How We Saw the Light and Got Solar

MARCH 2016 SOLAR POWERING IOWA / MREA Planning, Development and Sustainability Department Johnson County, Iowa Speaker: Becky Soglin
Why Solar?

- Clean energy
- Reliability
- Local/State Impact
- Savings
Process

1. Energy Efficiency Projects
2. Feasibility + Analysis
3. Request for Proposals (RFPs)
4. Proposal Assessment / Selection
5. Power Purchase Agreement (PPA)
6. Interconnection Agreements+
7. Public Awareness
Welcome!

Johnson County is proud to be the first county in Iowa to have entered into Power Purchase Agreements for solar arrays. The dashboard links below show you current and past energy generated. Visit anytime!

ARRAYS AT THE SECONDARY ROADS AND SEATS CAMPUS: 4810 Melrose Avenue in Iowa City, operational: October 20

Together, these two solar arrays should generate about 23% of the annual electricity needed at the campus and save taxpayers nearly $152,000 over the next 25 years. In addition, the renewable energy will annually avoid 86.5 tons of greenhouse gases, which is like taking 16.5 passenger vehicles off the road each year.

Secondary Roads
Wash Bay and West Garage
15.2 kW System

Secondary Roads and Fleet Maintenance Facility
70.56 kW System
Big burn prompted changes
New Secondary Roads and Fleet Maintenance Building

Relocated West Garage + Sec Roads Wash Bay

15.12 kW ground-mounted system

70.56 kW ground-mounted system

Building and solar array footprints are approximate.
1. Energy Efficiency

Avoid oversizing solar photovoltaic (PV) system—save money

- Audits (usually free)
- Projects – insulation, LED, etc.
- Utility incentives or rebates (timing is important)

- High-efficiency HVAC
- Daylighting + dimming controls
- Insulated doors, windows, roof
- Vent sensors
- In-floor heating

100,000+ kWh annual savings

$34,249 check
$12,000 annual savings
2. Feasibility: People

- Consultant (option)
- Internal Team
  - Leaders
  - Staff
    - Physical plant
    - Sustainability (Planning)
    - Finance/accounting
    - Legal
  - Solar basic training
2. Feasibility: Factors

Location

- Local building codes
- Shading
- Potential development/change in area
- Security
- Hazards (e.g. flood zones)
- Existing electrical (amp) service
- If existing structure roof, load and lift
2. Feasibility: Factors

Current and Future Energy Use

- Annual kWh and demand
- Rates, riders, fees, etc.
- Rate options and trends
- Solar will likely cover only *part* of need
  - still buy some energy from utility
  - no storage capability (yet)
2. Feasibility: Factors

**Timing**

- Tax credits will be fairly stable for several more years
- Our Sec Rds project took about a year
  - PPA negotiation
  - Interconnection
- Electrical infrastructure
## 2. Feasibility: Factors

<table>
<thead>
<tr>
<th>EXAMPLE (not our actual project)</th>
<th>kWh (annual)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total need</td>
<td>400,000</td>
<td>100%</td>
</tr>
<tr>
<td>Provided by solar panels</td>
<td>100,000</td>
<td>25%</td>
</tr>
<tr>
<td>Provided by utility</td>
<td>300,000</td>
<td>75%</td>
</tr>
</tbody>
</table>
3. Request for Proposal (RFP)

**RFP Document**
- Not a bid
- Design and install
- Short
- Electrical data + building documents online
- Mandatory on-site visit

**Process**
- RFP public hearings
- PPA public hearings (it’s a lease)

**Administer RFP**
- 30 days to respond
- Created FAQ as vendors asked questions
4. Proposal Assessment: Criteria

**“Apples to Apples”**
- Cover sheet

**Technical**
- kW / kWh delivered (verify)
- Cost
- Components
- Warranty

**Labor/Service**
- Experience
- Customer Service
- Warranty

**Buy Local Policy**
SERVICE + LOCATION COVER SHEET FOR JOHNSON COUNTY ADMIN OPEN SPACE (SOUTH FIELD)

COMPANY NAME:   DATE:

SERVICE: Figure the specific building's amps and volts accordingly into your calculations.

