CITY COUNCIL/ELECTRICAL ADVISORY COMMITTEE
June 14, 2017 – 4:00 p.m.
Regular Meeting

CITY COUNCIL
Marc Tall, Mayor
Ronald Beauchamp, Mayor Pro-Tem
Patricia Baribeau, Council Member
Michael Sattem, Council Member
Ralph Blasier, Council Member

ADMINISTRATION
James V. O’Toole, City Manager
Robert S. Richards, CMC, City Clerk
Ralph B.K. Peterson, City Attorney
Mike Furmanski, Electrical Superintendent
Melissa Becotte, City Controller

ELECTRICAL ADVISORY COMMITTEE
John Anthony, Chairperson
Ann Bissell, Vice Chairperson
Larry Arkens, Committee Member
Glendon Brown, Committee Member
Tim Wilson, Committee Member

Escanaba City Council Chambers: 410 Ludington Street - Escanaba, MI 49829

Meeting Agenda
Wednesday, June 14, 2017

CALL TO ORDER
ROLL CALL
APPROVAL/ADJUSTMENTS TO THE AGENDA
CONFLICT OF INTEREST DECLARATION
NEW BUSINESS

1. **Update – Electric Department – General Operations.**
   **Explanation:** An update on departmental operations will be given by Electrical Superintendent Mike Furmanski.

2. **Update – North Side Substation Construction.**
   **Explanation:** Administration will provide an update on the construction and commission of the North Side Substation.

3. **Approval – Northshore Substation Upgrade.**
   **Explanation:** Administration is seeking Council approval to retain Krause Power Engineering of Chippewa Falls, WI in an amount not to exceed $100,000 to perform the engineering design work and project administration and oversight needed to upgrade the existing substation into a permanent installation. The funds for this professional services agreement are budgeted in the upcoming fiscal year budget.

4. **Approval – For River Township - Breezy Point Distribution Line Upgrade.**
   **Explanation:** Administration is seeking Council approval to retain Krause Power Engineering of Chippewa Falls, WI in an amount not to exceed $15,000 to perform engineering design work to replace the existing distribution lines currently in place. The funds for this professional services agreement are budgeted in the upcoming fiscal year budget.

5. **Update – City-Owned Property Sale – Far Northside Adjacent to the Former Power Plant:**
   **Explanation:** Administration will lead a discussion on the possible sale of a piece of property adjacent to the former power plant property. The piece of property is the parcel where the temporary substation is located. This substation will be upgraded to a more permanent status and relocated just west of the current location. Thus this ~1.69 acre parcel will no longer be needed by the City. An adjoining landowner has shown interest in purchasing this property.

6. **Update – Solar Generation Project.**
   **Explanation:** Administration will provide an update on the potential solar project for the City.
GENERAL PUBLIC COMMENT
COMMISSION/STAFF COMMENT AND ANNOUNCEMENTS
ADJOURNMENT

The City of Escanaba will provide all necessary, reasonable aids and services, such as signers for the hearing impaired and audiotapes of printed materials being considered at the meeting to individuals with disabilities at the meeting/hearing upon five days notice to the City of Escanaba. Individuals with disabilities requiring auxiliary aids or services should contact the City of Escanaba by writing or calling City Hall at (906) 786-9402.

Respectfully Submitted,

James V. O'Toole
City Manager
May 22, 2017

Mr. Mike Furmanski
City of Escanaba – City Electric Department
410 Ludington Street
Escanaba, MI 49829

RE: Proposal for Professional Services – Northshore Substation Engineering

Dear Mr. Furmanski:

Per your request, Krause Power Engineering, LLC, is pleased to provide you the following proposal for the engineering services associated with the construction of the Northshore Substation and the associated Electric Distribution System feeder reconstruction.

