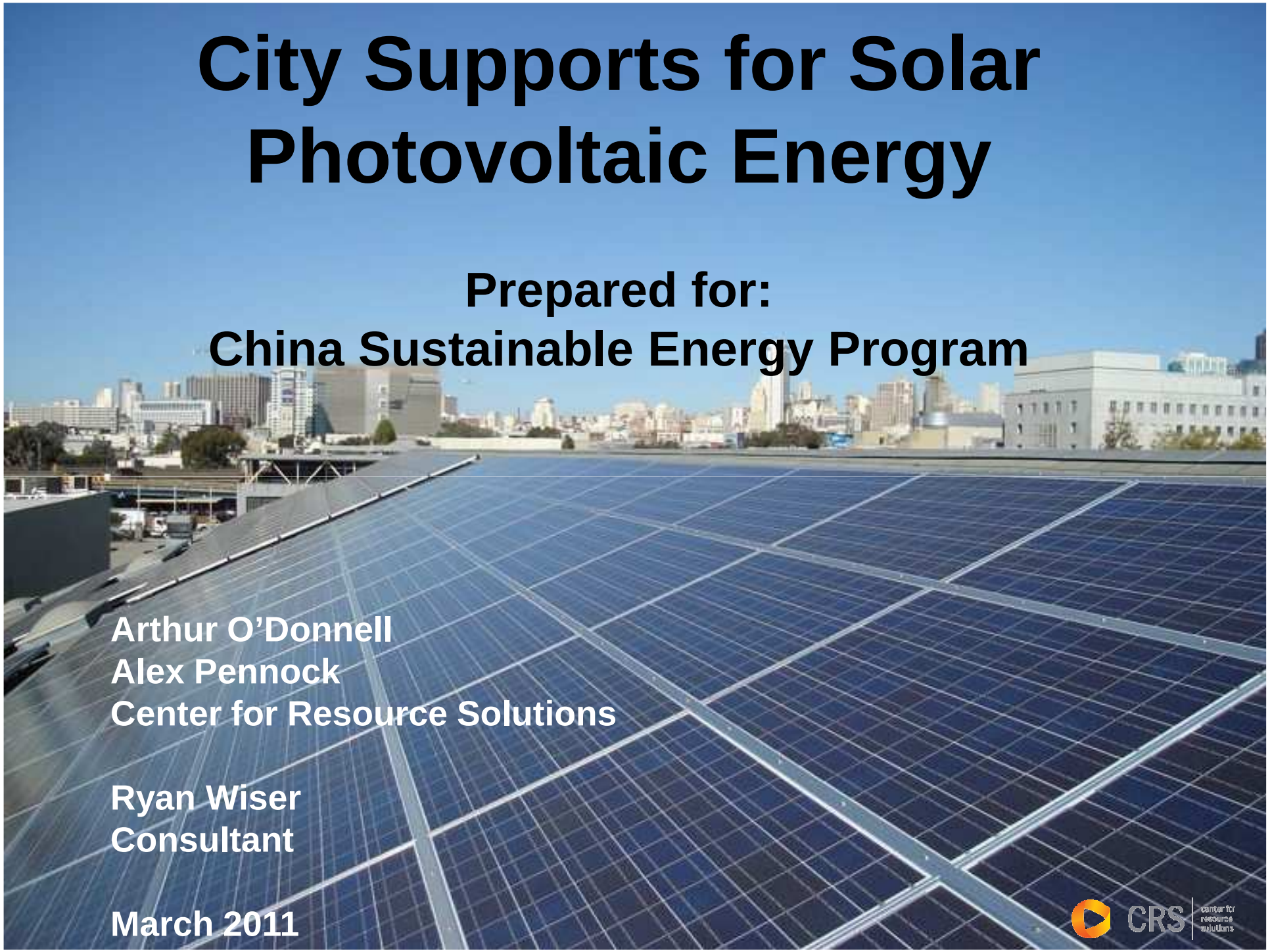
City Supports for Solar Photovoltaic Energy

Prepared for:
China Sustainable Energy Program



Arthur O'Donnell
Alex Pennock
Center for Resource Solutions

Ryan Wiser
Consultant

March 2011

In This Presentation:

- Role of Cities in Supporting Solar
- US Solar America Cities Program
- Model U.S. Cities and Projects
- International Cities in their National Context:
  - Australia
  - India
  - Japan
- Other Notable Cities
- Conclusions and Implications

