U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Challenges and Successes on the Path toward a Solar-Powered Community

Solar in Action

Sacramento, California

Includes case studies on:

- Developing Power Purchase Agreements for City Facilities
- Understanding the SolarShares Community Solar Program
- Establishing a Clean/Green Technology Industry Incentive Zone
- Streamlining Solar Permitting with Input from Clean Tech CEO Roundtables

SOLAR AMERICA CITIES

Part of the Solar America Communities program

October 2011

The Power Inn Alliance encourages innovation, development and adoption of clean energy, technology, and renewable resources. Operating the first fueling station in the nation to produce hydrogen with renewable power, the Sacramento Municipal Utility District takes advantage of the city's 296 sunny days a year to serve its fuel cell electric vehicles. *Photo from City of Sacramento, NREL/PIX 19475*

Cover photos from iStock/11701373, Tower Bridge and downtown Sacramento

About the U.S. Department of Energy's Solar America Communities program:

The U.S. Department of Energy (DOE) designated 13 Solar America Cities in 2007 and an additional 12 cities in 2008 to develop comprehensive approaches to urban solar energy use that can serve as a model for cities around the nation. DOE recognized that cities, as centers of population and electricity loads, have an important role to play in accelerating solar energy adoption. As a result of widespread success in the 25 Solar America Cities, DOE expanded the program in 2010 by launching a national outreach effort, the Solar America Communities Outreach Partnership. As the Solar America Cities program evolved to include this new outreach effort, the program was renamed Solar America Communities to reflect DOE's commitment to supporting solar initiatives in all types of local jurisdictions, including cities and counties. Visit Solar America Communities online at www.solaramericacommunities.energy.gov.

Sacramento's Starting Point

The City of Sacramento was designated by the U.S. Department of Energy (DOE) on March 28, 2008, as a Solar America City. Sacramento is dedicated to clean, renewable energy and sustainability, and the region has a long standing history of commitment to solar. The city is home to the Sacramento Municipal Utility District (SMUD), a forerunner in the development of photovoltaic (PV) applications.

When it received its Solar America City designation, Sacramento had a relatively high number of solar installations, with close to 350 PV systems installed within the city limits with a capacity of 3,026 kilowatts (kW), and 1,190 PV systems with a total capacity of 10,559 kW within the larger SMUD service area (covering Sacramento County and a portion of Placer County in the region).

The city's municipal operations had a 30-kW PV system on the Joe Serna Jr. / CalEPA Building, a 2-kW PV system at the city zoo, and numerous solar-powered parking meter kiosks and traffic sign flasher systems. Other major solar installations within city limits include state-owned buildings such as the East End Complex with 160 kW and the California Exposition Center with a 540-kW, ground-mounted array that doubles as parking lot shading.

Former Governor Arnold Schwarzenegger set a goal to install 3,000 megawatts (MW) of PV in California by 2017. Proportional to population, this would make the city's share of the PV goal approximately 40 MW. To achieve this ambitious goal, approximately $30 million per year needs to be invested in PV within the City of Sacramento. As a major landowner, employer, building manager, fleet operator, utility owner and operator, and zoning and permitting authority, the city can be a key partner in enabling SMUD to achieve its share of California's solar installation goal.

Building Partnerships and Setting Goals

The City of Sacramento identified several barriers to creating a robust solar market, including a lack of consumer information about the benefits of solar, and how to incorporate solar at both new construction and remodeling stages; real and perceived conflicts within existing city codes and policies that discourage solar, along with concerns about the solar permitting process being too expensive and too time consuming; high

initial costs and a lack of financing for solar projects; and a lack of understanding of existing solar-related business opportunities and job training.

Addressing these core issues became crucial elements of Sacramento's Solar America Cities strategy and required a high level of collaboration.

