

Faith Lutheran Solar Q & A

Background

Why are we talking about solar for church?

The main reason that we recently started looking at solar is financial. In the past 3 years, we have averaged an electric bill of almost \$42,000 per year. If electric rates climb as quickly as they have in the past few years, our electric bill will be a very significant portion of our overall budget. Solar is one way to avoid that future expense.

What committee is bringing this proposal forward? Are there multiple layers?

A team of volunteers (Kaydell Sunsten, Don Youngberg & Daniel Diemer) has been researching solar options. The Finance Committee and Church Council have reviewed their recommendations.

Have we looked at our electric consumption for potential reductions?

Yes, we have. Xcel has a program called Empower Intelligence (formerly called Infowise) that allows a business to gain insight into their usage. It provides data on electricity usage in 15 minute increments. We have data for most days going back to May. The automated load of data is supposed to happen daily. However, this isn't working. We have been working with Xcel and their vendor for many months to resolve the problem. For now, we get updates about once per month when they can do a manual load of data. It's helpful data as we try to coordinate various building functions, especially on a Sunday morning, to reduce our overall usage as well as peak usage, which are the two ways we are billed. Our custodians have done a great job on this front and actually decreased our usage by over 9% in 2023 vs. 2022 and our total Xcel bill by over \$5,000 for the year. In the past, we have replaced all light bulbs with LEDs where possible, and we have installed motion activated light switches to turn off lights in unoccupied rooms.

Roof vs. Ground

How would the panels affect our roof? Is it able to withstand the weight?

If we opt for roof mounted panels, the installers will verify the readiness of the roof prior to mounting panels. If the roof needs to be replaced, that would need to be done first. The shingles on the education wing only have about 3 years of life left, so that would need to be re-roofed prior to installation of panels. An estimate for that is \$119,000.

What are the advantages of ground mounted panels over roof mount?

Ground mounted panels can be installed at the optimal direction and angle for capturing the most sunlight, so fewer panels are needed to produce the same amount of power. They are less expensive to install and maintain due to accessibility. Snow can be removed with a special rake. Bi-facial panels also absorb sun from the back via reflection from snow in winter. Insurance is less expensive for ground mount as well.

What are the disadvantages of ground mounted panels?

Ground mounted panels may be perceived as unpleasant to look at. Vandalism could be a problem, but this can be mitigated with fencing. There is an extra installation cost for trenching the electric cables.

What are the advantages and disadvantages of roof mounted panels?

Advantages are that the panels are not very visible, and are inaccessible for vandalism. Wiring runs to the electric meter may be shorter. The panels may protect shingles from weather damage.

Disadvantages include higher installation and maintenance costs. The church roof has multiple angles with many that are not optimal for sunlight, so 100% electric replacement cannot be achieved. Snow cover cannot be cleaned off. Any maintenance to the roof, such as shingle replacement, would require panel removal and reinstallation. Our insurance company prefers ground mounted systems.

How much space will the panels require?

If we went with a roof mount system, it would take up most of the education wing and Faith Life Center roofs, plus some parts of the sanctuary and the rest of the building. If we went with a ground mount, it would take up a significant portion of the field west of the parking lot.

Who will maintain the land under the panels?

Us. It remains our land and we can mostly choose to do with it as we wish.

Can anything be planted under and between the panels on a ground mount system?

Absolutely! There are many examples of prairies, gardens, etc. under a solar system.

Is vegetation required for ground mount to shield view?

No. However, we do want to be good neighbors. If a nice wall of lilac or something similar would help, we can certainly do that.

Is there still space for the playground?