CRS center for resource solutions

Role of Cities in Supporting PV

- Actual deployment logistics (vs. high level policies often enacted at state/federal levels)
  - Historical Roles
    - Zoning and access
    - Improved permitting
  - Recent/Expanded Roles
    - Comprehensive planning
    - Training and job development
    - Model solar projects
    - Mapping and information
    - Financial support and tools

Zoning and Access

In the early years of the development of the PV industry segment it was necessary to change existing local rules or restrictions to accommodate solar installations: solar access laws, favorable zoning, and streamlining permitting were a focus.

CRS center for resource solutions

Zoning and Access

- In the U.S., property zoning is a local function, largely carried out by municipal or county jurisdictions, with some level of oversight by state government.

- The notion of a city enacting a comprehensive zoning law is a 20th century phenomenon, originating in New York City in 1916.

Zoning and Access

- **Solar Rights Act**--State of New Mexico; 1978
  Defined the right to use solar energy as a property right and provided for state encouragement of its use.
- **Solar Energy Ordinance**--Port Arthur, Texas; 1979
  Defined solar energy and mandated design principles that supported solar energy and also protected buildings.
- **Solar Access, Thermal Performance, and Solar Heat**--Soldiers Grove, Wisconsin; 1980. Set energy performance standards for new building, including a requirement that non-residential buildings receive a minimum of 50 percent of their heating from solar energy.

Streamlining Permitting

Streamlined local solar project permitting helps individual homeowners through the bureaucratic maze.

- In Sacramento, California, the process to secure a permit for a small roof-mounted PV system took three weeks, and the fees — for a building permit, plan check and inspection — were $1,000.
- In 2007, Sacramento reduced fee to $0.

CRS center for resource solutions

Comprehensive Planning

- Policies put in place as part of a city's periodic planning can have long-ranging effects, and may not be able to be changed for years or decades.
- It is important to work with city planning agencies to ensure that policies, projected growth and the resulting development path will support PV rather than hinder it.
- Yokohama's 2008 Energy Vision urban plan actively promotes renewable energy to reduce GHG emissions by 30% by 2025, 60% by 2050.

Training and Job Development

- A properly trained workforce is necessary to achieve PV installation goals on time.
- Support for training also helps transition workers from declining sectors and supplies a city with skilled workers, sustaining the industry beyond basic PV development targets.
- Many cities in the US provide extensive training for installers and support staff (and potential PV purchasers) as solar laws pass

Model Solar Projects

- City government can demonstrate support through large public PV projects on municipal buildings and elsewhere in the city.
  - San Francisco's Moscone Center, International Airport
- Electric utilities or private companies may do so as well, with or without city support.

Image credit: www.cleanfleetreport.com

Mapping and Information

- Information provided to potential commercial and residential customers aids in effective decision-making.
- Solar project and insolation maps were rolled out as part of Berkeley, CA solar programs.
- Likewise, comprehensive program information was made public, in addition to free consumer training and information sessions.

Financial Support and Tools

- Various city programs can provide financing and supporting information.
- Feed-in tariffs, loans paid back through property taxes, rebates, tax refunds.
- Money for programs often comes from utility public benefit funds, specific city bonds, or public / private partnerships.

U.S. Department of Energy
Solar America Cities Program

CRS center for resource solutions

Solar America Cities Program

- Initially funded by the U.S. DOE with a modest $4.9 million allocation in 2007, the program selected 25 cities across the nation and provided up to $200,000 each.
- Cities were also able to apply for up to $250,000 in technical assistance grants from the DOE and its national laboratories and contractors.
- Many used the funds to hire a full-time staff member to guide a more comprehensive sustainability or climate-action program that also incorporated solar efforts.
- City solar programs vary substantially, with some programs summarized in the following slides.

Solar America Cities Program

The goals of Solar America Cities include:

- Development of comprehensive city-wide approaches to promote solar energy.
- Use of stakeholder processes to include a wide range of interests in the community.
- Installation of solar PV units on city-owned buildings.
- Removal of barriers to installation that might exist in city charters, zoning, regulations, building codes, and rules for permitting and building inspections.
- Creation of new city-level financial supports, including rebates and tax incentives.

