

Solar Electric Power Association Research Overview

IEA PV Power Systems Workshop

Anaheim, CA

Oct. 26, 2009

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Solar Electric Power Association

About SEPA



- Mission is to facilitate utility use & integration of solar electric power
- Non-profit membership organization
- Reliable source of unbiased information about solar technologies, policies, and programs
- Bridge between utility & solar industries

SEPA Program Areas



About SEPA



Ongoing Activities

- **One-on-One Utility Support**
- **Solar Power International Conference and Expo w/Utility and Regulator Travel Scholarships**
- **Utility Solar Conference**
- **Online Resource Library**
- **Monthly Phone Seminars**
- **Bi-Weekly Electronic Newsletter and Email Alerts**
- **Membership Directory**
- **Fact finding missions to Germany, Spain, and.....**

Research Projects 2008



- **Electric Utilities and Solar, A Market Review**
- **2007 Top Ten Utility Solar Integration Rankings
Fact Finding Mission to Germany for Utility
Decision Makers**
- **Utility Solar Business Models**
- **Photovoltaic Capacity Valuation Methods**
- **Residential Photovoltaic Metering and
Interconnection Study**

Research Projects 2009

- **Utility Solar Procurement Study - Jan 2009**
 - Utility Industry Survey
 - Solar Industry Survey
 - Recommendations for key elements and design of procurement documents
- **Utility Solar Tax Manual - Jan 2009**
 - ITC issues specific to utilities
 - How to utilize the credit
 - Clean Renewable Energy Bonds

Research Projects 2009 SEPA

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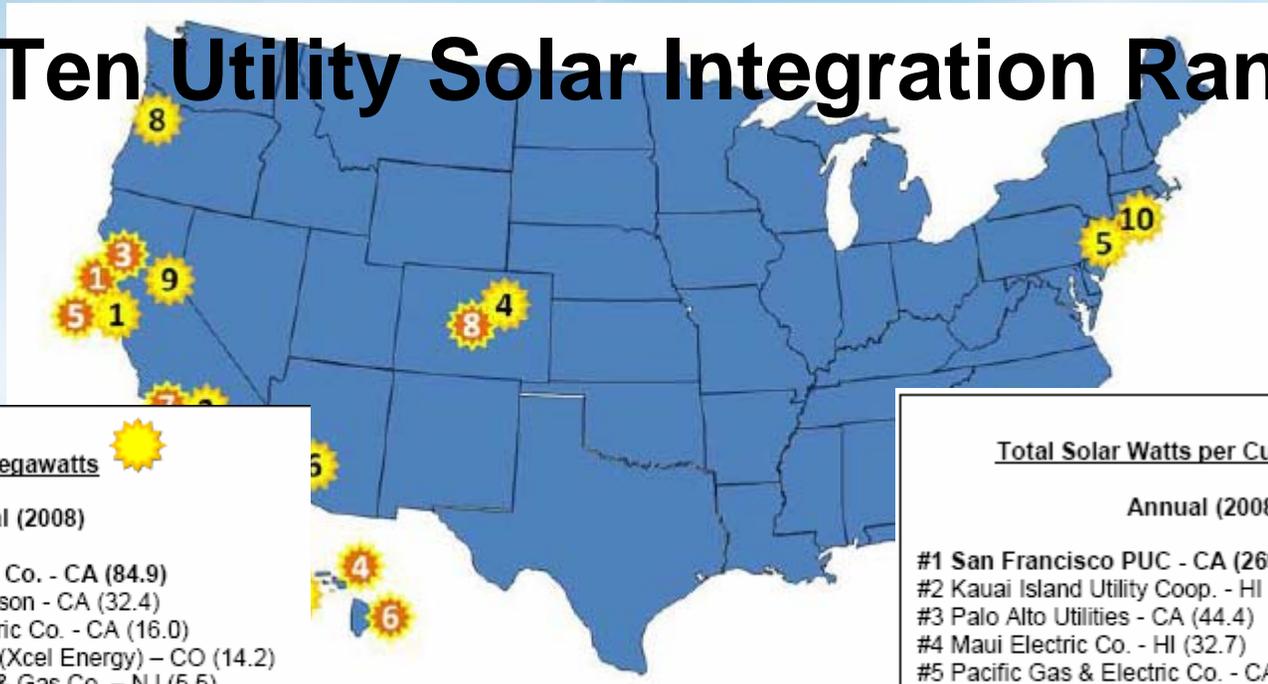
Decoupling Utility Profits from Sales: Issues for the Photovoltaic Industry