<table>
<thead>
<tr>
<th>Administration Building</th>
<th>kW (DC)</th>
<th>kW (AC)</th>
<th>Annual Production kWh</th>
<th>Amperage Per Leg</th>
<th>Cost: Outright</th>
<th>10-year PPA starting cost per kWh</th>
<th>Buyout cost at end of 10-year PPA</th>
<th>Total Cost of the 10-year PPA (include the buyout cost at end of PPA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1600 AMP Service at 240 volts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

25%  
10%  
Other %

Below, please note any assumptions and briefly describe use of location.

EXAMPLE ONLY

Proposed construction area ~15,900 sq. ft.
Based on image at Florida Energy Center

Figure 1. Photovoltaic cells, modules, panels and arrays.
DC wiring

Figure 1. Diagram of grid-connected photovoltaic system.

Adapted from Florida Energy Center
### 4. Proposal Assessment

NOTE: This summary was used when we were still planning on a single roof-mounted array. After we selected the vendor, due to net-metering issues, we had to downsize to two smaller ground-mounted arrays. However, this helps show proposal assessment.

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>COMPANY X</th>
<th>COMPANY Y</th>
<th>MOXIE SOLAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>System size</td>
<td>123.7 kW</td>
<td>140.25 kW</td>
<td>140.25 kW</td>
</tr>
<tr>
<td>System cost (outright; labor +equipment)</td>
<td>$321,776</td>
<td>$375,870</td>
<td>$370,322</td>
</tr>
<tr>
<td>Vendor estimated annual kWh production</td>
<td>158,100</td>
<td>164,720</td>
<td>175,704</td>
</tr>
<tr>
<td>Iowa Energy Center 84%</td>
<td>168,517</td>
<td>190,970</td>
<td>180,838</td>
</tr>
<tr>
<td>Company Location</td>
<td>Other County</td>
<td>Other County</td>
<td>North Liberty, Johnson County</td>
</tr>
<tr>
<td>Company Experience</td>
<td>X years in solar; X years in electricity</td>
<td>X years in solar</td>
<td>2+ years</td>
</tr>
</tbody>
</table>
Online calculators for array sizing

**PVWatts** uses a trial and error process to narrow the rating of the array to match your desired annual energy output. Care must be exercised in choosing realistic system loss factors as defined by the integral derate factor subcalculator. PVWatts also offers a simplified financial calculator providing the benefit of the solar array based on an assumed fixed value of energy.

[pvwatts.nrel.gov](http://pvwatts.nrel.gov)

**SAM** is a downloadable calculator application, which is used as a stand-alone tool. The SAM calculator offers greater flexibility and level of input detail and includes a substantial financial modelling aspect.

[sam.nrel.gov](http://sam.nrel.gov)