CRS center for resource solutions

Solar America Cities Program

New directions in 2010:

- The American Recovery and Reinvestment Act of 2009 (ARRA, the federal economic stimulus package), expands activities among the partner cities.
- U.S. DOE was looking for replicable projects and initiatives.
- On October 8, 2009, the DOE announced $10 million in grants for 40 special projects proposed by 16 Solar America partner cities.

Solar America Cities Program

Each city has a different plan, but there are some common trends:

- Improved community information, including interactive solar maps on city web sites;
- Outreach to schools, businesses or institutions;
- Encourage component manufacturers to locate in the municipality or region;
- Develop new incentives or financing mechanisms.

Solar America Cities Program

Some innovative cities in the program:

- Tucson, AZ – Comprehensive Planning
- Austin, TX – Ambitious PV Goals and Deployment
- Knoxville, TN – Industry Support and Worker Training
- Denver, CO – Large Airport Project
- San Francisco, CA – City-Owned Projects and Interactive Solar Maps
- Berkeley, CA – Tax-Based Financing (PACE)

Tucson, Arizona

CRS center for resource solutions

Tucson, Arizona

- Tucson has one of the most detailed and comprehensive solar development plans in the US, although its goals are modest.
- Only 1 MW of PV by 2009, but the city wants to have 15 MW in the immediate region by 2015.
- Using $8.8 million in public bonds to finance projects.

Tucson, Arizona

12 strategies included and described in the Solar Development Plan:

Economy	Policies
Market Awareness	Incentives
Infrastructure	Constituents
Coordinate Key Players	Worker Training
Enable City Government	Measurement
New Regulations	Execution

CRS center for resource solutions

Tucson, Arizona

Bruce Plenk, Tucson Solar Energy Coordinator:

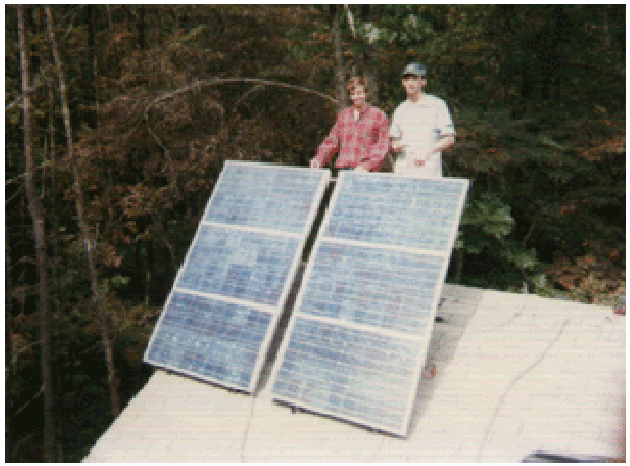
"First, our focus is to get solar on city buildings as a demonstration that solar works. Second, focus on policy issues for residential and commercial. So far, commercial hasn't taken off in Tucson. Why? The main reason is that cost of electricity in Tucson is low and the big chains don't want to pay such a large premium for solar."

Tucson, Arizona

What are the major obstacles?

"Everything is taking longer than expected. Coordinating among the players has been a challenge. For example: a neighborhood wants to install solar street lights, and the street light department doesn't know anything about solar street lights. They would prefer to install regular street lights," Bruce Plenk.

Austin, Texas



Austin, the capital of Texas, encourages both individual solar PV units and projects owned by its municipal utility, Austin Energy.

Large goals for development are usually set by states, but Austin intends to have 100 MW of PV by 2020.

Austin, Texas

As of March 2010 Austin Energy (the local utility) had supported:

- 1,050 customer-owned solar energy systems,
- 70 commercial projects,
- 24 municipal projects,
- 28 school installations, and
- 6 libraries.

These produced more than 4 MW of capacity.

Supported via incentives/rebates of various types provided by the municipal electric utility

CRS center for resource solutions

Knoxville, Tennessee

CRS center for resource solutions

Knoxville, Tennessee

- Several cities are focusing efforts on supporting and developing a local solar industry within their jurisdictions, with special attention paid to creating jobs and training for solar installers.
- As part of its overall effort, Knoxville wants to create a trained solar workforce.

Knoxville, Tennessee

- Holds public workshops to educate community members on solar technologies and opportunities;
- Develops locally offered, high quality solar installation certification courses;
- Creates technical training programs to educate relevant Knoxville and Knox County staff that PV systems can be installed in a safe and timely manner.

