

Energy Check-Up

Trinity Lutheran Church

Prepared for
Gail Seaver
Chairman,
Building Renovation Committee

Assessment Date
April 5, 2022

Property
13025 Newell Ave
Lindstrom, MN 55045



Prepared by:



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Suite 280
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EnerChange.org

Executive Summary

An energy assessment was performed at Trinity Lutheran Church on April 5, 2022 by Mark Ginsbach from EnerChange and Gail Seaver, Matt Mitchell, and Leroy Mitchell.

You are already saving money by:

- Having Saver's Switches installed on qualified air conditioning units
- Having converted lighting to LED

Energy budget:

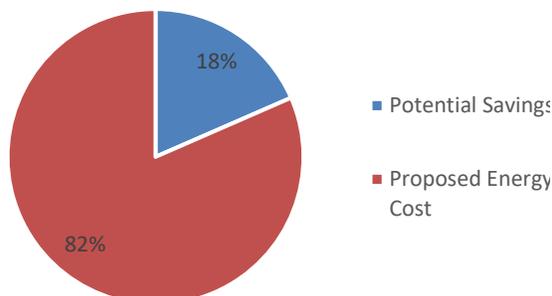
- \$20,000 annual total
 - \$10,000 Electric
 - \$10,000 Natural Gas

Assessment results:

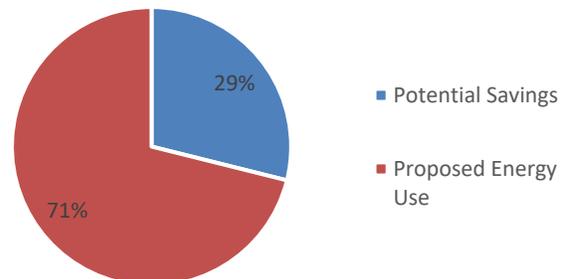
To maximize rebates as well as allowing us to fulfill our requirement to report energy savings –
*** Please contact EnerChange before implementing or contracting to implement these measures. ***

- 6 energy saving measures were identified
- \$3,500 per year estimated cost savings for all measures
- \$44,000 investment estimated to implement all measures
 - \$2,300 in Rebates will reduce the first cost amount
 - 0% or low interest loans are available for the remainder
- 12 year average payback on all measures

TOTAL ENERGY COST



TOTAL ENERGY CONSUMPTION



Prescription

To maximize rebates as well as allowing us to fulfill our requirement to report energy savings –

**** Please contact EnerChange before implementing or contracting to implement these measures. ****

1 - MAKE BEHAVIORAL AND OPERATIONAL IMPROVEMENTS

Annual Savings \$785 - Payback 0 years

The way people interact with their facility can make a big difference in energy consumption. Here were some of the observations and opportunities identified for your facility:

- We encourage you to do an After Hours Energy Treasure Hunt to expose another set of energy saving opportunities. For more information visit our website EnerChange.org and watch the Energy Treasure Hunt Webinar.

- Post the desired occupied and unoccupied settings at each thermostat.
- Encourage people to turn off the lights when they leave a room unoccupied.
- Label light switches so that people know what fixtures they are for.
- Replace leaking or damaged weather-stripping on exterior door and windows.
- Check to be sure the bell tower is air sealed from the occupied spaces.

2 - PERFORM A BOILER TUNE-UP THAT INCLUDES A COMBUSTION TEST

Annual Savings \$255 - Payback 2.4 years

Tune-up the hot water boilers to improve energy efficiency. Cleaning and adjusting the combustion system can improve efficiency by 3%. A rebate is available every two years.

3 - INSTALL WIFI ENABLED THERMOSTATS

Annual Savings \$729 - Payback 4.9 years

Install WiFi thermostats to control heating and cooling. Program them to set back the temperature 10 degrees during the heating season when the spaces are unoccupied. Relax the temperature requirements in the sanctuary per the attached organ guide. Use the weekly church calendar to program special events. In the summer, try to minimize the cooling that is being done at the same time in order to reduce electrical demand charges, which is based on how much electrical equipment is running in any 15 minute period. Stagger the start times of air conditioners so that hopefully not too many cycle on at the same time. Consider raising the sanctuary temperature a few degrees during the day if it is unoccupied so that large unit will cycle fewer times. In fellowship hall, allow one unit to do the cooling and put the other in the FAN ON mode – unless there are a lot of people on a hot day and need to run both units in cooling. About one additional ton of cooling is needed for every 25 people that walk into the space.

