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***Abstract***

Tucson, Arizona's Solar Integration Plan and Greater Tucson Solar Development Plan lay the groundwork for accelerated development of solar energy facilities in and around Tucson, requiring the installation of a minimum amount of solar electric generation capacity by 2015.

***Resource***

See separate PDF below.



# Solar Integration Plan

March 2009







# Solar Integration Plan



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Thornydale Phase III  
solar dedication  
September 12, 2007.

Speakers pictured left  
to right included:  
**Mark Schwirtz** (Trico  
Electric CEO),  
**Thomas P. Kimbus**  
(USDOE Solar  
America Cities  
Director),  
**Robert Walkup**  
(Tucson Mayor) and  
**Gabrielle Giffords**  
(U. S. Representative).





# Solar Integration Plan



## EXECUTIVE SUMMARY

Tucson is sunshine. What has primarily been a draw for health seekers and tourists is now also being recognized as a national asset in providing electricity. This clean renewable resource is useful to the City of Tucson and the entire country as a way to meet our electricity demands while reducing greenhouse gases and dependency on foreign oil.

The City of Tucson's **Solar Integration Plan**, March 2009, and its companion, the **Greater Tucson Solar Development Plan: Strategies for Sustainable Solar Power Development in the Tucson Region**, January 2009, were developed through the Tucson Solar Initiative, a Solar America Cities Program sponsored by the U. S. Department of Energy (USDOE). Both plans lay the groundwork for accelerated development of solar energy facilities in and around Tucson. The Greater Tucson Solar Development Plan calls for 16 megawatts (MW) solar electric generation capacity to be installed in the region by 2015. This Solar Integration Plan calls for 8 MW solar electric generation capacity to be installed in the City of Tucson by 2015. Copies of both plans are available online at <http://www.tucsonaz.gov/energy/links.html>.

The Introduction of this Solar Integration Plan briefly summarizes the City of Tucson's history of solar policy initiatives. Although much solar-related work is already underway, the City still needs to reduce the barriers and increase the amount of power generated by solar installations on city facilities. The remaining work must integrate with our City's **Framework for Advancing Sustainability** to reduce greenhouse gases and slow global warming.

The bulk of this Solar Integration Plan is organized into the following Guidelines for Action to make Tucson a leader in harnessing solar energy:

1. Organizing Our Efforts
2. Leading by Example on City Property
3. Improving Policies
4. Accelerating Demand
5. Engaging Utilities
6. Supporting Economic Development

Each guidelines section also outlines the action steps needed to move Tucson towards more solar.

Finally, this plan includes an Appendix of related solar rules, regulations and policies which are critical components for a sustainable solar infrastructure and that are summarized for the Arizona market.



# Solar Integration Plan



## INTRODUCTION

The first installation of solar systems on City of Tucson facilities took place in 1999. However, the policies underlying the City's commitment to solar began even earlier and continue in a new light as the city addresses issues of global warming and greenhouse gasses. This section discusses the foundations on which our City's solar policies are built.

### **Establishing Tucson's Solar Policies (1980)**

The Tucson-Pima County Metropolitan Energy Commission (MEC) has been the primary solar advisory committee for the City of Tucson since being established in 1980. The Commission is composed of members interested in energy policy and appointed by the Mayor and City Council and the Pima County Board of Supervisors. In the 1990's, the MEC was instrumental in establishing the Tucson Solar Village that evolved into the Civano Development. See, <http://www.civaneighbors.com/civano/bookshelf/>. Every Civano residence and business must have some demonstrated solar capacity. The City of Tucson Facilities Management Administrator currently serves on the MEC. More details are available on the MEC website at <http://www.tucsonmec.org/>.

### **Sustainable Energy Standard (1998)**

The City of Tucson adopted a Sustainable Energy Standard (SES) in 1998. Initially, the SES applied only to the community of Civano, but it was later expanded to all City-funded buildings. The SES is now tied to the 2006 International Energy Conservation Code (IECC) that was adopted by the City of Tucson on June 12, 2007. See Tucson City Mayor and Council Ordinance #10417 at [http://www.ci.tucson.az.us/clerks/minutes\\_2007.php](http://www.ci.tucson.az.us/clerks/minutes_2007.php).