Denver, Colorado

CRS center for resource solutions

Denver, Colorado

- 2 MW project at Denver International Airport featuring ground-mounted panels was dedicated August 2008.
- 9,200 panels cover 7 1/2 acres beside the main highway to and from the airport terminal.
- The PV system generates more than 3 million kilowatt hours of electricity a year.
- City officials say that will reduce carbon emissions by 6.3 million pounds a year.

Denver, Colorado

A second, 1.6 MW PV array was brought on-line in March 2010 to provide 100% of power for one of the airport's fuel-storage facility.

CRS center for resource solutions

San Francisco, California

CRS center for resource solutions

San Francisco, California

- San Francisco features the third largest number of local solar PV installations of any California city, following Los Angeles and San Diego.
- San Francisco documented 1,350 PV systems of various sizes and types, providing a little more than 7 MW.

San Francisco, California

- A 2007 San Francisco Solar Task Force set a goal to install as many as 10,000 rooftop panels and 55 MW of PV capacity by 2010.
- The economic slowdown downsized that goal to 31 MW of PV resources by 2012.
- In the long-run, however, San Francisco has identified up to 100 MW of potential for PVs located within city/county limits or on rights-of-way for water conduits and electric transmission lines.

San Francisco, California
Selected City Owned Projects

Project	Capacity	In-service Date
Moscone Convention Center	676 kW in three units	October 2003
Southeast Water Pollution Control Plant	255 kW	October 2005
Pier 96 – Norcal Recycling Center	245 kW	January 2007
City Distribution yard	134 kW	December 2007
North Point wastewater facility	241 kW	December 2007
Maxine Hall Neighborhood Medical Center	31.8 kW	December 2007
San Francisco International Airport	500 kW	February 2008

CRS center for resource solutions

San Francisco, California

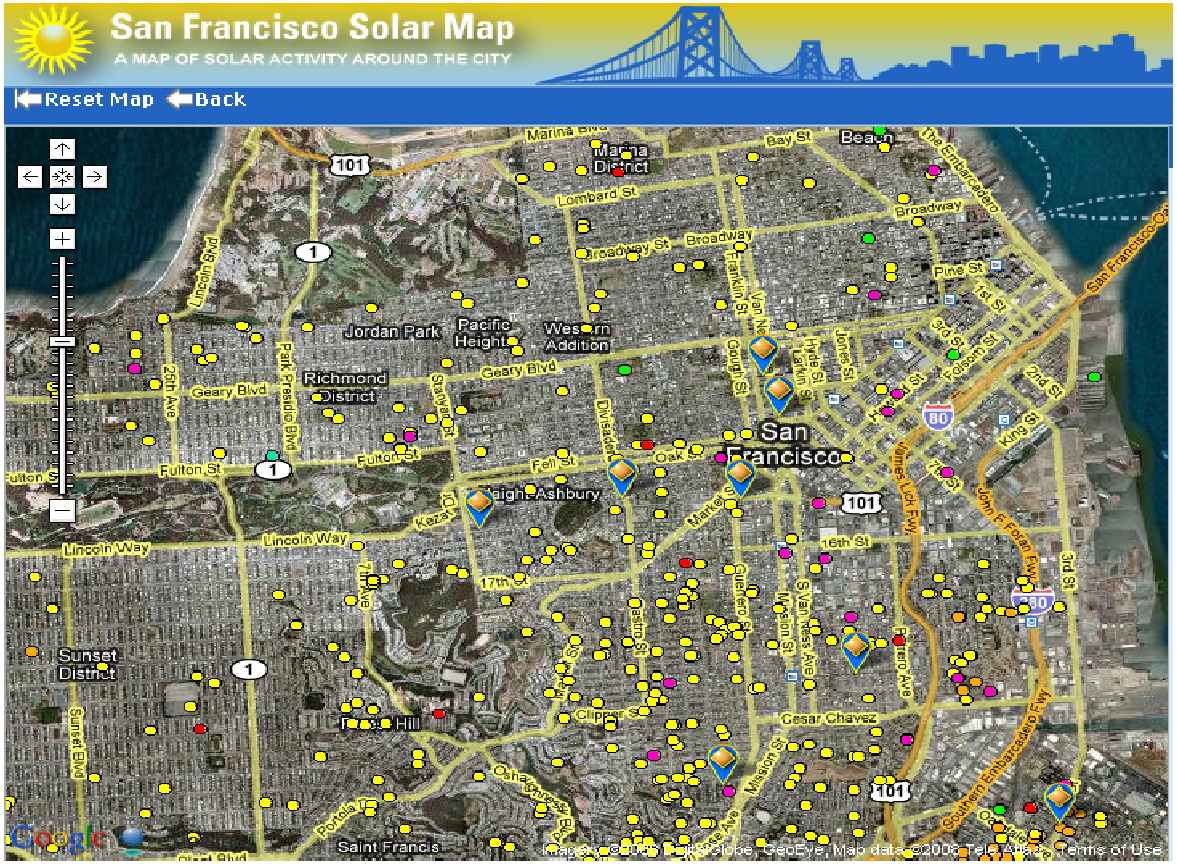
Site for proposed 5 MW Sunset Reservoir project

