

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

Solar in Action



Austin, Texas

Includes case studies on:

- Solar School Demonstration Projects and Curriculum Development
- Assessing Solar Potential on Rooftops
- Adapting a Solar Incentive Program to Changing Market Conditions
- The Pecan Street Project: Clean Energy Economic Development Collaboration



Solar panels line the top of the parking garage at Austin's Palmer Events Center. It is one of 35 solar systems on city-owned facilities in Austin. *Photo from Austin Energy, NREL/PIX 18399*

Cover photos from iStock/8879635, Austin city skyline

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.

Austin's Starting Point

Austin was designated by the U.S. Department of Energy (DOE) on June 20, 2007, as a Solar America City. The City of Austin has an established and long-term focus on sustainability. This is evidenced by the accomplishments of its citywide solar energy program, which has been in place since the 1980s and is operated by the municipal utility, Austin Energy. Prior to becoming a Solar America City, Austin benefited from the following programs and policies:

- A multifaceted Austin Energy strategic plan with a solar-specific goal of 100 megawatts (MW) by 2020
- A solar rebate program providing incentives to residential and commercial customers of Austin Energy
- An award-winning Green Choice® renewable energy pricing plan
- Highly visible solar installations on city-owned facilities, including libraries, recreation centers, parking lots, and garages
- Knowledgeable city permitting staff and inspectors to facilitate the installation process
- Well-established working relationships between stakeholders, such as solar contractors, outreach organizations, and the national solar industry.

Austin not only has an excellent solar resource potential but has a municipally owned utility with an established solar program and dedicated staff to focus on increasing the deployment of solar energy technologies. Combined with a very active and vocal community that engages in the public planning process, the city of 1.7 million has made significant strides to promote solar and other clean-energy technologies.

Building Partnerships and Setting Goals

In 2003, Austin Energy established a Strategic Plan that included a goal to install 100 MW of solar by 2020. The plan listed activities to achieve this goal, including a solar-on-schools program, solar installations on city facilities, and a photovoltaic (PV) rebate program.

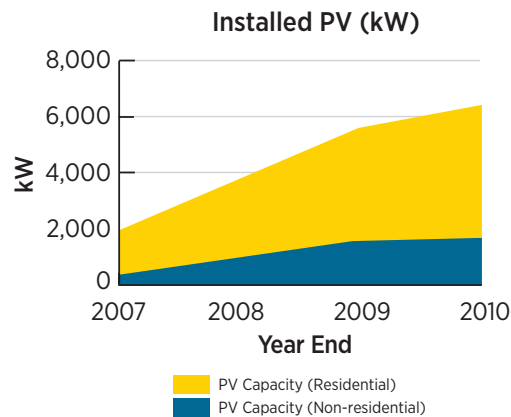
Austin Energy recently developed a Generation Plan proposing to increase the solar component to 200 MW of solar by 2020 (contingent upon approval by the Austin City Council following an affordability study). Although Austin entered the Solar America Cities partnership with an established solar program, the city was interested in augmenting its efforts in educational outreach and engaging in a systematic approach to determine the city's potential for solar energy.

When Austin became a Solar America City in 2007, together with its partners, the city identified the following activities to help achieve its solar goals:

- Develop a solar schools and educational plan involving solar energy installations and curriculum for K-12 students
- Perform a rooftop assessment of commercial, industrial, institutional, and government buildings suitable for solar energy deployment to determine the potential power production
- Quantify the combined impact of existing and planned wind energy generation and potential future central station solar power plants on the electric transmission system in West Texas. This information would be used to determine if additional transmission capacity must be planned and if thermal energy storage is needed.

These Solar America Cities activities complemented the city's other efforts to promote solar and other clean energy technologies. The City of Austin's Solar America Cities project partners include:

Installed Capacity Austin



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

- Texas Solar Energy Society
- Austin Independent School District
- Clean Energy Associates.

The city has partnered with these organizations for years and has developed good relationships with each of them. The partners understand the city's goals and have worked in collaboration to help meet those goals.



Austin promotes solar in the community through highly visible installations at municipal facilities, such as this taxi stand at the city-owned Austin Bergstrom International Airport. *Photo from Austin Energy, NREL/PIX 18400*



Austin City Hall is a Leadership in Energy and Environmental Design (LEED) Silver building with a 9-kW PV system. Photo from Austin Energy, NREL/PIX 18401

Accomplishments and Highlights

Because Austin has an established solar program with dedicated staff and funding, the city focused its efforts with the Solar America Cities program in very specific areas that it wanted to expand. Highlights of Austin's accomplishments through the Solar America Cities program include:

- The installation of PV systems at four K-12 schools and two community college campuses in Austin Energy's service territory
- An assessment of the rooftop area available for PV development within Austin Energy's service territory that determined 2,446 MW of capacity could be accommodated
- An assessment of the opportunity to load co-located wind and solar generation capacity onto a constrained transmission system while resulting in minimal losses.