## 4. Proposal Assessment - Inverters

<table>
<thead>
<tr>
<th></th>
<th>COMPANY X SINGLE (CENTRAL) INVERTER</th>
<th>COMPANY X ELEVEN (11) STRING INVERTERS</th>
<th>COMPANY Y SIX (6) STRING INVERTERS</th>
<th>MOXIE SOLAR 510 MICRO - INVERTERS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Location</strong></td>
<td>Suggests outside. Mezzanine or floor? (weighs 2,000 lbs)</td>
<td>Above office area or on roof</td>
<td>Mezzanine is likely location (TBD)</td>
<td>Roof</td>
</tr>
<tr>
<td><strong>2. Efficiency</strong></td>
<td>96.5%</td>
<td>98%</td>
<td>96.5%</td>
<td></td>
</tr>
<tr>
<td><strong>3. Fail impact</strong></td>
<td>If it stops working, all modules stop working. 100% fail</td>
<td>If one stops working, one-eleventh of the modules stop working. 9% fail.</td>
<td>If one stops working, one-sixth of the modules stop working. 17% fail</td>
<td>If one stops working, only one of the 510 modules stops working. 0.2% fail</td>
</tr>
<tr>
<td><strong>4. Repair</strong></td>
<td>Complex – need expert</td>
<td>Complex – need expert</td>
<td>Complex – need expert</td>
<td>Relatively easy fix but must go on roof</td>
</tr>
<tr>
<td><strong>5. Pros</strong></td>
<td>Single point of maintenance</td>
<td>Seems to be the standard for commercial uses.</td>
<td>Seems to be the standard for commercial uses.</td>
<td>If one breaks down or its module underperforms, 509 still work well</td>
</tr>
<tr>
<td><strong>6. Cons</strong></td>
<td>Fail impact is 100%; cannot see function of each module</td>
<td>A higher fail impact than with micros</td>
<td>A higher fail impact than with micros</td>
<td>Roof location is hot and not easily accessible; newer technology</td>
</tr>
<tr>
<td><strong>7. Manufact.</strong></td>
<td>Single: Solectrica in business since 2005;</td>
<td>SolarEdge</td>
<td>SMA has been in business 30 yrs</td>
<td>Enphase specializes in micro-inverters. 4th generation product.</td>
</tr>
</tbody>
</table>
# System Details

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>Make/Model</th>
<th>Warranty</th>
<th>70.56 kW System</th>
<th>15.12 kW System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar modules (array)</td>
<td>Solar World Sun Modules (up to 280 watts each)</td>
<td>25-year performance; 10-year product</td>
<td>252</td>
<td>54</td>
</tr>
<tr>
<td>Inverter Type/Number</td>
<td>Enphase Micro M-250</td>
<td>25-year</td>
<td>252</td>
<td>54</td>
</tr>
<tr>
<td>Racking for Ground-Mount</td>
<td>SnapNrack</td>
<td>10-year</td>
<td>One</td>
<td>One</td>
</tr>
<tr>
<td>Monitoring System for Both</td>
<td>Enphase Enlighten</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. Power Purchase Agreement

What Is It?

- A contract between a taxable company that installs and operates a solar PV (or other energy) system on a purchaser’s premises, and that purchaser buys the power.

- NREL PPA Checklist
5. Power Purchase Agreement

Renewables Tax Credits

• Federal: 30% of cost (through 2019)
• State: 18% of cost at the time; now 15% (up to $20,000 commercial)

Problem

• Governments cannot receive credits directly
5. Power Purchase Agreement

Solution

- Vendor providing solar PV system claims tax credits
- Vendor passes savings on to local government
- Government pays solar vendor during PPA (e.g., 11 cents/kWh)
- Vendor responsible for performance during PPA
5. Power Purchase Agreement

- PPA typically beats outright purchase for local governments
  - 10-year better than 20-year

**Example values**

<table>
<thead>
<tr>
<th></th>
<th>Outright</th>
<th>20-year + buyout</th>
<th>10-year + buyout</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$220,000</td>
<td>$190,000</td>
<td>$150,000</td>
</tr>
</tbody>
</table>
## 5. Power Purchase Agreement – 10yr

Initial comparison based on a single system on roof

<table>
<thead>
<tr>
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<tr>
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<td>150,495</td>
<td>164,720</td>
<td>175,704</td>
</tr>
<tr>
<td>Iowa Energy Center 84%</td>
<td>168,517</td>
<td>190,970</td>
<td>180,838</td>
</tr>
<tr>
<td>Subtotal of estimated payments over 10 yrs</td>
<td>$118,579</td>
<td>$216,983</td>
<td>$191,795</td>
</tr>
<tr>
<td>(2.5% annual escalation)</td>
<td></td>
<td>(3.5% annual escalation)</td>
<td>(3% annual escalation)</td>
</tr>
<tr>
<td>Buyout after 10 yrs</td>
<td>$128,000</td>
<td>$15,000 – $20,000</td>
<td>Up to $10,000</td>
</tr>
<tr>
<td>System total cost to County first 10 yrs w/buyout</td>
<td>$246,579</td>
<td>$236,983 – $241,983</td>
<td>$191,796 – $201,796</td>
</tr>
<tr>
<td>Overall Savings after 25 yrs</td>
<td>$161,816</td>
<td>210,015</td>
<td>~250,000-$275,010</td>
</tr>
</tbody>
</table>
5. PPA with Moxie Solar

