ENGINEERING A SUSTAINABLE FUTURE

Non-Residential Solar and Wind Site Assessment Report

Prepared for:

Nora Church Congregation Hanska, Minnesota

Site Visit: July 29th, 2009

Site Assessor contact information:

Peter Henry
pfhenry@energyconcepts.us
715-268-6893

Energy Concepts, Inc.
2349 Willis Miller Dr.
Hudson, WI 54016
(715) 381-9977

Executive Summary

Energy Concepts was contacted in July in regard to the renewable energy possibilities at the Nora Church, near Hanska, Minnesota. On July 29th, Peter Henry met with two representatives of the congregation and conducted an on-site appraisal for both a wind turbine and pole-mounted solar photovoltaic (PV) panels.

As discussed below, the site is judged to be a high quality location for either a wind turbine or a solar photovoltaic installation, though wind provides a clear scaling advantage that is reflected in production and payback estimates.

Wind turbines and solar PV technologies have improved dramatically over decades and provide reliable, predictable, utility grade electricity at a known cost. Maintenance expenses can be an issue with wind power, but regularly scheduled service calls have proven effective at minimizing costs and maximizing turbine life. Solar photovoltaic panels have very limited maintenance regimes and very low risk of failure over their expected 30-40 year life spans.

Both technologies work well and produce electricity reliably over many years making an investment in them safe, predictable and an overall asset to the property.

As a non-profit organization, the Nora Church has disadvantages in terms of benefitting from State of Minnesota grants and Federal tax advantages. Some religious organizations have successfully side-stepped these hurdles by having a congregant pay for and own the system, and then, sell electricity back to the church. This allows the individual to recoup the 30% Federal tax benefit, qualify for State of Minnesota Grants, as well as depreciate the equipment on an accelerated basis over five years.

Without a private party arrangement, wind and solar are still feasible, even desirable, at the Nora Church, though the resulting "payback" period is longer.   However, the future cost of electricity, systemic risk from global climate change and possible benefits from “carbon credits” in new Federal energy legislation -- all could affect current economic projections for renewable energy in the coming decades.

Our experience at Energy Concepts is that clients are extremely happy to have forged ahead with renewable energy despite long time horizons or uncertainty about future energy costs or legislative action. The power of energy independence, investing in a local green economy, electricity cost certainty, and contributing to a responsible energy/climate future are all significant and meaningful reasons to invest in clean energy today.

The Site

The Nora Church, founded in the 1870s near Hanska, Minnesota, is an historic location on a small knoll rising off Minnesota’s western prairie landscape. The site includes a sanctuary, a lengthy conditioned connecting hall, a meeting/dining space, a parsonage and an historic log building. There is an informal dirt road circling the entire property and an extensive cemetery located west of the church.

Nora Church Property @ 1000’ Across

The area surrounding the church is predominantly farmland on very flat, level terrain. There are occasional wind-breaks between fields, but not many, and the macro landscape is wide open to either wind or solar technologies.

Nora Church Location @ 5 miles Across

Electric Usage and Mechanicals

Overall electric usage at the church, parsonage and accompanying buildings appears to be modest (see attached Nora Church Electric Billings in *Appendix*). The average combined consumption from two different meters at the site is @1600 kWhs a month, according to data provided to Energy Concepts from Alliant Energy through Darrel Hinsman, a church representative.

Given the size and extent of buildings, overall electric usage should be considered below average. However, given that investments in energy efficiency pay back three times more quickly than do investments in renewable energy, we recommend that an efficiency audit be conducted at the site. Low hanging fruit in terms of lighting efficiency, insulation levels and envelope sealing should be explored before any investments in wind or solar.

In addition, with changes in occupancy at the parsonage, or expanded programming at the church, electric consumption patterns could change. That's why exploring every possible facet of energy conservation and efficiency at the site is a must before pushing ahead on a renewable energy project.

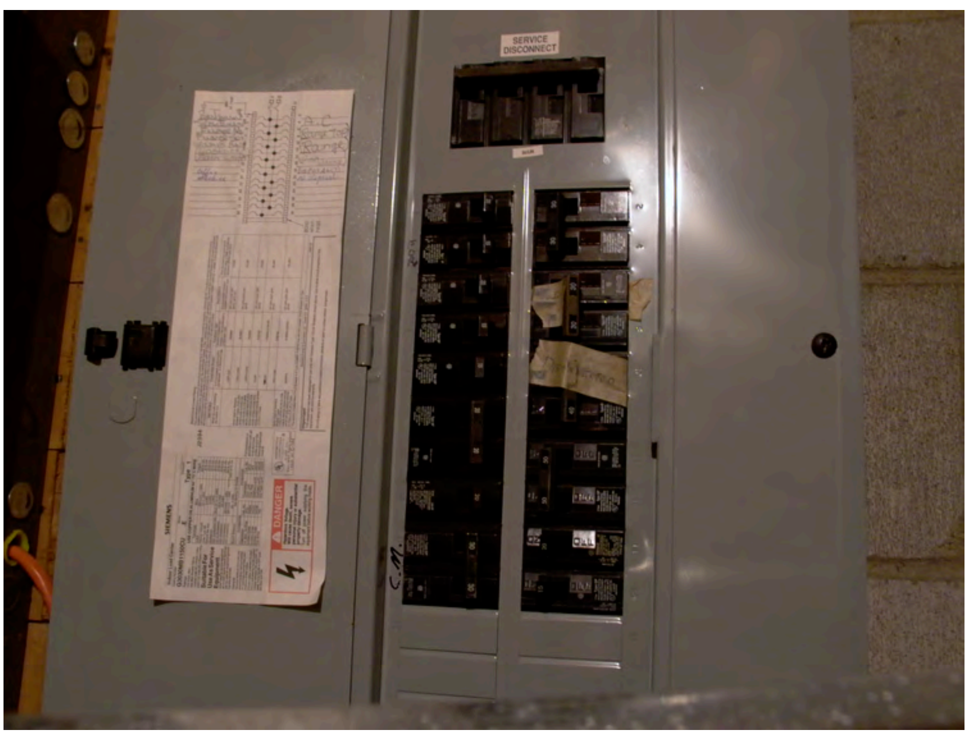
The electrical panel for the church is located in the north portion of the adjacent meeting hall.

