April 13, 2016 Meeting

The April, 2016 Waterloo Technical Society (WTS) meeting was called to order by President Gary Dorhout at 7:15 pm.

A total of 41 were in attendance.

Treasurer's Reports. President Dorhout read the Treasurer's report from Ken Friend. The treasury had a beginning balance of $1,494.09 with income from 3 membership dues of $30 and expenses of March's speaker dinner of $18 leaving a balance of $1,506.09. Reimbursement to Tim Schoenfelder for the purchase of the public address system for $337.92 and a payment of the pledge to the Solar Boat Racing Team of $300 leaves a new balance of $868.17 available for use by the Society. A total of 9 honorary and 62 paid members gave a membership roster of 71 members.

Old Business. President Dorhout requested that members invite speakers for the 2016-2017 year. Potential topics have been suggested:

1. Explanation of where recycling goods go and how they are processed. Common problems with material.
2. Current concrete road paving techniques, problems from the road engineers view point. Steve Crouse suggested Joe Owen of Kerry Cunningham Construction might speak on this topic.
3. Crop spraying by airplane problems, effectiveness, what crop problems are handled that way.
4. History of original land surveying.
5. History of manufacturing in Waterloo and Cedar Falls.
6. History of railroads in Waterloo and Cedar Falls, especially the WCF&N electric line. Gene Van Gorder will contact Robert Levis to arrange a speaking date.
7. History of mining in Iowa: Coal, Galena, Lead, Fracking sand.
8. Aerial photo services. Tim Schoenfelder suggests Mr. Gomes of Waverly, IA might speak on this topic.

Speakers for next year are being scheduled now:

14 Sep 2016 – Dr. Donald Gurnett U of Iowa -- Voyager Spacecraft
12 Oct 2016 - Cody Wilkinson – Air Seeding and Small Grains
9 Nov 2016 – Tom Nagle – Technology of Signs
TBD Brian Keierleber, County Engineer, Independence – Ultra High Performance Concrete Properties-Tim
TBD Joe Owen -- Current Concrete Road Paving Techniques – Steve Crouse
TBD Mr. Gomes, Waverly -- Using Ultralight Aircraft for Crop Inspections-Tim
TBD Robert Levis, WCF&N Railroad -- History of railroads in Waterloo and Cedar Falls– Gene Van Gorder

If anyone knows someone who could speak to those topics please let President Dorhout know.

Nominations for next year's officers are now being solicited. If any member has interest in an office, notify President Dorhout or Jim Garrett.

New Business. No new business was discussed.

Guest Speaker. Mr. Steve Bernard spoke about the Cedar Falls Utilities (CFU) Simple Solar Community Solar Project. Simple Solar consists of a collection of solar panels that CFU has built near Prairie Lakes Park in Cedar Falls. The project gives citizens an affordable and flexible way to use solar energy. CFU customers can invest in units and subscribe to a portion of the energy output from the project. This project came online on April 1, 2016.

Speaker: Steve Bernard is the Director of Customer Service and Business Development for CFU, where he oversees CFU's customer service office, marketing and sales, energy efficiency work and key account relationships. He is a Cedar Falls native and graduated from Iowa State in 1985 with a Bachelors' degree in mechanical engineering. Steve has been with CFU for 20 years, prior to that he lived in Wisconsin for 11 years and worked for The Trane Company and Northern States Power Company.

Background: CFU is a municipally owned utility that serves the City of Cedar Falls and outlying areas. They provide electric, natural gas, water, cable TV, high speed data and soon phone services. The Utility takes pride in supporting the innovative community through excellent service, while retaining low rates.

Solar provides a good balance to wind generation. On hot and humid summer days, the demand for electricity is at its highest. On these days, the sun is strong while the wind is usually calm. For this reason it made sense to have solar energy supplement the power generation rather than wind. The price of photovoltaic (PV) panels has dropped to a feasible cost recently.