- Revenue loss
- How rates are set
- Decoupling mechanisms
 - Revenue Cap
 - Inflation and productivity
 - Revenue per customer
- Alternatives to decoupling
 - Net metering limitations
 - Real time Pricing
 - Straight Fixed Variable rate design
 - Net loss revenue adjustments
 - More frequent rate cases

Research Projects 2009 SEPA

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- **Distributed Photovoltaic Generation for Regulated Utilities**
- **Top Ten Utility Solar Integration Rankings**



Total Solar Megawatts

Annual (2008)

- #1 Pacific Gas & Electric Co. - CA (84.9)
- #2 Southern California Edison - CA (32.4)
- #3 San Diego Gas & Electric Co. - CA (16.0)
- #4 Public Serv. Co. of CO (Xcel Energy) - CO (14.2)
- #5 Public Service Electric & Gas Co. - NJ (5.5)
- #6 Arizona Public Service Co. - AZ (3.56)
- #7 Hawaiian Electric Co. - HI (3.54)
- #8 Portland General Electric - OR (3.538)
- #9 Sacramento Municipal Utility District - CA (2.9)
- #10 Long Island Power Authority - NY (2.5)

Total Solar Watts per Customer

Annual (2008)

- #1 San Francisco PUC - CA (2696.3)
- #2 Kauai Island Utility Coop. - HI (47.1)
- #3 Palo Alto Utilities - CA (44.4)
- #4 Maui Electric Co. - HI (32.7)
- #5 Pacific Gas & Electric Co. - CA (16.4)
- #6 Hawaii Electric Light Co. - HI (13.6)
- #7 Burbank Water & Power - CA (12.9)
- #8 Black Hills Energy - CO (12.5)
- #9 Hawaiian Electric Co. - HI (12.0)
- #10 San Diego Gas & Electric Co. - CA (11.8)

Examples of Recent PV Announcements (>25 MW)



Project/Program	MW	Purchasing Utility	State	Anticipated Completion
SCE DG PV Program	250	Southern California Edison	CA	2008-2012
Topaz Solar Farm	550	Pacific Gas & Electric	CA	2011-2013
PG&E PV DG Program	500	Pacific Gas & Electric	CA	2015
California Valley Solar Ranch	250	Pacific Gas & Electric	CA	2010-2012
APS DG Program	125	Arizona Public Service	AZ	2009-2013
Solar4All DG PV Program	120	PSEG	NJ	2009-2013
CPS Energy Solar Project	100	CPS Energy	TX	2010
SDG&E DG PV Program	77	San Diego Gas & Electric	CA	TBA
Babcock Ranch Project	75	Florida Power & Light	FL	2010
JCP&L DG PV Program	42	Jersey Central P&L	NJ	2012
LIPA PPA (2 plants)	50	Long Island Power Authority	NY	2011
PSEG Loan Program	30	PSEG	NJ	2008
Cimarron Solar Project	30	Tri-State Generation	NM	2010
Austin Energy PV Project	30	Austin Energy	TX	2010
DeSoto NextGen Solar Center	25	Florida Power & Light	FL	2009
Florida Solar One	25	Tampa Electric	FL	2011

Research Projects in Development

- **Photovoltaic Incentive Program Survey - late 2009**
In coordination with SEPA, an electronic survey was developed and distributed by U.S. utility and state PV incentive program managers to consumers who installed PV systems and received a rebate to offset the cost. The survey asked about the participants' satisfaction and experiences with the installation, incentive, interconnection, and ongoing maintenance of their systems. The resulting report analyzed the data across geographies to draw distinctions and parallels across the country.
- **Solar Market Structure Comparison - late 2009**
Europe and the United States have strikingly different solar market structures, most clearly diverging around the use of feed-in tariffs and net metering respectively. This comparative study will look at the regulatory, incentive and metering components used to drive new solar installations in each solar market and draw out similarities and differences in approach and results between the two market styles.
- **Photovoltaic Technology Comparison - late 2009**
There are at least seven commercial photovoltaic panel technologies currently available in the market. This study will be a qualitative and quantitative comparison of photovoltaic technology types based on their technological characteristics, primary market uses, environmental profiles and other relevant components that define these traditional and emerging solar generation types.