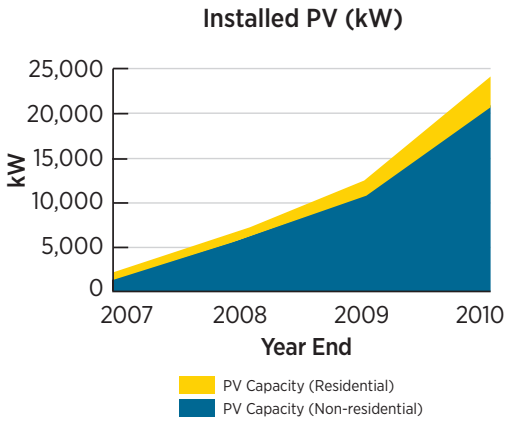
The City of Sacramento joined forces with multiple partners to help it reach its goals. Partners included the following:

- **SMUD:** A community-owned electric utility governed by a seven-member board of directors
- **CleanStart:** An initiative of the Sacramento Area Regional Technology Alliance designed to accelerate the development of clean technology ventures within the greater Sacramento region
- **Sacramento Tree Foundation:** A nonprofit organization working to grow healthy, livable communities in the Sacramento region by planting, protecting, and teaching about trees
- **Valley Vision / Green Capital Alliance:** A collaborative planning and research organization that is dedicated to securing the social, environmental, and economic health of the Sacramento region
- **Build It Green:** A membership-supported, nonprofit organization whose mission is to promote healthy, energy- and resource-efficient homes in California; the city has an ongoing collaboration with several jurisdictions in the development of green building policies and has partnered with Build It Green to form a Sacramento-based Public Agency Council to provide an ongoing regional forum.

Also, the Clean/Green Technology Incentive Zone (highlighted in this brochure) is part of a larger regional scope being executed by the Partnership for Prosperity, a collaboration between the Sacramento Area Commerce & Trade Organization, the Sacramento Metro Chamber, and Valley Vision.

Installed Capacity

Sacramento



Installed PV capacity increase from December 31, 2007, to December 31, 2010

Addressing the barriers to creating a robust solar market became the crucial elements of Sacramento's Solar America Cities strategy. *Photo from iStock/11701373*

A 540-kW PV system at the California State Exposition Fairgrounds produces power while providing shade for parked cars. *Photo from Sacramento Municipal Utility District (SMUD), NREL/PIX 19474*

Accomplishments and Highlights

In addition to the four case studies featured in this brochure, the project team accomplished the following:

- Planned and executed a Clean Tech Showcase and Summit event that occurs annually to feature the region's existing and new clean tech companies, investors, educators, and innovators
- Developed, in conjunction with CH2M HILL, a solar map website with a self- assessment capability to evaluate residential rooftops for solar potential
- Created a highly-visible sustainability Web page (www.cityofsacramento.org/generalservices/sustainability/)

Case Studies: Successes and Challenges

Developing Power Purchase Agreements for City Facilities

The City of Sacramento is a major landowner and building operator within the city. It operates a total of more than 450 municipal buildings and facilities; this equals nearly 6 million square feet within the 99 square miles that make up the city limits of Sacramento.

As part of the city's solar program, Sacramento sought to install a significant amount of PV on municipal rooftops and in highly visible community locations, such as libraries and community centers, to familiarize Sacramentans with solar power.

Initially, the city established a 5-MW installation goal at various municipal buildings within a 2-year anticipated time frame. Achievement of the 5-MW goal would result in Sacramento using solar energy to meet approximately 17% of the city's peak demand and 6% of the city's annual municipal electricity needs. In addition, 5 MW would contribute significantly to the 40-MW goal that is the city's obligatory share under the State of California Governor's Million Solar Roofs Program to install 3,000 MW of PV across the state by 2017.

To achieve the 5-MW goal, the city identified more than a dozen sites, both existing and new construction, for potential PV system installation. Potential sites identified included City Hall, a water treatment plant, an urban renewal brownfield site, the convention center, city zoo, and a golf course.