CRS center for resource solutions

San Francisco, California
PV for Bus Shelters

CRS center for resource solutions

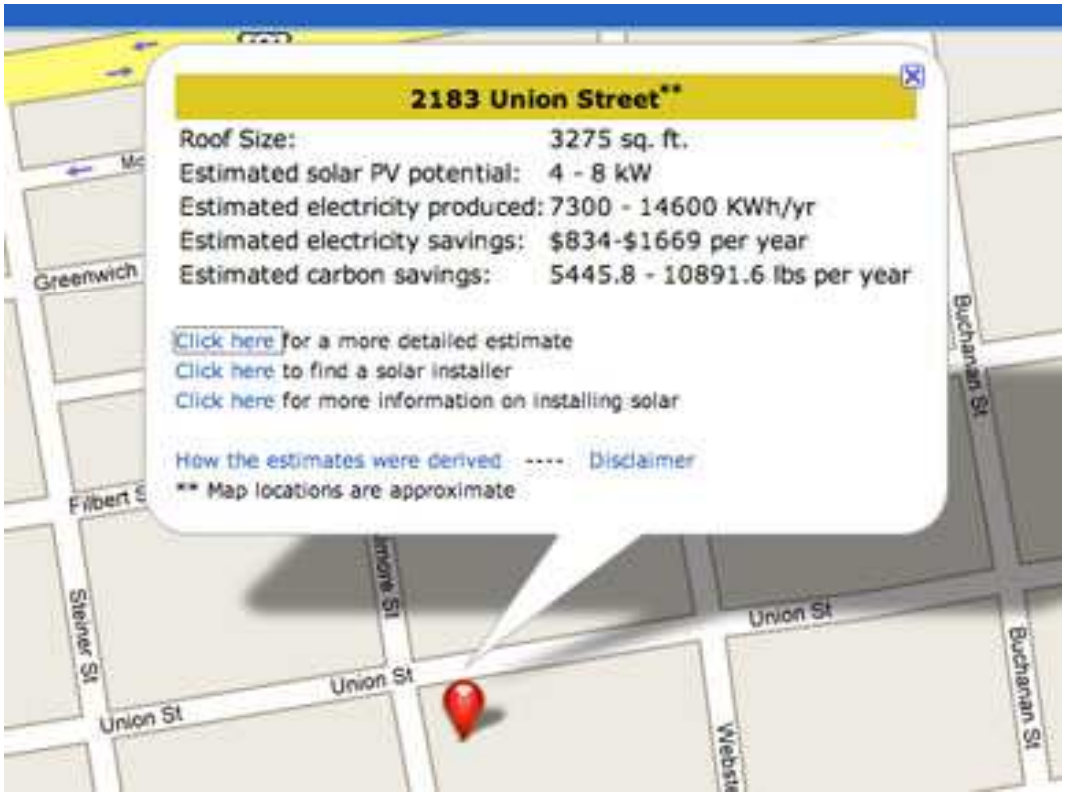
San Francisco, California Interactive Map of Solar Systems



Maps provide public education and outreach around solar, demonstrate variation in technologies, and project details