**PPA = 10 years**
- Most parts warranted for 25 years (racking = 10 years)

**During 10-year PPA**
- We pay more for **all** electricity combined (solar + utility) than if purchasing only from utility for 10 years

**After PPA ends**
- We pay nothing more for another 15 years of solar-generated electricity, aside from basic maintenance/repair

**ROI reached in year 13-14 normally**
Actual PPA Cost: $127,628

There will also be a buyout of up to $10,000 at the end of the PPA.

70.56 kW + 15.12 kW Systems
SYSTEMS COMBINED = 85.68 kW

<table>
<thead>
<tr>
<th>Year</th>
<th>Projected Production</th>
<th>Rate +2.5% Inflation/yr.</th>
<th>Projected Annual Payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>113775</td>
<td>0.1025</td>
<td>11,661.94</td>
</tr>
<tr>
<td>Year 2</td>
<td>113207</td>
<td>0.1051</td>
<td>11,898.06</td>
</tr>
<tr>
<td>Year 3</td>
<td>112640</td>
<td>0.1077</td>
<td>12,131.33</td>
</tr>
<tr>
<td>Year 4</td>
<td>112077</td>
<td>0.1104</td>
<td>12,373.30</td>
</tr>
<tr>
<td>Year 5</td>
<td>111516</td>
<td>0.1131</td>
<td>12,612.46</td>
</tr>
<tr>
<td>Year 6</td>
<td>110959</td>
<td>0.116</td>
<td>12,871.24</td>
</tr>
<tr>
<td>Year 7</td>
<td>110404</td>
<td>0.1189</td>
<td>13,127.04</td>
</tr>
<tr>
<td>Year 8</td>
<td>109852</td>
<td>0.1218</td>
<td>13,379.97</td>
</tr>
<tr>
<td>Year 9</td>
<td>109303</td>
<td>0.1249</td>
<td>13,651.94</td>
</tr>
<tr>
<td>Year 10</td>
<td>108756</td>
<td>0.128</td>
<td>13,920.77</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>$127,628.05</td>
</tr>
</tbody>
</table>
## 5. PPA with Moxie Solar

Example payments during and after 10-year PPA *(relative to entire campus annual use of 504,749 kWh)*

<table>
<thead>
<tr>
<th>Year</th>
<th>Our annual solar cost</th>
<th>Our annual utility cost*</th>
<th>TOTAL PAID for the year*</th>
<th>If only using utility, we would pay*</th>
<th>Difference compared to utility only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>$11,662 (includes maintenance/repair)</td>
<td>$31,121</td>
<td>$42,783</td>
<td>$40,178</td>
<td>-$2,605</td>
</tr>
<tr>
<td>Year 11</td>
<td>$0 (plus any maintenance/repair)</td>
<td>$40,405</td>
<td>$40,405</td>
<td>$51,431</td>
<td>$11,026</td>
</tr>
</tbody>
</table>

*Includes 2.5% annual inflation on utility costs and annual solar cost during PPA. However, we will use 3% in future projects.*
# Cost Savings Detail

