



Hamline Church Energy Audit 2023

Performed by



Timeline

- **Summer 2022:** Hamline Earthkeepers approached Council for approval of carrying out an updated energy audit. Earthkeepers researched energy audit providers and selected EnerChange as a zero-cost option and good fit for Hamline Church's needs.
- **November 2022:** EnerChange auditor met with Hamline Church staff and Earthkeepers for walk-through of building.
- **January 2023:** EnerChange delivered summary report and additional information regarding heating options. Stephanie Engebrecht joined staff as facilities manager.
- **2023:** New and expanded federal tax credits and rebates in effect for efficiency upgrades and renewable energy (Inflation Reduction Act, more on this later...)

Progress to Celebrate!

Comparison to 2014 audit:

Electricity use down 4%

(for most church buildings, usage was up over the past decade)

In 2022, 28% of our electricity use was provided by solar panels, saving us the cost of 26,685 kWh

Natural gas use down 11%

Big Picture: Four Recommendations from Audit

- Behavioral/Operational Improvements
 - Perform a Boiler Tune-Up that Includes Combustion Test
 - Upgrade Lighting to LED (continuation of lighting upgrades made since 2014 energy audit)
 - Replace Heating Plant
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- One topic not addressed in audit: Fans in sanctuary

Fans in Sanctuary

- Small fans at high point in sanctuary are nonfunctional
- Earthkeepers asked whether installing bigger and lower fans, to push down heated air, would lower church's energy use for heating.
- Energy audit did not address. Auditor stated that energy use by fans frequently outweighs any energy savings from running them.
- **Next steps:**
 - Further analysis would be necessary to determine whether some type and placement of ceiling fans would result in net energy reduction.
 - Church could request EnerChange to either perform additional analysis or recommend a vendor to perform this analysis and make a recommendation regarding fans.

Behavioral/Operational Improvements

- Post signage around building such as:
 - Preferred thermostat settings at each thermostat
 - Encouraging turning off lights when room unoccupied
 - Label light switches so people know which lights they control
- Replace leaking/weathered weather-stripping on doors
- **Next steps:**
 - Stephanie will consider signs and labeling to improve habits around energy use.
 - Stephanie will perform “After Hours Energy Treasure Hunt” (recommended by EnerChange) to identify additional operational improvements to reduce energy use.
 - Stephanie to inspect and replace weather-stripping, as needed.

Perform Boiler Tune-Up with Combustion Test

- Cleaning and adjusting the combustion system can improve efficiency by about 3%.
- A rebate is available every two years.
- Projected annual savings (\$1637) pay back the cost in 2 years.
- **Next Steps:** Stephanie will determine when this was last done and discuss with Hamline Church's boiler operator. If this project is due and financing is needed, follow-up with Trustees & Council

Upgrade Additional Lighting to LED

- Since 2014, some lights throughout church were updated to lower-energy fluorescent and LED.
- EnerChange recommended seeking bids to update remaining lighting to LED and update some fluorescent lighting to LED.
- Financing with no out-of-pocket costs is available.
- **Next Steps:**
 - **Quick win!** We are participating in an Xcel program for some free LED upgrades in the education wing.
 - Some energy-efficient changes can be incorporated into planned lighting updates for sanctuary.
 - Stephanie is communicating with lighting vendors to price potential additional upgrades to LED.

The Big One: Replace Heating Plant

- EnerChange recommends replacing our low-pressure steam heating plant. Heating is the biggest part of Hamline Church's carbon footprint.
- Options include:
 - Hot water (hydronic) heating
 - significantly more efficient than steam because it operates at a lower temperature and loses less heat in transfer.
 - Requires less maintenance and provides better building temperature control.
 - Heat Pumps
 - Ground Source Heat Pump (GSHP) or Ground Water Heat Pump (GWHP)
 - Highly efficient: heat facility for one-fourth the energy of even the best gas-fired boiler.
 - Added functionality: Can also be used to cool as well as heat.
 - Drastically reduces carbon footprint for heating (and cooling)
 - Most expensive, BUT:
 - Long-term savings more than offset costs
 - New financing options available

Preliminary Cost Analysis by EnerChange:

New to the scene
in MN:

	Do nothing	Hydronic Heat MOST ECONOMICAL	Ground Source Heat Pump ENERGY EFFICIENT	Ground Water Heat Pump SPACE EFFICIENT & ENERGY EFFICIENT
Initial cost	--	\$60,000	\$320,000*	Likely higher than GSHP, but...
Maintenance over 20 year period	\$16,079.95	\$6,231.11	\$1,246.22	
Energy cost over 20 year period	\$398,790.73	\$118,710.03 (Gas, based on current price)	\$136,959.69 (Electrical, based on current price)**	
Present value of future replacement	--	\$36,834.80 (future replacement @ 10 years)	Loses some efficiency after ~20 years	...Longer lifespan without losing efficiency
TOTAL	\$414,870.68	\$221,775.93	\$458,205.91*	

***BUT: new tax incentives and financing options are available starting in 2023
for energy-efficiency and renewable-energy upgrades...**

****Amount of electricity the heat pump would use to move 20 years worth of heat from the ground into the building.**

Financing Options and Incentives

*****NEW*** Direct-pay of Investment Tax Credit in 2022 Inflation Reduction Act:**

30-50% of cost of installation directly paid back to Hamline Church, despite no tax liability.

30% automatic + up to 10% if located in low-income area + up to 10% for US-made equipment/materials.

PACE Financing: Property Assessed Clean Energy

100% financing through St. Paul Port Authority, paid back as property-tax assessments.

5% interest for 10 years.

“No Cost Upfront” Financing: Hamline Church enters into Power Purchase Agreement with 3rd party installer, to purchase energy at a set cost for the financing period. MNIPL can help identify installer who can finance. Not as much cost savings as self-financing.

MNIPL and Center for Energy and Environment (CEE) – overall resources to help identify all available funding options for our specific project and recommend best financing approach

The Big One: Replace Heating Plant

- Recommended next steps:
 - Seek bids for further mechanical analysis of:
 - short-term efficiency improvements to boiler system
 - long term replacement option
 - Look to current study of Ground Water Heat Pumps for churches in MN
- Weigh Hamline Church's Creation Care goals and the urgency of the climate crisis in the decision of a replacement heating plant.