CRS center for resource solutions

San Francisco, California
Interactive Map of Solar Systems

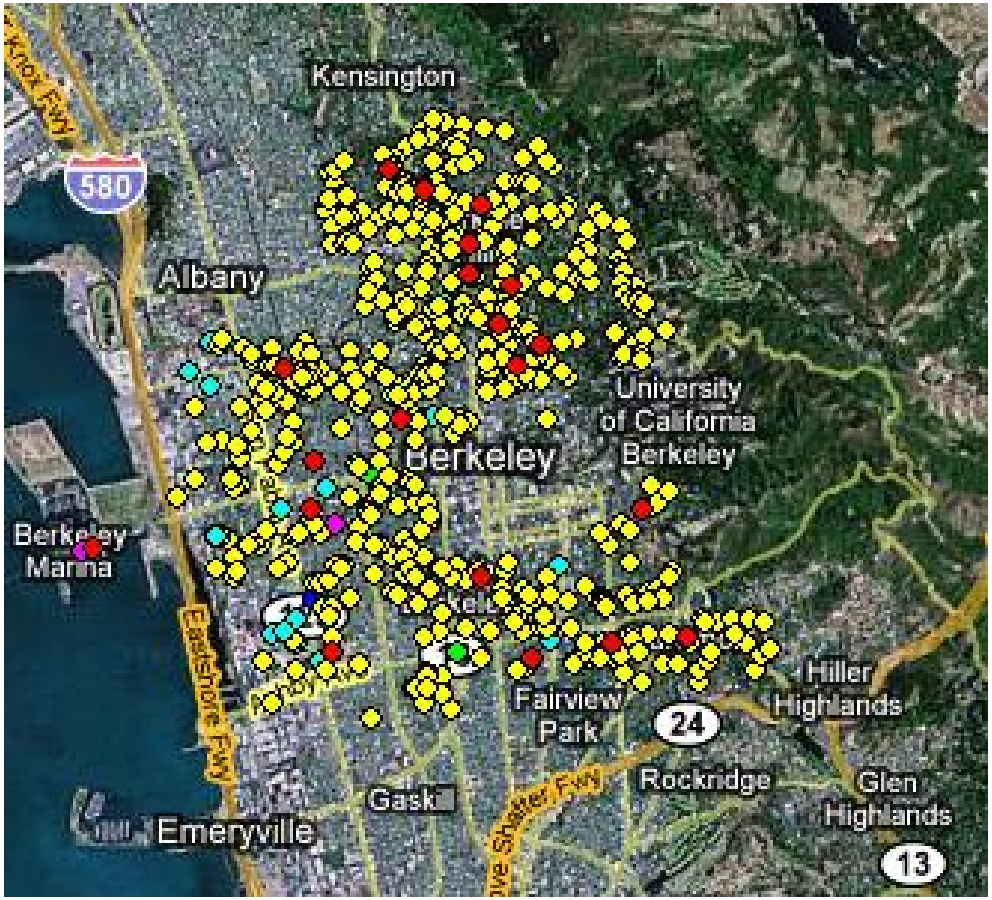


Project specifics are provided to help potential system buyers understand system sizing possibilities, potential costs and savings, compare other systems to buyers' site characteristics

San Francisco, California Residential Rebates

- GoSolarSF program launched in 2008
- Draws from the SFPUC's clean energy/energy efficiency fund
- High subscription led to lower per-system rebate
  - Initially $4,000 per system, down to $500
- Higher rebates for projects related to workforce development, environmental justice, low-income, multi-family and non-profits
- $9.5 million supported 3.8 MW of solar

Berkeley, California



CRS center for resource solutions

Berkeley, California

- **BerkeleyFirst** model introduced in 2007 involved pilot program to provide PV installation loans to homeowners to be repaid from property tax assessmentS over 20 years; 40 households enrolled.
- The idea has now expanded nationally under name *CityFIRST* and the mechanism is now called ***Property Assessed Clean Energy*** **(PACE)** to include energy efficiency.
- Program halted in 2010 as a result of Federal response by mortgage brokers; on hold until new legislation enacted.

PACE

- 20+ states have enacted laws and over 300 cities had planned to launch PACE-type models this year.
- Now on hold, as per earlier slide.
- DOE ARRA funding announced Oct. 19, 2009, included about $87 million for pilot programs around the country.
- Clinton Foundation announced plan to work with up to 300 cities.