North Side of Meeting Hall

Exterior Electric Meter on North Side of Meeting Hall

There are two separate service panels, one of which is a 200-Amp service which appears to have been updated in the last couple of decades.

1965 Electric Service Panel in Meeting Hall



Modern 200 Amp Service Panel in Meeting Hall

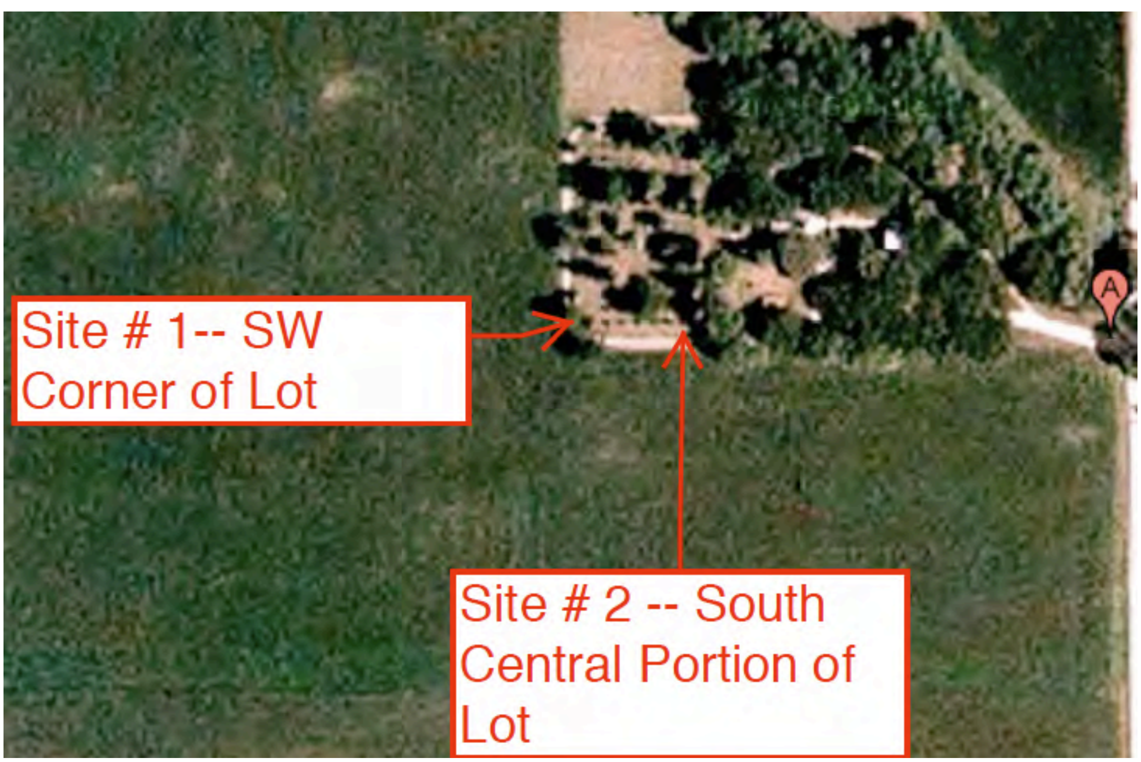
Bringing in amperages in excess of 20% of a service panel's rated capacity is no longer allowed under National Electric Codes. Depending on the size of any renewable energy installation, the electric service at this site will likely need reworking and/or replacement. Once a system has been selected for formal bidding, a qualified and experienced electrical engineer would be needed to determine the extent of any panel changes and their overall cost.

Wind Locations

Siting a wind system is a complex and multi-disciplinary task. Many factors need to be considered: distance to electrical service, heavy equipment access, orientation to prevailing winds, obstacles within the 500' x 30' zone of clearance, site aesthetics, legal setback requirements, tower safety, soil suitability, airport proximity, etc.

For more information about all these issues and considerations, please reference the attached ***Wind Supplement***, created by Wisconsin's Midwest Renewable Energy Association and Wisconsin's Focus on Energy. That document provides excellent background information and specifications for siting a wind turbine, types of towers, prevailing wind issues, etc.

For our purposes here, Energy Concepts has carefully studied the Nora Church site and identified two superior locations for a potential wind turbine and tower, marked on the map below as Site # 1 and Site # 2.



Both sites would present well to prevailing wind directions, allow easy access for heavy equipment, would preserve the site integrity of the church property, and be within 400' of the electrical panel on the north side of the Meeting Hall.