### **City General Plan (2001)**

The General Plan of the City of Tucson was issued in 2001 and is currently being revised for voter approval in 2011. Support for the use of solar technology in city buildings and public housing, when economically and technologically feasible, is included in Elements 11 and 14 and Policy 38 of the Plan. See, <http://www.tucsonaz.gov/planning/plans/genplan/gpintro.pdf>

### **LEED Silver and 5% Solar Energy Requirement (2006)**

As of the passage of Mayor and Council Resolution #20322, on April 18, 2006, all City buildings must meet U. S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Silver Certification. Solar energy is a favored strategy for attaining LEED Silver goals, and the Resolution mandates a 5% solar energy requirement. All new city financed buildings, including new hotels, a proposed new convention center, fire stations, etc., must meet 5% of their energy needs using some form of solar – photovoltaics (PV), hot water, or day-lighting. Additionally, up to 4% of the requirement can be met through cogeneration. City staff will monitor construction plans to assure this requirement is met. See [http://www.ci.tucson.az.us/clerks/minutes\\_2006.php](http://www.ci.tucson.az.us/clerks/minutes_2006.php)

### **Tucson Framework for Advancing Sustainability (2008)**

In 2008, City of Tucson Mayor and Council adopted the Tucson Framework for Advancing Sustainability. See [http://www.tucsonaz.gov/ocsd/docs/CMS1\\_032816.pdf](http://www.tucsonaz.gov/ocsd/docs/CMS1_032816.pdf). The Framework





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provides guidelines under which all city programs, including our solar program, will work to implement the Kyoto protocols and the US Mayors' Climate protection Agreement. One of the twelve initiatives of the Framework is a commitment to increase the use of renewable energy as ordered by Council Resolution #20443, Measure C.4. See, <http://www.ci.tucson.az.us/agdocs/20060906/20060906con.pdf> Attainment measures include: a) Reviewing the yearly total renewable energy generated by City facilities; b) Determining the percent of City energy usage resulting from renewable sources; and c) Calculating the 1990 to the present reduction in City operations' greenhouse gas emissions. All solar projects on city facilities will help to meet this goal.

## Solar Ready Ordinance (2008)

The City of Tucson has recently adopted a solar ready ordinance that requires all new houses and duplexes to be built with stub-outs so that PV and solar hot water heating can be installed at a later date without significant building modifications. See Tucson City Mayor and Council Ordinance #10549 (June 17, 2008) at [www.tucsonaz.gov/energy/solar%20ready%20flyer030409.doc](http://www.tucsonaz.gov/energy/solar%20ready%20flyer030409.doc), [http://www.tucsonaz.gov/dsd/What\\_s\\_New/PV\\_Prep.pdf](http://www.tucsonaz.gov/dsd/What_s_New/PV_Prep.pdf), and [http://www.tucsonaz.gov/dsd/GET\\_READY\\_FOR\\_SOLAR.pdf](http://www.tucsonaz.gov/dsd/GET_READY_FOR_SOLAR.pdf)



El Pueblo solar dedication event (May 29, 2009).



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## GUIDELINES FOR ACTION

This section outlines the guidelines and action steps needed to move Tucson toward more solar.

### 1. Organizing Our Efforts

#### 1.1. **Inventory Existing Installations**

According to TEP statistics, there were approximately 600 solar systems in place in Tucson in 2008. The City of Tucson had eight PV installations with a total capacity of 220 kW as well as five solar hot water/pool heating sites. Case studies and maps for the City's solar installations are available at

<http://www.tucsonaz.gov/energy/solarintucson.htm>. Solar America Cities street signs have also been placed around Tucson where large solar installations are visible.