Case Studies: Successes and Challenges

Solar School Demonstration Projects and Curriculum Development

Austin has supported solar in schools for decades by organizing and providing materials for model solar car races in the early days to more recently providing grid-connected demonstration systems for K-12 schools. Through the Solar

America Cities program, Austin expanded its efforts by installing highly visible PV systems at four local K-12 schools as well as two community college locations. Each system is equipped with a Web-based monitoring system that allows schools to see how their system is performing and compare it to other schools.

Funding for the design, equipment, construction, and management of these projects was provided by Austin Energy as matching funds for the Solar America Cities grant.

To complement the PV systems at the local school districts, Austin also worked with science coordinators and curriculum directors from the Austin Independent School District (AISD) to develop materials that will be used in conjunction with the PV systems installed at schools. The intent was to create materials that would facilitate a hands-on education in the sciences. These materials were developed for several grade levels so that the learning process builds from one grade level to the next, with the installed PV systems integrated into the learning process.

There were a number of opportunities in this task to leverage other existing curriculum development efforts. Austin Energy and AISD staff completed a thorough literature search of existing solar curricula for ideas of activities and concepts to include in the new solar curriculum.

AISD district staff developed the curriculum materials that are being integrated into AISD's science curriculum. Although there are more than 120 schools in the district, students from every school will have access to Web-based PV generation data from all systems and

lessons that utilize the data. To promote the curriculum, a workshop will be held for teachers. Austin Energy manages the overall direction for this effort.

PV systems were also installed at two campuses of the local community college, Austin Community College (ACC). ACC offers an Associate of Applied Science Renewable Energy Specialization in Solar Photovoltaic and Solar Thermal Power, as well as individual courses in solar energy. In addition to providing hands-on experience, ACC's courses prepare students for taking the North American Board of Certified Energy Practitioners (NABCEP) Photovoltaic Entry Level Certificate of Knowledge or Photovoltaic System Installer Exam.

Austin
installed six
high-profile
PV systems
at schools
and
colleges.

Assessing Solar Potential on Rooftops

Austin Energy determined that assessing the potential for rooftop PV systems would be a valuable study to help establish solar generation goals. Austin worked with local consultant Clean Energy Associates (CEA), which researched publicly available data to determine rooftop area and convert it to a potential PV generating capacity and annual energy generation.

CEA used data sources from the Travis and William County Appraisal Districts, the City of Austin, and Austin Energy to construct a rooftop assessment model. The model used a top-down, stepwise analytical approach to determine the rooftop square footage available on buildings in Austin Energy's service area.

Once an available rooftop square footage figure was obtained, the model applied factors to convert the available square footage into the available power (MW) and annual energy (megawatt-hours or MWh) potential under three different PV development scenarios:

- **Scenario 1.** Current technology (all crystalline silicon modules deployed). In this scenario, the model assumed all PV would be installed using typical currently commercially available, high-efficiency crystalline silicon solar panels.

This PV installation is located at Austin Community College, Riverside Campus, which offers certificates and 2-year degrees in renewable energy, and is supported by the City of Austin. *Photo from Austin Energy, NREL/PIX 18433*



The solar thermal collectors at Austin Energy's Sand Hill Energy Center are used to power an absorption chiller in summer and a heating system in winter. *Photo from Austin Energy, NREL/PIX 18402*

- **Scenario 2.** Combination of crystalline and thin film. This scenario assumed residential properties would use crystalline modules (due to their space constraints) while non-residential properties would deploy thin film technologies. Because current thin-film products have a lower power density than crystalline products; this results in lower estimates of both total capacity and annual energy.
- **Scenario 3.** All thin film. This scenario assumed that all available rooftop space was devoted to thin-film modules. Due to the lower power density rating of thin-film products, this scenario resulted in the lowest estimates of total capacity and annual energy.

The results of this study were ultimately used to assist Austin Energy in determining the solar portion of its Generation Plan. The results were also presented at the annual conference of the American Solar Energy Society. According to the results of the assessment, if fully developed under Scenario 1, rooftops within Austin Energy's service area could accommodate approximately 2,446 MW of PV capable of producing approximately 3.2 million MWh annually. This annual generation is equivalent to about 27.6% of Austin Energy's 2008 annual energy consumption. This also would enable Austin to receive 84% of its total current generation capacity from rooftop PV.

Substituting all potential PV capacity with thin-film deployment reduces the annual energy production to about 1.9 million MWh annually, equivalent to about 16.1% of Austin Energy's 2008 annual energy consumption.

