

2012 SEPA Utility Solar Rankings

solar electric power association



Sixth Annual 2012 SEPA Utility Solar Rankings

June 2013

Bart Krishanmoorthy Senior Research Associate Solar Electric Power Association

Becky Campbell, PE Senior Manager of Research Solar Electric Power Association Mike Taylor Director of Research Solar Electric Power Association





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Acknowledgements

The Solar Electric Power Association would like to thank all the participating utilities for submitting their data in the survey (see appendix for a full list), as well as the American Public Power Association, Edison Electric Institute, and the National Rural Electric Cooperative Association in assisting with distributing the survey. Special thanks goes to Larry Sherwood at IREC for collaborating on data verification.

Feedback

The Solar Electric Power Association would appreciate feedback on this and past reports, as well as new areas of research we should consider in the future. Please take a moment to provide comments and suggestions through an online survey: http://tinyurl.com/SepaReportFeedback

Cover Photo

Construction at the 290 MW Agua Caliente Project in Yuma County, Arizona. Pacific Gas and Electric holds a PPA contract for the project's energy. (Courtesy: First Solar, Inc.)

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About the Report

The Solar Electric Power Association's (SEPA) sixth annual Utility Solar Rankings report details the results of an annual survey sent to hundreds of utilities in the United States asking them about the solar electric installations in their service territories. All data is directly reported and the results do not include any estimates.

Solar energy installations can be owned by customers, solar companies, or the utilities themselves and range from residential homes to large solar farms. Nearly all of the projects are integrated into the electric grid. The annual rankings include new solar electric projects installed in 2012. The cumulative rankings take into account all solar that was interconnected into the utility's grid through the end of 2012, including all prior years. The results allow comparisons against peer or national benchmarks.

Each of the Top 10 rankings includes both 'Solar Megawatts' and 'Solar Watts-per-Customer' in the following categories:

- National
 - Annual
 - \circ Cumulative
- Utility Type (Annual)
 - o Cooperative
 - Investor-Owned
 - o Municipal

All photovoltaic capacity is derated 80% and reported in alternating current (-ac), making the data comparable to other generating technologies and utility metrics. Most other photovoltaic industry data is reported in direct current (-dc) and will seem slightly higher by comparison, though when converted are quite similar.

The report is broken down into four sections, beginning with the **National Solar Rankings** for 2012, followed by a chapter on **Utility-Type Rankings**, examining how the three major utility types (cooperative, investor-owned and municipal) ranked. The Report ends with **What to Expect in 2013**, a discussion of anticipated solar trends and predictions on utilities to watch through the end of 2013. The **Appendix** contains a list of definitions of terms commonly used throughout the report, information on the survey methodology, and a list of all participating utilities.

A special webpage has been set-up for the results, which includes interactive maps and tables: <u>www.sepatop10.org</u>.

Introduction

SEPA's sixth annual Utility Solar Rankings report analyzes the amount of solar power integrated by U.S. electric utilities as of the end of 2012. It covers 265 of the most solar-active utilities, representing more than 96 percent of the national U.S. solar electric power market.

Three key trends emerged from the data:

1. Annual solar capacity surpassed 2 gigawatts for the first time in 2012.

Utilities integrated almost 2.4 gigawatts (GW-ac) or 2,384 megawatts (MW-ac) of solar electric capacity in 2012. This is equivalent to the construction of 8 natural gas combined cycle power plants. The U.S. now has more than 300,000 solar projects and almost 6.1 GW-ac installed across the country.

2. Utilities purchased more than 1 gigawatt of large-scale solar.

The market share for large-scale solar projects (> 5 MW) was 1,106 MW or 46 percent of all annual solar capacity, a growth of almost 160 percent over 2011. This wholesale market segment encompassed more than 70 photovoltaic (PV) projects exceeding 5 MW in capacity, including Pacific Gas and Electric's (PG&E) power purchase agreement with the largest solar PV project in the world, the first 250 MW of the 290 MW Agua Caliente project. Overall, utilities owned 12 percent and purchased the remaining 88 percent through power purchase agreements. No concentrating solar power (CSP) projects were completed in 2012, but at least 6 projects totaling 750 megawatts are anticipated in 2013. The large solar segment has grown into a key part of the market in only a few years, and will continue growing in 2013.

3. Customer-sited solar remains a large part of the solar market.**

Net metered projects, effectively the customer-facing part of the market, accounted for more than 99 percent of the number of installed systems in 2012. Utilities interconnected nearly 90,000 net metered projects totaling 1,151 MW-ac last year, representing a 46 percent growth over 2011. There are currently about 3.5 GW of net metered projects in the country, about 80 percent of which are concentrated in five states – California, New Jersey, Arizona, Hawaii and Massachusetts.

The remainder of the report includes discussion on the national rankings, including an analysis of the Top 10 cumulative utilities' solar portfolios, as well as rankings by utility-type (cooperative, investor-owned and municipal).



Figure 1: Annual Total Solar Megawatts, 2010-2012.







Figure 3: Annual Customer-sited Solar Megawatts, 2010-2012.

*As compared with the Interstate Renewable Energy Council and Greentech Research data, both of which use different sources and/or methodologies.

**Note that adding the values in Figures 2 and 3 will not produce the value displayed in Figure 1 because Figure 1 also includes non-centralized projects that are installed on the utility-side of the meter, for example projects that participate in a Feed in Tariff program.

National Rankings

The annual national rankings measure a utility's newly installed solar power and include photovoltaic and concentrating solar power technologies that were interconnected between January 1 and December 31, 2012. The data includes everything from distributed customer rooftops to wholesale contract purchases from independent power producers to utility-owned projects. There are two rankings categories—*Solar Megawatts* (MW), which measure a utility's total solar capacity, and *Solar Watts-per-Customer* (W/c), which standardizes solar capacity by the size of the utility. SEPA recognized the Top 10 utilities in these two categories at its annual Utility Solar Conference (USC), held in Portland, Oregon in April 2013.

ANNUAL SOLAR MEGAWATTS

Pacific Gas and Electric (PG&E), for the fifth consecutive year, retained the top spot in the annual solar megawatts rankings with a total of 806 MW installed in 2012. This represents an increase of 180% from the previous year and is driven by projects from large-solar contract commitments signed in 2011 or earlier. Unlike 2011's more balanced deployment, PG&E's 2012 portfolio was heavily weighted by nearly 630 MW of centralized capacity across 9 projects. Two projects, the 290 MW Agua Caliente Solar and the 150 MW Mesquite Solar I facilities, are among the largest in the world. The remaining 176 MW of new solar came from more than 17,500 distributed generation (DG) projects, primarily customer-sited. Southern California Edison (SCE) came in second, up from 4th place in the previous year, integrating 195 MW. A majority of SCE's solar portfolio came from more than 15,000 distributed projects representing more than 167 MW of capacity. This is nearly equal to PG&E's share of the distributed market segment in 2012. The growth of distributed solar in key states can be attributed to the increasing trend of third-party solar contracting and the continued declining costs of PV, which compensated for a downward trend in state and utility solar incentive levels and availability. Upwards of 75% of residential homes used a third-party solar provider in California last year, driving new distributed market growth, even while the California Solar Initiative (CSI) incentive programs were largely concluding.



Figure 4: 2012 Annual Solar Megawatts (MW-ac)

Since 2007, Public Service Electric & Gas (PSE&G) has ranked nationally in every survey, with no exception in 2012. PSE&G ranked third, but saw a decline in year-on-year megawatts from 181 in 2011 to 145 in 2012, its first decline since 2008. This can be attributed to the significant decline in solar renewable energy credit (SREC) prices which has caused a slower solar market in the state. SREC prices in 2011 were well above \$600/SREC, which prompted an oversupply of SRECs relative to the needed supply based on state policy requirements, and prices declined to as low as \$70 in 2012.