Our proposed Scope of Work includes the following:

- Develop a project budget and timeline based on a project scope replicating the North Substation design at the Northshore site.
- File a revised Transmission Load Interconnection Application with ATC. Support the application through receipt of authorization.
- Provide requirements to a geotechnical testing firm to provide soil borings of the site, soil resistivity testing and a geotechnical engineering report for foundation and grounding grid design requirements.
- Provide a topographic survey.
- Design the grounding grid based on the fault current and overcurrent study results we have and the soil resistivity/borings reports.
- Design the grading plan.
- Design the substation foundations including power transformer support and bus and switch support foundations.
- Design the structural steel elements including switch and bus support structures based on the North Substation layout.
- Layout the SCADA system architecture.
- Layout the feeder cable routing and conduit provisions.
- Provide standard insurance requirement options for Owner’s consideration for use in bidding documents
- Write plans and specifications, advertise and bid, review and recommend the substation construction bid package (includes physical construction and control wiring). This includes contract development and management.
- Conduct pre-construction meetings as required.
- Provide construction administration for the substation building, foundation work, electrical construction work and testing/commissioning.
- Provide major material lists as required and assist the Utility with evaluations of materials for procurement (may be a combination of existing excess stock materials, direct purchases and bids).
• Update the Utility’s arc-hazard assessment as required.
• Provide pertinent information for the update the Utility’s SPCC plan (by others).
• Create relay and voltage regulator control settings files.
• Work with Utility staff for in-house construction activities.
• Create and/or update drawings as required. Provide hard copy, pdf and CADD files for records.
• Train operators/linemen in the operation of the new systems, including on-site training.
• Track estimate to actual construction costs and schedule progress.
• Review contractor applications for payment. Recommend payments as applicable.

We can begin this work with your written authorization to proceed and in accordance with our Miscellaneous Services Contract approved by the Utility on June 24, 2010, for an hourly fee estimated not to exceed $100,000.00.

If our Proposal for Professional Services is acceptable, please sign and date in the space provided below and return to:

Krause Power Engineering, LLC
2029 County Highway I, Suite 1
Chippewa Falls, WI 54729.

If you have any questions, I can be reached at 715-577-1369 or by email at dkrause@krausepowerengineering.com. Thank you for the opportunity to work with you.

Sincerely,

[Signature]

Dave Krause, P.E.

Note: This proposal may be withdrawn or modified if not accepted within 30 days of the Proposal Date.

Authorized representative:

_________________________________  ____________________________
Signature                                      Date
May 22, 2017

Mr. Mike Furmanski
City of Escanaba – City Electric Department
410 Ludington Street
Escanaba, MI 49829

RE: Proposal for Professional Services – M35 Ford River Distribution Line Design

Dear Mr. Furmanski:

Per your request, Krause Power Engineering, LLC, is pleased to provide you the following proposal for the engineering services associated with the construction of a new overhead feeder along M35.

Our proposed Scope of Work includes the following:

- Design an overhead line complete with conductor material and tension selection and based on the utility’s standard materials list.
- Calculate the pole structural loadings based on the conductor selection.
- Work with Utility staff in selecting a pole supplier who can meet the structural loadings as calculated above.
- Work with Utility staff for in-house construction activities.
- Create and/or update drawings as required. Provide hard copy, pdf and CADD files for records.
- Track estimate to actual construction costs and schedule progress.
- Review contractor applications for payment. Recommend payments as applicable.

We can begin this work with your written authorization to proceed and in accordance with our Miscellaneous Services Contract approved by the Utility on June 24, 2010, for an hourly fee estimated not to exceed $15,000.00.

If our Proposal for Professional Services is acceptable, please sign and date in the space provided below and return to:

Krause Power Engineering, LLC
2029 County Highway 1, Suite 1
Chippewa Falls, WI 54729.

If you have any questions, I can be reached at 715-577-1369 or by email at dkrause@krausepowerengineering.com. Thank you for the opportunity to work with you.

Sincerely,

Dave Krause, P.E.

Note: This proposal may be withdrawn or modified if not accepted within 30 days of the Proposal Date.