4 - INSTALL HIGH EFFICIENCY BOILERS

Annual Savings \$1721 - Payback 22 years

Replace the existing boilers with high efficiency hot water boilers. Especially the oldest boiler which appears to have had an oversized burner installed which has no turndown capability.

5 - INSTALL EQUIPMENT WITH HIGH ENERGY EFFICIENCY

Always consider paying more for more energy efficient units. Look for Energy Star units not only for HVAC equipment but kitchen and office appliances as well. Rebates are often available.

Notes Regarding Equipment Quotes from Aerotek:

Heating with hot water can be one of the most efficient ways of heating a building if it can be done with lower water temperatures. The proposal calls for four 150 MBH boilers, installing two in each boiler room but I think the heating load should be recalculated. It seems to me that the loads to each boiler room are different and the 600 MBH total boiler capacity seems short. Also, we might want to convert the sanctuary air handler to hot water which will increase the load on the boilers.

The proposal calls for the HW boilers to provide domestic hot water by installing a heat exchanger and a storage tank in each boiler room. The water heater in the old boiler room only serves the kitchen and two rest rooms; so consider installing point of use water heaters or keeping the existing electric heater. Another option is to run a new hot water line from the West Boiler Room to serve that area.

Instead of using recirculation pumps on domestic hot water lines to keep hot water readily available, consider using a Chilipepper System (or a similar system) which uses a pump to run water from the hot water line into the cold water line until hot water arrives. The energy advantage is that you are not having to constantly heat water that no one is using. It is faster than running hot water down the drain to get hot water and does not waste water. <https://chilipeppersales.com/>

Using heat recovery ventilators to improve indoor air quality is a great idea. You do not want to run these all the time since they take energy to run the fan and you are not recovering 100% of the energy in the air being exhausted. I would suggest installing CO2 controls to turn the units on and off as needed since you primarily need to ventilate a space only if there are people occupying it. When there are not infections to be concerned about, 1200 ppm of CO2 is considered acceptable. When we have things like COVID or flu and cold seasons, you may want to set the controls to 600 PPM. If the system runs continuously, eventually the indoor CO2 levels will approach the outdoor levels of about 450 ppm. Possibly you could tie your dehumidifiers into this system, especially if you can bypass the air exchanger and just recirculate basement air.

Other items to consider:

- Convert the sanctuary air handler which has an 80% efficient furnace to heat with hot water from the high efficiency boilers. If you size the coil to use 140 degree water, it could be fed with return water from the radiation systems which require higher temperatures. This would return water to the boiler at a lower temperature than it would otherwise see and raise the boiler's combustion efficiency.
- Install a centralized building automation system to monitor and control the boilers, pumps, rooftop units, air handlers, and radiation systems.
- Install new controls for the sanctuary air handler. I'm not quite sure of the design intent of the unit but it seems like it should have better controls for heating, cooling, and ventilation. Include a variable speed drive for the fan motor to allow it to run at slower speeds.
- Some zones are served by independent heating and cooling controls which allows for simultaneous heating and cooling. We need to guard against that.

- Install CO2 controls on all units that draw in outside air, like suggested for the heat recovery ventilators.
- Specify multi-stage compressors for cooling equipment and variable speed fans for air handlers.