## 86 kW combined

<table>
<thead>
<tr>
<th>YEAR</th>
<th>For Comparison--No Solar: Estimated Utility Bill</th>
<th>Estimated Annual Output (kWh) with .5% annual productivity decline</th>
<th>Solar PPA Annual COST (Values from previous sheet)</th>
<th>With Solar: Estimated Utility Bill</th>
<th>With Solar: Estimated Annual Difference to Johnson County</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$40,178.00</td>
<td>113,775</td>
<td>$11,661.94</td>
<td>$31,121.51</td>
<td>$2,605.45</td>
</tr>
<tr>
<td>2</td>
<td>$41,182.45</td>
<td>113,206</td>
<td>$11,893.72</td>
<td>$31,945.96</td>
<td>$2,657.23</td>
</tr>
<tr>
<td>3</td>
<td>$42,212.01</td>
<td>112,640</td>
<td>$12,130.11</td>
<td>$32,791.95</td>
<td>$2,710.04</td>
</tr>
<tr>
<td>4</td>
<td>$43,267.31</td>
<td>112,077</td>
<td>$12,371.19</td>
<td>$33,660.02</td>
<td>$2,763.91</td>
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<tr>
<td>5</td>
<td>$44,348.99</td>
<td>111,517</td>
<td>$12,617.07</td>
<td>$34,550.76</td>
<td>$2,818.84</td>
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<tr>
<td>6</td>
<td>$45,457.72</td>
<td>110,959</td>
<td>$12,867.83</td>
<td>$35,464.75</td>
<td>$2,874.86</td>
</tr>
<tr>
<td>7</td>
<td>$46,594.16</td>
<td>110,404</td>
<td>$13,123.58</td>
<td>$36,402.58</td>
<td>$2,932.00</td>
</tr>
<tr>
<td>8</td>
<td>$47,759.02</td>
<td>109,852</td>
<td>$13,384.41</td>
<td>$37,364.88</td>
<td>$2,990.27</td>
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<tr>
<td>9</td>
<td>$48,952.99</td>
<td>109,303</td>
<td>$13,650.43</td>
<td>$38,352.27</td>
<td>$3,049.71</td>
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<tr>
<td>10</td>
<td>$50,176.82</td>
<td>108,756</td>
<td>$13,921.73</td>
<td>$39,365.40</td>
<td>$3,110.32</td>
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<tr>
<td>11</td>
<td>$51,431.24</td>
<td>108,213</td>
<td>$0.00</td>
<td>$40,404.95</td>
<td>$11,026.29</td>
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<tr>
<td>12</td>
<td>$52,717.02</td>
<td>107,671</td>
<td>$0.00</td>
<td>$41,471.58</td>
<td>$11,245.44</td>
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<tr>
<td>13</td>
<td>$54,034.94</td>
<td>107,133</td>
<td>$0.00</td>
<td>$42,566.00</td>
<td>$11,468.94</td>
</tr>
<tr>
<td>14</td>
<td>$55,385.82</td>
<td>106,597</td>
<td>$0.00</td>
<td>$43,688.93</td>
<td>$11,696.88</td>
</tr>
<tr>
<td>15</td>
<td>$56,770.46</td>
<td>106,064</td>
<td>$0.00</td>
<td>$44,841.10</td>
<td>$11,929.36</td>
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<tr>
<td>16</td>
<td>$58,189.72</td>
<td>105,534</td>
<td>$0.00</td>
<td>$46,023.27</td>
<td>$12,166.46</td>
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<tr>
<td>17</td>
<td>$59,644.47</td>
<td>105,006</td>
<td>$0.00</td>
<td>$47,236.20</td>
<td>$12,408.26</td>
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<tr>
<td>18</td>
<td>$61,135.58</td>
<td>104,481</td>
<td>$0.00</td>
<td>$48,480.70</td>
<td>$12,654.88</td>
</tr>
<tr>
<td>19</td>
<td>$62,663.97</td>
<td>103,959</td>
<td>$0.00</td>
<td>$49,757.57</td>
<td>$12,906.39</td>
</tr>
<tr>
<td>20</td>
<td>$64,230.57</td>
<td>103,439</td>
<td>$0.00</td>
<td>$51,067.66</td>
<td>$13,162.91</td>
</tr>
<tr>
<td>21</td>
<td>$65,836.33</td>
<td>102,922</td>
<td>$0.00</td>
<td>$52,411.81</td>
<td>$13,424.52</td>
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<td>22</td>
<td>$67,482.24</td>
<td>102,407</td>
<td>$0.00</td>
<td>$53,790.91</td>
<td>$13,691.33</td>
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<tr>
<td>23</td>
<td>$69,169.30</td>
<td>101,895</td>
<td>$0.00</td>
<td>$55,205.85</td>
<td>$13,963.45</td>
</tr>
<tr>
<td>24</td>
<td>$70,898.53</td>
<td>101,386</td>
<td>$0.00</td>
<td>$56,657.55</td>
<td>$14,240.97</td>
</tr>
<tr>
<td>25</td>
<td>$72,670.99</td>
<td>100,879</td>
<td>$0.00</td>
<td>$58,146.98</td>
<td>$14,524.01</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$127,622.01</strong></td>
<td><strong>$161,997.48</strong></td>
<td><strong>$10,000.00</strong></td>
<td><strong>$1,082,771.15</strong></td>
<td><strong>$151,997.48</strong></td>
</tr>
<tr>
<td><strong>buyout max after 10 yrs</strong></td>
<td><strong>$10,000.00</strong></td>
<td><strong>$1,082,771.15</strong></td>
<td><strong>$10,000.00</strong></td>
<td><strong>$1,082,771.15</strong></td>
<td><strong>$10,000.00</strong></td>
</tr>
<tr>
<td><strong>totals w/buyout</strong></td>
<td><strong>$137,622.01</strong></td>
<td><strong>$1,092,771.15</strong></td>
<td><strong>$151,997.48</strong></td>
<td><strong>$1,082,771.15</strong></td>
<td><strong>$10,000.00</strong></td>
</tr>
</tbody>
</table>