Arizona Public Service (APS) has dropped a rank from the previous year to 4th place, integrating 123.5 MW, which is about a 20 MW decline year-on-year. NV Energy made the list for the first time with a 5th place ranking, jumping 12 spots from the previous year. Jersey Central Power & Light maintained its 6th place ranking by integrating over 98 MW, more than a 45 MW increase from 2011. Tucson Electric Power (TEP) is also a new entrant with an overall ranking of 7th place, integrating over 73 MW, a jump from 18th place last year.

Other notable Top 10 utilities included Progress Carolinas, a North Carolina utility, who ranked 8th and with their newly merged sister utility Duke Carolinas at 14th, brought the state of North Carolina into the top five states nationally. As evidenced by the comparatively large average system size – 579 kW and 160 kW for Progress Carolinas and Duke Carolinas, respectively (compared to 71 kW nationally) – the increased activity at these two utilities occurred in the commercial and utility-scale segments through a combination of the state's renewable energy tax credit and favorable qualifying facility (QF) rates.

Sacramento Municipal Utility District (SMUD) was the only municipal utility to make the national rankings at 9th overall. SMUD integrated 66 MW of solar, mostly through the build-out of 54 MW of centralized projects in their feed-in tariff program (FIT) that was initiated in 2010. Other notable municipal utilities that did not rank but saw significant solar activity in 2012 include CPS Energy (TX), Salt River Project (AZ), and Los Angeles Department of Water and Power (CA) with annual solar rankings of 16th, 17th, and 18th, respectively. Overall, 138 MW of solar was integrated by municipal utilities, including 20 that integrated 1 MW or more each.

Hawaiian Electric Company (HECO) has had a consistent presence in the past Watts-per-Customer rankings but entered the megawatt rankings for the first time in 2012. HECO ranked 10th with a total of 65 MW of new solar capacity, about 43 MW of which was residential and 22 MW non-residential, but which included no utility-scale solar. Nearly 9 MW of residential and non-residential installations were part of HECO's FIT program, while the remainder fell under the utility's net energy metering program. Depending on the size of the PV system, the FIT rates range between 19.7-21.8 cents per kilowatt hour,

which is actually well below their average retail rates. Overall, 5% of HECO customers now have solar, which is driven by a combination of high electricity prices that make solar more cost competitive and aggressive state renewable energy policies designed to increase renewable energy to 40% by 2030 and lower oil consumption for electricity generation. (Hawaii is the only state that utilizes oil for a sizeable portion of their electricity production.)



University of Arizona Science and Technology Park: A 23 MW, multiple technology commercial research project completed in coordination with TEP. (Courtesy: Tucson Electric Power)

No rural electric cooperative utilities (co-ops) ranked in the Top 10 megawatt category, but they integrated 36 MW of solar in total, including eight that integrated 1 MW or more. (Municipal and cooperative utilities are typically smaller than investor-owned utilities.)

This year's #10 ranked utility would have ranked 5th in 2011, which reinforces how quickly solar markets have grown. Still, the Top 10's share of the overall annual capacity was 73% and their share of the number solar projects integrated on an annual basis was 61%, which have been fairly consistent (Figure 5).



Figure 5: National Top 10 Share of Solar Capacity and Number of Projects Integrated on an Annual Basis, 2010-2012.

ANNUAL SOLAR WATTS-PER-CUSTOMER

It was surprising to find an Ohio utility taking the top spot in this year's annual Watts-per-Customer rankings, but it was a bigger surprise to find three in the Top 10 – the City of St. Mary's, Bryan Municipal and Napoleon Light & Power. All three utilized voluntary solar actions to drive solar growth in a non-traditional solar state.

The City of St. Marys Municipal System, a 4,000 customer municipal utility, ranked first nationally with 563 Watts-per-Customer with their 2.3 MW allocation of the 3.6 MW Napoleon Solar Facility completed last year. Napoleon Light & Power (OH) similarly took 9th place with their 1.04 MW allocation, giving them 180 Watts-per-Customer.¹ The Napoleon Solar Facility is owned by American Municipal Power (AMP). It was



built using military veterans through Tipping Point Renewable Energy's program Solar by Soldiers, which hires American veterans for solar installations. The project also utilized local resources, including modules and racking equipment. AMP has an ongoing commitment to develop up to 300 MW of solar projects, whose energy will be offered to its 126 member utilities, which span six states.

The 3.6 MW Napoleon Solar Facility (Courtesy: AMP Partners)

¹ The Village of Waynesfield is the third off-taker of the project, utilizing 200 kW from the solar facility, which equates to 404 Wattsper-customer. However, Waynesfield didn't meet the minimum 500 customer criteria in the watts-per-customer category and was given an honorable mention in lieu of ranking.

Kauai Island Utility Cooperative (KIUC) took the 2nd spot with 282 Watts-per-Customer, up from 12th place in the previous year. Most of the solar integration came from a newly built 6 MW Port Allen Solar Facility, making it the largest solar facility in Hawaii. The remaining solar capacity is from residential and non-residential DG solar, which are nearly equally split. Kauai's cumulative solar capacity is 14 MW, or nearly 23 percent of their peak weekday demand.



Figure 6: 2012 Annual Solar Watts-per-Customer

Bryan Municipal Utilities of Ohio took the third spot with 276 Watts-per-Customer, based on their recently built 1.6 MW solar field purchased through a PPA. The Bryan Board of Public Affairs has a voluntary 20% by 2015 renewable energy goal, which was established in 2007. The solar project brings the city up to 17% renewable and a new hydropower plant will increase it to 23% by 2015. The board has since increased the goal to 25% by 2020.

In addition to KIUC, the state of Hawaii has two other utilities that made the list, including Hawaiian Electric Company (HECO) (4th), and Maui Electric Company (MECO) (6th). The other two utilities, HECO and MECO, integrated new solar capacity through distributed solar, primarily residential installations.

Notably, HECO and Tucson Electric Power are the only two investor owned utilities in the Watts-per-Customer ranking, and the only two to rank in both categories, versus five in previous years. This indicates a diversification of solar integration among utilities, especially smaller ones. Of the 10 utilities listed in the Top 10 Watts-per-Customer rankings, 8 of them are small utilities with less than 100,000 customers. This is a significant increase from the previous year, in which only four small utilities were ranked.

Non-residential and centralized projects provided a majority of new solar energy for 7 utilities. This includes a newcomer, Chickasaw Electric Cooperative. The cooperative is purchasing the output from the 4 MW West Tennessee Solar Farm, which was built through the Volunteer State Solar Initiative, which provided funds sourced from the American Recovery Reinvestment Act. The Initiative is a comprehensive solar energy and economic development program for the state of Tennessee. Another utility that integrated a large scale solar project was the Imperial Irrigation District, with the 23 MW Imperial Valley Solar Project, which was the 9th largest solar project built in 2012.



The 4 MW West Tennessee Solar Farm (Courtesy: Chickasaw Electric Cooperative)

Vineland Municipal Electric Utility is one of three returning utilities to make this list with a 10th place ranking of 162.2 Watts-per-Customer. The utility was able to maintain its Top 10 ranking through the integration of over 4 MW of solar energy, with a majority of the installations coming from nonresidential installations.

The cutoff point for this year's Top 10 annual solar Watts-per-Customer ranking, was 162.9 W/c, not quite double the 83 W/c it took last year to make the list.