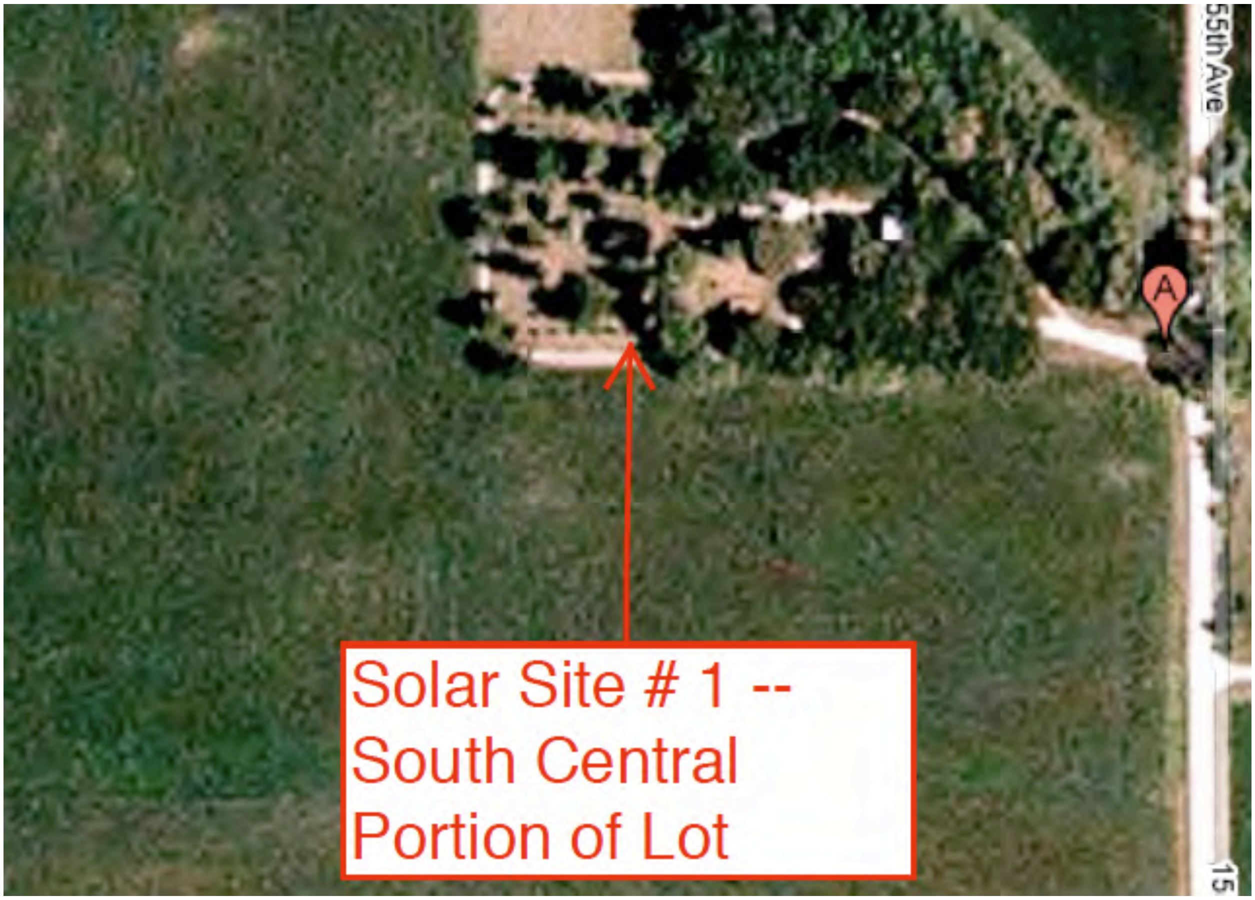
The only advantage identified is that Site # 1 is further from the cemetery and the tower could be erected on the other side of the little road circling the property. Site # 2 would be on the north side of that road and its tower footing would be much closer to the cemetery proper. In both cases, trenching from the tower would skirt the south side of the cemetery and turn north behind the Log Building and continue past the Church before turning east once clear of the Meeting Hall corner.

Site # 1 is @ 100' further from the electrical service, which may result in as much as $1,000 additional expense for wire and trenching.

Otherwise, Sites # 1 and # 2 are considered to be identical in terms of cost and electrical production. However, as mentioned to Mr. Hinsman, in both cases the proximity to the property line to the south, and, at Site # 1, to the west, presents a legal setback issue. **Resolving this important legal issue is essential before seeking formal bids.** (Read the *Summary* for further discussion of this matter.)

Solar PV Location and Top of Pole System

Given the extent of shading on most of the Nora Church property, Energy Concepts identified only a single location for solar PV panels, indicated below on the map.



It is possible to site solar PV panels at the same location as Wind Site # 1, but as mentioned at the site visit, it would mean cutting down a large oak tree in the southwest corner of the property.

Solar PV panels can be installed at remote locations on poles. This mounting scheme, referred to as “top of pole mount”, can include a tracking mechanism to “track” the sun east to west daily. Or, panels can be “fixed mounted” facing @ 35 degrees to the south, meaning they have no tracking mechanism.

Solar arrays such as this require a substantial cement foundation, which is excavated using a large auger on a skid-steer.

An 18’-- 8” steel beam is sunk into the cement with a rebar cage surrounding and securing it. PVC conduit is brought into the foundation to house electrical wire.

After a month of cement curing, a steel racking system is attached capable of holding as many as 18 -- 230 watt panels.

The resulting 4.14 kW system produces @ 5600 kWhs annually in this part of North America; more if the system installed has a tracking mechanism.

Installed Wind Turbine Cost Estimates

The installed cost of wind turbines fluctuate in price depending on proximity to a major installer, the turbine type, the tower type, distance to the service panel and any rework of the electrical service.

Foundations for mid-size small turbines are in the range of 10' x 20', requiring multiple yards of cement with rebar caging and steel attachment stubs.

Tower prices vary with manufacturer, tower type and tower height. At this location, Energy Concepts recommends a free-standing tower, meaning no guy wires, to conserve space around the tower. Free-standing towers cost more to erect and service.

For a variety of reasons-- overall production, maintenance, return-on-investment --Energy Concepts has determined that a minimum tower height at the Nora Church site is 100'.

Wind turbines also vary in price according to manufacturer, nameplate rating and quality. Energy Concepts will only specify turbines it deems to be reliable, durable and highly productive. These turbines are more expensive than "gimmick" turbines that, for a variety of reasons, do not meet basic standards for renewable energy production.

The table below depicts our most recent actual installed prices for a variety of high-quality wind turbines with a free-standing tower height of at least 100':

Bergey 10 kW XL (Bergey Wind Corporation)	Jacobs 31-20 20 kW (Wind Turbine Industries Corporation)	Proven WT-1500 15 kW (Proven Energy)	ARE 442 (Helix Corporation)
100' Freestanding Tower	100' Freestanding Tower	100' Freestanding Tower	100' Freestanding Tower
@ **$75,000**	@ **$85,000**	@ $**125,000**	@ **$65,000**

These are only estimates. Depending on reworking of the electrical service and the installer's distance to Hanska, MN, prices could be somewhat higher or lower.