BUSINESS MODEL DEFINITION

- a focusing device that mediates between technology development and economic value creation.

Harvard Business School scholars Henry Chesbrough and Richard S. Rosenbloom



Drivers

- Favorable demand-side policies (eg, decoupling)
- Renewable portfolio standards (state and possible federal)
- Climate change / future cost of carbon
- Volatile fuel prices
- Decreasing solar costs, combined with utility buying power
- Customer demands for “green”
- Availability of 30% federal incentive to investor owned utilities (previously excluded)

EMERGING* MODELS CONSIDERED



Utility ownership of solar assets

Utility purchasing solar output

Utility financing solar assets

* The report also describes existing state, regional and utility solar programs, and how these differ from the business models considered here.

Infinite number of utility business models



- 2008 SEPA study identified 13 solar business models under consideration by various utilities
 - others have since emerged
- A promising utility solar business model:
 - creates value in the energy marketplace
 - enables the utility to capture part of that value
 - will sustain itself over time
- “Utility Solar Business Models: Emerging Utility Strategies & Innovations” available for free download at www.solarelectricpower.org
- Phase II of the study is now beginning – cost allocations

THE ALL-IN-ONE



\$100 million for solar loans to residential & commercial customers

Paid back by customers in form of RECs to help utility meet RPS

120 MW program over next 5 years

40 MW of utility owned pole mounted AC systems
(200 W panels on 200,000 poles)

43 MW of utility owned distributed generation on government facilities

35 MW of centralized PV (brownfields, underdeveloped real estate)

2 MW of on affordable housing



Business Models Phase 2



Program Overview:

- Petition filed with Florida Public Service Commission 5/16/08; granted 8/4/08; docket closed 9/2/08.
- FP&L will build, own & operate three discrete central solar projects totaling 110 MW throughout Florida.
 - 25 MW DeSoto Energy Center is expected to be the nation's largest PV facility when completed in late 2009; will use SunPower PV tracking technology.
 - 75 MW Martin Energy Center will be the world's first hybrid solar thermal / combined cycle plant supplying thermal energy for existing steam turbine; will be nation's 2d largest solar thermal plant when built in 2010.
 - 10 MW Space Coast Energy Center at Kennedy Space Center; public/private partnership expected to allow FP&L & NASA to leverage engineering, design & operational expertise, & develop & refine solar technology.
- Plants proposed & approved by Florida Public Service Commission under Florida Statutes §366.92 [House Bill 7135], effective 7/1/08, providing for full cost recovery of all reasonable & prudent costs of up to 110 MW for zero-GHG emissions renewable projects with all land, zoning & transmission rights secured.
 - costs to be deemed reasonable & prudent if provider used reasonable & customary industry practices in design, procurement & construction in a cost-effective manner appropriate to the facility location.

Business Models Phase 2



Program Size: 110 MW Same

Program Cost: \$688M (excl interest during construction) Same Project costs reported to be \$173.5M for DeSoto; \$476.3M for Martin; \$78.9M for Space Center.

Project Size: DeSoto PV: 25MW Martin ST: 75MW Space Ctr PV: 10MW Same Estimated capacity factors: DeSoto PV – 19.4% (if stationary; more if tracking) Martin solar thermal – 23.6% Space Center PV – 18% (stationary)

Utility Retains, Sells or Acquires: RPS credit; electricity to grid; thermal to CCGT Same

Cost Recovery & Billing:

Eligible for full cost recovery, per statute Same PSC approved eligibility under §366.92 environmental cost recovery clause (ECRC); prudence will be considered in a subsequent ECRC proceeding. Estimated customer bill impact 83¢/1,000 kWh initially, 31¢ over 25 years of operation.

Other: FP&L testimony cites access to parent FPL Group's ownership of 310 MW SEGS plant & "unique industry leading skills & in-depth solar experience"; multi-pronged strategy of developing renewable projects, managing renewable programs, negotiating renewable PPAs, & developing renewable supply side generation. Also confirms land & transmission rights & zoning permits for each site, as required by statute. FP&L petition received very favorably by PSC & approved unanimously.

Important Dates: Docket closed as of 9/2/08.