Authorized representative:

_________________________________________  ________________________________________
Signature                                           Date
Joint Delta County Commissioners and Escanaba City Council Meeting

May 31, 2017 4 PM City Council Chamber

Escanaba Solar Project

1. Why Invest in Solar Generation Now?

2. Regional Solar Generation Activities

3. Escanaba Solar Project Description

4. 25 Year Levelized Cost of Solar Generation
   - One time installation cost provides 25+ years of electric generation
   - Minimizing installation costs is critical in successful projects

5. Summary of Avoided Costs with Local Solar Generation

6. Delta County Airport Potential Site
   - Proposed Site Location
   - Proposed Lease Terms
   - Concerns with Delta County Airport Site
Why Invest in Solar Generation Now?

Solar - Declining Prices and Increasing Installations

- Solar generation in the US is booming largely due to falling prices.
- Installation costs have dropped almost 60% in the past 10 years.
- Installation costs for utility scale projects, 1MW to 100MW, in 2016 averaged $1.60 per Watt (DC) Capacity.
- Installation costs are predicted to fall further with continued growth.
• In 2016, for the first time ever, solar was the largest new source of electricity generation capacity, more than new natural gas and wind capacity.

• Utility scale solar generation accounted for 72% of the solar capacity installed in 2016.

• Installation cost for solar is very dependent on the scale of the project. Small residential systems with 15 panels, for example, cost 2 to 3 times more than utility scale projects with 3,000 or more panels.

• In 2015, utility scale solar projects used 3 types of mounting systems:
  - 47% Fixed tilt angle
  - 47% Single Axis Tracking
  - 6% Dual Axis Tracking

  ![Diagram of solar panel configurations](image)
  - PV array facing south at fixed tilt.
  - One axis tracking PV array with axis oriented south.
  - Two-axis tracking PV array

• Single and dual axis tracking systems are higher cost to install and maintain, but they increase generation output in the late afternoon when electric loads are peaking.
Regional Solar Generation Projects

- In late 2016, Heritage Sustainable Energy completed the construction of a 1.1 MW(DC) solar facility. The solar facility is located northeast of Garden, MI, adjacent to the Heritage electrical substation which supports their wind turbines.

- 3,496 individual 315 watt solar panels
- Each panel is 76.9” long by 38.7” wide
- Panels are mounted on a fixed 35° tilt rack system in rows facing south
- Panels are mounted on concrete ballast blocks. This higher cost mounting system was required because of sedimentary rock formations close to the surface, which prohibited the lower cost driven posts solar panel supports.
- Note the slight accumulation of snow with these fixed tilt panels in December.
In the summer of 2017, the Marquette Board of Light and Power (MBL&P) plans to construct a 0.15MW Community Solar Project adjacent to their office building on Wright Street.

- 480 individual 315 watt solar panels
- Panels to be sold to residential and business customers with the panel generation credited to their monthly electric bills at $0.063/kWh for 25 years
- Installation cost is $1.83/watt. After the Energy Optimization program rebate of approximately $75 per panel, the customer cost is $499 per panel, or $1.58/watt.
- MBL&P designed the Solar License and Management Agreement so that residents or businesses purchasing the solar panel(s) should be eligible to receive the 30% Federal Investment Tax Credit. (Note, the eligibility is not guaranteed)

L’Anse has announced a Community Solar Program feasibility study. Community electric customers would purchase panels in the project. The feasibility study is being supported by grants and WPPI, their power supplier.

NextEra and WPPI plan to build a 100 MW solar project adjacent to NextEra’s Point Beach nuclear power plant in Two Rivers, WI.

- Solar project to be completed in 2021
- WPPI is a public power energy supplier that serves 51 municipal utilities and co-operatives in Wisconsin and Upper Michigan. UP members include: Gladstone, Alger-Delta Co-op, Baraga, Crystal Falls, L’Anse, Negaunee and Norway.
- The facility will provide renewable energy to WPPI members to comply with Michigan’s Renewable Energy Standards.
3. Escanaba Solar Project Description