#### 1.2. **Establish Objectives**

Tucson's Mayor and Council have supported additional solar projects. Now in the works are 1 megawatt (MW) of PV being installed at seven Clean Renewable Energy Bonds (CREBs) sites as well as 1 MW to be installed at the Central Avra Valley Storage and Recovery Project (CAVSARP) site under a power purchase agreement (PPA). By the end of 2009, the total city PV capacity should reach 2.2 MW. Plans are to double this to 5 MW by 2015. Residential and commercial installations should also reach an additional 3 MW by 2015.

#### 1.3. **Survey for Barriers**

Informal nonscientific surveys previously taken from attendees at various public events have shown three major reasons for not yet having installed solar: a) high price, b) lack of sufficient information or 3) waiting for additional technological breakthroughs.

#### 1.4. **Build Local Infrastructure**

1.4.1. Maintain funding for the City of Tucson Solar Energy Coordinator position to assure that solar policies are addressed within the City.

1.4.2. Fund a Regional Solar Coordinator position in partnership with Pima County to assure a wide distribution of solar information to the public.

#### 1.5. **Coordinate with Regional Initiatives**

1.5.1. Pima Association of Governments (PAG) houses the Southern Arizona Regional Solar Partnership, a group of businesses and governmental agencies working to implement pro-solar policies. See <http://www.pagnet.org/Programs/EnvironmentalPlanning/SolarPartnership/tabid/684/Default.aspx/>

1.5.2. Rep. Gabrielle Giffords' Office has been a leader in sponsoring federal legislation to promote solar and in sponsoring public information sessions around Tucson





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and in Phoenix called Solar 101 meetings. See <http://giffords.house.gov/legis/solar-energy.shtml/>

- 1.5.3. Arizona Research Institute for Solar Energy (AzRISE) at the University of Arizona has coordinated research on solar, sponsored conferences, and produced publications to advance solar in Arizona. See, <http://www.azrise.org/>
- 1.5.4. Tucson-Pima County Metropolitan Energy Commission (MEC) continues in its active role advising Mayor and Council and the County Board of Supervisors on energy and solar issues. See, <http://www.tucsonmec.org/>

## 2. Leading by Example on City Property

### 2.1. Plan Installations

- 2.1.1. Move ahead with plans for additional solar installations on City land and facilities. Identify, map and prioritize future city solar sites for PV and solar hot water based on electric load, hot water demand, roof structure, and location. Likely sites will include ward offices, community centers, fire stations, and recreation centers.
- 2.1.2. Install solar pool heating at all City Parks and Recreation Department pool sites.
- 2.1.3. Retrofit existing City buildings with solar hot water and/or PV whenever economically feasible
- 2.1.4. Develop solar street and parking lot lighting, as well as parking shade structures. Including electric vehicle charging stations, if and when possible, and make them available to city departments.
- 2.1.5. Develop list of the required permits for solar installations, contact information, cost and timelines and include it on the web site. Additionally, distribute all such information to solar developers.
- 2.1.3. Intervene early in new building design discussions with all departments to assure solar is fully considered from the beginning planning stages of all new City building projects.

### 2.2. Pursue Funding Opportunities

- 2.2.1. When funds are available, the first source of funds will be the solar portion of the City's Energy Office budget.
- 2.2.2. Apply for New Clean Renewable Energy Bonds (CREBs).  
Given the current, difficult economic position of the City of Tucson that is projected to endure for several fiscal years ahead, obtaining funds from outside the City budget has become extremely important. Thus, building on our experience with a \$7.6 million CREBs allocation to finance 2009 projects, New CREBs will be an important financial strategy for FY 2010 and beyond. The



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Internal Revenue Service (IRS) allocated the original CREBs based on the smallest to largest criteria, so that the most expensive project funded was \$3.2 million. That size criteria will continue with New CREBs allocations, so we must apply for City sites that fall into the range most likely to be funded. We should consider CREBs for buildings, parking shade structures and vacant land in choosing these projects.

## 2.2.3. Investigate other no interest bonds.

We will fully investigate the new Qualified Energy Conservation Bonds (QECBs) and related bond offerings to determine if they are appropriate solar financing tools for Tucson.