Adapting a Solar Incentive Program to Changing Market Conditions

Prior to its participation in the Solar America Cities program, Austin Energy launched a solar PV rebate program for residential and commercial customers. When the program began in 2004, the incentive level was as high as \$5.00/watt. This incentive, along with the federal tax credit and the decreasing price of PV modules, created a large demand for PV systems. The rebates sold out every budget cycle. Because of the high demand, Austin Energy reduced its per installation incentive to allow more customers to participate. Demand further intensified at the end of 2008 with the threat of the federal tax credit ending, resulting in the highest participation the program has seen to date. The volatility of the program demand demonstrated to Austin Energy the importance of being prepared to accommodate and expect market changes that impact participation and its overall budget. Since then, Austin Energy began offering performance-based incentives for commercial, nonprofit, and multi-family customers up to 20 kilowatts (kW). Overall, the PV rebate program has been a great success for the city. Austin Energy also launched a successful solar water heater rebate program that offers \$2,000 for retrofit systems and \$1,500 for new construction projects.

The Pecan Street Project: Clean Energy Economic Development Collaboration

The City of Austin joined a community-wide collaboration that could potentially increase solar technology deployment on a large scale. The Pecan Street Project was formed by city representatives, Austin Energy, The University of Texas, the Austin Technology Incubator, the Greater Austin Chamber of Commerce, and the Environmental Defense Fund. These founding partners each have representatives on the board of Pecan Street Project Inc., a nonprofit organization formed in 2009.

The team's core objectives were to inventory the best options for reforming the energy distribution system; identify and address the technology, economic, and policy challenges to implementing those options; and offer Austin Energy as a test lab for entrepreneurs and corporations whose technology would power the new system.

The Pecan Street Project published a Report of Recommendations for the city to pursue. Highlights of the recommendations that will facilitate increased usage of solar technologies include the following:

- Deploy 20 MW of new distributed renewable resources via a request for proposal (RFP) that allows solar co-ops, ground-mounted solar, solar-above parking lots, and solar on school roofs to compete on cost
- Launch distributed renewable energy pilots including up to 2 MW of co-op solar in which several residents or businesses pool their finances to invest in off-site solar generating facilities such as big-box retailers
- Quantify the true value of distributed solar generation (such as the impact more solar has on criteria pollutants and their cost impacts, potential local job creation, economic development, and increased tax revenue)
- Deploy a net meter rate for new solar customers equal to the wholesale peak rate
- Revise the building code to require "Solar Ready" specifications (e.g., orientation, unobstructed solar access) for new homes built after 2012.

A solar curriculum is a scalable teaching medium to reinforce math, science, and other subjects.

Top Takeaways

- Research activities funded by the Solar America Cities program played an integral role in assisting Austin Energy with increasing the solar portion of its generation goals and enhancing the overall impact of its solar program.
- Austin Energy learned the importance of working directly with curriculum developers and school decision makers regarding solar curriculum development in the school district. Austin Energy worked closely with these individuals to show how solar energy concepts can be a valuable and scalable teaching mechanism for enforcing math, science, and other subjects while addressing state mandated educational standards.
- When construction projects are included as cost-share for a federally funded project, all project participants should be aware of special federal approvals that are required (such as National Environmental Policy Act (NEPA) compliance

review) and the time required so that it is communicated to all parties impacted by the project.

- The volatility of the solar rebate program demand made Austin Energy realize the importance of being prepared to accommodate and expect market changes that would impact program participation and its overall budget.
- The success of Austin's solar program today is a result of several decades of efforts in which the city, local community, and solar industry have worked together to take advantage of the supportive culture for clean energy, resource conservation, and advanced technologies.

Next Steps

Austin has emerged as a national leader in clean energy technology deployment with a heavy emphasis on solar energy. To further its solar program, Austin will focus on the following activities:

- Through the Solar America Cities Special Projects funding, Austin Energy will provide a solar outdoor learning center to be installed at schools in the Austin Independent School District. Curriculum materials developed through the Solar America Cities program will be taught in the learning centers and available to all schools.
- Austin Energy is currently exploring options to incentivize solar for nonprofit organizations that have difficulty taking advantage of the existing incentive structure.
- Austin Energy also is considering a feed-in tariff for larger projects.
- With only 5 years remaining in its Strategic Plan, which allocated solar incentives for 10 years, Austin Energy is looking at ways to slowly move away from cash-based incentives.



Austin Community College, Rio Grande campus, displays a PV installation that also provides shade. Photo from Austin Energy, NREL/PIX 18434

Additional Resources

- Austin Energy Solar Incentives: www.austinenenergy.com/Energy%20Efficiency/Programs/Rebates/solar%20rebates/index.htm
- Austin Energy Strategic Plan: www.austinenenergy.com/about%20us/newsroom/Reports/strategicPlan.pdf
- Austin Energy Generation Plan: www.austinenenergy.com/about%20us/Environmental%20Initiatives/climateProtectionPlan/generationBriefingSummary.pdf
- Pecan Street Report of Recommendations, 2010: http://www.pecanstreet.org/wordpress/wp-content/uploads/2011/08/Pecan_Final_Report_March_2010.pdf

For more city information, contact:

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For more information on going solar in your community, visit *Solar Powering Your Community: A Guide for Local Governments* at http://solaramericacommunities.energy.gov/resources/guide_for_local_governments/

For more information on individual cities' solar activities, visit www.solaramericacommunities.energy.gov/solaramericacities/action_areas/

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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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