Wind Speed and Production Estimates

Average wind speeds are derived from State Wind Maps, in this case a 2006 80 Meter WindLogics Minnesota Wind Map (located in ***Appendix***). The actual methodology for calculating wind speed is based on data from a series of meteorological towers, spaced at regular intervals, which use anemometers to measure actual wind speeds. From these data points, estimates are then interpolated across intervening distances.

Wind experts have determined it more accurate to establish wind speeds at a known distance above the ground and then use a proven mathematical relationship to arrive at the wind speed at the proposed turbine height. In this case, we start with the estimated average wind speed at 80 meters, 260 feet, and then derive the speed down at hub height, 100 feet.

Wind estimates are scientifically derived but their overall accuracy is dependent upon a uniformity of landscape and air flow. Their accuracy, or lack thereof, has a huge impact on electricity estimates since production estimates are **cubed** by the swept area of available wind. Energy Concepts believes it is important to stay with the most conservative interpretation of wind data so as not to “over-promise” actual electrical production.

Our annual average wind speed estimate at 80 meters for the Nora Church location is in the range of 16.3--17.2 mph. Since the church sits atop a little knoll, and wind accelerates up inclines, we feel confident in going with the 17-mph number.

The following table shows production numbers and payback determinations for the same four wind turbines above--all estimates based on 100’ towers. Data is derived from ***7th Wind -- Wind Turbine Performance Model***, a state of the art wind calculator.

Turbine	Installed Cost	Annual Production Estimate	Percentage of Current Electric Usage	Simple Payback Period at .09 Cents a kWh
Bergey 10 kW	@$75,000	14,318 kWhs	74.6%	58 years
Jacobs 20 kW	@$85,000	29,804 kWhs	155.2%	31.5 years
Proven 15 kW	@$125,000	30,556 kWhs	159.1%	45.5 years
ARE 442	@$85,000	22,271 kWhs	116%	42.5 years

Data Assumptions: Wind speed at 100’ hub height of 13.5 mph. Electricity cost of .09 cents a kWh.

Discussion of Wind

The data above shows the value of “scaling” that accrues with a wind turbine. With an average wind speed of **13.5 mph at hub height**, a larger turbine, like the Jacobs 31-20, will produce 155% of current consumption. With a simple payback period of 31.5 years, the Jacobs appears to be the best turbine for this site. And, it is manufactured in Minnesota. However, the Jacobs 31-20 requires annual maintenance because it is gear-driven, including a regular oil change. In general, one should allocate 2% of overall turbine cost in annual maintenance expenses for the Jacobs 31-20; 1% for all other turbines.

Because of “Net Metering”, a Federal Law passed in 2005, any excess electrical production that passes onto the grid must be fairly compensated by Alliant Energy at the current retail rate. A special electric meter would be installed with the turbine’s commissioning that literally can spin in two directions--and the “net” difference between usage and production would be charged, or credited, to the Church account.

In general, the higher the wind turbine off the ground, the smoother and stronger is the wind flow. This increases production, but perhaps more importantly, can curtail maintenance costs from reduced jostling and buffeting. In most cases, Energy Concepts would recommend a tower height of 120’ to capture the cubing effect of increased average wind speeds and the probability of reduced maintenance. However, since only the Bergey 10 kW is producing below current consumption, we are comfortable with the turbine hub height at 100’.

That said, for an incremental cost of @$5,000-$7,000, (i.e. less than 10%) the same turbines would produce anywhere from 10%-20% more electricity. More evidence of the value of scaling wind up.

Also, as evident from the Simple Payback calculation, having a private investor take this on and sell the power back to the church would greatly reduce the payback period as he or she could recoup the 30% tax credit, and if it were an actual business, also depreciate the equipment cost over 5 years. (See ***Appendix*** for example.)

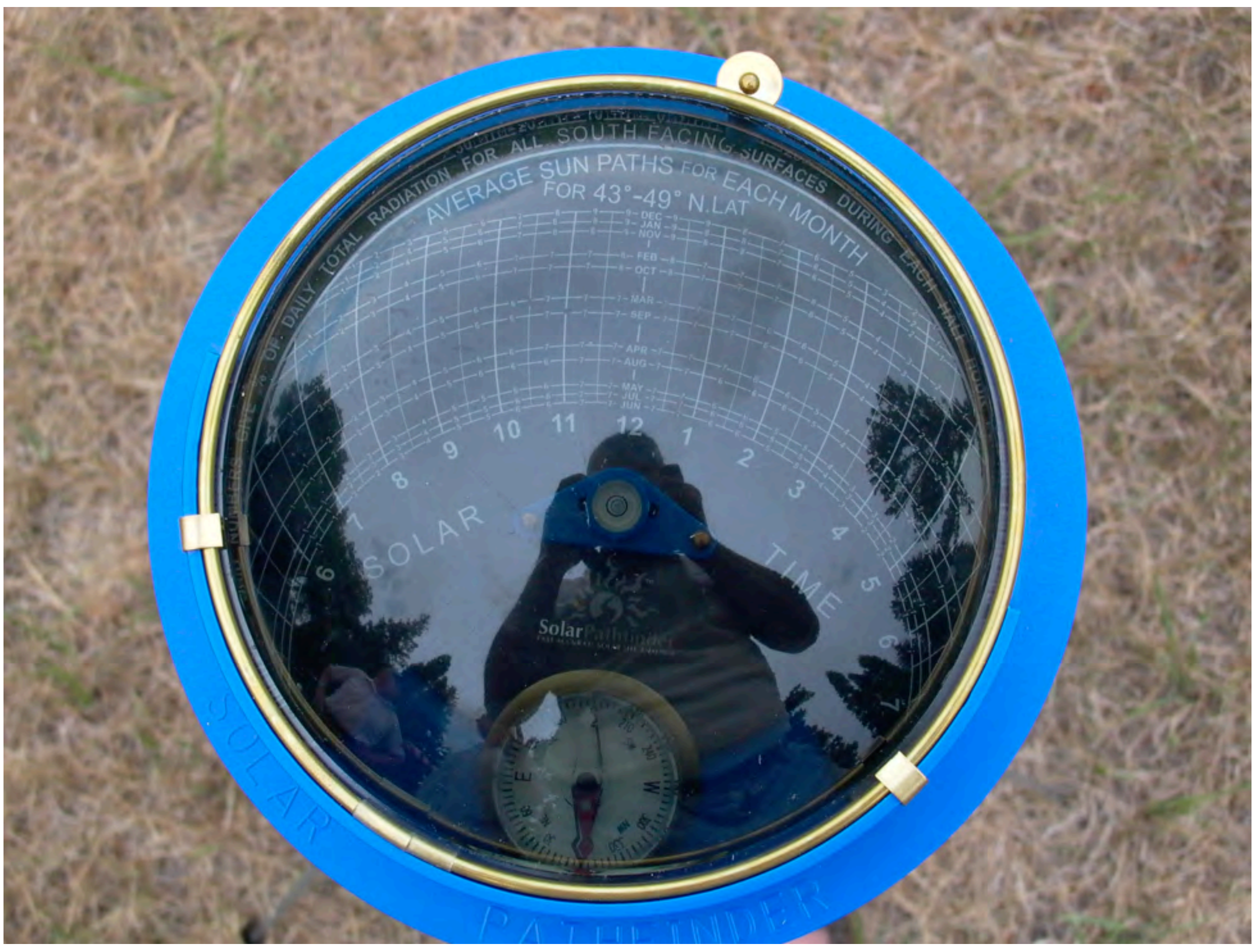
It must be noted however, that **there are legal hurdles to siting a wind turbine at this location because the tower height exceeds the setback distance to the neighboring property,** even if just a corn field. Depending on the neighboring landowner, and current town and county ordinances in regard to wind turbine siting, there may be months of meetings ahead before a tower permit can be issued.