Challenges in Financing Municipally Owned Solar Systems. Sacramento's solar installation goal posed budget constraints due to a lack of readily available financing for municipally owned systems. The high initial cost of PV, the tax-exempt status of local jurisdictions, and the low cost of utility-provided electricity have traditionally led to financing arrangements that require greater than 20-year loan terms to meet the city's desire to have financial neutrality, or better yet, a financial payback. The city does not qualify for federal tax incentives or other benefits that tax-paying companies may enjoy when installing solar-electric systems.

The city addressed this barrier through several strategies. First, third-party ownership of systems allows tax-paying corporations to receive credits and account for depreciation and other incentives that are not available to local jurisdictions. Second, SMUD unveiled a pay-for-performance incentive program that will make solar ownership by third parties more desirable in the Sacramento service territory. And finally, Sacramento is working with SMUD to determine the feasibility of providing surrogate roof space for SMUD's SolarShares Program (described below).

The city is especially interested in exploring the potential for joint capitalization of new systems and joint purchasing of system output. For example, the city might make an in-kind contribution of solar sites (e.g. city-owned rooftops and parking structures), with the cost of the PV array itself borne by a community of investors that could include SMUD, local businesses, and community organizations.

Ownership, Operation, and Maintenance Relationships for Municipally Owned Systems. Due to a lack of capital, the PPA model of having a third party design, install, own, operate, and maintain the system and sell power to the city was attractive.

However, Sacramento was concerned about third-party ownership of assets that are located on city property and the long-term relationship that would result between the city and the third-party owners over the operations, maintenance, and eventual disposal of the solar assets. It addressed this barrier by researching best practices employed by other cities; conducting an installer survey to discover quality of materials used, financial strength, years in business, liabilities, and other issues that may forecast a company's long-term financial outlook; and developing a model agreement between the city and third parties to promote successful operation, maintenance, and eventual disposal of solar assets.

Developing this business model required economic and site analysis, formation of a local task force, and other start-up expenses, which was funded in part from the DOE Solar America Cities grant, and in part from matching in-kind contributions from the City of Sacramento and SMUD.

Technical Approach. City facilities were evaluated as potential sites based on the following criteria:

- Adequate electric load
- Security of site
- Public relations value
- Fleet vehicle shading potential
- Adequate roof space and type
- Mix of new construction and existing buildings
- Geographical distribution.

Upon collecting the appropriate information to determine reasonable PV system size, the city scaled back its original goal of 5 MW open to multiple third-party providers to a goal of 4 MW of solar production from a single provider. Sacramento is now targeting 2 MW based on feedback received during the preliminary proposal process that determined that 2 MW was a better target due to orientation and structural constraints of existing municipal facilities.

Results and Accomplishments. From the original list of potential sites, 11 were targeted for PV installations—7 existing and 4 new construction sites. The following significant issues were encountered during the preliminary sizing of the systems:

- Uncertainty about extension of federal solar tax credits
- Proper length of Power Purchase Agreement contract given SMUD's low rates
- An early 19th-century "networked" electrical distribution system in downtown Sacramento that made two projects questionable; those sites were removed from the list of potential sites.

A major accomplishment, through the support of DOE's technical assistance team, was the development of templates for a solar request for quote, solar license agreement, and solar Power Purchase Agreement that meet the needs of the City of Sacramento.

Understanding the SolarShares Community Solar Program

- SolarShares is a community solar program pioneered by SMUD in 2008. This program allows customers to purchase a portion of the solar energy generated by a 1-MW PV installation in Sacramento County. SMUD purchases the output of the third-party-owned system (through a Power Purchase Agreement) and resells it to SolarShares customers for a fixed monthly fee based on customer electricity usage and the size of the block they choose to purchase. The customer buys an annual amount of solar energy by selecting a size for their "virtual rooftop system."
- The size of system offered to a given customer depends on the customer's annual electricity consumption for the previous 12 months. Smaller energy users are restricted to smaller systems to preclude the possibility of over-generation and make the program available to a greater number of customers.
- The customer's annual usage also determines his or her monthly SolarShares fee. Because larger energy users receive greater value from net metering due to SMUD's tiered rate structure, they pay more per kWh for SolarShares but still pay about the same annual premium as smaller energy users for participating in the program.

