Solar Electricity Outlook

Source: NREL

Source: SMUD
Outline

- SEPA
- Solar in Florida
- Setting Policy
- Renewable Portfolio Standards
- Position of the Florida Solar Industry Association
About SEPA

- Formed in 1992 as the Utility Photovoltaic Group
- Mission: facilitate solar solutions for **utilities**
  - Provide you with unbiased information
  - Answer your questions, big and small
  - Help you collaborate with utility peers
  - Be the bridge to the solar industry and others
- Membership
  - Electric Utilities – 100 members
  - Industry – 100 members
  - Stakeholders – 100 members
Projects
- Solar Incentive Program Survey
- Solar Capacity Methodology Project
- Utility Metering and Interconnection Survey
- Decoupling White Paper
- Utility Solar Case Studies
- Utility Solar Year in Review
- Utility Business Models

Ongoing Activities
- Online Resource Library
- Solar Programs Options Tool
- Peer Match Tool
- One-on-One Utility Support
- Monthly Phone Seminars
- Utility Travel Scholarships to Solar Power Conference and Expo
- Solar Power Conference and Expo
- Bi-Weekly Electronic Newsletter and Email Alerts
- Membership Directory
- FindSolar.com
- PowerClerk Software Discount
Outline

- SEPA
- Solar in Florida
- Setting Policy
- Renewable Portfolio Standards
- Position of the Florida Solar Industry Association
Solar Radiation

Total = Direct + Diffuse
(sunlight) + (scattered)

PV = Total

CSP/CPV = Direct only
Total – PV
Resource Comparison

1,000 MW in 2006
101 MW in 2006

Source: SEIA
DOE’s Solar America Cities will develop specific local solar infrastructure and deployment plans to provide models for other similarly situated localities.
SOLAR WATER HEATING
CUMULATIVE VALUE FROM 1979 TO 2006

- Solar Water Heater has a design life of 20 years
- Florida residents installed 136,000 solar water heaters from 1978 through 2006
- $500 million industry
- Offset nearly 100 tons of Green House Gases
- In a declining market!

Lakeland Electric has been deploying solar water heating systems and selling thermal energy for years!
Table 3: Annual market growth in selected countries

Table downloaded from the IEA-PVPS website: www.iea-pvps.org
Data may be reproduced with acknowledgement to the IEA Photovoltaic Power Systems Programme

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AUS</td>
<td>2,0</td>
<td>3,0</td>
<td>3,0</td>
<td>3,8</td>
<td>2,8</td>
<td>3,9</td>
<td>4,4</td>
<td>5,5</td>
<td>6,5</td>
<td>6,7</td>
<td>8,3</td>
<td>9,7</td>
</tr>
<tr>
<td>AUT</td>
<td>0,3</td>
<td>0,3</td>
<td>0,5</td>
<td>0,7</td>
<td>0,8</td>
<td>1,2</td>
<td>1,2</td>
<td>4,2</td>
<td>6,5</td>
<td>4,2</td>
<td>3,0</td>
<td>1,6</td>
</tr>
<tr>
<td>DEU</td>
<td>5,3</td>
<td>10,1</td>
<td>14,0</td>
<td>12,0</td>
<td>15,6</td>
<td>44,3</td>
<td>80,9</td>
<td>83,4</td>
<td>153,0</td>
<td>613,0</td>
<td>866,0</td>
<td>953,0</td>
</tr>
<tr>
<td>ESP</td>
<td>0,8</td>
<td>0,4</td>
<td>0,2</td>
<td>0,9</td>
<td>1,1</td>
<td>3,0</td>
<td>3,6</td>
<td>4,8</td>
<td>6,5</td>
<td>10,4</td>
<td>20,3</td>
<td>60,5</td>
</tr>
<tr>
<td>FRA</td>
<td>0,5</td>
<td>1,5</td>
<td>1,7</td>
<td>1,5</td>
<td>1,5</td>
<td>2,2</td>
<td>2,6</td>
<td>3,3</td>
<td>3,9</td>
<td>5,2</td>
<td>7,0</td>
<td>10,9</td>
</tr>
<tr>
<td>ITA</td>
<td>1,7</td>
<td>0,2</td>
<td>0,7</td>
<td>1,0</td>
<td>0,8</td>
<td>0,5</td>
<td>1,0</td>
<td>2,0</td>
<td>4,0</td>
<td>4,7</td>
<td>6,8</td>
<td>12,5</td>
</tr>
<tr>
<td>JPN</td>
<td>12,2</td>
<td>16,2</td>
<td>31,7</td>
<td>42,1</td>
<td>75,2</td>
<td>121,6</td>
<td>122,6</td>
<td>184,0</td>
<td>222,8</td>
<td>272,4</td>
<td>289,9</td>
<td>286,6</td>
</tr>
<tr>
<td>KOR</td>
<td>0,1</td>
<td>0,3</td>
<td>0,4</td>
<td>0,5</td>
<td>0,5</td>
<td>0,8</td>
<td>0,7</td>
<td>0,6</td>
<td>2,5</td>
<td>5,0</td>
<td>21,2</td>
<td></td>
</tr>
<tr>
<td>NLD</td>
<td>0,4</td>
<td>0,9</td>
<td>0,7</td>
<td>2,5</td>
<td>2,7</td>
<td>3,6</td>
<td>7,7</td>
<td>5,8</td>
<td>19,6</td>
<td>3,6</td>
<td>1,7</td>
<td>1,5</td>
</tr>
<tr>
<td>USA</td>
<td>9,0</td>
<td>9,7</td>
<td>11,7</td>
<td>11,9</td>
<td>17,2</td>
<td>21,5</td>
<td>29,0</td>
<td>44,4</td>
<td>63,0</td>
<td>100,8</td>
<td>103,0</td>
<td>145,0</td>
</tr>
</tbody>
</table>
**Annual PV by State**