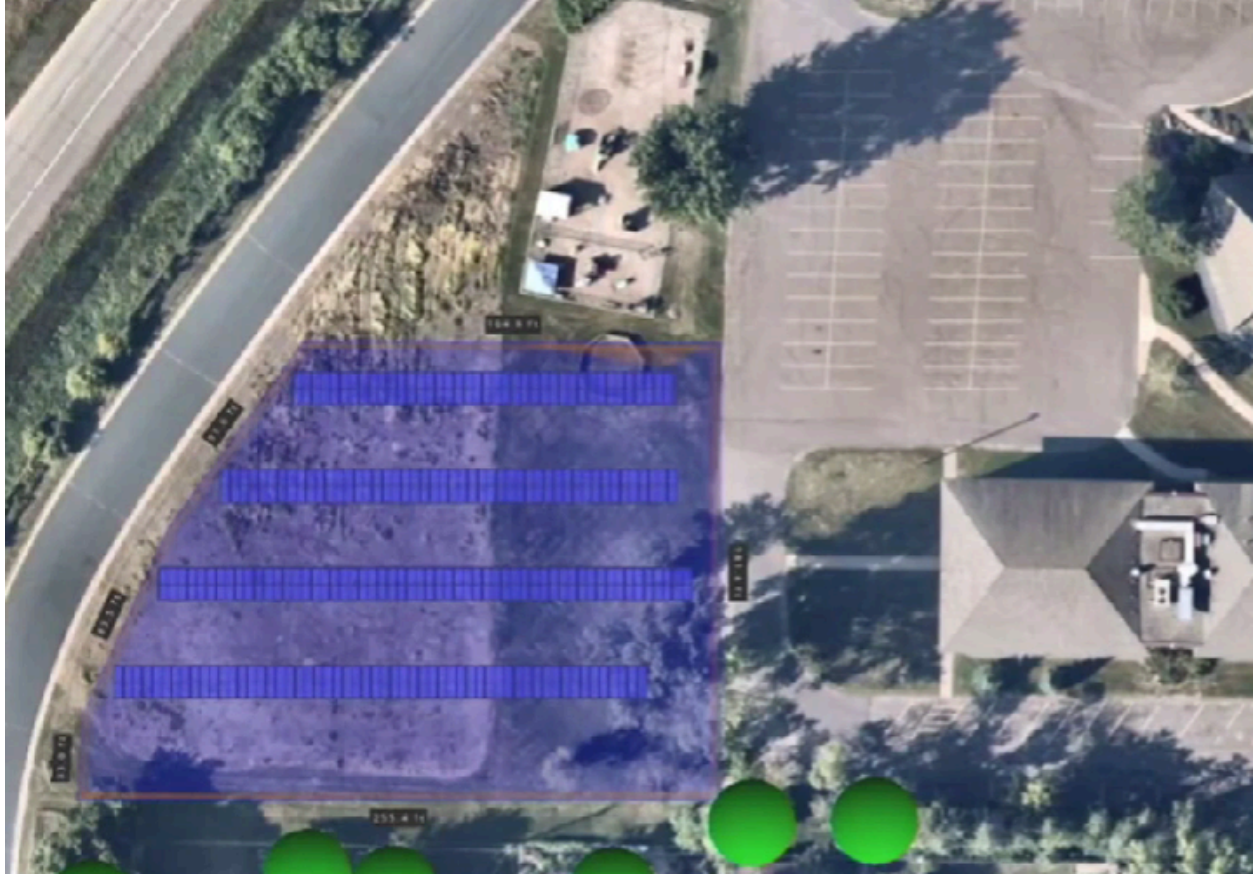
Yes. The older kid playground at the north end of the field will stay where it is. The gaga pit structure would likely be moved across the driveway. The new playground for younger children at the west end of the education wing will not be impacted.

Would a ground mount interfere with the geothermal system?

The field has 13 lines for our geothermal system. They are spaced every 20 feet. Those pipes are all at least 12 feet under the ground. The supports for the solar system would be at least 26 feet apart and would be no more than 6 feet deep. We would like the installation to be between the geothermal lines so that we can readily perform maintenance on either as needed. The panels weigh about 60 pounds each. With several hundred out there, this is some risk of the ground not supporting the weight properly. Our vendors have all said that a ground survey will be done and that there are many options for supporting a ground mount rack.