Solar Production Estimates

Solar PV is one of the most reliable and predictable of all renewable technologies. In order to calculate electricity production from PV panels, a website created by the National Renewable Energy Laboratory (NREL), an offshoot of the Department of Energy, provides the most accurate estimate data.

To estimate annual output of kWh per year for a solar PV system at this site, the NREL software tool called PV Watts is used. PV Watts takes into account such factors as daily solar radiation (kWh/m2/day) in the area, type of mount (fixed, single axis or dual axis mounted), azimuth angle between the direction of the array and due south, tilt angle of the array, and a de-rating factor which calculates any electrical losses in the inverter, transformer, AC and DC wiring, PV module mismatch, as well as a percentage de-rating for soiling, shading, and panel age. In this case, a de-rate factor of 78% was used to account for the system losses, 20% due to wiring and inverter losses, 2% for average snow shading.

Below is a Solar Pathfinder photo for a top of pole mounted panel array at Solar Site # 1.



The Solar Pathfinder depicts a 270 degree view of the sky, projected over the entire year. In the photo above, notice that the months of the year appear in the very middle of the Pathfinder, and the hours of the day along the bottom. Using these, we can establish what percentage of the solar resource will fall on the panels at this location in every month of the year.

Even with the one oak tree in the SW corner of the Nora Property, we estimate that this location will garner in excess of 90% of the solar resource. If the tree were removed, and it is just the one tree, the likely amount of resource would increase to over 95%. This is an excellent solar site as indicated in the production tables below.

Type of Solar Array	Installed Cost	Annual Production Estimate	Percentage of Current Electric Usage	Simple Payback Period at .09 Cents a kWh
Top of Pole Fixed 18-230 watt Sunpower Panels 4.14 kW	@$44,000	5,500 kWhs	28.5%	88 years
Top of Pole Tracker 16-230 watt Sunpower Panels 3.68 kW	@$46,000	6,600 kWhs	34%	77 years

Finding a qualified and experienced solar installer in the Hanska area may be problematic and add cost to these numbers, which are valid within 100 miles of Hudson, Wisconsin. The trenching distance, almost 400’ to the electrical service, could also result in an increased cost as well.

Discussion of Solar

Solar PV modules are relatively easy to install, highly reliable, require little or no maintenance and could be quickly incorporated into the Nora Church site. As reflected in the table above, for $46,000 the Nora Congregation could instantly provide 34% of their electricity with clean, locally produced power. Again, if a private party or business installed this system, Federal tax credits and depreciation would make it more attractive.

Notice that the Simple Payback Period is quite a bit longer than wind. This reflects the fact that the area surrounding the Nora Church is an excellent wind location, and as mentioned, when wind is scaled up, large production advantages accrue.

However, unlike a wind turbine, the Nora Congregation could quickly install a top of pole dual axis tracker without a lot of government red tape or administrative delay. There are no known legal hurdles to moving ahead with a solar top of pole array at this location. At Energy Concepts, average lead times to turn-key installation of a pole-mounted solar array is now around 2.5 months.

Summary

Energy Concepts has visited the Nora Church property near Hanska, Minnesota and determined that it has excellent wind potential and very good solar possibilities as well. The numbers produced above, we believe, are accurate and conservative estimates of costs and likely production scenarios.

Wind is clearly the best renewable energy application for this property, with average wind speeds of 13.5 mph at the recommended 100' hub height. Sitting above the prairie floor on a little knoll, Nora Church is a superior location for harvesting wind and production numbers bear that out. (See Payback spreadsheets in ***Appendix***.)

However, wind is much more complicated than solar, and particularly at this site.

One, there is the problem of an inadequate legal setback from the adjacent property, currently a corn field. This was discussed at our site visit and members of the congregation are aware that a land purchase, an official agreement of some kind or a variance would be needed to site a turbine tower at Site # 1 or Site # 2. This could involve a lengthy process to work out, particularly given the collective nature of a church congregation.