## 2.2.4. Apply for utility rebates.

We will give high priority to applying for Trico and TEP Renewable Energy Standard and Tariff (REST) funds - retroactively for day lighting and solar hot water projects already in place, and beforehand for future solar projects. The Production Based Incentive (PBI) approach that TEP uses for commercial projects mandates that bids must be placed with TEP for electricity to be produced in the future, with the amount paid being based on actual production. Additionally, the "self-directed" portion of the City's REST funding can be accessed in amounts matched by City funds to pay for renewable energy projects. This use of REST funds enables a portion of the City's REST assessment (approximately \$300,000 per year), to be invested rather than expended. TEP has already been notified of the City's intention to utilize self-directed REST funds in 2009 and 2010. Trico has a similar but smaller REST program.

## 2.2.5. Utilize Power Purchase Agreements (PPAs).

Tucson Water issued a Request for Proposals (RFP) in June 2008 that resulted in a PPA contract to build a 1 MW project in later 2009. PPAs are, and will continue to be, the most likely vehicle to finance solar energy projects without utilizing City funds in the near future. Under such a PPA arrangement, which is designed to utilize tax credits unavailable to the City, a third party builds, owns, and maintains solar systems on City property. The City, in return, "rent" the space to the third party, and agrees to the long-term purchase, at a set price and for an extended period (usually 20 years), of all electricity generated by the installation(s). A legal issue concerning whether PPA providers, as sellers of electricity, are utilities which must be regulated, and if so, how is now before the Arizona Corporation Commission (ACC) and may be resolved in late 2009.





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- 2.2.6. The City of Tucson will develop a PPA template to use in future Request for Proposals (RFPs), building on work done by Pima County in recent months. We will vet this document through the City Attorney's office as well as soliciting advice from outside counsel for the City familiar with these instruments. We will also review the PPAs being used by the University of Arizona and Davis-Monthan Air Force Base in developing ours, which could then be shared with other Arizona cities and counties.
- 2.2.7. Apply for appropriate stimulus funds. The City will investigate and pursue all possibilities to use federal stimulus funds for solar projects, including both Energy Efficiency Community Block Grant (EECBG) and State Energy Projects (SEP) funding.
- 2.2.8. The City will continue to seek federal earmark funding for specific projects, recognizing that they often require a match of non-federal funds, which could come from utility rebates, bond funds or PPAs.
- 2.2.9. Seek funding from Homeland Security for solar emergency backup capacity where possible; maintain portable solar generators (trailer with panels and batteries) for quick deployment in emergency situations.
- 2.2.10. Utilize Energy Performance Contracts (EPCs). Another possible financing method involves combining energy savings contracts with solar projects with an energy service company (ESCO). In this case, money can be saved by installing various lighting; heating, ventilating and air conditioning (HVAC); insulation; and other energy-saving devices in City buildings and using the money saved to install solar on these buildings. This can have a double payback since the electric load can be reduced and part of this reduced load can be met by solar.
- 2.2.11. Specific city agencies or buildings should be supported when they consider installing solar on their facilities, such as the airport and the City Transportation department using solar crosswalk flashers and considering solar street and parking lot lights. We will work with these other departments to assure they have sufficient information to fully consider the solar option. City council offices may choose to demonstrate their commitment to "Being Green" by using money from their budgets to install PV and/or solar water heating on their buildings.
- 2.2.12. All new city buildings must meet the LEED Silver standard and have 5% solar as part of their design. This means that all new city buildings should have solar as part of their construction budget. We will review construction plans to assure this is included in plans and budgets for these new buildings.
- 2.2.13. There are a few other options available for consideration that the City has not pursued to fund solar projects. One is the issuance of general obligation bonds specifically designated for solar projects. Another is the use of a specialized tax vehicle called the New Markets Tax Credits program, whereby an investor can put money into a Certified Community Development Entity and earmark the funds for solar. This needs further investigation. Another possibility with some