- Planned solar facility capacity up to 1 MW(DC). Final Project size depends on:
  - Installation cost in $/watt obtained in RFP response
  - Escanaba Electric Department budget has a surplus Renewable Energy Fund balance to pay for a major portion of the Project.
  - Commitments by Escanaba Electric Department residents, businesses and local government customers to purchase panels in the Project.
- A One Megawatt, 1MW (DC) capacity system would consist of:
  - 3,175 individual 315 watt solar panels
  - Panel dimensions are 38.7” wide by 76.9” long
  - For a fixed tilt mounting system, approximately 635 hydraulic driven posts are required.
  - DC wiring connects the panels to their inverter
  - Inverters to convert solar panel DC power to output 480 volts AC power
  - 480 volt AC wiring to a step-up transformer for connecting to the City of Escanaba electric distribution system
  - Expected annual average output of 1,206,000 kWh over the contracted 25 year life of the project.
  - Requires approximately 5.5 to 6 acres, a plot about 400’ x 600’
  - Security fence around the perimeter of the facility
- Key Escanaba Solar Project site requirements for good performance and low installation costs are:

  - Unrestricted sun exposure for 30+ years – no trees or building shading the panels
  - Flat site requiring minimal grading, bush or tree removal
  - Low cost to use site (purchase, lease or rent)
  - Ground soils depth and type suitable for low cost installation (driven posts for vertical support of panels)
  - Close proximity to existing City electric distribution lines with adequate capacity
  - Minimal cost and time for regulatory approvals (e.g., FAA) to implement project
  - Public Visibility for economic development benefits
4. Updated 25 year Levelized Cost of Solar Generation

1. Using the Escanaba Airport weather station data, the National Renewable Energy Laboratory (i.e., NREL) website pvwatts calculator estimates the annual electricity production at 1.28 kWh per watt (DC) of solar generation Capacity. This annual production estimate assumes:
   - No shading
   - Panels oriented to face due south
   - Panels tilted at a fixed 35° orientation
   - 0.84 conversion efficiency for DC to AC (98% inverter efficiency assumed)

2. Other key assumptions in the 0.84 conversion efficiency include:
   - A 2 % loss to panel soiling
   - 6 % loss as a result of snow on the panels (~25.5% of annual solar generation occurs in the four months with the most snowfall, December through March)
   - 2.5 % loss due to DC & AC wiring and connectors
   - New solar panels

3. The 1.28 kWh of annual electricity production per watt (DC) of solar generation capacity is an expected long term mean value. Actual year to year annual production may vary + or – 10% from this expected mean value.
4. The NREL website pvwatts calculator also estimates the monthly electricity production.

The highest production is in the months of June and July with the lowest production in the months of November and December.

5. With no degradation of Photovoltaic (PV) generation, 1 watt (DC) of solar PV Capacity will produce 32.00 kWh over 25 years (1.28 x 25 = 32.00).

6. Assuming a more realistic 0.5% loss of generation Capacity per year, after the first year of installation, 1 watt (DC) of solar PV Capacity will produce 30.15 kWh over 25 years (i.e., 1.206 annual average kWh/watt).

7. With the estimated cumulative kWh’s of generation over 25 years, 30.15 kWh, one can calculate a Levelized Cost of Generation over this same 25 year period. For example, with an Installed cost of $1.70/watt (DC) Capacity, $1.70 / 30.15 kWh = $0.0564/kWh, yields a 25 year Levelized Cost of $0.0564/kWh for solar generation in Escanaba.

Another way of expressing solar levelized cost is a one-time investment of $1.70/watt provides electricity at a fixed cost of $0.0564/kWh for 25 years.
8. An accurate 25 year Levelized Cost analysis should include Annual Operation and Maintenance (O&M) costs in addition to the Initial Installation cost. The following types of O&M costs should be expected:

- Mowing grass and weeds in areas under and surrounding the solar panel racks
- Monitoring the performance of the solar generation facility components, such as individual panels and inverters
- Cleaning exterior surface of the panels if necessary, e.g., bird droppings or accumulated dust
- Replacement of defective components beyond the equipment warranty, e.g. inverters typically have a 10 year warranty

9. A February, 2016 NREL publication indicated the O & M costs averaged $0.016/watt of Capacity per year for large utility scale solar generation projects (i.e., 1 to 10 MW). A NextEra solar expert indicated the O&M cost should range from $0.012 to 0.015/watt. After evaluating the two leading local site locations, the Airport and BP Products, and conducting preliminary lease or purchase discussions, the $0.012/watt O&M cost is considered a conservative estimate for the Escanaba Solar Project economic analysis. Using the $0.012/watt O&M cost estimate, the annual O&M cost for a 1 MW(DC) facility would be $12,000 per year.