Results to Date. SMUD has built one SolarShares solar installation and will continue to expand the program based on the results from the pilot effort. SMUD's goal is to keep the system subscribed up to 95% of its full output, with the remaining 5% used as a safety margin to ensure that SMUD can keep its delivery commitment to customers if the system produces less energy than estimated.

The 1-MW system was subscribed to the desired level within six months of program inception. Little paid marketing was necessary—media stories and word of mouth were sufficient to produce this level of demand. Approximately 700 customers were sufficient to fully subscribe the system, and there is a persistent waiting list of approximately 60 customers. The current mix by customer size is about 27% small, 51% medium, and 22% large.

Participants benefit from getting a fixed-price renewable energy product that is priced only moderately above grid price from the outset and that may eventually be less expensive, depending on how long they remain in the program.

The utility is able to reduce the cost of adding renewable generation within the distribution grid by having a subset of ratepayers defray the higher cost of PV relative to other renewable energy sources.

The ability to site systems on rooftops as well as less developable land gives many community institutions (such as schools) the potential to serve as system hosts and perhaps receive revenue in the form of space leasing.

Given these advantages, it is not unreasonable to expect that a SolarShares model can dramatically expand PV market penetration over what would be possible through sheer private acquisition by households and businesses at this stage in the development of the technology.

Establishing a Clean/Green Industry Incentive Technology Zone

To encourage the development of a local solar industry and, in particular, increase the production of solar technology locally, Sacramento designated an area within a 5000-acre radius as a Clean/Green Technology Zone. The zone includes several areas with different boundaries and designated business areas, including the Power Inn Alliance, Clean Technology Enterprise Zone, Recycling Market Development Zone, and Regional Innovation/Technology Zone. This area contains more than 2,000 businesses, Sacramento California State University, and the SMUD headquarters.

The Power Inn Alliance, one of the city's most efficient Property and Improvement Districts, and other stakeholders have begun efforts to transition the area from a standard industrial zone into an integrated, mixed-use area with a focus on clean technology. Recent developments in the Power Inn area include office and recreational facilities at Granite Park; a 2.5-MW ground-tracking solar installation at Depot Park, Sacramento's former army base; and the development of a strategic plan for the development of 140 acres as an innovation technology park. Leveraging these efforts, Sacramento aims to grow a new industry cluster while becoming a center for innovation and job creation.

As an incentive, the clean tech zone is located within a state-designated Enterprise Zone; new solar businesses choosing to locate there will enjoy the following benefits:

- Sales tax credits on qualified property
- Wage tax credits for five years related to hiring eligible employees
- 100% net operating loss carryovers available for 15 years
- Rapid depreciation of equipment

In addition to these benefits, the city also may issue tax-exempt industrial development bonds to eligible solar businesses that request subsidized financing.

Sacramento's Economic Development Department used technical assistance from DOE and retained CH2M HILL to provide an assessment and evaluation of the zone. It focused on solar energy (and solar supply chain products) as a key energy sector that can serve as an anchor technology and catalyst for the development of the area.

The assessment report was completed in July 2010. It identified opportunities to capitalize on existing assets, and provided recommendations for the city to bridge gaps.

Streamlining Solar Permitting with Input from Clean Tech CEO Roundtables

The Green Capital Alliance is a partnership of education and research institutions, workforce and economic development organizations, utilities, local government leaders, and private business striving to make the Sacramento region a hub for a clean energy technology industry cluster.

Roundtable discussions were held for the Chief Executive Officers (CEOs) from the Green Capital Alliance in 2007, 2009, and 2010. A reccurring theme stemming from the roundtable discussions was a concern from the local business community regarding the ease of obtaining permits for solar systems—there is a perception among residential and commercial stakeholders that obtaining permits for solar is a lengthy, difficult, and expensive process.