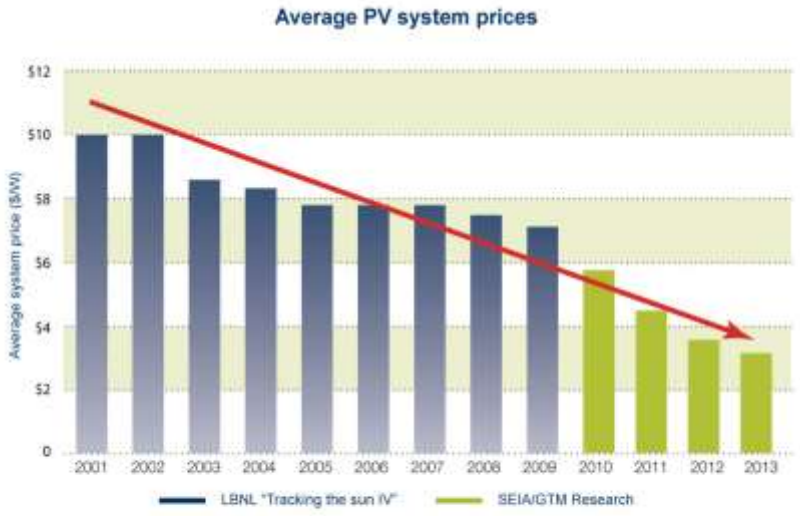


Figure 1. Average system price in dollars per Watt for solar panels. Costs are reasonable for CFU to use solar power to supplement its generating capacity.

As shown in Figure 2, there is sufficient sunlight in Iowa to generate electricity using PV panels that face due South, angled for latitude location (42°30'N).

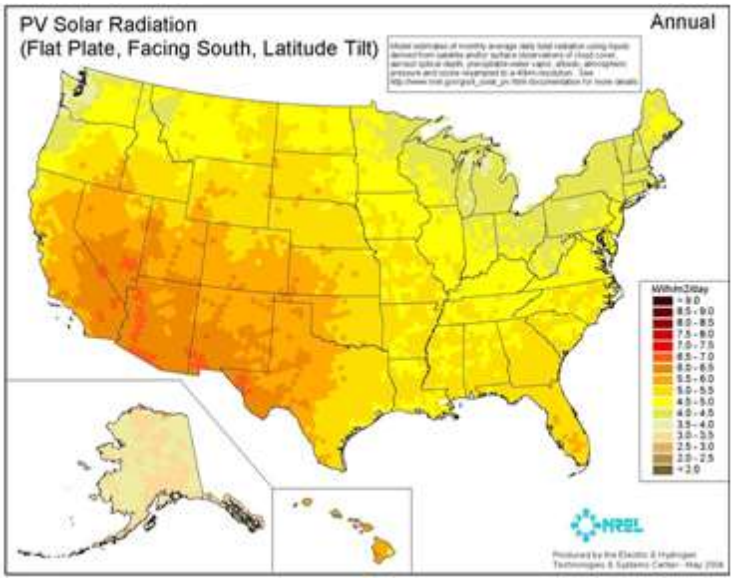


Figure 2. Model estimates of monthly average daily total radiation using inputs derived from satellite and/or surface observations of cloud cover, aerosol optical depth, precipitable water vapor, albedo (light reflected by the earth), atmospheric pressure and ozone resampled to a 40 km resolution. Source: http://www.nrel.gov/gis/il_solar_pv.html.

Cedar Falls Utilities already provides the lowest cost power to its customers. Figure 3 shows the rates for regions around the USA.



Figure 3. Utility rates per kWHr for regions across the United States.

Solar power is generated at its highest level when demand peaks. Customers usually demand power to cool homes and offices when the day is warmest. Figure 4 shows how the PV panels peak power coincides with peak demand, but the demand does not drop as quickly as the power generation from the panels.