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possible legal complications includes partnering with taxable investment entities to build and operate solar facilities. However, the City Attorney has advised that such partnerships might violate the gift clause of the Arizona constitution and an IRS ruling effectively prohibits such entities. Further research is needed on this option. See complete solar financing options for Tucson memo by DOE Tiger Team at <http://www.tucsonaz.gov/energy/Tucson%20Finance%20June%2028.pdf> or using a national perspective, the DOE paper found at <http://www.nrel.gov/docs/fy08osti/43115.pdf/>

## **2.3. Improve Solar Procurement Practices**

- 2.3.1. Simplify the solar procurement process in cooperation with the City's Procurement Department staff in order to minimize confusion and delays, avoid contractual pitfalls, and minimize or eliminate later add-on costs.
- 2.3.2. Use the USDOE Tiger Team study, when it is completed, as a basis for improving the City's solar procurement process.

## **2.4. Commission and Monitor All Systems**

All solar energy systems installed on city facilities must be properly and fully commissioned to assure proper initial performance. This will require some work with commissioning agents who are not normally familiar with PV or solar hot water. To the greatest extent possible, all of the city's solar systems should be placed on Fat Spaniel or some other monitoring system to allow for alarms when production fails or drops. All hot water systems need temperature and flow meters (BTU meters) and a monitoring connection. All systems should be inspected every 6 months and re-commissioned after 5 years.

- 2.4.1. Develop monitoring system for all solar hot water and PV systems and connect with the City's Energy Management and Control System (EMCS) when available.
- 2.4.2. Create and maintain an internet-based map showing all City solar installations and providing information about the systems.
- 2.4.3. Train City staff to install, commission, monitor and maintain City solar equipment to decrease dependence on outside vendors.

## **2.5. Develop Standards**

The City of Tucson will develop specific standards for solar equipment to include in all Requests for Proposals (RFPs) on City solar projects.

- 2.5.1. Develop a mechanism to verify that the 5% solar requirement is met for new buildings.
- 2.5.2. Develop the PV standard.
- 2.5.3. Develop the solar water heating standard.
- 2.5.4. Develop the day-lighting standard.



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2.5.5. Develop the commissioning standard for both PV and solar hot water.

2.5.6. Develop the monitoring standard for solar projects.

## 3. Improving Existing Policies

### 3.1. **Streamline the Permitting Process**

Tucson adopted a template for residential PV installations that have a reduced wait time for plan reviews to 1-2 days in most cases. Residential solar projects are no longer subject to zoning or equipment height requirements. Commercial installations generally are reviewed in less than 10 working days. The Template assists the City's Planning and Development Services Department to expedite solar permitting. See more details at [www.tucsonaz.gov/dsd/Permit\\_Review\\_/Residential/ResidentialPhotovoltaicElectrical.pdf/](http://www.tucsonaz.gov/dsd/Permit_Review_/Residential/ResidentialPhotovoltaicElectrical.pdf/)

### 3.2. **Conduct Code Official Training**

As funds permit, the City will continue to offer training for code officials and installers concerning both PV and solar hot water systems.

### 3.3. **Advocate New Initiatives**

- 3.3.1. Require at least 80 percent of lots in all new residential development site plans to be solar oriented, i.e., the long side of the building is within 30 degrees of an east-west line
- 3.3.2. Review plans and require, to the greatest extent possible, that all south facing roofs (and the southern portion of flat roofs) be kept clear of vent pipes, HVAC equipment, and other possible shading devices so the roof is available for the maximum solar installation.
- 3.3.3. Require all non-residential buildings to be solar ready as a transition to requiring all non-residential buildings to be equipped with solar hot water and photovoltaic (PV) systems.
- 3.3.4. Establish a future date by which all new commercial buildings, strip malls, houses and other residential buildings will be required to have solar PV and solar water heating unless granted a waiver.
- 3.3.5. Do not issue building permits for plans that do not incorporate solar use unless a waiver has been granted.
- 3.3.6. Give priority and/or subsidized rentals to Section 8 landlords with solar water heating or PV on their properties.