**Solar+buyout+utility** $1,220,393.16
## 5. Effect of PPA with Moxie Solar

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NO SOLAR</strong></td>
<td>ESTIMATED MIDAMER 25 YRS OF ELECTRIC COSTS</td>
<td>$1,372,390</td>
</tr>
<tr>
<td><strong>SOLAR / PPA</strong></td>
<td>10-YEAR MOXIE SOLAR PPA $127,622 + BUYOUT UP TO $10,000** + ESTIMATED 25 YRS OF ELECTRIC COSTS PAID TO MID AMER ($1,082,771)</td>
<td>$1,220,393</td>
</tr>
<tr>
<td><strong>SAVINGS WITH SOLAR / PPA</strong></td>
<td></td>
<td>$151,997</td>
</tr>
</tbody>
</table>
5. PPA Process

Before signing PPA with preferred company, ensure you receive from company and review:

- Detailed equipment list
- Schematics and drawings
- Interconnection data
- PPA draft and details
- Details on ground covers/fencing (if needed/included)
- Statements on
  - Maintenance and security during PPA
  - Amount of electricity to be generated
  - Responsibility for codes, laws, etc.
  - Monitoring portal

A more detailed list of these suggestions is provided in the “Resource” slides at the end of this presentation.
An Important Digression! Net Metering

Net metering

• Ability to send excess energy generated back to the grid and receive a kWh credit on utility account and/or a $ credit value.

• Affects system size and ROI
Net Metering and PPAs

• Each utility has its own interpretation of the Iowa Utilities Board ruling for solar arrays and net metering tariffs

• Essentially, some pay more, some pay less for excess energy generated

Your Specific Utility
Net Metering and PPAs

Net-metering Rule

• Per MidAmerican Energy, for an entity to be eligible for net metering at a retail or net billing (NB) tariff: "Generating capacity and associated energy is intended to serve only the electric requirements of the owner of the Facility."

Utility View

• Because we have a PPA, MidAmerican Energy does not consider us to be the owner.

Rock-and-Hard Place

• But without the PPA, we wouldn’t have been able to get the tax credits...
Net Metering and Rates

Rates (Tariffs)

- Retail rate would be about 7 cents per kWh
- Instead wholesale (QF) 1 to 2 cents per kWh
Net Metering: Downsize