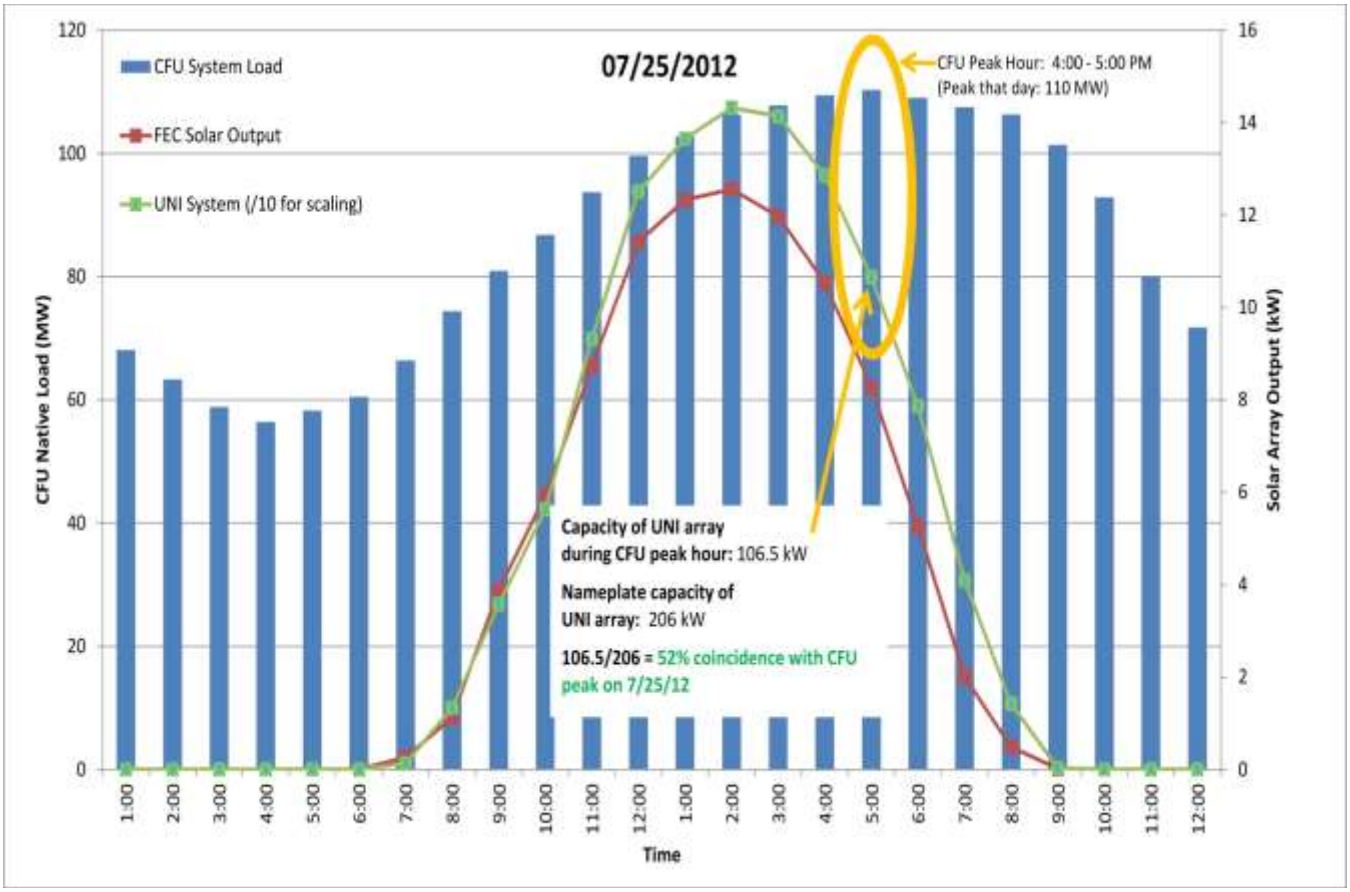


Figure 4. Demand and solar power output for a typical summer day in Cedar Falls. UNI array is 52% of CFU Solar Park, neither solar system generates throughout the entire demand cycle.