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## 4. Accelerating Demand

### 4.1. **Develop Financial Incentives**

- 4.1.1. The City of Tucson currently offers a discount of up to \$1,000 on all building permits for solar installations or for buildings that include solar hot water or PV.
- 4.1.2. The City has considered “Berkeley First” type financing (incorporating solar investments into individual property tax payments) but must wait for a state law change before such a program would be possible.
- 4.1.3. Align funding to reach the goals set forth in the 2008 Framework for Sustainability and other national and international agreements ratified by the City.
- 4.1.4. Continue research on low cost solar applications producing positive cash flow

### 4.2. **Educate Consumers**

- 4.2.1. Publicize the exemption of solar equipment from rooftop screening requirements in commercial or residential designs.
- 4.2.2. Promote utilization of electric vehicles coupled with solar charging stations
- 4.2.3. Create opportunities for City employees to take classes and become proficient in solar technology.
- 4.2.4. Publicize existing solar training opportunities on the City’s Energy Office Website.
- 4.2.5. Make City solar facilities available for tours by educational groups of both adults and children to provide examples of best practices in solar installations.

### 4.3. **Develop Solar Access Laws**

While Arizona allows cities to pass an ordinance that regulates solar access, ARS 9-462.01 (A)(3), the City of Tucson has not done so. Passage would assist the implementation of the solar ready ordinance. State laws already exist to prevent Home Owners Associations (HOAs) from disallowing the installation of solar devices. ARS 33-1816.

- 4.3.1. Maximize and protect solar access to all lots by requiring variations in lot size and orientation to maximize solar access for development as a whole, and integrate solar access into Flexible Lot Development Update.
- 4.3.2. Evaluate solar setbacks for all buildings over one story when reviewing plans for building or remodeling; reject or modify plans that significantly impair solar access of neighbors.
- 4.3.3. Consider solar access when approving landscaping plans and establish a tree dispute resolution process to resolve solar access issues, e.g., when one neighbor’s trees shade another neighbor’s solar panels.



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- 4.3.4. Review all zoning plans/site plans/development plans for solar access and availability.

## 5. Engaging Utilities

### 5.1. **Organize a Customer Aggregation Program**

The City of Tucson is involved in discussions with TEP and Pima County to establish a meter aggregation program for the City that would be a precedent for non-city customers of TEP. The City has thousands of electric meters and pays one bill. The plan would encourage TEP to aggregate our meters for purposes of solar net metering. Net metering is presently only available at each meter; thus, solar installation is restricted on buildings with small loads, even when those buildings have a large roofs or suitable adjacent ground. TEP has so far not been willing to make this change, but discussions are ongoing. The City has also engaged in discussions with One Block off the Grid, a commercial aggregator. If the City is successful in executing this change, the same policy would be available for businesses at shopping malls, neighborhoods, etc.

### 5.2. **Support Aggregated Net Metering**

We will work with TEP, Pima County and others to move toward virtual net metering, also called aggregated net metering, which would allow us to get full retail value for all electricity produced by city solar facilities, regardless of the location of the solar equipment and the load at a particular site. While not a direct financing tool, this would allow much more flexibility of location for solar within the city and make some additional projects more feasible, especially large ground mounted projects at locations with little or no electric load.

### 5.3. **Optimize Rate Structures**

The City will continue to monitor Trico and TEP's tariffs and filings with the Arizona Corporation Commission (ACC) to assure they support solar projects.

## 6. Supporting Economic Development

### 6.1. **Recruit Business and Industry**

Tucson Regional Economic Opportunity (TREO) is the economic development office for both the City of Tucson and Pima County. TREO has established solar industry development as a high priority. The City will work with TREO and Pima County to attract solar industry to Tucson as a means of expanding the solar circle and procuring cheaper solar equipment for installation on city buildings.