Since utility doesn’t allow us to send energy back to the grid…

<table>
<thead>
<tr>
<th>Project</th>
<th>Original 10-year PPA</th>
<th>Actual 10-year PPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 array</td>
<td>1 array</td>
<td>2 arrays</td>
</tr>
<tr>
<td>Serve one building with excess to grid</td>
<td>Serving different buildings. Nothing sent to grid.</td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>140 kW</td>
<td>86 kW</td>
</tr>
<tr>
<td>Type</td>
<td>Roof-mount</td>
<td>Ground-mount</td>
</tr>
<tr>
<td>Solar Electricity Generated/ Year</td>
<td>175,704 kWh</td>
<td>113,775 kWh</td>
</tr>
<tr>
<td>Solar Electricity relative to total need 504,749</td>
<td>34.8%</td>
<td>22.5%</td>
</tr>
<tr>
<td>Cost (includes $10,000 buyout after 10 years)</td>
<td>$197,475</td>
<td>$137,628</td>
</tr>
<tr>
<td>Savings after 25 years</td>
<td>$249,788</td>
<td>$151,997</td>
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Net Metering: Downsize

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# Net Metering: Downsize

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<td>2 arrays&lt;br&gt;Each serves one distinct building. Nothing sent to grid.</td>
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Net Metering – Action Taken

In spring 2015, Iowa Utilities Board (IUB) solicited comments on regulatory framework for distributed generation.

Johnson County Board of Supervisors asked IUB to ensure that PPAs are eligible for net metering at retail rates.

- IUB solicitation
- Johnson County submission
- Docket NOI-2014-0001

Additional information
http://energydistrict.org/resources/distributed-generation/
6. Other Steps After Installation

- Inspection
  - Iowa City
  - MidAmerican

- Proof of Insurance

- Witness Test

- Certificate of Completion

- Other documents
7. Public Awareness
Expected Results of Solar Array

Offset 86.5 tons annually
Greenhouse Gases of...

Offset CO₂ emissions of...

Equal carbon sequestered by...

Source: http://www.epa.gov/cleanenergy/energy-resources/calculator.html
## Secondary Roads Solar PV Arrays

### Benchmarking

<table>
<thead>
<tr>
<th>Meter Name</th>
<th>Start Date</th>
<th>End Date</th>
<th>Consumption = Generation</th>
<th>Consumption Units</th>
<th>Dollar Amount</th>
<th>$ Per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 kW Solar West Garage and Sec Rds Wash Bay</td>
<td>8/6/2015</td>
<td>8/31/2015</td>
<td>1,873.00</td>
<td>kWh</td>
<td>$191.91</td>
<td>$0.1025</td>
</tr>
<tr>
<td>15 kW Solar West Garage and Sec Rds Wash Bay</td>
<td>8/31/2015</td>
<td>9/30/2015</td>
<td>2,295.36</td>
<td>kWh</td>
<td>$235.27</td>
<td>$0.1025</td>
</tr>
<tr>
<td>15 kW Solar West Garage and Sec Rds Wash Bay</td>
<td>9/30/2015</td>
<td>10/31/2015</td>
<td>1,790.20</td>
<td>kWh</td>
<td>$183.50</td>
<td>$0.1025</td>
</tr>
<tr>
<td>15 kW Solar West Garage and Sec Rds Wash Bay</td>
<td>10/31/2015</td>
<td>11/30/2015</td>
<td>1,363.44</td>
<td>kWh</td>
<td>$139.75</td>
<td>$0.1025</td>
</tr>
<tr>
<td>15 kW Solar West Garage and Sec Rds Wash Bay</td>
<td>11/30/2015</td>
<td>12/31/2015</td>
<td>780.00</td>
<td>kWh</td>
<td>$79.98</td>
<td>$0.1025</td>
</tr>
<tr>
<td>15 kW Solar West Garage and Sec Rds Wash Bay</td>
<td>12/31/2015</td>
<td>1/31/2016</td>
<td>1,412.54</td>
<td>kWh</td>
<td>$144.79</td>
<td>$0.1025</td>
</tr>
<tr>
<td>15 kW Solar West Garage and Sec Rds Wash Bay</td>
<td>1/31/2016</td>
<td>2/29/2016</td>
<td>1,385.01</td>
<td>kWh</td>
<td>$141.96</td>
<td>$0.1025</td>
</tr>
<tr>
<td><strong>SUBTOTALS 15k kW</strong></td>
<td><strong>7</strong></td>
<td><strong>10,899.55</strong></td>
<td></td>
<td></td>
<td><strong>$1,117.16</strong></td>
<td></td>
</tr>
<tr>
<td>70.56 kW Solar PV Sec Rds and Fleet Maintenance</td>
<td>10/20/2015</td>
<td>10/31/2015</td>
<td>2,239.00</td>
<td>kWh</td>
<td>$229.50</td>
<td>$0.1025</td>
</tr>
<tr>
<td>70.56 kW Solar PV Sec Rds and Fleet Maintenance</td>
<td>10/31/2015</td>
<td>11/30/2015</td>
<td>5,844.99</td>
<td>kWh</td>
<td>$599.11</td>
<td>$0.1025</td>
</tr>
<tr>
<td>70.56 kW Solar PV Sec Rds and Fleet Maintenance</td>
<td>11/30/2015</td>
<td>12/31/2015</td>
<td>3,616.94</td>
<td>kWh</td>
<td>$370.74</td>
<td>$0.1025</td>
</tr>
<tr>
<td>70.56 kW Solar PV Sec Rds and Fleet Maintenance</td>
<td>12/31/2015</td>
<td>1/31/2016</td>
<td>6,615.10</td>
<td>kWh</td>
<td>$678.05</td>
<td>$0.1025</td>
</tr>
<tr>
<td>70.56 kW Solar PV Sec Rds and Fleet Maintenance</td>
<td>1/31/2016</td>
<td>2/29/2016</td>
<td>6,452.50</td>
<td>kWh</td>
<td>$661.38</td>
<td>$0.1025</td>
</tr>
<tr>
<td><strong>SUBTOTALS 71 kW</strong></td>
<td><strong>5</strong></td>
<td><strong>24,768.53</strong></td>
<td></td>
<td></td>
<td><strong>$2,538.78</strong></td>
<td></td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td></td>
<td></td>
<td><strong>35,668.08</strong></td>
<td></td>
<td><strong>$3,655.94</strong></td>
<td><strong>0.1025</strong></td>
</tr>
</tbody>
</table>
Next Solar PV Projects