### Kilowatts (DC) (grid-tied only)

<table>
<thead>
<tr>
<th>State</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>70.6</td>
<td>87.1</td>
</tr>
<tr>
<td>New Jersey</td>
<td>17.9</td>
<td>16.4</td>
</tr>
<tr>
<td>Nevada</td>
<td>2.6</td>
<td>14.6</td>
</tr>
<tr>
<td>Colorado</td>
<td>0.9</td>
<td>12.4</td>
</tr>
<tr>
<td>New York</td>
<td>2.7</td>
<td>4.4</td>
</tr>
<tr>
<td>Hawaii</td>
<td>0.3</td>
<td>2.4</td>
</tr>
<tr>
<td>Arizona</td>
<td>2.1</td>
<td>2.1</td>
</tr>
<tr>
<td>Connecticut</td>
<td>0.5</td>
<td>1.8</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>1.5</td>
<td>1.4</td>
</tr>
<tr>
<td>Oregon</td>
<td>0.5</td>
<td>1.1</td>
</tr>
<tr>
<td>Other States</td>
<td>1.9</td>
<td>4.4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>101.5</strong></td>
<td><strong>148.1</strong></td>
</tr>
</tbody>
</table>

Source: IREC / Prometheus Institute

Growth: CA, FL, HI, MD, NC, NJ, NM, NY, OR, PA, TX
Currently PV is financially competitive where there is some combination of high electricity prices, excellent sunshine and/or state/local incentives.
Attractive in about 250 of 1,000 largest utilities, which provide ~37% of U.S. residential electricity sales. 85% of sales (in nearly 870 utilities) are projected to have a price difference of less than 5 ¢/kWh between PV and grid electricity. In large areas, PV is cheaper than grid electricity.
Attractive in about 450 of 1,000 largest utilities, which provide ~50% of U.S. residential electricity sales.

91% of sales (in nearly 950 utilities) have a price difference of less than 5 ¢/kWh between PV and grid electricity.

Across most of the highest U.S. population areas, PV is cheaper than grid electricity.
Rooftop Potential (2015)

720 GW potential

Source: DOE/NREL
PV installation
- some 440 kWp
- some 150 inverters

strong grid
- PV on 4 feeders
- transformer Sn: 400 kVA
- Sk: 11 MVA
- main feeder: 150 mm² Al
- apartment branch: 35 mm² Al

VdEW guidelines
- 2% voltage rise permitted
- 220 kVA inverter power
Outline

- SEPA
- Solar in Florida
- Setting Policy
- Renewable Portfolio Standards
- Position of the Florida Solar Industry Association
Most energy technologies have been subsidized – the trick is to adjust subsidies with the market and price changes.
CALIFORNIA PROGRAM HISTORY
Japanese Residential Program History