10. Assuming a 0.5% loss of generation Capacity per year, the average O & M cost per kWh of solar generation is $0.010/kWh.

\[
\text{\$0.012/watt} \times \frac{1 \text{ watt}}{1.206 \text{ kWh}} = \text{\$0.0100/kWh O&M Cost}
\]
11. Combining the initial Installation cost with the annual average O&M cost, the 25 year Total Levelized Cost of electricity generated can be calculated. 

The adjacent Table provides the Total Levelized Cost of Electricity in $/kWh as a function of the Installation Cost in $/watt.

<table>
<thead>
<tr>
<th>Solar Generation Facility Installation Costs, $/watt</th>
<th>25 Year Levelized Cost (1) of Electricity Generated, $/kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>0.04317</td>
</tr>
<tr>
<td>1.10</td>
<td>0.04648</td>
</tr>
<tr>
<td>1.20</td>
<td>0.04980</td>
</tr>
<tr>
<td>1.30</td>
<td>0.05312</td>
</tr>
<tr>
<td>1.40</td>
<td>0.05643</td>
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<tr>
<td>1.50</td>
<td>0.05975</td>
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<tr>
<td>1.60</td>
<td>0.06307</td>
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<tr>
<td>1.70</td>
<td>0.06638</td>
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<tr>
<td>1.80</td>
<td>0.06970</td>
</tr>
<tr>
<td>1.90</td>
<td>0.07301</td>
</tr>
<tr>
<td>2.00</td>
<td>0.07633</td>
</tr>
</tbody>
</table>

(1) Includes $0.0100/kWh O&M costs

12. For Comparison, the current, 2016-2017 Escanaba Electric Energy Rates are:

<table>
<thead>
<tr>
<th>Customer Type</th>
<th>2016-2017 Energy Rate, $/kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>.09570</td>
</tr>
<tr>
<td>Commercial</td>
<td>.08925</td>
</tr>
<tr>
<td>Municipal</td>
<td>.09303</td>
</tr>
<tr>
<td>Large Power</td>
<td>.07228 to .1550</td>
</tr>
</tbody>
</table>

Effective rate depending on Load Factor & Demand Charge

Clearly, the expected 25 Year Levelized Cost of Electricity from solar generation is less than the current residential, commercial, municipal and large power (effective) energy rates.
13. Purchasing and installing solar generation capacity essentially stabilizes electric energy costs for 25+ years. The useful life of a well-designed and maintained quality solar generation system is expected to be more than 25 years, lowering the Levelized Costs further. To illustrate this point, the adjacent Table compares 25 year and 30 year levelized costs.

<table>
<thead>
<tr>
<th>Solar Generation Facility Installation Cost, $/watt</th>
<th>Levelized Costs of Electricity Generated(^1), $/kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0</td>
<td>.07633</td>
</tr>
<tr>
<td>1.8</td>
<td>.06970</td>
</tr>
<tr>
<td>1.6</td>
<td>.06307</td>
</tr>
<tr>
<td>1.4</td>
<td>.05643</td>
</tr>
<tr>
<td>1.2</td>
<td>.04980</td>
</tr>
<tr>
<td>1.0</td>
<td>.04317</td>
</tr>
<tr>
<td>(1) Includes $0.0100/kWh O &amp; M costs</td>
<td></td>
</tr>
</tbody>
</table>

The additional 5 years of generation reduce the Levelized Generation Costs an additional $.005 to $.01 per kWh (i.e., 12 to 14%).

14. If the installed cost for a solar generation facility does not exceed $1.70/watt, a solar generation project should lower the cost for all Escanaba electricity customers, based on the avoided costs.