6 - INSTALL A SOLAR PHOTO VOLTAIC SYSTEM

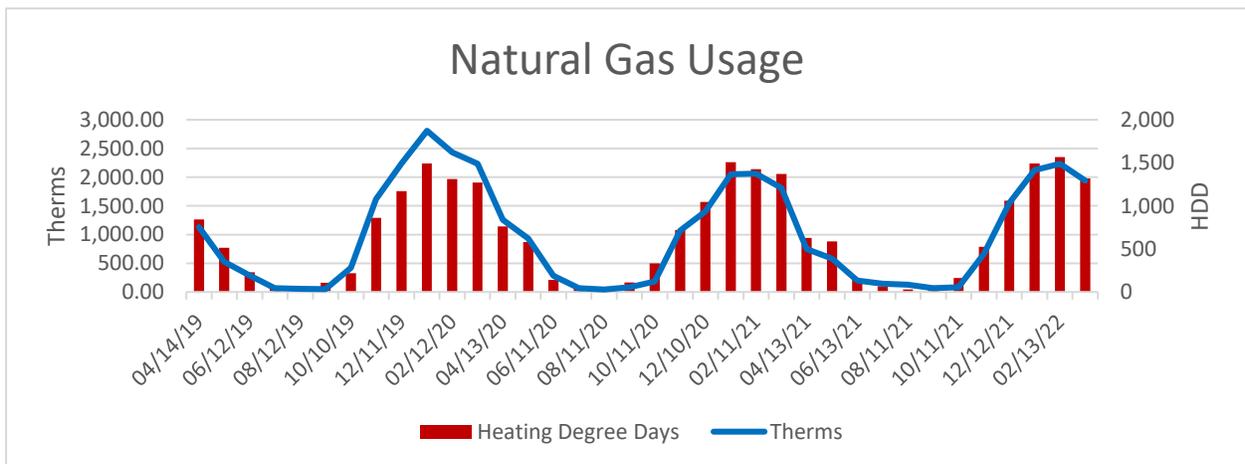
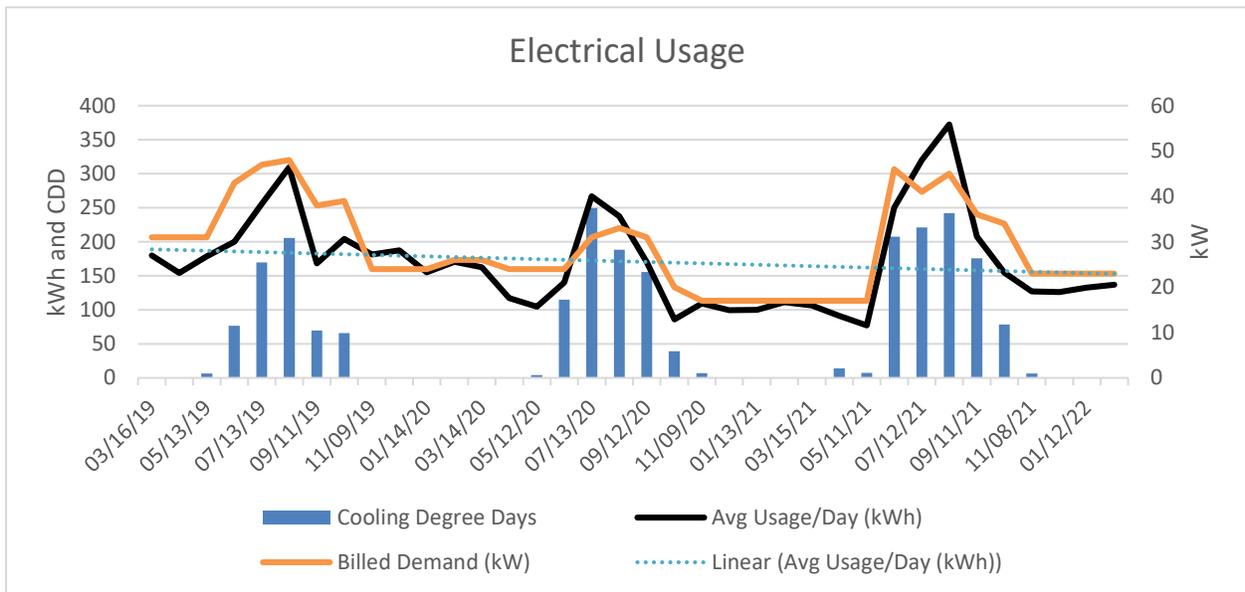
I think solar panels are a good idea and worth exploring! EnerChange can't help too much since we are dedicated to energy conservation and solar panels are energy producers. But there are options as to whether you own the panels and use the power or someone else owns them and sells you the power at a discount. Another option may be to install the panels as part of a community solar program to allow others to purchase panels and see credits on their own electric bills. Minnesota Interfaith Power & Light is a non-profit organization that can help you navigate the options. The contact there is Buff Grace, buff@mnipl.org; 651-323-3167. Their website is <https://www.mnipl.org/>

Prescription Savings Table:

ECO #	Energy Conservation Opportunity	Estimated Total Cost Savings (\$/Year)	Estimated Rebates (\$)	Estimated Installed Cost (\$)	Payback (Years)
1	MAKE BEHAVIORAL AND OPERATIONAL IMPROVEMENTS	\$785	\$0	\$0	0.0
2	PERFORM A BOILER TUNE-UP THAT INCLUDES A COMBUSTION TEST	\$255	\$200	\$800	2.4
3	INSTALL WIFI ENABLED THERMOSTATS	\$729	\$0	\$3,600	4.9
4	INSTALL HIGH EFFICIENCY BOILERS	\$1,721	\$2,100	\$40,000	22.0
5	INSTALL EQUIPMENT WITH HIGH ENERGY EFFICIENCY				
6	INSTALL A SOLAR PHOTO VOLTAIC SYSTEM				
Totals		\$3,490	\$2,312	\$44,400	12.1

