Bringing Solar Power to the People: Multi-Year Case Study of a First-in-Time Community Solar Garden

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THE GRID: LA PLATA ELECTRIC ASSOCIATION ("LPEA") PERSPECTIVE

Generation & transmission-owned facilities

LPEA: Residential Solar Photovoltaic (“PV”) Options

- **Full retail rate credit for 100% of annual use**
- Net Energy Metering (“NEM”) @ Point of Use
  - >100% of annual use: Average wholesale credit
  - PV equipment is usually owned by homeowner
- Community Solar Garden (“CSG”)
  - PV installation generally distant from point of use, resulting in “virtual” NEM for CSG customers
  - 100-120% of annual use: Average wholesale credit
  - >120% of annual use receives no credit at all
  - PV capacity usually leased from third-party owner
LPEA: NEM PRICING CHALLENGES

- **Rooftop PV**: 4 kW: 10.3¢ / kWh
- **Solar Garden**: 500 kW: 6¢ / kWh
- **Utility-Scale Solar**: 30 MW: 4¢ / kWh
- **LPEA Retail Rate**: 12.5¢ / kWh + 5.1¢ / kWh in distribution costs
- **Tri-State Wholesale Rate**: 7.4¢ / kWh + 4.4¢ / kWh in transmission costs
- **Wholesale Market**: 3¢ / kWh

CSG 20-Year Fixed Lease: More Now, Less Later (Maybe!)

- IF LPEA rates escalated at projected 5% p.a., economic crossover point would occur in Yr 9
- Significant environmental benefits projected
  - At 19,000 kWh/year of CSG generation:
    - 13.1 metric tons of CO₂ reductions/year, equal to:
      - Avoiding 31,194 vehicle miles = 1,477 gallons of gasoline
      - Planting 336 trees = 10.74 acres of forest
- Despite pie-in-the-sky rate escalation, signed on for anticipated 100% of annual use with first-in-time CSG in LPEA’s service territory.
HISTORICAL USE

CSG Year 1: Leased 11.274 kW
(5.53% of Total)

Anticipated kWh = 18,000/yr
YEAR 1 EXPERIENCE

CSG Year 2: Dropped to 10.278 kW (5.04% of Total)

Anticipated kWh = 19,265/yr
Anticipated kWh = 18,000/yr
YEAR 2 EXPERIENCE

CSG Year 3: Dropped to 9.397 kW (4.61% of Total)

Anticipated kWh = 19,265/yr

Anticipated kWh = 18,228/yr
YEAR 3 EXPERIENCE

CSG Year 4: Maintained 9.397 kW
(4.61% of Total)

Anticipated kWh = 19,265/yr

Anticipated kWh = 18,228/yr

LPEA: Summer Loading vs. “What if?” Solar Generation

Peak Summer Load vs. Summer Solar Production

Peak Time
06/19/17
6:30 pm

18% coincident with summer peak loading

### 12 Months of Actual LPEA Data: Solar % at Coincident Peak

<table>
<thead>
<tr>
<th>Month</th>
<th>Date / Time of Peak</th>
<th>% Solar Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug-17</td>
<td>08/31/17 5:00 pm</td>
<td>53%</td>
</tr>
<tr>
<td>Jul-17</td>
<td>07/05/17 5:00 pm</td>
<td>18%</td>
</tr>
<tr>
<td>Jun-17</td>
<td>06/20/17 6:30 pm</td>
<td>18%</td>
</tr>
<tr>
<td>May-17</td>
<td>05/18/17 9:00 pm</td>
<td>0%</td>
</tr>
<tr>
<td>Apr-17</td>
<td>04/03/17 8:00 pm</td>
<td>0%</td>
</tr>
<tr>
<td>Mar-17</td>
<td>03/06/17 7:00 pm</td>
<td>0%</td>
</tr>
<tr>
<td>Feb-17</td>
<td>02/06/17 7:00 pm</td>
<td>0%</td>
</tr>
<tr>
<td>Jan-17</td>
<td>01/25/17 7:00 pm</td>
<td>0%</td>
</tr>
<tr>
<td>Dec-16</td>
<td>12/26/16 6:30 pm</td>
<td>0%</td>
</tr>
<tr>
<td>Nov-16</td>
<td>11/30/16 6:30 pm</td>
<td>0%</td>
</tr>
<tr>
<td>Oct-16</td>
<td>10/06/16 8:00 pm</td>
<td>0%</td>
</tr>
<tr>
<td>Sep-16</td>
<td>09/19/16 8:00 pm</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Average Availability</strong></td>
<td></td>
<td><strong>7%</strong></td>
</tr>
</tbody>
</table>