Solar permitting processes vary widely among the seven local jurisdictions within the County of Sacramento, and fees also vary greatly—from $192 to $823, with the City of Sacramento averaging $724 for a small solar PV system of 3 kW.

Key findings from the roundtable discussion are as follows:

- Different costs and processes within the region continue to be a challenge
- Building inspectors unfamiliar with solar technology may cause unnecessary delays in plan reviews and inspections
- Permit fees should be either a flat fee for small-scale solar systems or a graduated fee based on the actual inspection and review costs rather than fees based on valuation of the construction and equipment cost

- Homeowners need more education to better understand available incentives and the benefits of solar energy

In response to the CEO roundtable findings, the City of Sacramento partnered with SMUD and the other jurisdictions within Sacramento County to adopt a standardized solar permit application in addition to a three-year fee waiver for residential solar systems.

While the city has already made strides in adopting the standardized application for solar and has committed to over-the-counter reviews, more can be done to further streamline the review process of larger projects and educate potential applicants. The fee waiver adopted by Sacramento and other cities within the county expired at the end of 2009.

City staff has engaged local jurisdictions to update the standardized application and has begun the process of assessing how best to proceed on the variation in fees that currently exists. The city primarily is interested in establishing a flat fee for residential permits for systems under 3 kW to supersede the expired fee waiver.

Once the permit application is standardized, the city will create a pilot program for the online submittal of minor permits, including small-scale solar systems to be launched in 2012.

Top Takeaways

- Infrastructure improvements to the Clean/Green Technology Zone will support more intensive use by the solar industry, as will continued marketing of the area's attributes to attract businesses.
- Stronger relationships between various jurisdictions in the region must be established to retain consistency among different permitting agencies' review processes and fees.
- Local jurisdictions have largely relied on the local utilities to educate homeowners and contractors about the benefits of solar energy as well as the permitting process. Cities need to directly engage with homeowners and contractors regarding solar energy, the permitting process, and available resources.
- One of the region's economic advantages is lower energy costs compared with other areas of California. However, this becomes a barrier to widespread adoption of solar technology due to an increased payback period on the original investment of solar equipment. Instituting "time-of-use" electricity rate structures could help alleviate some of this concern by creating greater cost burdens for times of peak energy load.

Next Steps

The City of Sacramento is finalizing updates to its building permit application and review process for PV and solar hot water systems on existing structures. In addition, reforms to the city's municipal code will streamline the planning review, especially for projects involving large ground-mount arrays.

These improvements will include the following:

- Partnering with SMUD and other jurisdictions to revise the standardized application for small-scale PV systems
- Creating an online submission for applications and fees
- Hosting educational workshops for contractors and homeowners on how to obtain permits for a solar system.

Additional planned activities include the following:

- Providing interactive, educational kiosks at three municipal locations—Sacramento Zoo, the permit counter for building and planning applications, and a park
- Continuing to seek out opportunities to support and cultivate solar economic development in the clean tech zone
- Developing awareness of the clean tech zone as an attractive location for the solar industry, especially in nearby technology clusters like the Bay Area.

Additional Resources

- City of Sacramento Sustainability Web page: www.cityofsacramento.org/generalservices/sustainability/
- Green Capital Alliance: www.greencapitalalliance.org
- SMUD Solar Map: http://smud.solarmap.org/

For more city information, contact:
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Clockwise from top left: *Photovoltaic system in Philadelphia Center City district (photo from Mercury Solar Solutions); rooftop solar electric system at sunset (photo from SunPower, NREL/PIX 15279); Premier Homes development with building-integrated PV roofing, near Sacramento (photo from Premier Homes, NREL/PIX 15610); PV on Calvin L. Rampton Salt Palace Convention Center in Salt Lake City (photo from Utah Clean Energy); PV on the Denver Museum of Nature and Science (photo from Denver Museum of Nature & Science); and solar parking structure system at the Cal Expo in Sacramento, California (photo from Kyocera Solar, NREL/PIX 09435)*

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