CRS center for resource solutions

International Cities in Their National Context

- Australia: Solar Homes and Communities Plan
  - Alice Springs and Adelaide – iconic projects and supports
- India: Development of Solar Cities
  - Nagpur
- Japan:
  - New Energy Vision
  - Next Generation Energy Parks
  - Eco-Model Cities
    - Tokyo

Australia: Solar Homes and Communities Plan

- The Australian Government started purchasing renewable energy in 1995 and came out with a Renewable Energy Industry Program (now the Renewable Energy Development Initiative) in 1998 to foster the growth and development of renewable energy sources and commercial technology.
- In 2000, the Solar Homes and Communities Program was created as a way to help reduce emissions by getting home owners to install solar PV systems through a rebate program. Solar Homes and Communities ended in July 2009.

Australia's Solar Cities Initiative

- Goal to identify and reduce barriers to energy efficiency and solar use by homes, businesses
- Cities: Adelaide, Alice Springs, Blacktown, Central Victoria, Moreland, Perth and Townsville
- Solar technologies, community education, energy options, pricing and rewards systems
- Funding:
  - Consortia of governments, businesses and non-profits
  - Australian Government provided AU$94 million

Adelaide and Alice Springs

CRS center for resource solutions

Adelaide and Alice Springs

The Adelaide and Alice Springs Solar Projects involve several components:

- Solar PV systems and solar hot water systems together with the use of Smart Meters to know how much energy is produced, used and fed into the grid.
- Special incentives such as rebates and discounts funded by federal and state governments.
- Feed-in tariffs -- Alice Springs used a gross feed-in-tariff and Adelaide a net feed-in-tariff.
- Generating public awareness through consumer campaigns.

Adelaide and Alice Springs

- Both cities have “iconic” solar projects; however, the projects of both cities will only be able to supply peak demands using solar power, such as at water pumping stations.

- *Adelaide Central Bus Station:* One of the iconic projects installed 320 solar panels on the station’s rooftop and annually generate 70MWh.

Adelaide: Green City Program

- *Solar street lamps* called the *Solar Mallee Trees* are designed after the indigenous mallee tree and each solar tree produces an average of 864 kWh yearly but only uses 125 kWh of energy.
- *North Terrace Precinct Project*: solar PV systems installed on public and government buildings in the district that generate 129,265 kWh each year.
- *Solar Schools Program* has a target of 250 schools running on solar power by 2014 and it has already given grants and powered 111 schools.

Adelaide Solar City

- Received additional AU$15 million federal grant for Adelaide Solar City plan.
- 350 home PV funded by the Federal Solar Homes and Communities Plan, provided by BP Solar.
- Adelaide Central Bus Station's 320 PV panels generate 70MWh to recharge the bus and for the grid.
- Energy assessments for businesses energy efficiency. A federal subsidy of AU$2,000 available per participant.
- Seven *"iconic" solar PV installations* in the Adelaide Central Business District and selected sites.
- A load-shifting trial using smart meters for seasonal, annual pricing and peak / off-peak pricing options.

Alice Springs

Three iconic projects are:

- The 1,300 PV modules on the rooftop of the Crowne Plaza hotel that generates 531 MWh
- The Desert Knowledge Australia Solar Center displays solar power technologies in commercial scale installations and at the same time feeds solar power into the grid
- The Smart Living Centre that serves as a free resource and community education hub

Total programs budgeted at AU$37 million, AU$12.3 million of which was a federal grant

India: Solar Cities

- In 2008 India enacted a Solar Cities program, implemented as part of India's 11th five year plan (2007-2012).
- The program will support the development of 60 "solar cities", 1 – 5 in each state.
- 15 cities selected by early 2010 by the Indian government.
- Promote renewable energy and energy efficiency measures, awareness and capacity at the local level.

India: Solar Cities

- Federal government will supply 50% of implementation costs; local governments will supply the remainder.
- Applicants prepare a Master Plan, with:
  - the city's projected energy usage in ten years and how renewable energy and energy efficiency measures can meet that demand
  - the city's previous renewable energy initiatives
  - the city's ability to put together a panel of experts to guide the process
  - advisory group to assist in process

Nagpur, India

- Nagpur in Maharashtra was the first Solar City accepted into the program.
- Goal of meeting 10% of its energy consumption with renewable energy and energy efficiency by 2012.
- Federal contribution about $US2.04 million.
- Solar technologies for powering street, traffic, and garden lights will be used, and the city will implement solar water heating in addition to other measures for a smart electrical grid.