LPEA’s Expenses Drivers

**Customer**
Driven by number of customers. Nearly identical for each residential customer.

**LPEA Demand**
Driven largely by customer load at time of LPEA’s system peak

**Purchased Power: Demand**
Driven by customer load at time of LPEA peak during the peak period

**Purchased Power: Energy**
Expense associated with fuel and base load generation

## LPEA: Monthly Residential Expenses vs. Revenues

<table>
<thead>
<tr>
<th></th>
<th>Typical Member (654 kWh)</th>
<th>High Usage Member (1,848 kWh)</th>
<th>Low Usage Member (273 kWh)</th>
<th>Solar Member (0 kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer</td>
<td>$16.44</td>
<td>$16.44</td>
<td>$16.44</td>
<td>$16.44</td>
</tr>
<tr>
<td>LPEA Demand</td>
<td>$33.56</td>
<td>$64.35</td>
<td>$26.85</td>
<td>$33.56</td>
</tr>
<tr>
<td>Pur Pwr Demand</td>
<td>$21.27</td>
<td>$63.82</td>
<td>$11.60</td>
<td>$19.78</td>
</tr>
<tr>
<td>Pur Pwr Energy</td>
<td>$27.49</td>
<td>$77.69</td>
<td>$11.47</td>
<td>$0</td>
</tr>
<tr>
<td>Total Expenses</td>
<td>$98.76</td>
<td>$222.30</td>
<td>$66.36</td>
<td>$69.78</td>
</tr>
<tr>
<td>Standard Revenue</td>
<td>$103.66</td>
<td>$253.55</td>
<td>$55.75</td>
<td>$21.50</td>
</tr>
<tr>
<td>Standard Margin</td>
<td>$4.90 4.7%</td>
<td>$31.25 12%</td>
<td>-$10.61 -19%</td>
<td>-$48.28 -225%</td>
</tr>
</tbody>
</table>

LPEA: Net Metering Economics Summary

- If a typical 654 kWh member net meters with 100% solar
  - LPEA expenses decrease by $28.98
  - LPEA revenues decrease by $82.16
  - Net impact to LPEA is loss of $53.18 or $0.081/kWh
- LPEA currently net meters 10 million kWh annually
  - Impact from net metering is $810,000 annually
  - LPEA rates are currently 0.8% higher to accommodate current net metering practices

Would PV’s Direct Costs to LPEA Be Offset by Its Benefits?

### Build-Up of PV Value in California

<table>
<thead>
<tr>
<th>Value Category</th>
<th>Cost Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value of Health Benefits*</td>
<td>0.02 - 0.04</td>
</tr>
<tr>
<td>Value of Avoided NOx Emissions*</td>
<td>0.01 - 0.03</td>
</tr>
<tr>
<td>Value of Avoided CO2 Emissions*</td>
<td>0.33 - 1.77</td>
</tr>
<tr>
<td>Value of Avoided Water Use</td>
<td>0.01 - 0.05</td>
</tr>
<tr>
<td>Value of Fossil Fuel Price Hedge</td>
<td>0.41 - 0.95</td>
</tr>
<tr>
<td>Value of Grid Support*</td>
<td>0.09 - 0.28</td>
</tr>
<tr>
<td>Avoided Generation and T&amp;D Losses*</td>
<td>Site Specific</td>
</tr>
<tr>
<td>Avoided Generation Fuel Cost (Natural Gas)</td>
<td>3.24 - 9.71</td>
</tr>
<tr>
<td>Avoided Generation Variable Operation &amp; Maintenance Cost*</td>
<td>0.00 - 0.08</td>
</tr>
<tr>
<td>Avoided Distribution Cost* (All Costs Allocated to Summer Peak)</td>
<td>0.19 - 2.95</td>
</tr>
<tr>
<td>Avoided Transmission Cost* (All Costs Allocated to Summer Peak)</td>
<td>0.04 - 0.72</td>
</tr>
<tr>
<td>Avoided Generation Capacity Fixed Operation &amp; Maintenance Cost*</td>
<td>0.19 - 0.44</td>
</tr>
<tr>
<td>Avoided Generation Capacity Capital Cost*</td>
<td>2.73 - 4.01</td>
</tr>
</tbody>
</table>

RANGE OF TOTAL VALUE OF PV: 7.8 – 22.4 ¢/kWh

Conclusions: NEM for CSG Impacts ALL LPEA Members

- Jury still out on whether the NET impact to non-CSG participants is positive or negative
  - Ongoing debate on how to value (in)direct benefits
  - (In)direct benefits being incorporated into tariffs in some jurisdictions (e.g., New York)
- Remote circuits in rural Colorado limit feasible PV capacity more so than for denser circuits
- Politically divided population = politically divided LPEA cooperative membership.
Thank you! Questions?

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