If we did ground mount, what would the footprint look like?

Here is a view on one of the bids as an example:



The Solar Panels

What maintenance is required?

Solar panels are virtually maintenance free. Production can be reduced by dirt and debris, so occasional rinsing can help, but is not required. The inverters (that change the panel output from DC to AC) may need to be replaced approximately every 10 years and would cost perhaps \$10,000 each time.

Does snow cover reduce the output?

Yes, the forecasted production in the bids takes the average snowfall for our area into account. The panels in our finalist bids are all bi-directional. This type of panel produces power the regular way, plus up to 20% from light collected from underneath the panels. So if they are covered in snow, we can still produce something. This is a benefit of ground mount panels over roof mount. Further, the panels are mounted at an angle, so snow may blow or slide off. The panels generate a small amount of heat, so that helps with melting the snow. Ground mounted systems can be cleaned off with a special rake. Any reduction in snow cover will increase production more than estimated.

Can the angle on ground mount panels be changed?

No, all ground mount panel bids are for a fixed (non-moving) mount. The maintenance cost of moving mounts is typically more than the cost of the electricity generated via gained efficiency.

What about disposal costs at the end of the life span of the panels?

Unknown at this time. Panels will likely be recycled at their end of life. Glass composes most of the weight of a solar panel (about 75 percent), and glass recycling is already a well-established industry. Other materials that are easily recyclable include the aluminum frame, copper wire, and plastic junction box. Panels may also be refurbished and sent to developing countries.

What about hail damage?

The panels are strong, but large hail may damage the glass. Replacement would be covered by insurance.

How would solar panels affect insurance costs?

Our insurance coverage would increase to cover the value of the panels. The premium increase is estimated at \$3,600 per year.

Is there a warranty?

Each installer and product vendor provides warranties. Typical warranties include 10 years on installation workmanship, 25-30 years on panel performance (under 20% loss of production), 10 years on inverters, and 25 years on racking.

What about waiting 5 years considering rapidly changing technology?

Technology does advance; however, each year we wait is another year we are paying high electricity bills. Unless modified by congress, the 30% federal tax rebate expires in 2032.

Did we evaluate the quality of the panels in the bids?

We rely on the vendors to propose the best components for us. All of the final bids include Tier 1 high quality panels. As new panels come out with higher efficiency or better degradation, the bids have changed to include them.

If we do ground mount, how tall would they be and would they make noise?

The panels would be 2 high in portrait orientation on the racks. This would make the highest point about 12 feet off the ground and the lowest point about 3 feet off the ground. And no, they would not make any noise.

References

Have we done due diligence by talking with others who have installed solar panels? Have they realized the predicted savings over time?

We have reached out to vendors for references from similar large installations for this purpose. We have spoken to several churches about their experiences. Everyone said that they were happy to have done the project. Projections for cost & electricity production are reasonably close to the estimates. One church in Minneapolis said that after 5 years, they are only generating about 80% of the estimated electricity, but they were not installed by one of our vendor finalists.

Finances

Rough estimate on cost of a loan?

It depends on the amount borrowed. The current rate is roughly 6.5%. For a 20 year loan of about \$340,000 after the rebate, and an 18 month interest only loan for the rebate amount, the interest would cost about \$280,000. This would be offset by savings of about \$1,350,000 in electric costs for the same 20 year period.

When will we realize the completion of the loan on the building?

The mortgage matures in November 2032. A potential loan for the solar project would NOT extend that.

What is the total cost? When will it break even? Can savings be set aside for future maintenance?

The total cost for the final 3 bids is between \$555,000 and \$576,000. From a system cost perspective, we project that it will take 11 years to pay for the project. From a cash flow perspective, it's 1 year. The cost of the solar system (loan + insurance - credits) is much less than the cost of our current electric bill. Future maintenance costs should be quite minimal. The only significant one is replacing the inverters. They are roughly \$10,000 and should last about 10 years. We could set aside money annually into an account for this purpose. Or we could increase our annual contribution to the Capital Repairs Reserve.