'12	'11		
1	1	Pacific Gas & Electric Co. (CA)	805.6
2	4	Southern California Edison (CA)	194.6
3	2	Public Service Electric & Gas Co. (NJ)	144.5
4	3	Arizona Public Service (AZ)	123.5

Sacramento Municipal Utility District (CA) 65.9

102.3

98.1

73.3

69.5

65.2

	Anr	nual Solar Watts-per-Customer (Wa	tts-ac)
'12	'11		
1	NR	City of St. Marys (OH)	562.8
2	12	Kauai Island Utility Co-op (HI)	282.1
3	NR	Bryan Municipal Utilities (OH)	275.8
4	10	Hawaiian Electric Co. (HI)	219.6
5	NR	Chickasaw Electric Co-op (TN)	216.7
6	7	Maui Electric Co. (HI)	198.3
7	23	Imperial Irrigation District (CA)	190.0
8	19	Tucson Electric Power Co. (AZ)	181.8
9	NR	City of Napoleon (OH)	180.1
10	1	Vineland Municipal Electric Utility (NJ)	162.2

Annual Solar Megawatts (MW-ac)

Jersey Central Power & Light (NJ)

Tucson Electric Power Co. (AZ)

Progress Carolinas (NC)

10 14 Hawaiian Electric Co. (HI)

17 NV Energy (NV)

5

6 6

7 18

8 NR

9

Figure 7: 2012 Annual Utility Solar Rankings

A Snapshot of National Trends

In 2012, there were twenty utilities that integrated 20 MW or more on an annual basis, which was the minimum threshold to make SEPA's National Top 10 list just two years ago. Nationally, utilities integrated 2,385 MW of new solar capacity in 2012, a new record and an increase of 63% over 2011, and more than 13 times the 167 MW installed in 2009.

SEPA's participating utilities integrated a median of 212 kW of solar *capacity* each in 2012; however, the median *number* of projects integrated by all utilities on an annual basis was just 9. This relatively high median capacity compared against a low number of projects further reinforces SEPA's observation that larger-scale solar project growth is strongly influencing solar market trends.

Geographically, it isn't a surprise that California and New Jersey added the most solar capacity with 1,172 MW and 273 MW respectively, followed by Arizona, North Carolina, and Nevada. However, looking at the number of projects that were completed reshuffles the list order. There were ten states that saw more than 1,000 new solar projects developed in 2012, including 42,200 in California and 12,500 in Hawaii.



CUMULATIVE SOLAR MEGAWATTS

The cumulative national rankings measure a utility's historical solar portfolio and include solar projects that were interconnected at any point prior to December 31, 2012. Similar to the annual rankings, there are two rankings categories –*Solar Megawatts* (MW) and *Solar Watts-per-Customer* (W/c).

As displayed in Figure 10, the cumulative solar capacity has been growing exponentially with the Top 10 utilities each year contributing a majority of solar capacity. In the past several years, the solar capacity share from the Top 10 utilities has decreased as more utilities begin integrating solar. In 2012 the Top 10 utilities account for nearly 80% of cumulative solar capacity in the U.S., up from 74% in 2011. The increase can be attributed to centralized solar development within the Top 10 utilities, and the large build out for PG&E in particular.

Looking at cumulative solar project numbers, the Top 10 utilities have nearly 200,000 solar installations, which account for 68% of the entire survey. The slight percentage difference (80% of capacity vs. 68% of numbers) can be attributed to large-scale solar growth.



Figure 10: Growth in Cumulative Solar Megawatts, 2007-2012.

For the second year in a row, PG&E ranked first in overall cumulative solar capacity with 1,569 MW, or nearly 30% of the national total. PG&E doubled its cumulative solar capacity last year, moving from 762 to 1569 MWs, and marking the first time that a single electric utility in the U.S. exceeded 1 gigawatt of solar capacity. Solar capacity now represents around 8% of PG&E's historical peak demand. Last year also marked the first year that centralized solar accounted for more capacity in PG&E's portfolio than customer sited PV. PG&E's utility-scale portfolio includes 30 projects totaling 830 MW through 2012, with as much as 540 MW of new projects coming online in 2013.

Southern California Edison was just shy of the 1 GW mark with 947 MW in 2012, but certainly passed that threshold in the first quarter of 2013. In previous years, SCE's solar portfolio was largely centralized solar projects, but now over half comes from distributed solar - 81% of SCE's new capacity in 2012 came from DG projects. However, SCE is expected to complete over 460 MW of centralized solar projects in 2013.

For the third year in a row, PSE&G held the third spot, this year with 443 MW of total solar capacity. As mentioned previously, the utility has experienced a slowed growth due to the SREC market pricing, but still integrated over 145 MW in 2012. Nearly 80% of its cumulative capacity is customer-sited, with the

Table [•]	Table 1: Cumulative Solar Megawatts (MW-ac)				
'12	'11	Utility	MW-ac		
1	1	Pacific Gas & Electric Co. (CA)	1,569		
2	2	Southern California Edison (CA)	947		
3	3	Public Service Electric & Gas Co. (NJ)	443		
4	4	Arizona Public Service (AZ)	320		
5	8	NV Energy (NV)	218		
6	9	Jersey Central Power & Light (NJ)	204		
7	5	Xcel (CO)	165		
8	7	San Diego Gas & Electric Co. (CA)	164		
9	11	Sacramento Municipal Utility District (CA)	142		
10	10	Atlantic City Electric	128		
		Other Utilities	1,146		
		Total	5,446		

remaining coming from PPAs (7%) and utility-owned PV projects (13%). With the renewal of PSE&G's Solar 4 All program, the utility plans on installing up 20 MW of utility-owned solar capacity in 2013.

Overall, there was little change in the cumulative rankings with the exception of Sacramento Municipal District (SMUD), which rose to 9th place from the previous year's 11th and represents the only municipal utility in the cumulative rankings in the last three years.

A closer look at the Top 10 utilities' cumulative solar portfolios (Figure 11) reveals a few interesting shifts in overall solar development by technology (PV, CSP) and project type (customer, PPA, utility-owned), including:

Large solar shows an upward trend, but over a yearly basis, it is highly utility specific as past contracts or plans are executed over multi-year periods. For example, PG&E saw a large increase in centralized solar projects last year, which will continue in 2013. SCE only integrated 30 MW of large solar in 2012, but is expected to complete over 460 MW in 2013. These multi-year project paths create large shifts in the portfolio development of each utility.

Utility-owned generation (UOG) saw a slight decrease within the national energy mix. A total of 160 MW of utilityowned solar was completed in 2012, a 32% decrease over the 237 MW installed in 2011. Overall, about 9% of the cumulative solar market was utility-owned megawatts in 2012, a decline from 11% in 2011. Preliminary numbers show a total of over 200 MW of UOG anticipated in 2013. The growth of UOG is much slower than the overall growth of solar



This 10 MW rooftop solar project, located on a Dexus Property Group warehouse in Perris, CA, is part of SCE's utility-owned solar portfolio. (Courtesy: Southern California Edison)

energy and is highly individualized to certain utilities.

CSP markets did not change in 2012, but are poised for significant growth. Even though there
weren't any major CSP projects commissioned in 2012, expect to see this market segment pick
up over the next several years. Over 750 MW of CSP plants are expected to come online in
2013. This includes three facilities that are part of the Ivanpah Solar Electric Generating System
totaling 377 MW. PG&E and SCE have PPAs for these projects. The output from the 250 MW
Solana Generating Station will be purchased by APS, and includes 6 hours of thermal storage.



Figure 11: National Cumulative Top 10 Megawatt Utility Solar Portfolio Distribution

CUMULATIVE SOLAR WATTS-PER-CUSTOMER

2012 was the first year that a single utility achieved over 1,000 watts of solar capacity per customer, with Vineland Municipal Electric Utility taking the top spot for the second year in a row. The 25,000 customer municipal utility integrated over 4 MW of solar in 2012, bringing its total to 28 MW.

Along with taking the top spot in the Annual Solar Watts-percustomer, the City of St. Marys Municipal Electric System moved into the second spot cumulatively.

