculations based on equations from <http://www.ceere.org/iac/assessment%20tool/ARC2244.html#10TSB>

### COST SAVINGS:

\$1,470.06

### IMPLEMENTATION COST:

\$1,350.00

### SIMPLE PAYBACK:

0.9 Years

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## WATER FAUCET AERATORS

### RECOMMENDATION:

Replace the water faucet aerators with 0.5 GPM aerators in restroom and kitchen sinks. These savings operate with the assumption that existing aerators are 2.2 GPM.

### ASSUMPTIONS:

Water Heater Efficiency =	80%
Water Cost =	\$5.05 /CCF
Sewage Cost =	\$6.60 /CCF
Fuel Rate =	\$0.737 /Therm
Number of Faucets =	5
Implementation Cost =	\$3.95 /Faucet

### ASSUMPTIONS:

Existing Flow Rate =	2.2 GPM
Proposed Flow Rate =	0.5 GPM
Exiting Water Temp =	120 °F
Incoming Water Temp =	55 °F
Faucet Uses/Day =	8 /Day
Average Run Time =	0.25 Minutes

### SAVINGS:

Water Saved =	1,241 Gallons/Year
Fuel Saved =	8 Therms/Year

### COST SAVINGS:

Water =	\$8
Gas =	\$6
Sewer =	\$11
Total Annual Savings =	\$25.52 /Year

### IMPLEMENTATION COST:

\$19.75

### PAYBACK:

0.8 Years

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