Japan Supports for Cities

- Japan was the first country to give major political support for PV.
- A market support since 1995 provided grants for residential customers, as well as commercial and industrial customers.
- Support system declined late 2000s, but has subsequently been reinvigorated in a somewhat different form

Japan Supports for Cities

Japan New Energy Vision

- More than 300 cities and towns received support for solar demonstration projects with initial subsidies from the government owned New Energy and Industrial Technology Development Organization (NEDO).

Next-Generation Energy Parks

- Parks provide the public exposure to technology and methods for meeting RPS and Kyoto Protocol targets, including PV, small wind, fuel cell vehicles, R&D, and generation facility tours.
- Seven areas chosen: Sapporo City, Rokkasho Village, Ota City, Yamanashi City, Aichi Prefecture, Izumo City, and Anan City.
- Initiated by the Ministry of Economic, Trade and Industry (METI).

Japan Supports for Cities

Eco-Model Cities

- The “Promotion Council for the Low Carbon Cities” encourages cities to meet ambitious targets for GHG emissions reductions
- Disseminates information on EMCs to international audience
- Targets achieved mainly through renewable energy and efficiency.
- 82 Japanese cities applied to be EMCs,13 selected.
- Selected cities long-term reduction goals exceed 50% by 2050, have already established renewable energy and climate programs.
- EMCs’ efforts include: public bond-financed renewables, utility green power programs, zero carbon goals, utility and residential scale PV.

Eco-Model City - Tokyo

Tokyo, the country's capital, has a goal of reducing GHG emissions by 25% by 2020, and have 20% of total energy use come from renewable energy, particularly PV.

In 2006, GHG targets were established and were subsequently merged into the Tokyo Environmental Master Plan (2008), which contained a target for 1 GW of solar PV within city limits.

CRS center for resource solutions

Other Notable Cities

Barcelona, Spain

- Barcelona is the second largest city in Spain
- Non-governmental organizations in the city pushed for energy efficiency and renewable energy and helped pave the way for the Barcelona Solar Thermal Ordinance (STO) in 2000.
- Though mostly to promote solar thermal, STO became a successful model for cities to follow.
- Requires new and renovated buildings with over 0.8 MW hot water demand to use solar thermal for 60%
- Nearly 25 MW installed through 2005, with an estimated annual energy savings of 32,000 MWh
- 52 municipalities in the province of Catalonia to implement their own STO

Barcelona, Spain

The Barcelona program has been expanded to install solar PV at city facilities, but not without controversy.

To gain public support explanatory guides were published by the city, periodic round tables and meetings with concerned citizens and groups were held, and demonstrations of installation projects were done at public swimming pools and municipal sports facilities.

CRS center for resource solutions

Daegu, South Korea

CRS center for resource solutions

Daegu, South Korea

- The City of Daegu wants to become an energy-efficient and sustainable city by 2050.
- Targeting energy innovation, new industries and eco-cultural development.
- Member of the International Solar Cities Initiative, a program that connects scientists and policymakers around sustainable energy issues.
- Daegu installed 635 kW of solar in schools, parks and other public buildings after joining ISCI.

Daegu, South Korea

- To boost the local renewable energy industry, 11 industrial districts around Daegu will be linked to create the Daegu-Gyeonbuk Free Economic Zone (DGFEZ) to create a green energy industrial belt encompassing solar energy, fuel cells, wind power, etc.

Conclusions

- Many options exist for cities to support solar: there is no one size fits all” solution
- Early innovator cities can create momentum and further action by additional cities
- Community size and jurisdictional abilities impact the mix of solar programs and efforts
- Local governments react to national framework conditions: central government funding, technical assistance, and awards are all important for success

Implications for China

- International experience demonstrates that a “menu” of options exist for cities to use to support solar energy
- Solar Cities Programs are most effective if supported with cost-share funds from the federal government, with various program options available
- China’s cities are already active in solar, and international experience is not all directly applicable, but China may wish to explore the creation of a more-formal solar cities program, supported by the central government
- Need for more research to understand which of the international examples might be most appropriate given China's unique conditions, and existing legal authorities

CONTACT

Center for Resource Solutions
415-561-2100
info@resource-solutions.org

CRS center for resource solutions