Despite New Jersey and California representing the two largest solar markets in the U.S., only one utility from each of these states made it onto the cumulative watts-per-customer rankings, versus 5 utilities in 2010. This market diversification and expansion into smaller customer based municipal and electric co-op utilities will likely continue.

Fable 2: Cumulative Solar Watts-per-Customer				
'12	'11	Utility	W/Customer	
1	1	Vineland Municipal Electric Utility (NJ)	1,133	
2	NR	City of St Marys (OH)	563	
3	5	Kauai Island Utility Co-op (HI)	430	
4	2	Maui Electric Co. (HI)	412	
5	9	Hawaiian Electric Co. (HI)	375	
6	10	Pacific Gas and Electric Co. (CA)	300	
7	11	Hawaii Electric Light Co. (HI)	294	
8	6	Arizona Public Service (AZ)	286	
9	NR	Bryan Municipal Utilities (OH)	276	
10	21	Tucson Electric Power Co. (AZ)	274	
	- 1		_, ,	

 $\ensuremath{\mathsf{NR}}$ = No Rank; the utility either did not participate in or was not ranked in the previous year's rankings.

Hawaii's significant market growth is seen in three utilities (HECO, MECO, HELCO) making the top 10.

As in previous years, all three types of utilities are represented in this list, with six investor-owned utilities (IOUs), three municipal utilities (munis), and one co-op. In 2011, the cutoff to make the Top 10 was 146 Watts-per-customer, but utilities needed nearly double that amount to make the rankings list for 2012.

A Different Perspective: Penetration Rates

Penetration rate, the *number* of solar systems per customer rather than the solar *capacity* per customer (or the % of a utility's customers that have solar projects), is another method of comparing the amount of solar utilities have integrated.* Hawaiian utilities, often recognized for their high levels of solar penetration, rank 1-4 under this lens. Maui Electric Company has about 5.4% of their customer-base with a solar system, followed closely by Hawaiian Electric Company with approximately 5.2% penetration. Hawaii Electric Light Company and Kauai Island Utility Cooperative had 4.2% and 3.1% penetration levels, respectively.

This category includes all three major utilities types, with five investor-owned utilities, three cooperative utilities, and two municipal utilities making the Top 10. As in 2010 and 2011, the 2012 rankings included nine Western region utilities and one Central region, Verendrye Electric Co-op (ND). There has yet to be an Eastern region utility rank in the Top 10 for this category.

ʻ12	<u>'11</u>	Utility	# Solar Systems / Cust.
1	1	Maui Electric Co. (HI)	5.4%
2	2	Hawaiian Electric Co. (HI)	5.2%
3	4	Hawaii Electric Light Co. (HI)	4.2%
4	5	Kauai Island Utility Co-op (HI)	3.1%
5	3	Roseville Electric (CA)	2.4%
6	6	Verendrye Electric Co-op (ND)*	1.9%
7	7	City of Palo Alto Utilities (CA)	1.8%
8	9	Sulphur Springs Valley Electric Co-op (AZ)	1.7%
9	11	San Diego Gas & Electric (CA)	1.52%
10	10	Pacific Gas & Electric (CA)	1.49%

Table 3: Level of Solar Penetration Based on Number of Utility Customers

*Verendrye's projects are small, utility-owned projects that are sited at water pumping stations as opposed to customer-sited systems.

Utility Type Rankings

As previously mentioned, there was nearly 2.4 GW of solar energy installed nation-wide last year. More than 87% of new solar capacity was integrated by investor-owned utilities, with municipal utilities integrating nearly 11% and co-ops 2%. However, when this is standardized by number of customers, the watts-per-customer aligns much more closely: 31 watts/customer IOUs, 17 watts/customer municipal, and 15 watts/customer cooperatives.

Although most new solar capacity was integrated by IOUs, there were some consistencies between the three type of utilities and market segments - residential, non-residential and centralized solar projects. Figure 12, reveals that, across all utility types, the majority of new solar capacity built in 2012 was through centralized PV projects. Centralized PV accounted for 57% of new solar capacity for municipal utilities. IOUs and co-ops share similar numbers with 45% and 47%, respectively. Residential solar contributed the smallest capacity share for all utility types, with between 15-21%. This is indicates similar solar integration strategies across all utility types.



Figure 12: A break-down of cumulative quantity of projects and solar capacity by share of market segment and utility-type in 2012.

In terms of project numbers by market segment, an overwhelming majority of solar projects were residential with ranges of 83-92% among the various utility types. As mentioned, overall residential megawatts make up the least amount of new capacity but account for the greatest number of net metered interconnections into utility grids. Centralized solar projects account for the smallest count of interconnections, yet make up the majority of new capacity, accounting for only 0.07% of all of the IOUs' project interconnections, but the majority of megawatts.

INVESTOR-OWNED UTILITIES

Investor-owned utilities serve the largest number of customers and are typically subject to state renewable portfolio standards, where applicable. These factors have led IOUs to become some of the most solar-integrated utilities in the country. A total of 68 IOUs were represented in this year's survey, accounting for nearly 62 million electric customers nationally.

Annual Solar Megawatts

The National Annual Top 10 megawatt rankings had 9 IOUs on the list and the IOU specific ranking brought National Grid into the #10 spot. National Grid built six distributed utility-owned projects from 2009-2011, but none in 2012. They similarly didn't have any centralized projects, where land and siting costs are generally high. Instead, the utility's solar development came from almost 1,300 customer projects in the residential and commercial segments, including several sited at brownfields and landfills that benefitted from a state rebate program and an SREC market.

'12	'11	Utility	MW-ac
1	1	Pacific Gas & Electric Co. (CA)	806
2	4	Southern California Edison (CA)	195
3	2	Public Service Electric & Gas Co. (NJ)	145
4	3	Arizona Public Service (AZ)	124
5	13	NV Energy (NV)	102
6	6	Jersey Central Power & Light (NJ)	98
7	14	Tucson Electric Power Co. (AZ)	73
8	NR	Progress Carolinas (NC)	70
9	11	Hawaiian Electric Co. (HI)	65
10	16	National Grid (MA)	55
		Other Utilities	369
		Total	2,100

previous year's rankings.

Progress Carolinas and Hawaiian Electric also had 100% distributed solar projects in their 2012 portfolio, while SCE and PSE&G had 80% and 90% respectively.

In contrast, three utilities in the Top 10 had a majority of their portfolio from large solar projects - PG&E, NV Energy and TEP.

Annual Solar Watts-per-Customer

All three of Hawaii's IOUs ranked in this year's Annual IOU Watts-per-Customer Top 10 list with Hawaiian Electric Company, Maui Electric Company and Hawaii Electric Light Company taking the 1st, 2nd and 5th spots, respectively. As previously mentioned, Hawaii's high energy costs, limited space, and the state's renewable energy policies have fostered rapid distributed solar integration.

The largest growth observed this year was from Green Mountain Power (GMP), who jumped from integrating 6 watts/customer in 2011 to 113 in 2012. The utility integrated 3 solar projects totaling more

Т	Table 5: IOU 2012 Annual Solar Watts per Customer				
	'12	'11	Utility	W/Customer	
	1	6	Hawaiian Electric Co. (HI)	220	
	2	4	Maui Electric Co. (HI)	198	
	3	12	Tucson Electric Power Co. (AZ)	182	
	4	8	Pacific Gas & Electric Co. (CA)	154	
	5	11	Hawaii Electric Light Co. (HI)	136	
	6	7	UNS Electric, Inc (AZ)	133	
	7	31	Green Mountain Power Co. (VT)	113	
	8	1	Arizona Public Service (AZ)	110	
	9	10	Jersey Central Power & Light (NJ)	101	
	10	20	NV Energy (NV)	88	

than 6 MW and interconnected nearly 500 residential solar installations totaling another 5 MW. The residential segment took advantage of GMP's performance based incentive program, which offers an additional 6 cents/kWh on top of the net metering rate.