Utility Summary

From February 2021 to 2022	Electricity	Natural Gas
Energy Provider	Xcel Energy	Xcel Energy
Rate Category	General Service	Large Commercial Firm
Energy Consumption per Year	63,840 kWh	10,461 Therms
Energy Cost Per Year	\$9,930	\$9,917
Combined Electrical Energy & Demand Cost	\$0.156 per kWh	\$0.891 per Therm
Energy Use Intensity Typical for Worship Facilities	3 to 6 kWh per SqFt	0.3 to 0.6 Therms per Sqft
Your CURRENT Energy Use Intensity	3.0 kWh per SqFt	0.48 Therms per Sqft
Your PROPOSED Energy Use Intensity	2.8 kWh per SqFt	0.32 Therms per Sqft



Building Overview and Operation

Trinity Lutheran church was initially built in 1901 with office and education spaces added in 1958, fellowship hall addition in 1978, a sanctuary expansion in 1990, the Kirvida Memorial Lounge addition in 1992, and the narthex rebuilding and expansion in 2002. The facility now has 12,600 square feet on two levels. Besides services on Sundays and Wednesdays, the building is used by church and community groups throughout the week about 6 hours per day.

The building is primarily heated with two hot water boilers. The oldest boiler is in the church basement and is rated at 360 MBH for mechanical firing and 296 MBH for hand firing. A replacement burner was installed in about 1982 and is rated for 460 MBH with no turndown. Hot water is distributed throughout the 1901 construction by five circulation pumps that are controlled by thermostats in the various zones. The Main Entrance zone pump is no longer used because of changes made in the 2002 expansion.

The 1978 and later additions are heated with a 375 MBH hot water boiler. Hot water is circulated to baseboard radiators and temperatures are controlled with electric thermostats and control valves. Four PTAC units provide cooling and heating with hot water to most of the offices.

The sanctuary has a 1994 vintage ventilation system with a 3 hp fan, a furnace rated for 387.5 MBH, and a 10 ton condenser for cooling. The damper on the outside air duct is automatically controlled but the sequence of operation for this unit is not known. The outside air damper does not seal tightly causing the mechanical room to be cold.

Other Systems:

- In addition to the sanctuary ventilation system there are two 5 ton split systems to provide cooling.
- Fellowship hall, the adjacent gathering area, and one office are cooled with three 5 ton cooling-only rooftop units.
- Narthex and Nursery are heated and cooled with a high efficiency furnace and 5 ton air conditioner.
- Kirvida Memorial Lounge is cooled with a 2 ton split system.

There are 46 tons of cooling installed. It appears that there is approximately 25-30 tons of cooling on at the same time during the summer which is causing electrical demand ratchet penalties in the winter months.

Other items noted:

- Some outside doors do not seal tightly.
- The pipe organ has its own humidifying system and the sanctuary is kept at 68-70 degrees all year for the organ.
- There is an interest to install solar PV on the flat roof.

Join the EnerChange Alumni Club!

You know first-hand about the economic and environmental benefits gained by saving money while saving energy through the services provided by EnerChange. Your peer organizations could most assuredly benefit from these same services.

Email a future EnerChanger the link bit.ly/enerchange-referral and they'll let us know that they're ready to get started. As a thank you, we'll send you a digital decal for your website that confirms your participation as an EnerChanger and can serve as a link for people to learn more about us.

In Our 10 years, EnerChange has:

- 700+ Clients and over 1,000 buildings
- \$3,600 average annual/perpetual savings
- Save over 17 Million in energy costs

EnerChange Can Help With:

- Equipment Recommendations – Retrofit or New Construction
 - Fits your needs
 - Maximize energy efficiency
 - Determine the best utility rebate and facilitate the process
 - Payback analysis to allow “apples to apples” comparison of quotes
- Behavioral & Operational Recommendations
 - Low to no-cost options, i.e. programming existing thermostats with setbacks
 - After Hours Audit
 - Forming a Green Team
- Finding Financing:
 - Low or no interest loans, Grant and Cost Share opportunities
 - Cash neutral terms – where upgrades are paid for from energy cost savings

You Can Help EnerChange by:

- Calling us when you are thinking about doing anything that can save energy!
 - Buying LED light bulbs
 - Tuning up a boiler
 - Replacing HVAC equipment
 - Upgrading equipment
 - Installing automation
 - Building expansion
 - Installing insulation
 - Replacing motors
- Calling us when you have completed an energy efficiency project

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