15. A large utility scale solar project (e.g., 1MW (DC) capacity), with significantly lower installation costs ($/watt (DC) capacity), offers dramatically lower 25 Year Levelized Cost of electricity generated savings compared to much higher cost small private solar systems (e.g., Residential or Business).
16. The solar panel mounting system impacts the annual energy production and 25 Year Levelized Costs as shown below:

<table>
<thead>
<tr>
<th>Array Mounting System</th>
<th>Annual Initial Energy Production; kWh/watt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed 35° Tilt at 180° Azimuth</td>
<td>1.280</td>
</tr>
<tr>
<td>Single Axis Tracking with 0.0° Tilt at 180° Azimuth</td>
<td>1.408 (a 10% gain over the Fixed 35° Tilt system)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>25 Year Total Levelized Cost of Electricity Generation</th>
<th>Levelized Cost, $/kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar Generation Facility Installation Costs, $/watt</td>
<td>Fixed 35° Tilt Angle (1)</td>
</tr>
<tr>
<td>---------------------------------------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>1.00</td>
<td>.04317</td>
</tr>
<tr>
<td>1.10</td>
<td>.04648</td>
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<td>.05975</td>
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<td>1.70</td>
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<td>.07301</td>
</tr>
<tr>
<td>2.00</td>
<td>.07633</td>
</tr>
</tbody>
</table>

(1) Includes $0.0100/kWh O & M Costs

(2) Includes $0.0100/kWh O & M Costs which generates 10.1% higher income stream to cover more complex tracking system maintenance.
17. Comparison of solar generation as a function of time of day for 35\(^\circ\) Fixed Tilt Angle and Single Axis Tracking with 0.0\(^\circ\) Tilt

Comparison of Solar Generation as a Function of Time of Day for July 22nd, Using Escanaba (AWOS) Airport Average Weather Data

Maximum Conversion Efficiency = 0.84

Solar Generation data from NREL PV Watts Calculator at pvwatts.nrel.gov/pvwatts.php
18. Installation Cost Expectations for 2018

- For a 1 MW size facility, the installation cost is expected not to exceed $1.70/watt.

- With an Energy Optimization Rebate, $75 per 315 watt panel, the installation cost is expected not to exceed $1.46/watt

19. Key Levelized Cost Analysis Findings:

- With the declining installation costs of utility scale solar generation facilities (i.e., $1.70/watt and lower), solar generation is a cost competitive electric generation source, even without federal incentives (i.e., investment tax credits).

- A one-time investment in a utility scale solar generation capacity essentially stabilizes or fixes future electric costs for 25+ years into the future.

20. Utility scale solar generation costs are less than a conservatively estimated (i.e., 50% Capacity Factor) avoided cost with solar generation for Escanaba. Escanaba’s avoided cost is $0.070 in 2016-2017 and $.079 in 2023-2024. Thus, utility scale solar generation within the Escanaba electric system is expected to benefit ALL the electric customers, Residential, Commercial and Large Power, by lowering costs for the entire system.
5. Summary of Avoided Costs with Local Solar Generation

Avoided Costs include:

➢ **ENERGY:** The eliminated purchase of one kWh of Energy from Escanaba’s current contract energy supplier with each kWh of local solar generation.

➢ **CAPACITY:** Reduction of the Capacity Cost for the annual Escanaba peak electric load because of the local solar generation occurring at the time of the peak load.

Historically, the annual Escanaba peak load occurs between 3 and 5 PM on a week day in July or August.

➢ **TRANSMISSION:** Reduction in Escanaba’s monthly co-incident load due to local solar generation at the time of the ATC system peak load.

An historical analysis of the monthly ATC system peak load data found that for the six months of the year from April through September, the monthly ATC peak load occurs before sunset, between noon and 6PM.

➢ **MiRECs:** Reduction in Escanaba’s purchased Michigan Renewable Energy Credits (MiRECs) to comply with Michigan’s Renewable Energy standards.
The Avoided Cost approach for calculating the solar generation credit is utilized so that the Residential, Commercial or Large Power customers who are NOT participating in the voluntary Escanaba Solar Project are not subsidizing the project costs.