Overall, there were 6 incumbents and 4 newcomers to this year's list. The newcomers include NV Energy, GMP, HELCO, and TEP.

	Holding Companies Cumulative Utilities MW _{AC} ¹							
1	PG&E Corporation	1,569	PG&E					
2	Edison International	947	SCE					
3	Public Service Enterprise Group	443	PSE&G					
4	Pinnacle West Capital Corp.	320	APS					
5	FirstEnergy Corp.	221	JCP&L, Met-Ed, Penelec, Penn Power, West Penn Power					
6	Xcel Energy, Inc.	218	Xcel CO, NM, MN					
7	NV Energy, Inc.	218	NV Energy					
8	Duke Energy	183	Duke Carolinas, IN, KY, OH; Progress Carolinas, FL					
9	Pepco Holding Inc.	172	Pepco, Delmarva Atlantic City					
10	Sempra Energy	164	SDG&E					
	Other IOU Utilities	926						

Tables 6 lists the aggregated cumulative solar by IOU holding company. The list is similar to the national rankings in many respects.

he top four holding ompanies only have one ubsidiary each and mirror e national cumulative dividual utility rankings. he remaining holding ompanies have at least one ubsidiary in the national ankings as well, with one ception. None of Duke nergy's subsidiaries appear the individual cumulative tility rankings, but as a olding company, the ombined solar amounts ace Duke Energy in the ghth position with 183 MW.

¹ Total only includes capacity that is assigned to regulated utilities. Any solar ownership through an unregulated affiliate is not reflected above and is allocated to the utility purchasing the energy on contract.

MUNICIPAL UTILITIES

Even though many municipal utilities are exempt from RPS requirements, depending on their state's regulatory structure, many have voluntarily developed solar projects and programs. The municipal

utilities represent the largest group of participating utilities in this year's survey with 135 covering more than million customers.

Annual Solar Megawatts

Compared to last year, there are only two newcomers to the 2012 municipal Top 10 MW rankings, CPS Energy and Lakeland Electric. Once again, SMUD took the top spot for annual solar megawatts with a total of nearly 66 MW of new capacity. This was a more than 13 MW increase from the previous year. CPS Energy, the municipal utility for San Antonio, TX took the 2nd spot, up

Table 7: Municipal Utilities 2012 Annual Solar Megawatts				
'12	'11	Utility	MW-ac	
1	1	Sacramento Municipal Utility District (CA)	66	
2	13	CPS Energy (TX)	33	
3	6	Salt River Project (AZ)	32	
4	5	Los Angeles Dept. of Water & Power (CA)	30	
5	7	Imperial Irrigation District (CA)	28	
6	2	Long Island Power Authority (NY)	19	
7	12	Lakeland Electric (FL)	5	
8	9	Gainesville Regional Utilities (FL)	4.3	
9	4	Vineland Municipal Electric Utility (NJ)	4.1	
10	3	Austin Energy (TX)	3	
		Other Utilities	29	
		Total	254	



Municipal utility Imperial Irrigation District has a 30 PPA contract for the above pictured 23 MW Sun Peak Solar Project (Courtesy: Imperial Irrigation District)

from 13th place in 2011. More than 90% of CPS's new capacity was centralized solar, which was due to the partial build out of the utility's commitment to purchase 400 MW of large solar projects. A second Texas muni, Austin Energy, made this year's list at 10th. In contrast, all of Austin's new capacity was integrated through DG projects.

Salt River Project (SRP) reached the third spot primarily with the completion of the 19 MW PSEG Queen Creek Solar Farm, via PPA with PSEG Solar Source. In addition, more than 8 MW of residential solar projects were integrated along with more than 4 MW of commercial solar. SRP has a voluntary goal to obtain 20 percent of its electricity from renewable sources by 2020. Currently, the utility has achieved 10 percent.

Two Florida utilities are also on this year's list, including Lakeland Electric and Gainesville Regional Utilities. Lakeland integrated both DG and centralized solar, with the completion of the 5 MW Lakeland Linder Regional Airport solar project. Gainesville Regional Utilities' new solar is primarily from the non-residential DG market segment. The utility's feed-in tariff program was a key driver.

The overall municipal solar development increased by nearly 40 MW to 254 MW, compared to the previous year. More than half of the solar development at municipal utilities was achieved by centralized solar projects. Residential solar accounted for 38 MW, or 15% of the municipal totals. California municipal utilities integrated the most solar with more than 130 MW, while Texas took the second spot with over 36 MW. Ten states added more than 1 MW of solar from municipal utilities.

Annual Solar Watts-per-Customer

There are four utilities that are ranked in the municipal annual watts-per-customer Top 10 list this year that did not rank last year. This includes the City of St Marys Municipal Electric System and Napoleon Light & Power ranking 1st and 4th respectively. Both utilities are located in Ohio, and they are joined on

the ranking list by fellow Ohio muni, Bryan Municipal Utilities.

Pulaski Electric System of Tennessee experienced the biggest leap in ranking position from 68th place in 2011 to 7th in 2012. In 2011, the utility integrated 1 Watt-per-customer, while in 2012 that total jumped to 91 Watts-per-customer. The utility integrated five nonresidential solar projects totaling 1.3 MW that were installed in the utility's 14,123-customer service territory. Pulaski Electric is a member utility of the Tennessee Valley Authority (TVA), who's

Table 8: Municipal Utilities 2012 Annual Solar Watts-per-Customer						
'12	'11	Utility	W/Customer			
1	NR	City of St Marys (OH)	563			
2	NR	Bryan Municipal Utilities (OH)	276			
3	7	Imperial Irrigation District (CA)	190			
4	NR	Napoleon Light & Power (OH)	180			
5	1	Vineland Municipal Electric Utility (NJ)	162			
6	3	Sacramento Municipal Utility District (CA)	110			
7	68	Pulaski Electric System (TN)	91			
8	2	Fayetteville Public Utilities (TN)	81			
9	10	Silicon Valley Power (CA)	47			
10	5	Gainesville Regional Utilities (FL)	46			

NR = No Rank; the utility either did not participate in or was not ranked in the previous year's rankings.

Green Power Providers Program has been responsible for propelling several small municipal and co-ops onto SEPA's various Top 10 ranking lists in recent years.

Only two municipal utilities on the Top 10 list have more than 100,000 customers, including Imperial Irrigation District and Sacramento Municipal Utility District. The remaining utilities on this list range from about 4,000 customers to 92,000 customers.

COOPERATIVE UTILITIES

A total of 62 co-ops participated in this year's utility solar rankings survey, up from 53 in2011. They represented 2.6 million customers nationally, serving primarily rural and exurban areas. In total, co-ops integrated more than 36 MW, a 45% increase from 2011. Nearly 17 MW of this capacity came from

centralized solar projects with residential and non-residential solar projects accounting for 8 MW and 12 MW, respectively.

Annual Solar Megawatts

Up from second place in 2011, Kauai Island Utility Cooperative takes the top spot with a total of 9.2 MW of solar. Most of the co-op's new solar capacity is from the previously mentioned 6 MW Port Allen Solar Facility. KIUC's remaining solar capacity comes from equal shares of residential and non-residential solar capacity. According to KIUC, the levelized cost of energy (LCOE) of solar in the utility's territory is currently cheaper than the wholesale cost of electricity. In other words, solar has reached retail grid parity.