Project Links:

Business Models Phase 2



Utility: FLORIDA POWER & LIGHT **Type:** investor-owned
Program Name: *FPL Next Generation Solar Energy Centers*

Program Type(s): Central – 3 separate facilities totaling 110 MW, at 3 different locations,

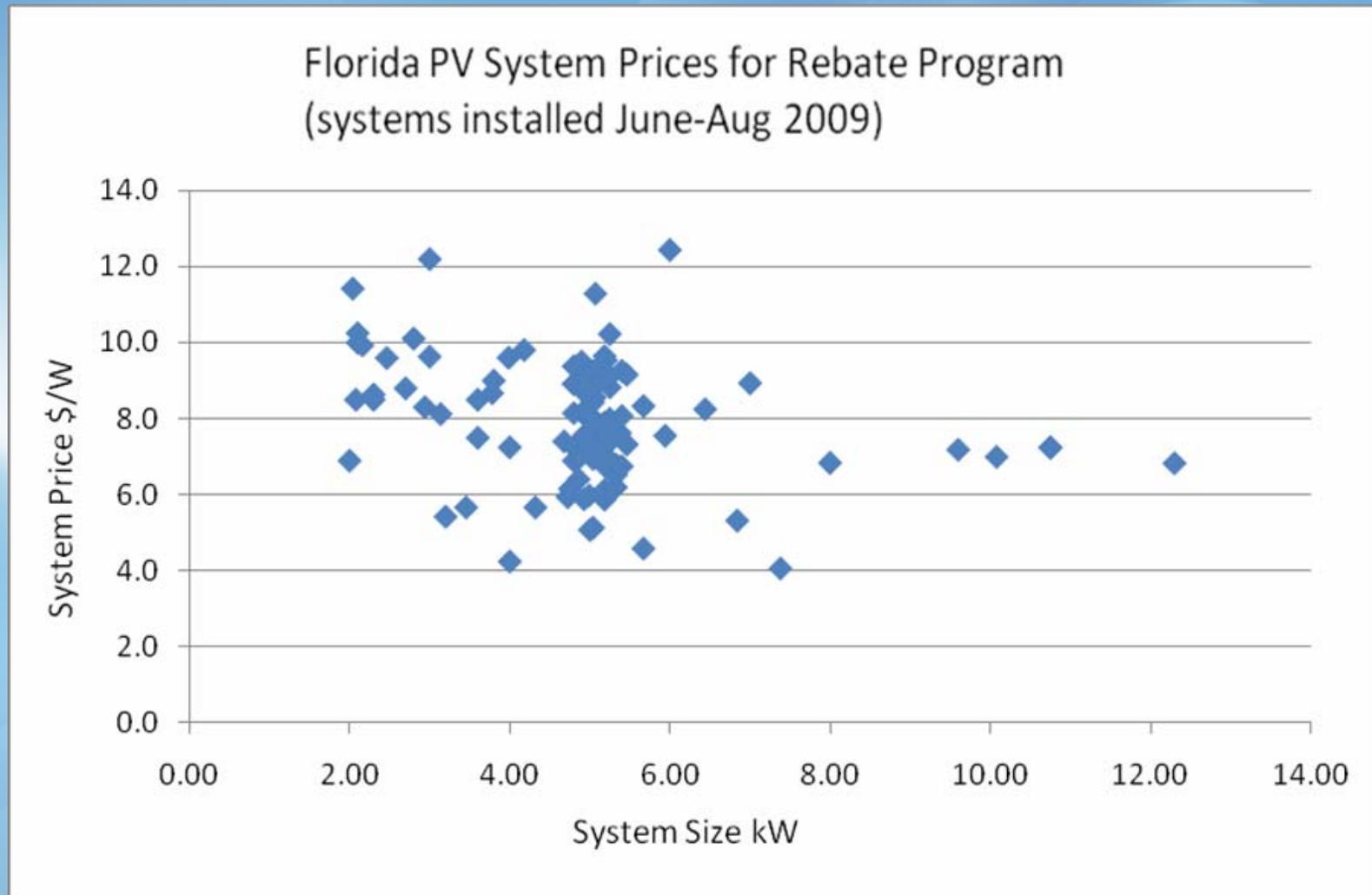
Technologies: Two PV, one solar thermal (trough)

Asset Ownership: Utility

Side of Meter: Utility

Siting: Two on utility property, including solar thermal connected to existing combined cycle; third on federal property at Kennedy Space Center

Prices are Dropping – but.....



Soon to be the largest PV system in the US – Arcadia, FL



727.520.8181
www.aerophoto.com

Desoto Next Generation Solar Energy Center

Image # 90724 1012
Date 07.24.09

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Thank you!



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