What is the cost per year now and if we did solar?

Our 2023 electric bill was \$42,000. With only the 30% federal rebate included, our annual bill with solar would be \$31,000. With all incentive programs, it could be as low as \$18,000.

Are rebates and credits mandated?

Yes, most are. The federal rebate is good until 2032. Xcel's programs are in Minnesota state law and have no expiration. For those rebates or credits, if we qualify, we are guaranteed to get it. One rebate we would apply for is first come, first served for a limited pool of funds.

The parking lot also needs expensive repairs. How to prioritize spending?

Ultimately, the congregation is responsible for all spending. Our council and finance committee certainly work hard to prioritize the needs and finances of the church. We have the organ, parking lot and roof all to repair the coming years. Faith has saved its covid relief funds of roughly \$230,000 for such purposes.

Is the cost of installation included in the bids?

Yes. All of the bids include all labor and materials. One of the vendors includes the cost of a fence while the others do not. And none of them include the cost to take down the very large tree at the southeast corner of the field.

What is the expected cost of insurance for solar?

Using one of our most recent bids, we were quoted just over \$3,600 per year.

How have we modeled the finances of the project with both overall and electric inflation?

We used data from the past 20 years. In that time, overall inflation is 2.5% and electric inflation is 2.9%.

Are we going to raise money for the project?

Yes! If the congregation votes to do the project, then we will have a fundraising drive. We already have \$50,000 that we can use.

Can we look at the financial summary?

Here is the summary of our most recent bid with all three major incentives included:

Select One...		Select One...		Summary-Cash		Summary-System	
Bid	16	Finance Configuration	9	Break Even (years)	1	Break Even (years)	11
Date	4/10/2024	Last Years e-cost	\$ 43,238	Cash Cost with solar	\$ 738,543	Project Cost with Solar	\$ 1,048,458
Company	Cedar Creek	General Inflation	2.5%	Total Cost without solar	\$ 2,082,761	Total Cost without Solar	\$ 2,082,761
Mount	Ground	Electric Inflation	2.9%	Total Savings (30 yrs)	\$ 1,344,218	Total Savings (30 yrs)	\$ 1,034,303
Size kWh	232	System Degradation	0.4%	NPV of solar e-Costs	\$ 536,683		
Annual kWh	299800	Lifespan (years)	30	NPV of no solar e-Costs	\$ 1,417,196		
Offset	97%	Project Cost	\$ 551,470	NPV Total Project Savings	\$ 940,210		
Panels	400	Rebate	30.0%	Internal Rate of Return	473.0%		
Cost	\$ 551,470	Cash Investment	\$50,000				
Rebate	\$ 165,441	Short Loan Interest	6.5%	Cash Value without solar			
Final	\$ 386,029	Short Loan Months	12	After year...			
Future electric bill (year 1)	\$ 13,838	Short Loan Principal	\$ 300,000	5	\$56,515		
Cost per kW	\$ 1,664	Long Loan Interest	6.5%	10	\$63,879		
PV Rider Credit (year 1)	\$ 5,600	Long Loan Months	240	15	\$72,203		
Overage annual value	\$ -	Long Loan Principal	\$ 201,470	20	\$81,612		
Annual Insurance cost	\$ 3,626	PPP	N	25	\$92,246		
Low Income & SolarReward	\$ 130,147	ERP	N	30	\$104,266		
		Chuck	Y				
		CD's	N				
		Campaign	\$0				

Alternatives

Consideration of buying into a solar farm? Benefits?

Subscription model - buying a specific amount of electricity from the farm. When you subscribe to a solar farm, you're purchasing electricity at a lower rate than you would pay for traditional utilities. There is not a need for upfront costs or system ownership. There is a monthly fee that is charged. Participants who subscribe to a solar project will receive credits towards their electricity bills based on the energy their share of the system generates.