Why have a community solar project? Several factors went into the decision to have a community solar park as opposed to having individuals own their own solar generating capability:

- 75% of properties are not suited for home-installed solar.
- Solar garden
  - helps minimize the cost per installed kW
  - allows a customer to invest without the hassle of installing their own
  - economies of scale and professional management
  - lower cost alternative to privately owned solar

Often objectives can have opposing elements – for instance, being financially supported by those willing to participate means some risk and an initial investment by participants, which may hinder "broad" participation. So you find ways to accommodate both, in CFU's case you'll see they set a target investment small enough to allow for a minimal investment.



Figure 5. A private firm owns the Solar Array Park. This permits acquiring tax incentives that reduce the price to CFU which distributes the power to its customers and credits its customers based on units they purchased.

A third party ownership of the Solar Array Park which sits on land donated by the City of Cedar Falls adds complexity to the project but is critical due to 30% tax credit. In theory CFU can thus purchase the energy for a lower cost than building it without benefit of tax credits.

The customer deal:

- $399 upfront per Unit (can pay over 12 months)
- Monthly bill credit for 20 years
- If customers move off CFU system or otherwise no longer pay a CFU electric bill, ability to transfer Units or sell them back to CFU

Emphasized this was not a quick financial payback for customers (15 years). No guarantees. Would we get enough interest? To build a 500 kW array, we'd need commitments for ~ 3000 Units.



Figure 6. Artist rendition of the site (cost $1,000). Money well spent because it helped customers visualize the project

Results:

- UNI helped tremendously by signing on to roughly 20% of the array's capacity
- Customer pre-enrollments were excellent – 1250 households and businesses
- Participant interest levels range from 1 unit to several hundred units
- 7000 units subscribed at campaign end
- 6500 panels – 305 watts each
- 41 inverters – 36 kW AC
- Total capacity ~ 1,500 kW AC



Figure 7. Construction began in November 2015



Figure 8. Iowa winter approached slowly so work continued.



Figure 9. 16' beams driven 10' deep, then cross beams installed.



Figure 10. Operational on April 1, 2016 as planned.

Construction is complete, with commercial operation date of April 1, 2016! The largest community solar array in the State of Iowa. 100% subscribed, and capable of producing roughly 2,700 MWH per year with an anticipated 30 year life. This is equivalent to total power needed by 270 homes annually.

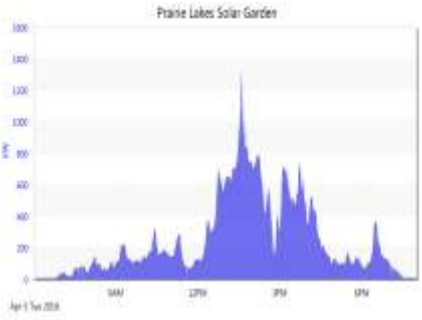


Figure 11. Output from the Solar Garden on a cloudy day, April 5, 2016.

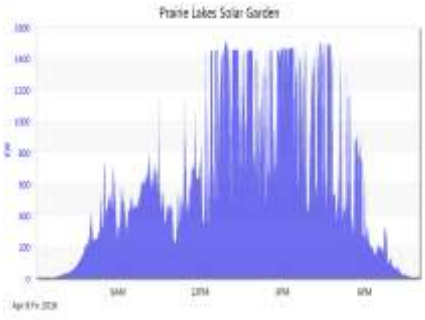


Figure 12. Output from variable cloudy day, April 8, 2016.

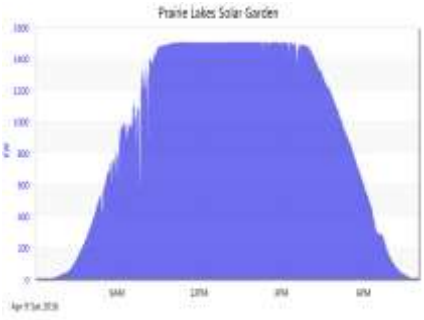


Figure 13. Output on a sunny day, April 9, 2016. Power limited by inverter capacity.

Next Meeting. Our May 11, 2016 meeting features Mr. John Burnett of Cedar Valley Makers, explaining the technology of entrepreneurial start ups at the Tech Works.

Respectfully submitted,

James R. Stevenson, Vice President and Secretary