Source - NEDONEF and Sharp estimate
Incentives Dropping – some quickly!!!
POLICY OBJECTIVES

- Market diversity
  - Customer and application variety
  - Retrofit and new construction
  - Small to large scale
  - Solar thermal and solar electric systems.
- Economic development & job
- Distributed solar market
- Reduction of system installed cost
- Long-term program
- Flexible program
- Adequate Funding
- Value grid benefits:
- Value societal and environmental benefits:
- Public awareness
POLICY DESIGN CRITERIA

- Maximize investor confidence
- Economic Efficiency
- Program Incentive Monitoring
- Program Administrative transparency and simplicity
Balance of system / installation costs will fall as policy becomes more solar friendly

State/local governments and utilities can have major impacts on the local price of solar electricity by impacting installation costs

Solar production is global but every installation is local

State/local governments and utilities can promote solar by:
- streamlining solar permitting
- facilitating interconnection to the grid
- establishing solar-friendly net metering regulations
- banning homeowner association restrictions against solar
- establishing installer and code official training centers at community colleges
- offering tax incentives (sales, income, property) to solar purchasers
- creating public outreach and information campaigns
Outline

- SEPA
- Solar in Florida
- Setting Policy
- Renewable Portfolio Standards in Florida
- Position of the Florida Solar Energy Industry Association
State - RPS

Data: IREC
State – RPS Solar

~ 9,000 MW @ ~500,000 sites

Data: IREC, SEPA
FLORIDA ENERGY RELATED GOALS

- Reduce current emission levels 10% by 2012, 25% by 2025 and 40% by 2050

*Though an Executive order is just guidance to legislative agencies, this is assumed to be the initial target*

- To meet this target, both a 20% Renewable Portfolio Standard and energy efficiency are necessary.
What are the emission goals?

<table>
<thead>
<tr>
<th>Base Year and Goal Years</th>
<th>Millions kWh*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007**</td>
</tr>
<tr>
<td>Electric Consumption with Business as Usual - All Sectors* @ 2.8% Average Growth</td>
<td>225,889</td>
</tr>
<tr>
<td>Less Energy Efficiency Reductions increasing at 2.5%/yr***</td>
<td>241,688</td>
</tr>
<tr>
<td>Less emission neutral RPS of 8% 2012 (19,335 million kWh) and 20% 2025 &amp; 2050 (60,000 &amp; 122,000 million kWh)</td>
<td>222,353</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emissions</th>
<th>Base</th>
<th>Less 10%</th>
<th>Less 25%</th>
<th>Less 40%</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂ (1000 metric tons)</td>
<td>130325</td>
<td>117,293</td>
<td>97,744</td>
<td>78,195</td>
</tr>
<tr>
<td>lbs/kWh</td>
<td>1.1539</td>
<td>1.0550</td>
<td>0.8092</td>
<td>0.3194</td>
</tr>
<tr>
<td>SO₂ (1000 metric tons)</td>
<td>412</td>
<td>371</td>
<td>309</td>
<td>247</td>
</tr>
<tr>
<td>lbs/kWh</td>
<td>0.0036</td>
<td>0.0033</td>
<td>0.0026</td>
<td>0.0010</td>
</tr>
<tr>
<td>NOx (1000 metric tons)</td>
<td>227</td>
<td>204</td>
<td>170</td>
<td>136</td>
</tr>
<tr>
<td>lbs/kWh</td>
<td>0.0020</td>
<td>0.0018</td>
<td>0.0014</td>
<td>0.0006</td>
</tr>
</tbody>
</table>

Both a RPS and Energy efficiency through utility measures, codification and builder mandates can result in both immediate and long term air quality benefits to Florida.
Outline

- SEPA
- Solar in Florida
- Setting Policy
- Renewable Portfolio Standards in Florida
- Position of the Florida Solar Energy Industry Association
TO ASSURE A REASONABLE SOLAR FACTOR OF THE RPS, A 2% PV PLUS A 2% SOLAR THERMAL SET ASIDE ARE PROPOSED, ALONG WITH A SUITE OF POLICIES (MOST OF WHICH ALSO PROMOTE OTHER RENEWABLES)

✓ Net Metering
✓ Interconnection
✓ Property tax exemption
✓ Licensing, certification