Ownership model - participants directly own a portion of the solar energy system. You receive energy credits based on the number of panels you own in the farm. It requires the ability to make an initial upfront investment in the solar installation. By investing upfront, they gain control over their share of the solar project.

Pros

- You eliminate installation and ownership costs. Some locations are not optimal for solar installation.
- It is easier to adjust the amount of power you need. Do not need to change installation.
- No increase in insurance rates.
- No panels located on the property.

Cons

- After you install solar panels, the energy you harness from them is free. When you join a community solar farm you pay monthly for your energy allowance. So savings are not as high.
- Reliant on availability of a solar farm in your area. There might not be one available.

- Do not get the benefits of the current rebates on solar.

Have we also looked into wind energy?

Wind turbines take a large footprint and are considerably more expensive. We have not asked the city if they are allowed.

The Project

What are we voting on at the 4/28 meeting?

The congregation will be presented the best bid for Faith, as determined by the solar team. The congregation will vote on approving the project, which would include borrowing money to do the project. The bid finalists are between \$550,000 and \$577,000.

Have we talked to our neighbors about the project?

No not yet. There are three houses that are adjacent to the field. We do plan on talking to them.

What type of fence are we looking at?

One vendor includes a 6 foot high chain link fence in their bid. No other vendors do. But it's up to us if we want a different type of fence. We would want to make sure that our choice of fence is OK with the insurance company and includes a gate for maintenance.

How likely is it that our project would be approved or denied by Xcel?

We don't know. Xcel has a map of grid "space" for solar. It's color coded as a green/yellow/red. Most of Washington and Chisago county are red. This means that they don't have much capacity remaining. However, red doesn't mean that you can't get a project. And Faith is not far from a green area. We submitted a pre-interconnection application and that showed that we are on the Wyoming substation and it looks like there is capacity there. So we hope that we would get approval. But we don't know until we submit the application. If it's denied, then there is an appeal process.

Why aren't other churches doing this?

Federal law changed in 2022 allowing non-profits to get a 30% rebate on the cost of their project. Prior to that, the 30% incentive was in the form of a tax credit. So to get the value of that tax credit, non-profits like churches would have to partner with a company to own the panels and then buy the power from them. Some of the savings were lost that way and it didn't make a lot of sense. Now, the 30% rebate check makes it a much better value. Another reason that other churches might not be looking as hard at solar is that they have a low electric bill. Faith has a very high electric bill because we heat and cool the building with geothermal, run by electricity. Consequently, our gas bill is quite low. Other churches might not have a high enough electric bill to worry them.

What about electric storage?

We are not looking at a battery system at this time. We instead use the electric grid. When we overproduce, the extra goes into the grid. When we don't produce enough, what we need comes from the grid. This is referred to as Net Metering, and Xcel will bill us for the extra we take from the grid or pay us for any extra we produce.

Project Timeline

When will we find out if Xcel's grid is ready?

We submitted a pre-interconnection application to Xcel. This showed that we are connected to the Wyoming substation and it looks to us like there is enough capacity for our project.

However, we wouldn't get a final answer until we vote to move forward with this project and submit our interconnection application with Xcel.

Is there a timeline or deadline we need to meet?

No. The federal tax rebate is locked in at 30% until 2032. There are three good reasons to move soon on this project. First, our interconnection application is more likely to be approved the earlier we go. Second, it saves us money right away. So the sooner we start, the sooner we start saving. Third, one of the incentives we would apply for is first come, first served until those funds run out.

Can we draw input from church members that have been through this at their residence?

Yes. Two of the solar team members have solar on their homes. It helps to know what the process is like for working with Xcel.

What are requirements for a city building permit?

We've contacted the city, and they will allow solar panels at the church after review and approval of a building permit. The setback for the panels is 30 feet from the road and 10 feet from other boundaries. Fences can be installed on or near property lines if certain conditions are met. Fence height is limited to 6 feet.