**Solar Generation Credit = Avoided Costs – O&M Costs**

The credit associated with each kWh of solar generation is based on the Avoided Cost after subtracting the Operating and Maintenance (O & M) Costs.

The solar credit will be applied to the monthly Residential or Business customer’s electric bill in proportion to the number of solar panels owned by that individual customer.
6. Delta County Airport Potential Site

Proposed Site Location

Reasons for selecting the proposed site location:
- Fewer trees on the south side of the road, which could shade the solar panels
- Shorter distance and resulting lower wiring costs, to connect to the existing City of Escanaba distribution system.
- Existing access road to reach the site
- Flat and open site requiring minimal improvements
- Visible from Airport Terminal to promote area economic development image
Proposed Lease Terms for the Delta County Airport Site

May 14, 2017

- 30 year lease for approximately 5.5 acres with option to extend lease for multiple 5 year periods.

- Airport staff continue to mow leased property

- $3,000 annual lease payment to use site ($16,360/acre payment over 30 years. ($0.126 / sq. ft. lease payment)

- When useful life of the solar generation facility is complete (i.e., 30+ years), the Escanaba Electric Department is responsible for removing the solar panels, racking system, driven foundation poles, wiring, etc. and returning the site to the original condition.

- A 2 year exclusive option to lease the property is required to complete the following tasks before implementing the final lease agreement:
  a. File FAA Form 7460-1 along with a Solar Glare Hazard Analysis Tool (SGHAT) assessment of the proposed solar facility for FAA review and approval. A preliminary SGHAT assessment for the proposed site indicates minimal issues. This task and contacts with the FAA will require the Airport Manager support and involvement.

  b. Shade analysis to determine whether or not trees on the south side of the Airport Road will shade the solar panels over the 30+ years for the project. Some tree removal may be required.
c. Conduct a Geotechnical site assessment to determine the soil type, water table level, soil corrosivity, and vertical and lateral load capacity. This testing is required to establish the feasibility of driven post foundation construction option and the required depth for the driven posts. The Geotechnical assessment is expected to include:
   - Digging test pit trenches (e.g., 5)
   - Boring holes (e.g., 5-9)
   - Soil resistivity testing
   - Driven pile or post load testing
The Geotechnical data is required to prepare a Project RFP.

d. Escanaba Electric Department obtaining City Administration and Council approval to issue an RFP for the solar generation facility.

e. With the solar panel costs defined by the RFP responses, promote Solar Panel sales to Escanaba Electric Department customers.

f. Based on the RFP responses, the City Council approving the solar generation project to proceed with awarding the construction contract, with Project completion in 2018-2019.
Concerns with Delta County Airport Site

- Site location and design require FAA Review and Approval
  - A Glare assessment for approaching aircraft is required
  - To conduct the Solar Glare Hazard Tool (SGHAT) assessment requires defining:
    - Exact location for the solar panels (Development of detailed Project layout plan.)
    - Solar panel mounting system (fixed tilt or single axis tracking)
  - A separate aeronautical study is submitted for each corner of the solar project site and the highest overall point of the project.
  - The FAA Review requires approximately 45 days.

- The FAA application, submitted by the Airport Manager, will require support details from the Escanaba Solar Project, and probably the Airport Consulting Engineer to ensure that all FAA requirements are met.

- Existing airport geotechnical data indicates shallow groundwater depths, less than 6’. Poured or cast in place concrete foundations for mounting the solar panels may be required instead of driven posts, resulting in higher installation costs for the Project.
Key Solar Project Presentation “Take Aways”

1. Utility scale solar generation is cost competitive today, even without Federal Investment Tax Credits.

2. Solar generation is a long term investment over 25+ years. Therefore components must be designed for a 25+ year life.

3. Design facility and select site to minimize initial installation investment, operating and maintenance costs to minimize the investment payback time.

4. For a business or resident investing in the Escanaba Solar Project, the best initial investment is electric usage efficiency upgrades, such as LED lights, energy efficient motors, appliances, fans, etc.