- Building code requirements (new, remodel, disaster rebuild, existing incentive program)
- Delete the eminent domain regulatory issue
- When undergrounding neighborhoods, design the distribution plant for DG compatibility
- A market responsive renewable energy payment
**Benefits from solar investment**

<table>
<thead>
<tr>
<th>Solar Electric-PV based on 4 GW new</th>
<th>Solar Thermal based on 105 million sq.ft. new</th>
</tr>
</thead>
<tbody>
<tr>
<td>6000 MWh</td>
<td>6000MWh</td>
</tr>
<tr>
<td>123 million tons of CO₂</td>
<td>49 million tons of CO₂</td>
</tr>
<tr>
<td>290,000 tons of SO₂</td>
<td>155,000 tons of SO₂</td>
</tr>
<tr>
<td>522,000 tons of NOₓ</td>
<td>85,000 tons of NOₓ</td>
</tr>
<tr>
<td>54,000 job-years in state</td>
<td>18,000 job-years total</td>
</tr>
<tr>
<td>83,000 job-years in US</td>
<td></td>
</tr>
<tr>
<td>1700 MW dispatchable equivalent</td>
<td>820 MW of demand reduction</td>
</tr>
<tr>
<td>26 peakers</td>
<td></td>
</tr>
<tr>
<td>Peak Energy Values ??</td>
<td></td>
</tr>
<tr>
<td>CA 23-35, NY 9-16 ¢/kWh</td>
<td></td>
</tr>
</tbody>
</table>
Email quote: Ed Reagan Gainesville Regional Utilities after SEPA fact finding mission to Germany with 31 US utilities

I’ve been really torn – we were heading down the path for a big group purchase (through Coelectric or more recently SEPA based on your comment).

On the other hand, as a muni this leaves lots of federal incentives on the table. Monetizing the tax issues is pretty complicated. It also locks in a system type etc etc.

I also really liked the economic stimulus package features of an FIT, the ability to allow residential, commercial, and green field projects, and the opportunity it gives for small investors. A utility project just does not do this.
Thank you…

Christy Herig
727-543-1285
cherig@solarelectricpower.org
www.SolarElectricPower.org
The Solar Electric Power Association is a 501(c)3 nonprofit membership organization, formed in 1992 as the Utility Photovoltaic Group. SEPA has more than 300 utility, electric service provider, manufacturer, installer, government, and research members. Our mission is to facilitate solutions for the use and integration of solar electric power by utilities, electric service providers, and their customers. To achieve this mission, SEPA:

1. Provides products, services, and strategies;
2. Fosters business to business networking;
3. Shares information on solar electric technologies, applications, programs, and business solutions; and,
4. Reports on and evaluates policies, regulations, and legislation.

Current Projects
SEPA has a number of projects underway. If you are interested in serving an advisory or other role for any of these projects, please let us know.

1. Solar Incentive Program Survey
SEPA has coordinated the design of a standard survey that solar incentive program managers, at utilities or state organizations, can distribute to their past participants that have installed a solar system on their home or business. Learning about why consumers participate in the solar incentive and their experiences with the process will help program managers improve them for future participants. SEPA is collecting individual results for each program, performing a broad analysis across the programs, and publishing a final aggregated report.

2. Solar Capacity Methodology Project
SEPA has partnered with SUNY Albany, Clean Power Research, and Vote Solar on a consensus building project through the Solar America Initiative to bring utilities and stakeholders together to develop and agree on 1-3 methodologies for calculating photovoltaic capacity value. While the diversity of solar resources, installation variables, and utility operations prevent consensus on any one number, the development of 1-3 standard methodologies through a consensus process will bring legitimacy and understanding among the various stakeholders.

3. Utility Metering and Interconnection Survey
SEPA has completed a survey effort, in collaboration with IREC, to better understand utility metering and interconnection practices - costs, requirements, etc. The final report, to be released in February 2008, will take an objective look at the results and make best practices recommendations that provide win-win situations for utilities and customers.

4. Decoupling White Paper
SEPA is currently collaborating with the Regulatory Assistance Project on a white paper related to decoupling and solar. While decoupling has received increased attention in the energy efficiency world, it is not commonly known in the solar industry as a policy method for reducing the issue of "lost revenues" due to decrease sales of electricity when a customer installs a solar system.

5. Utility Solar Case Studies
SEPA is developing a series of 15-20 case studies of successful and replicable utility solar projects or programs that will be integrated into SEPA’s SPOT and Peer Match tools (see descriptions below), as well distributed directly to utilities around the country. The intent is to demonstrate utility program types and structures that benefit both the utility and the solar industry.