Second, wind turbines require regular maintenance. While turbine service providers are becoming more numerous, their cost and availability should be investigated and discussed before moving ahead. As mentioned, the rule of thumb for turbine maintenance is 1% of the turbine cost (not project cost) per year; 2% for the Jacobs 31-20 which needs annual oil changes. The surest way to lose money in renewable energy is to neglect regular turbine servicing on a wind machine.

Third, wind energy involves some potential down-side risks. Free-standing towers, such as recommended here, can be sources of mischief for young people looking for a late-night climbing adventure. Likely, the tower base would need to be fenced or tower access otherwise limited. Also, despite the overall quality of wind turbines listed, there are times when production does not pan out as expected--for a variety of reasons and factors. Wind is fickle and capturing it successfully should not be taken as an absolute sure thing. Finally, a wind turbine sitting atop a 100' tower is an unusual visual spectacle, particularly at an historic church property. Some people will think it's charming; others might strongly dislike it. Carefully considering the turbine tower's overall aesthetic appearance is a crucial public discussion to have.

Solar, on the other hand, is a much more predictable, reliable and a comparatively simple technology with which to garner clean energy. Putting a solar array on a top of pole mount near the southern property boundary would be a solid, safe and effective way of producing renewable power. As shown on the Pathfinder photo, the solar resource at this location is well over 90%.

Because of the limited space on a pole-mounted system, the efficiency of the solar panels installed is critical. Energy Concepts is the exclusive dealer for Sunpower modules, the most efficient commercially available panel in the world, and we invite you to investigate why and how these panels would outperform any other module on the market. Whether Energy Concepts is involved in this project or not, mounting Sunpower panels would make a huge difference in electrical production over decades.

As mentioned in the ***Executive Summary***, choosing to produce clean energy is much more than just a dollar and cents issue. Energy Concepts is proud to be working with individuals and communities throughout the Midwest who understand the critical importance of investing in their local economy, increasing American energy independence and reducing systemic climate risk, all while building the value of their property.

There is no more important first step than choosing a highly qualified and experienced installation firm to push this project forward. More than just a contractor, Nora Church needs to think in terms of bringing in an "energy developer" -- a company that can lead the project from initial design phase, through governmental and utility bureaucratic hurdles, to high quality contracting, commissioning and project close-out.

Energy Concepts is happy to assist at any level in bringing clean energy to the Nora Church Congregation.

Appendix

Attached below are several examples of Payback Spreadsheets, as deduced from a project's initial first cost, production estimates and any Federal or State subsidies.

The language below was included in an email to Mark Wiger in regards to producing the spreadsheets.

> *Nora Church Congregants:*
>
> *In response to Mark's request as articulated below, I am appending some more tables with payback estimates. I am going to limit it to the Jacobs 31-20 wind turbine, since that is, by far, the best value in wind, and the solar Top of Pole Mount with a tracker --*

looking at different rates of electricity inflation. (More than that is simply drowning you in numbers, if I haven't already.)

I want to note that we used to do this kind of thing more often, but are trying to cut back on it. These payback estimates may make people feel more secure about investing in alternative energy, but, ultimately, predictions about electric rates years in advance, combined with no clear understanding about what the Federal government is going to do to restrict energy pollution and reward clean energy, makes these things very incomplete.

Plus, and this is important, there is no consideration here of the "time value" of money. Google it. But essentially, spending money now, which is what you will be doing in investing in alternative energy, is not the same as spending that money 5 or 10 years in the future. So, the tables themselves distort what money will be worth down the road. To figure that out, one would need to know the rate of inflation as a whole over the next 25 years. Good luck with that.

Just two reasons why we feel these tables are not a good picture of a future cost/price/payback landscape--and trying to pin it down is a kind of numerical sophistry.

The best reasons to invest in wind and solar are the ones that you can count on now and in the future: it's the right thing to do for the local economy and the planet, it increases the value of your property, it contributes to a climate solution, it will save money over the long term (though how much is not fair to predict).

That said, if electricity goes up 15% a year over the life of a Jacobs 31-20, and the other assumptions hold true, you will pay for it in 13 years and have made almost a half million dollars by year 25. And trust me on this: our customers are not investing in solar and wind just because they expect to make that kind of money--though many of them hope they will.

And again, the Nora Congregation payback is greatly restricted by not qualifying for the Federal 30% tax credit, and, with solar at least, the Minnesota Solar Reward, which is currently $2.00 a Watt. You would need a private party to qualify for those as mentioned in the report.

Happy to respond to more questions and queries. And I really hope that the Congregation does something positive on this front.

Below: Spreadsheet for Jacobs 31-20 at 5% electricity inflation

Jacobs 31-20 20 kW Turbine

100' Free

29,000 Annual kWh Produced (As calculated by 7th Wind Modeling)

	Fed/State Tax Rate
0.09	Alliant Electric Rate
1.05	Escalation Factor

Year #	First Cost	FOE Rebate	Rebate Income* $	Tax Adjusted Rebate $	30% Tax Credit** $	Annual Electrical Savings $	Annual Maintenance $	Cumulative $
1	(85,000	0	0	0	0	2,610	0	(82,390)
2						2,741	(300)	(79,950)
3						2,878	(300)	(77,372)
4						3,021	(300)	(74,651)
5						3,172	(300)	(71,778)
6						3,331	(300)	(68,747)
7						3,498	(300)	(65,549)
8						3,673	(300)	(62,177)
9						3,856	(300)	(58,621)
10						4,049	(2,000)	(56,572)
11						4,251	(500)	(52,820)
12						4,464	(500)	(48,856)
13						4,687	(500)	(44,669)
14						4,922	(500)	(40,248)
15						5,168	(500)	(35,580)
16						5,426	(500)	(30,654)
17						5,697	(500)	(25,457)
18						5,982	(500)	(19,974)
19						6,281	(500)	(14,193)
20						6,595	(500)	(8,098)
21						6,925	(500)	(1,673)
22						7,271	(500)	5,099
23						7,635	(500)	12,234
24						8,017	(500)	19,750
25						8,418	(500)	27,668

$0.09	$/kWh (l Alliant
1.05	Escalation Factor
*	The Rebate qualifies as income which subjects it to income tax.
**	When claiming the rebate as income, the 30% tax credit is applied to system retail cost.