'12	'11	Utility	MW-ac
1	2	Kauai Island Utility Co-op (HI)	9
2	NR	Southern Maryland Electric Co-op (MD)	7
3	NR	Chickasaw Electric Co-op (TN)	4
4	12	Kit Carson Electric Co-op (NM)	3
5	9	Sulphur Springs Valley Electric Co-op (AZ)	2.1
6	22	United Power (CO)	1.9
7	17	Caney Fork Electric Co-op (TN)	1.2
8	1	Blue Ridge Mountain EMC (GA)	1.1
9	3	Middle Tennessee EMC (TN)	0.9
10	14	Volunteer Energy Co-op (TN)	0.7
		Other Utilities	5.7
		Total	36.2

NR = No Rank; the utility either did not participate in or was not ranked in the previous year's rankings.

Southern Maryland Electric Cooperative (SMECO), which is a survey newcomer in 2012, integrated nearly 7 MW of solar. Similar to Kauai, a majority of SMECO's new capacity comes from one centralized, utility-owned solar project, the 5.5 Hebert Farm Solar Project. This solar project is unique because SMECO owns it via an LLC that is wholly owned by the cooperative. Typically, co-ops are unable to take advantage of any federal solar incentives since non-profit entities cannot monetize tax incentives. In this case, the utility created a taxable subsidiary, which in turn was able to receive funds from the American Recovery and Reinvestment Act 1603 tax grant. KIUC will use a similar arrangement for a 12 MW project expected to reach completion in 2013 or 2014.

In third place is Chickasaw Electric Cooperative with 4 MW of new solar capacity. The utility participated in the 2011 survey but it reported no new solar installations. As mentioned in the overall Watts-percustomer section, the co-op integrated a 4 MW solar facility, which was installed through TVA's Green Power Providers Program.

KIUC and SMECO integrated the most residential solar with 1.5 MW and 1.3 MW respectively. While the smaller overall capacities of the co-ops indicate that co-ops have historically been slower to embrace the development of solar projects SEPA sees co-ops as areas of fast growth (for their size) in the coming years.

A total of five utilities on this year's list are distribution members of TVA. TVA's Green Power Providers program offers a performance-based incentive to homeowners and businesses that install renewable

energy systems. The output from this program is then used towards TVA's green power pricing program, Green Power Switch. But the recent addition of larger projects within TVA's territory is driven by the renewable standard offer in which renewable energy generators that have systems that are 50 kW to 20 MW in size can enter into 20 year price contracts.

Annual Solar Watts-per-Customer

Even though solar integration among co-ops has been comparatively small, their overall penetration of solar has drastically increased. Two coops on this list made it to the National Annual Watts-percustomer rankings, KIUC and Chickasaw Electric Cooperative, versus one in 2011. It is also the first time that two co-ops surpassed the 200 Watts-percustomer mark, versus one in 2011. The previous year's cutoff was also lower with 13 Wattsper-customer.

Table 10: Cooperative Utilities 2012 Annual Solar Watts-per-Customer					
'12	'11	Utility	W/Customer		
1	2	Kauai Island Utility Co-op (HI)	282		
2	NR	Chickasaw Electric Co-op (TN)	217		
3	10	Kit Carson Electric Co-op (NM)	89		
4	NR	Southern Maryland Electric Co-op (MD)	45		
5	9	Sulphur Springs Valley Electric Co-op (AZ)	42		
6	17	Caney Fork Electric Co-op (TN)	39		
7	26	United Power (CO)	28		
8	14	Tri-State EMC (CA, NC, TN)	24		
9	1	Blue Ridge Mountain EMC (GA)	23		
10	5	Mountain Electric Co-op (TN)	19		

NR = No Rank; the utility either did not participate in or was not ranked in the previous year's rankings.

Kit Carson Electric Co-op improved its ranking to 3rd from 10th. This was in large part from the completion of a community solar project. Clean Energy Collective constructed the 100 kW Foothills Solar Array at Taos Charter School on a carport structure above the school's parking lot. The solar project utilized 420 modules in which each module can be purchased by utility customers. In return, the module owner receives credit on their monthly electric bill. In addition, the utility energized two projects that total 2.4 MW, one of which utilized concentrating photovoltaics.

Sulphur Springs Valley Electric Co-op was able to improve its ranking to 5thplace in part from the co-op's SunWatts Rebate program. The program provides the utility's customers with two options, a capacity-based upfront rebate or a production-based incentive (PBI), both for PV systems that are 10 kW or less. Projects that are greater than that can only utilized the PBI.

KIUC will likely be continue to be among the co-op solar leaders in the next couple of years, with plans for two 12 MW centralized projects coming online along with an expectations of up to 9 MW of residential solar capacity. As was mentioned previously, Kauai's cumulative solar capacity is 14 MW, or nearly 23 percent of their peak weekday demand. Hawaiian utilities generally have seen the highest penetrations of solar in the country, learning to managing the real-time variations in capacity and leading research projects on how best to manage a high-solar distribution grid.

What to Expect in 2013?

Overall, market analysts anticipate around 2.6 - 3.6 GW-ac of PV installed² in 2013 and 0.75 - 1 GW of additional CSP capacity, which would represent a near doubling of overall solar capacity from 2012 on the high end. SEPA expects large-scale solar to continue its rapid growth in overall capacity in 2013. This market segment alone is likely to add 3 - 3.5 GW of new generation.³ In addition to continued growth in the centralized project market segment, SEPA expects the number of net metered projects to continue expanding rapidly, which will accelerate the discourse around rate impacts in policy and regulatory arenas.

In terms of project pricing, analysts are predicting installed costs to continue their decline in 2013. SEPA and Navigant Consulting estimate that the average installed costs of utility-scale projects will fall to the \$2.00/Watt range, while commercial projects will average closer to \$3.00/Watt⁴. There are several indications that some pricing has already dropped below these levels. This would represent a decline of approximately 18% and 4% for centralized and commercial project costs, respectively, from 2012 averages.

Focusing on utilities, SEPA expects that several new utilities may rise into the Top 10 rankings in 2013. SEPA's 2013 utility watch list includes:

- Indianapolis Power & Light: This Midwestern IOU has contracts for 90 MW of centralized PV that is expected to come online in 2013. With just under 500,000 customers, if all of IPL's anticipated capacity is commissioned in 2013, IPL might be a utility to look for on next year's Megawatts and/or Watts-per-Customer rankings.
- Georgia Power: This Southern Company utility is expecting up to 105 MW of utility-procured large-scale projects to come online in 2013. Looking forward, SEPA expects Georgia Power's voluntary solar commitment to continue to grow for the next several years.
- **CPS Energy:** While CPS Energy isn't a solar newcomer, this municipal utility took a little "breather" after the commissioning of its Blue Wing Solar Project back in 2011. However, SEPA expects the utility's deployment of its procured 400 MW of centralized projects to pick up momentum this year, possibly taking CPS back to the rankings list in 2013.
- Imperial Irrigation District: Imperial Irrigation District (IID) is a fairly small (~150,000 customers) municipal utility in Southern California that has already started to make headlines in 2013 (starting with its entrance onto SEPA's National Watts-per-Customer list). In addition to the popularity of its customer incentive program, IID has plans to procure large-scale solar projects over the next several years that may help it maintain its spot in the rankings.
- **Delaware Electric Cooperative:** Delaware Electric Cooperative has made a major investment in solar for their size. The co-op is set to commission a 4 MW cooperative-owned solar farm financed without incentives and with no immediate rate impact on its member-customers.

² As evidenced by forecasts from GTM Research, and Bloom New Energy Finance, among others. Analysts typically report PV forecast data in units of DC.

³ Including both CSP and PV technologies. For SEPA's updated list of centralized project development, visit <u>http://www.solarelectricpower.org/solar-project-announcements-solar-data-and-mapping</u>.