Administration Building and/or Health and Human Services Building

New Ambulance Services and Medical Examiner Building
Resources

OVERALL GUIDANCE
Iowa Energy Center  Solar PV Energy Guide

TAX CREDITS
Iowa Department of Revenue  Solar Energy System Tax Credits

REQUEST FOR PROPOSAL
The Solar Foundation  Steps to a Successful Solar Request for Proposal

POWER PURCHASE AGREEMENTS
National Renewable Energy Laboratory  Power Purchase Agreement Checklist for State and Local Government
U.S. Department of Energy  Power Purchase Agreements

PROCESS
PPAs plus Mistakes to Avoid (based on California school districts but helpful overview of issues)
Iowa Utilities Board: Informational Guide for On-Site Generation (residential and small business use)
Resource  Before signing PPA with preferred vendor, ensure that you receive and review:

• Complete, detailed list of equipment including brands, models, quantities, efficiency ratings, warranties and tilt of panels
• Length, width and height data for array
• Schematics and other drawings or images
• Interconnection data
• PPA draft and details (cost, buyout fees / terms, early termination)
• How vendor will maintain array during PPA including safety, security and protection from vandalism; maintenance protocol (who you call, etc.)
• If applicable, any proposed ground covers or fencing
• Statements
  • that array will generate expected amount of electricity (e.g., *not more than the building demands if you do NOT plan to net meter*)
  • that vendor is responsible for all federal, state, local and utility codes, laws and regs + permits
  • That vendor ensures coordination on public-facing monitoring website and compatibility of entire monitoring system with infrastructure and website.
Contacts

Josh Busard, Assistant Administrator and Sustainability Coordinator
jbusard@co.johnson.ia.us

Becky Soglin, Sustainability Specialist
bsoglin@co.johnson.ia.us

Johnson County (Iowa) Planning, Development and Sustainability 319-356-6083