Below: Payback Spreadsheet for Jacobs 31-20 at 10% electricity inflation

Jacobs 31-20 20 kW Turbine

100' Free

29,000 Annual kWh Produced (As calculated by 7th Wind Modeling)

	Fed/State Tax Rate
0.09	Alliant Electric Rate
1.1	Escalation Factor

Year #	First Cost	FOE Rebate	Rebate Income* $	Tax Adjusted Rebate $	30% Tax Credit** $	Annual Electrical Savings $	Annual Maintenance $	Cumulative $
1	(85,000	0	0	0	0	2,610	0	(82,390)
2						2,871	(300)	(79,819)
3						3,158	(300)	(76,961)
4						3,474	(300)	(73,787)
5						3,821	(300)	(70,266)
6						4,203	(300)	(66,362)
7						4,624	(300)	(62,038)
8						5,086	(300)	(57,252)
9						5,595	(300)	(51,958)
10						6,154	(2,000)	(47,803)
11						6,770	(500)	(41,534)
12						7,447	(500)	(34,587)
13						8,191	(500)	(26,896)
14						9,010	(500)	(18,385)
15						9,911	(500)	(8,974)
16						10,903	(500)	1,429
17						11,993	(500)	12,922
18						13,192	(500)	25,614
19						14,511	(500)	39,625
20						15,963	(500)	55,088
21						17,559	(500)	72,147
22						19,315	(500)	90,961
23						21,246	(500)	111,707
24						23,371	(500)	134,578
25						25,708	(500)	159,786

$0.09	$/kWh (I Alliant Electric Rate
1.1	Escalation Factor
*	The Rebate qualifies as income which subjects it to income tax.
**	When claiming the rebate as income, the 30% tax credit is applied to system retail cost.

Below: Payback Spreadsheet for Jacobs 31-20 at 15% electricity inflation

Jacobs 31-20 20 kW Turbine

100' Free

29,000 Annual kWh Produced (As calculated by 7th Wind Modeling)

	Fed/State Tax Rate
0.09	Alliant Electric Rate
1.15	Escalation Factor

Year #	First Cost	FOE Rebate	Rebate Income* $	Tax Adjusted Rebate $	30% Tax Credit** $	Annual Electrical Savings $	Annual Maintenance $	Cumulative $
1	(85,000	0	0	0	0	2,610	0	(82,390)
2						3,002	(300)	(79,689)
3						3,452	(300)	(76,537)
4						3,969	(300)	(72,867)
5						4,565	(300)	(68,602)
6						5,250	(300)	(63,653)
7						6,037	(300)	(57,916)
8						6,943	(300)	(51,273)
9						7,984	(300)	(43,589)
10						9,182	(2,000)	(36,407)
11						10,559	(500)	(26,348)
12						12,143	(500)	(14,706)
13						13,964	(500)	(1,241)
14						16,059	(500)	14,317
15						18,468	(500)	32,285
16						21,238	(500)	53,023
17						24,423	(500)	76,946
18						28,087	(500)	104,533
19						32,300	(500)	136,333
20						37,145	(500)	172,978
21						42,717	(500)	215,194
22						49,124	(500)	263,819
23						56,493	(500)	319,811
24						64,967	(500)	384,278
25						74,712	(500)	458,490

$0.09 $/kWh (PPCS w/tax)

1.15 Escalation Factor

* The Rebate qualifies as income which subjects it to income tax.

** When claiming the rebate as income, the 30% tax credit is applied to system retail cost.

Below: Payback Spreadsheet for Jacobs 31-20, with private investor and 7% electricity inflation:

Jacobs 31-20 20 kW Turbine

100’ Free

29,000 Annual kWh Produced (As calculated by 7th Wind Modeling)

0.40	Fed/State Tax Rate
0.09	Alliant Electric Rate
1.07	Escalation Factor

Year #	First Cost	MN Rebate	Rebate Income* $	MACRS Depreciation $	30% Tax Credit** $	Annual Electrical Savings $	Annual Maintenance $	Cumulative $
1	(86,000	0	0	16,876	25,800	2,610	0	(40,714)
2				4,584		2,793	(300)	(33,637)
3				2,711		2,988	(300)	(28,238)
4				1,689		3,197	(300)	(23,652)
5				822		3,421	(300)	(19,709)
6						3,661	(300)	(16,348)
7						3,917	(300)	(12,731)
8						4,191	(300)	(8,840)
9						4,484	(300)	(4,655)
10						4,798	(2,000)	(1,857)
11						5,134	(500)	2,777
12						5,494	(500)	7,771
13						5,878	(500)	13,149
14						6,290	(500)	18,939
15						6,730	(500)	25,169
16						7,201	(500)	31,870
17						7,705	(500)	39,075
18						8,245	(500)	46,819
19						8,822	(500)	55,141
20						9,439	(500)	64,080
21						10,100	(500)	73,680
22						10,807	(500)	83,987
23						11,563	(500)	95,050
24						12,373	(500)	106,923
25						13,239	(500)	119,662

$0.09	$/kWh (Alliant w/tax)
1.07	Escalation Factor
MN	Unclear if there will be a State subsidy

Below: 3.9 Top of Pole Mount Solar System Payback Spreadsheet

"Sol-Lectric™ 3.9 kW" - MN

Solar Electric Financial Analysis

3900 DC Watts

5,50(Annual kWh (kilowatt hours produced)