⁴ Pricing values are based on tracked systems. For more pricing information, check out SEPA's Q1 2013 Centralized Solar Projects Bulletin at <u>http://www.solarelectricpower.org/resources/publications.aspx</u>.

Appendix

A. DEFINITIONS

Annual Rankings

These rankings cover a reporting period of solar electric systems that came online between January 1, 2012, and December 31, 2012.

Capacity

The aggregated nameplate grid capacity of all solar electric systems owned by an electric utility's retail customers, under contract for the purchase of the solar electric output, and/or owned by the electric utility, expressed either in megawatts-ac (MW-ac) or Watts-per-Customer-ac (W/c).

All photovoltaic direct-current system capacities (MW-dc) have been de-rated 80% to alternating current grid-capacity (MW-ac). All photovoltaic California Energy Center alternating-current system capacities (MW-CEC-AC) have been de-rated to alternating current grid-capacity using the following method:

AC=(CEC-AC/IE/PE)*80%, where

IE=median inverter efficiency=95.5% PE=median panel efficiency=89.1%.

Concentrating Solar Power Technology (CSP)

Solar technology that utilizes mirrors or lenses to concentrate sunlight on a point or line and generate high-temperature heat, which is captured to generate electricity in a thermodynamic process.

Cumulative Rankings

These rankings cover a reporting period of solar electric systems that came online anytime before December 31, 2012.

Electric Utility

Regulated investor-owned, municipal, or cooperative (or other public power) utility; wires-only utility; generation and transmission utilities, cooperatives, power agencies, or similar. The solar Watts-per-Customer ranking requires a minimum of 500 customers for ranking eligibility.

Photovoltaic Technology (PV)

Utilizes a photosensitive material to generate electricity directly from sunlight; PV can also be magnified using mirrors or lenses in low- or high-concentrations, known as concentrating photovoltaic technology (CPV).

B. SURVEY METHODOLOGY

The SEPA utility solar rankings survey was distributed via email in January 2013 to around 400 utilities nationally, as well as utility association outlets. From the total, 265 utilities responded (Appendix c). Within a period of two months, data was collected, follow-up calls were made, and lastly, utilities were given the opportunity to verify the data they submitted or their peers' data in a review process.

In the survey email, respondents could submit their data in MW_{AC}, MW_{CEC-AC}, or MW_{DC}. All solar DC and CEC-AC megawatts were converted to AC grid capacity ratings (see definitions).

Stand-alone CSP project capacity is based on the nameplate rating of the facility, while hybrid CSP projects are derated from the thermal nameplate rating of the solar field (even if the power block for the overall project has a higher electric capacity), both using standard industry practices.

The data is self-reported by each individual utility and fact-checking was done with other utilities, thirdparty data sources and industry experts; no third-party auditing was conducted.

Utility customer numbers for the Watts-per-Customer rankings were obtained from the U.S. Department of Energy's (DOE) Energy Information Administration.

A copy of the survey instrument can be accessed <u>here</u>.

C. PARTICIPATING UTILITIES

4-County Electric Power Association (MS) Aberdeen Electric Department (MS) AEP Ohio (OH) AEP Texas (TX) Alcorn County Electric Power Association (MS) Ameren Missouri (MO) Appalachian Electric Cooperative (TN) Appalachian Power (WV) Arab Electric Cooperative Inc (AL) Arizona Public Service (AZ) Athens Electric Department (AL) Athens Utilities Board (TN) Atlantic City Electric (NJ) Austin Energy (TX) Austin Utilities (MN) Avista Utilities (WA) Beaches Energy Services- Jacksonville Beach (FL) Benton County Electric System (TN) Black Hills Energy (CO) Blue Ridge Mountain Electric Membership Corp (GA) Bolivar Energy Authority (TN) Bowling Green Municipal Utilities (KY) Bristol Tennessee Essential Services (TN) Bristol Virginia Utilities (VA) Bryan Municipal Utilities (OH) Bryan Texas Utilities (TX) Caney Fork Electric Cooperative (TN) Carroll County Electric Department (TN) CenterPoint Energy (TX) Central Electric Power Association (MS) Central Hudson Gas & Electric Corporation (NY) Chickasaw Electric Cooperative (TN) City Of Alcoa (TN) City of Ames Electric Services (IA) City of Banning (CA) City of Bushnell (FL) City of Clewiston (FL) City of Ellensburg (WA) City Of Florence Utilities (AL) City of Fort Pierce (FL) City of Ft. Meade (FL) City of Havana (FL) City of Key West (FL) City of Kissimmee (FL) City of Lake Worth Utilities (FL) City of Leesburg (FL) City of Lodi Electric Utility (CA) City of Lompoc (CA) City Of Maryville Electric Department (TN) City of Napoleon/Napoleon Light & Power (OH) City of Newberry (FL) City of Ocala (FL) City of Oxford Electric Department (MS) City of Palo Alto Utilities (CA) City of St Marys (OH) City of St. George Energy Services Department (UT) City of Starke (FL) City of Tallahassee (FL) City Of Tupelo Light & Water (MS) City Water Light & Power (IL) Clarksville Department Of Electricity (TN) Cleveland Utilities (TN) Clinton Utilities Board (TN) College Station Utilities (TX)

Colorado Springs Utilities (CO) Columbia Power & Water Systems (TN) Columbia Water and Light (MO) Connecticut Light and Power Company (CT) Consolidated Edison (NY) Consumers Power Inc. (OR) Cookeville Electric Department (TN) CoServ Electric (TX) CPS Energy (TX) Cullman Electric Cooperative (AL) Cullman Power Board (AL) Cumberland Electric Membership Corp (TN) Decatur Utilities (AL) Delaware Electric Cooperative (DE) Delmarva Power (DE) Delta-Montrose Electric Association (CO) Detroit Edison-DTE Electric (MI) Dickson Electric Department (TN) Douglas Electric Cooperative (OR) Duck River Electric Membership Corp (TN) Duke Carolinas (NC) Duke Indiana (IN) Duke Kentucky (KY) Duke Ohio (OH) Duquesne Light Company (PA) East Mississippi Electric Power Association (MS) Electric Power Board of Chattanooga (TN) Elizabethton Electric System (TN) Erwin Utilities (TN) Etowah Utilities (TN) Favetteville Public Utilities (TN) Florida Keys Electric Cooperative (FL) Florida Power & Light Company (FL) Forked Deer Electric Cooperative (TN) Fort Collins Utilities (CO) Fort Loudoun Electric Cooperative (TN) Fort Payne Improvement Authority (AL) Fulton Electric System (KY) Gainesville Regional Utilities (FL) Gallatin Department of Electricity (TN) Georgia Power Company (GA) Gibson Electric Membership Corp (TN) Glasgow Electric Plant Board (KY) Glendale Water & Power (CA) Grays Harbor PUD (WA) Green Cove Springs Electric Utility (FL) Green Mountain Power Corporation (VT) Greeneville Light & Power System (TN) Harriman Utility Board (TN) Hawaii Electric Light Company (HI) Hawaiian Electric Company, Inc. (HI) Hickman Electric Plant Board (KY) Hickman-Fulton Co Rural Electric Co-op Corp (KY) Holston Electric Cooperative (TN) Holy Cross Energy (CO) Hopkinsville Electric System (KY) Humboldt Utilities (TN) Huntsville Utilities (AL) Imperial Irrigation District (CA) Indiana Michigan Power (IN) Indianapolis Power & Light Company (IN) Jackson Energy Authority (TN) Jellico Electric and Water Systems (KY) Jersey Central Power & Light (NJ)

