Georgia Tech Clean Energy Speaker Series:
SE Solar Project Development Incentives & Challenges

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May 26, 2010
Today’s topics

- Three types of solar – three business models
- Drivers and impediments for commercial solar project development
- North Carolina case study: SunEdison’s Duke project
Three types of PV, three business models

Residential
- Standard Solar, Silver Spring, MD

Commercial/Industrial
- SunEdison, Kohl’s Laguna Niguel, CA

Utility
- SunEdison, Alamosa, CO
Residential PV: Largely Cash Purchase Business

Residential:

- Historically cash purchase
- Alternative financing models just getting started: PACE and power purchase agreements
- Characterized by upfront incentives
- Higher installation costs, but offsetting highest electricity cost
- Net metered, grid tied systems most common
- Less cost sensitive customer
- Key challenges: upfront investment, HOA, complexity for home owner
Commercial/Industrial: Dominated by Power Purchase Agreements

- 90% of commercial/industrial done via power purchase agreements (PPAs)
- Characterized by output based incentives (PBI, SREC)
- Economies of scale drop installation costs, but offsetting lower electricity rates
- Customer is very cost sensitive
- Provides the benefit of distributed generation
- Interconnected on customer side of the meter
- Roof or ground mount
- Key challenges: financing, net metering

Utility Scale: Power Purchase Agreements or Ownership

Utility:

- Ownership models driven by state regulations
- Competing against wholesale power rates
- Greatest economies of scale but incurring earthwork and foundation costs
- Interconnected on the utility side of the meter
- 100% ground mount
- Key challenges: land use, permitting, financing, utility interest, interconnection studies
Solar construction occurring all over the US

CA: 1,102 MW
NV: 100 MW
CO: 59 MW
AZ: 50 MW
HI: 27 MW
MA: 18 MW
NY: 34 MW
CT: 20 MW
NJ: 128 MW
FL: 39 MW

Solar friendly states on the rise

What makes a state “solar friendly?”

- **Renewable Portfolio Standard (RPS):** specifies amount of energy that must come from renewable sources by a target year. Some states have specific solar RPS requirements.

- **Net metering:** allows electricity to flow back to the grid when a customer’s generation exceeds usage, offsetting electricity consumed at a different time.

- **Interconnection standards:** set of technical, contractual, metering, and rate arrangement processes by which an electric customer connects an electricity-generating system to the grid.
Solar financials driven by more than just insolation levels

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<thead>
<tr>
<th></th>
<th>South East US</th>
<th>North East US</th>
<th>West US</th>
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<tbody>
<tr>
<td>Solar Insolation Levels</td>
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<td>Electricity Rates</td>
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<td>Peak/Congestion Charges</td>
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<td>Large peak load</td>
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Sun Edison LLC - confidential & proprietary. Do not redistribute.
Benefits of solar

Distributed solar produces power where needed

Solar offsets peak power

1. Actual SunEdison production data from 200 kW SunEdison solar installation—August 2008
Source: SunEdison team analysis; Illustrative example
Distributed solar supports more jobs than any other energy source.

**Job Creation Potential of Various Electricity Generation Assets**

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Number of Jobs per MW</th>
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<tbody>
<tr>
<td>Coal</td>
<td>1</td>
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<tr>
<td>Natural gas</td>
<td>2</td>
</tr>
<tr>
<td>Nuclear</td>
<td>3</td>
</tr>
<tr>
<td>Tidal</td>
<td>4</td>
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<td>Wind</td>
<td>5</td>
</tr>
<tr>
<td>Geothermal</td>
<td>6</td>
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<tr>
<td>Biomass</td>
<td>7</td>
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<tr>
<td>Solar PV</td>
<td>35</td>
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Declaring a state open for solar business

Typical market signals required:
- State incentive structure that encourages private financing
- Ability to secure long-term contracts
- Market demand (RPS)
- Net metering
- Interconnection standards
- Appropriate tax structure
- Zoning/permitting standards
- Incentives designed to meet three separate residential, commercial and utility-scale business models
- Allow 3rd party developers
Case study: Duke Energy Davidson County Project, North Carolina

Basic project information:
- 17 MW Project/ 354 acres
- RFP issued 8/2007
- Contract award 5/2008
- Broke ground summer 2009
- Phase 1 (4 MW) completed 12/2009
- Phase 2 – 4 will be complete 12/2010
Steps in getting Davidson County built

1. Permitting/legal
2. Engineering
3. Financing
4. Construction & procurement
5. Earthwork
6. Foundations
7. Electrical
8. Interconnection
Davidson County Lessons Learned

- Large projects = long timelines
- State tax incentive limits investment, doesn’t encourage it
- Anticipate market/legislative changes
- Utility/developer/legislative/PUC partnership is critical
- Create repeatable template
- Maintain tight control over supply chain

- Non issues:
  - Technology
  - Skilled labor