5.5 CO2 emission reduction per year (tons/year)

Year	First Cost	Net Cost After Rebate	30% Tax Credit (b,f)	Depreciation Basis (g)	MACRS 5 YR Depreciation w/ 50% bonus first year (c)	Estimated Annual Electrical Savings (d,h)	Cumulative
0	(44,000	(44,00	13,20(	30,800	$7,392.00		(23,408)
1					$1,971.20	$500	(20,937)
2					$1,182.72	$535	(19,219)
3					$709.63	$572	(17,937)
4					$709.63	$613	(16,615)
5					$354.82	$655	(15,605)
6						$701	(14,903)
7						$750	(14,153)
8						$803	(13,350)
9						$859	(12,491)
10						$919	(11,572)
11						$984	(10,588)
12						$1,052	(9,536)
13						$1,126	(8,410)
14						$1,205	(7,205)
15						$1,289	(5,915)
16						$1,380	(4,536)
17						$1,476	(3,060)
18						$1,579	(1,480)
19						$1,690	209
20						$1,808	2,018
21						$1,935	3,953

2

0.3

0.40

0.1

1.1

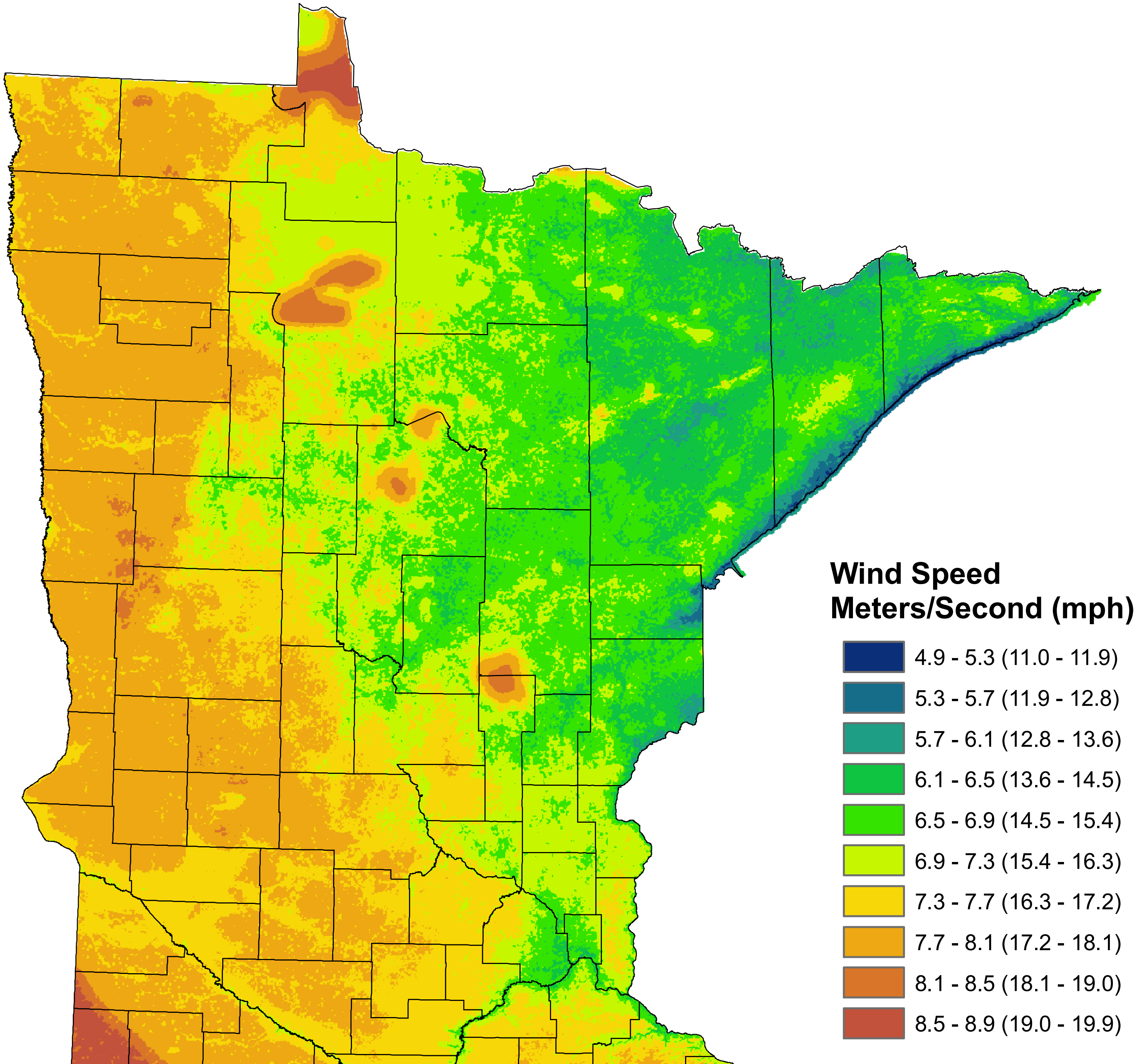
22						$2,070	6,023
23						$2,215	8,238
24						$2,370	10,608
25						$2,536	13,145

Financial Analysis Assumptions

(a)	0%	http://www.state.mn.us/mn/externalDocs/Commerce/Solar_Electric_Rebate_
(b)	0%	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US02F&State=fed
(c)	0	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US06F&State=fed
(d)	$0.09/kWh	
(e)		
(f)		
(g)		
(h)	7%	
(i)	0%	
(j)	0%	

Disclaimer: The information provided in this proposal is an estimate and should NOT be considered legal or financial advice. Proper legal counsel, along with financial and tax guidance, is required to definitively determine the financial benefits of installing a solar electric system.

Minnesota's Wind Resource by Wind Speed at 80 Meters



MINNESOTA DEPARTMENT OF COMMERCE

WindLogics®

This map has been prepared under contract by WindLogics for the Department of Commerce using the best available weather data sources and the latest physics-based weather modeling technology and statistical techniques. The data that were used to develop the map have been statistically adjusted to accurately represent long-term (40 year) wind speeds over the state, thereby incorporating important decadal weather trends and cycles. Data has been averaged over a cell area 500 meters square, and within any one cell there could be features that increase or decrease the values shown on this map. This map shows the general variation of Minnesota's wind resource and should not be used to determine the performance of specific projects.

January 2006