6. Utility Solar Year in Review
SEPA will publish a "Utility Solar Year in Review," to summarize and categorize utility solar activities and the results of SEPA’s projects, which will include highlights of:

- Historical, 2007, and forecasted utility owned/contracted solar installations;
- Summary of customer-owned solar installations;
- Major utility solar projects of note initiated in 2007; and
- SEPA activity and project results as outlined above

7. Utility Business Models
Over the next 5-10 years, the customer-utility relationship will change as onsite generation, storage, and efficiency make commercial and residential customers more dynamic participants in the electric industry. Even today commercial customers in some states can reduce their annual consumption by 20-30% with a solar system that is owned and operated by a third-party developer, paying nothing up-front for the system. While these situations and electricity amounts are currently small, they will increase in scale, and SEPA is undertaking an effort to understand ways that utilities can transform their business approach to retain customer and utility benefits.
Ongoing Activities
As always, we are continuing our ongoing activities and are always looking for new ones to add to the list.

1. Online Resource Library
The Resource Library located at www.SolarElectricPower.org has over 200 solar documents categorized by individual topic and date. Reports from around the industry are added as they become available.

2. Solar Programs Options Tool
SEPA has built and is currently putting the final tweaks on the Solar Programs Options Tool (SPOT). SPOT is an online evaluation tool that recommends and prioritizes solar electricity options for electric utilities, including:
- Residential & Commercial Incentives
  - Solar Generating Plants
  - Power Purchase Agreements (PPAs)
  - Renewable Energy Credits (RECs)
  - Green Power Pricing Programs
  - Education, Demonstration, and Research
SPOT users provide basic information about their utility and then identify and rank their solar goals and objectives. The result is recommendations and information about program options that are most likely to help the utility meet its stated goals.

3. Peer Match Tool
SEPA’s online Utility Peer Match tool launched in April/May 2007. This tool allows utility employees to identify and contact other utility employees more experienced in the solar programs and/or technologies of interest.

4. One-on-One Utility Support
SEPA staff provides one-on-one direct support on a regular basis to utilities and other SEPA members with questions about solar technologies, programs, and projects, which directly and indirectly results in increased utility and/or customer use of solar electric power.

Through the Solar America Initiative, SEPA will be developing a Utility Solar Toolkit that provides a comprehensive resource for utilities of all experience levels, geographies, and types, including an interface designed to filter the experience to a utility’s specific criteria. Additionally, SEPA will be hiring three regional directors in 2008 responsible for developing on-going relationships with target utilities in their region and providing resources, materials, and events for utilities at-large, as well as one-on-one utility interaction.

5. Monthly Phone Seminars
SEPA hosts monthly phone seminars on topics of interest to both utilities and the solar industry. Details can be found on the SEPA Events page.

6. Utility Travel Scholarships to Solar Power Conference and Expo
SEPA offers $1,000 travel scholarships to utility employees who could not otherwise attend the conference due to budget or travel restrictions. The intent of the scholarships is to increase the geographic and experience diversity of utility attendees and over time, the areas where solar projects and programs develop. For more information, contact Emily Brown at 202-857-0898 x2.

7. Solar Power Conference and Expo
This event, jointly presented by SEPA and SEIA, is the largest U.S. solar event. SEPA members receive significant discounts on registration and exhibition fees. The conference includes tracks on policy, technology, markets, and finance.

8. Bi-Weekly Electronic Newsletter and Email Alerts
SEPA members automatically receive the most relevant and important news on solar technologies, policies, and programs. An archive of past newsletter is available to members in the Members Only section of this website.

9. Membership Directory
The membership directory in the Members Only section of our website allows you to pick up the phone to call other members any time to ask questions, request advice, or discuss potential business opportunities.

10. FindSolar.com
SEPA, together with the American Solar Energy Society, manages this online national solar directory and costs/savings estimator. FindSolar.com provides a tool for SEPA members and their customers no matter where they are located in the U.S.

11. PowerClerk Software Discount
PowerClerk allows managers of solar programs to efficiently and effectively receive incentive applications, process incentive applications, analyze programs, and report on program results. PowerClerk is offered by Clean Power Research, and SEPA members receive a significant discount on the set-up fee.