Joe Wheeler Electric Membership Corp (AL) Johnson City Power Board (TN) Kauai Island Utility Cooperative (HI) Kentucky Power (KY) Kingsport Power (TN) Kit Carson Electric Cooperative (NM) Knoxville Utilities Board (TN) La Plata Electric Association (CO) Lafollette Utilities Board (TN) Lakeland Electric (FL) Lawrenceburg Utility Systems (TN) Lenoir City Utilities Board (TN) Lexington Electric System (TN) Lincoln Electric System (NE) Long Island Power Authority (NY) Los Angeles Department of Water and Power (CA) Loudon Utilities (TN) Louisville Utilities (MS) Madison Gas and Electric Company (WI) Maui Electric Company Ltd (HI) Mayfield Electric & Water System (KY) Memphis Light, Gas and Water (TN) Meriwether Lewis Electric Cooperative (TN) Metropolitan Edison (PA) Middle Tennessee Electric Membership Corp (TN) Milan Department Of Public Utilities (TN) Minnesota Power (MN) Monroe County Electric Power Association (MS) Moorhead Public Service (MN) Morristown Utility Commission (TN) Mountain Electric Cooperative (TN) Murfreesboro Electric Department (TN) Murray Electric System (KY) Nashville Electric Service (TN) Natchez Trace Electric Power Association (MS) National Grid (MA) Navajo Tribal Utility Authority (AZ) Nebraska Public Power District (NE) New Albany Light Gas & Water (MS) New York Power Authority (NY) Newport Utilities Board (TN) North Alabama Electric Cooperative (AL) North East Mississippi Electric Power Association (MS)North Georgia Electric Membership Corp (GA) NSTAR Electric Company (MA) NV Energy (NV) Oak Harbor Public Power (OH) Oak Ridge Electric Department (TN) Omaha Public Power District (NE) Oncor Electric Delivery Company, LLC (TX) Orange and Rockland (NY) Orlando Utilities Commission (FL) Pacific Gas and Electric Company (CA) Pacific Power (OR) Paris Board of Public Utilities (TN) Pasadena Water and Power (CA) PECO Energy (PA) Penn Power (PA) Pennsylvania Electric Company (PA) Pennyrile Rural Electric Cooperative Corp (KY) Pepco (Potomac Electric Power) (DC) Pickwick Electric Cooperative (TN) Pike County Light & Power Co. (PA) Plateau Electric Cooperative (TN) Plumas-Sierra Rural Electric Cooperative (CA)

Pontotoc Electric Power Association (MS) Portland General Electric (OR) Powell Valley Electric Cooperative (TN) Prentiss County Electric Power Association (MS) Progress Carolinas (NC) Progress Florida (FL) Public Service Co. of New Mexico-PNM (NM) Public Service Company of Oklahoma (OK) Public Service Electric & Gas Company (NJ) PUD #1 of Ferry County (WA) Puget Sound Energy (WA) Pulaski Electric System (TN) **Riverside Public Utilities (CA)** Rockland Electric Company (NJ) Rockwood Electric Utility (TN) Rocky Mountain Power (UT) Roseville Electric (CA) Russellville Electric Plant Board (KY) Sacramento Municipal Utility District (CA) Salt River Project (AZ) San Diego Gas & Electric Company (CA) San Marcos Electric Utility (TX) Sand Mountain Electric Cooperative (AL) Santee Cooper (SC) Seattle City Light (WA) Sequachee Valley Electric Cooperative (TN) Sevier County Electric System (TN) Sheffield Utilities (AL) Silicon Valley Power/City of Santa Clara (CA) Snohomish County PUD (WA) Southern California Edison (CA) Southern Maryland Electric Cooperative (MD) Southwest Tennessee Electric Membership Corp (TN) Southwestern Electric Power Co (LA) Springer Electric Cooperative (NM) Springfield Department of Electricity (TN) Starkville Electric System (MS) Sulphur Springs Valley Electric Co-op (AZ) Sweetwater Utilities Board (TN) Tallahatchie Valley Electric Power Association (MS) Tampa Electric Company (FL) Tarrant Electric Department (AL) Tennessee Valley Electric Cooperative (TN) Tombigbee Electric Power Association (MS) Trico Electric Cooperative, Inc. (AZ) Tri-County Electric Membership Corp (NC) Tri-State Electric Membership Corp (GA) Truckee Donner PUD (CA) Tucson Electric Power Company (AZ) Turlock Irrigation District (CA) Tuscumbia Electricity Department (AL) United Power (CO) UNS Electric, Inc (AZ) Upper Cumberland Electric Membership Corp (TN) Upper Peninsula Power Company (UPPCO) (MI) Verendrye Electric Coop. (ND) Village of Arcade (NY) Village of Minster (OH) Village of Waynesfield/Waynesfield Electric Department (OH) Vineland Municipal Electric Utility (NJ) Volunteer Energy Cooperative (TN) Warren Rural Electric Cooperative Corp (KY) Weakley County Municipal Electric System (TN) West Kentucky Rural Electric Cooperative Corp (KY) West Penn Power (PA)



Western Massachusetts Electric Company (MA) Wheeling Power (WV) Wisconsin Public Service (WI) Wyandotte Municipal Services (MI)

Xcel CO - Public Service Company of Colorado (CO) Xcel MN - Northern States Power (MN) Xcel NM - Southwestern Public Service Co. (NM)

SEPA Research Report Summaries

Utility Community Solar Handbook: A Development Guide for Utility-Managed Community Solar Programs (2013)

Written specifically for utilities looking to create a community solar program, this handbook describes the major issues and components that need to be addressed in program design and provides methods to get the process started. These suggestions and considerations are based upon the lessons learned from community solar programs managed by several SEPA member utilities.

Centralized Solar Projects and Pricing Quarterly Bulletin with Pricing Section - Q1 2013 (2013)

SEPA's members-only quarterly solar projects bulletin will provide a summary and commentary on the centralized PV and CSP projects activity in the United States. The latest edition includes an updated solar projects pricing section.

Utility Solar Business Model Quarterly Bulletin: "Net Metering Issues" – Version 2 (2012)

This electronic bulletin is part of an ongoing collaborative research between SEPA and EPRI to document and examine the expanding range



solar electric power association

of utility solar business model activities in acquiring solar energy and owning PV assets. The fifth edition explores impacts of net metering (NEM) on utility revenue collection and the utility customer. The report includes NEM revenue loss and ratepayer equity issues as well as two case studies that detail utility solar program alternatives to net metering offered by the City of Palo Alto and Austin Energy.

Summary Report of the SEPA Fact Finding Mission to New York and New Jersey (2012)

This Summary Report of the SEPA Fact Finding Mission to New York and New Jersey provides an overview of each presentation from the meetings and site visits with some figures for additional detail. The FFM started in Long Island, NY and finished in Atlantic City, NJ. Each day included meetings and discussion with local utilities and other hosts and included at least one solar site visit each day.

Germany Fact Finding Mission Event Summary (2012)

German policies have spurred dramatic renewable energy market growth, and the corresponding deployment of renewable energy resources has resulted in an electric utility

1220 19th Street NW, Suite 800, Washington, DC 20036, U.S.A.

Tel: 202.857.0898

system that is heavily saturated by intermittent energy sources, including solar. SEPA returned to Germany in June 2012, the site of SEPA's first international FFM five years earlier, to study Germany's advanced market, the country's successes, current challenges and future approaches.

Changing Ownership of Distributed Photovoltaics (2012)

Over the past decade, the U.S. photovoltaic (PV) market has grown at an average annual rate of approximately 70%, with distributed, rooftop systems accounting for much of the expansion. Indeed, at the end of 2011 there were more than 200.000 distributed PV systems totaling nearly 2,500 MWAC installed in the United States. Within this distributed market. three ownership models have emerged over time: customer-owned, solar industry-owned and utilityowned. In assessing each PV ownership model, the paper examines the advantages and the challenges of each ownership model to the respective stakeholders, and the critical issues at play as the cost of PV continues to fall.