### 6.2. **Encourage High Quality Training**

A well-trained solar work force is essential for reaching the goals for growth in use of solar energy. Recent classes at Pima Community College and annual classes in Tucson put on by Solar Energy International (SEI) have provided a beginning work force that the City of Tucson can enhance in the following ways:



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- 6.2.1. Assure a solar training/placement component to any City Green Jobs program.
- 6.2.2. Encourage solar contractors hired for City projects to donate their procurement-required apprenticeship funds directly to solar training programs at local institutions and offer internships where possible.
- 6.2.3. Encourage training programs to work with JobPath, Joint Technical Education District (JTED) and other local job placement agencies, particularly in low-income neighborhoods.
- 6.2.4. Use federal job training funds for solar training programs.
- 6.2.5. Encourage Pima Community College to institutionalize its solar PV and solar hot water classes as part of its regular curriculum that is offered at several campuses, on varying days, and at different times.
- 6.2.6. During the time that the City of Tucson has access to USDOE Tiger Team (technical assistance) resources, the City will sponsor additional trainings for solar technicians.



Public Safety Training Academy (PSTA) 472.5 kW single axis tracking system.





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## APPENDIX: Rules, Regulations & Policies

These rules, regulations and policies represent areas that the U.S. Department of Energy (DOE) has determined to be important components in the initiative to create a sustainable solar infrastructure. These rules and regulations are described in a way that supports the Arizona market. This information is current as of March 2009.

### A. Net Metering

Net metering provides full retail price or an equivalent amount of kilowatt hours for all solar-generated power. The goal is to have all solar-generated power (not a limited amount) fully compensated at full retail rates, including excess production beyond the needs of the house or building where the power is generated. The rules are set by the Arizona Corporation Commission (ACC). The federal Energy Policy Act of 2005 (EPAct 2005) requires state regulatory authorities and certain non-regulated utilities to consider a net-metering standard by August 2008. On October 2008 the ACC adopted a Net-Metering rule. The rule has the following highlights:

- Utilities must connect with Net Metering Facilities.
- Excess kilowatt hours generated during any month will be rolled over to next month to offset the next month's bill
- At the end of the year, the utility must issue a check or billing credit to customers whose generated amounts exceed their demand for the past year at the utility's avoided cost (not the full retail amount).
- Each utility will submit a Net Metering Tariff in 2009
- There is no limit to the size of the net metering facility.
- To stay up to date with this proposed regulation, see [http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=AZ01R&state=AZ&CurrentPageID=1&RE=1&EE=0](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=AZ01R&state=AZ&CurrentPageID=1&RE=1&EE=0) .
- The ACC Docket on this matter is RE-00000A-07-0608
- For a thorough overview of net metering issues and examples of model rules and best practices, see Chapter 4 of the Interstate Renewable Energy Council's (IREC's) Connecting to the Grid Handbook (2007) found at: <http://www.irecusa.org/index.php?id=86> .

### B. Standard Interconnection

Interconnection between solar facilities and the electric utility grid is necessary to deliver the solar-generated power. Having a standardized and simplified interconnection agreement is important so that solar installers can easily work with different utilities. Goals for such agreements include different levels of review to match the size and complexity of the solar system, standardized application forms, no external disconnection switch requirement, and no requirement of utility



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insurance or indemnification. As of now, Arizona has no statewide standard interconnection agreement.

The Interstate Renewable Energy Council's (IREC's) Connecting to the Grid Handbook (2007) found at: <http://www.irecusa.org/index.php?id=86> summarizes the status of interconnection policy: A stakeholder group has met for over a year under the auspices of the ACC to develop an Arizona interconnection standard. To review the current status of this project, see ACC Decision 69674 (June 28, 2007) with draft rules and ACC Docket No. E-00000A-99-0431 available at <http://www.azcc.gov/divisions/utilities/electric/dg.asp>.

## C. Public Benefit Funds

Public benefit funds (PBF) are state-level programs typically developed during electric utility restructuring by some states in the late 1990s to ensure continued support for renewable energy resources, energy efficiency initiatives and low-income energy programs. These funds are most commonly supported through a very small surcharge on electricity consumption (e.g., \$0.002/kWh). This charge is sometimes referred to as a system benefits charge (SBC). PBFs commonly support rebate programs for renewable energy systems, loan programs, research and development, and energy education programs (Database of state incentives for renewable energy and energy efficiency, <http://www.desireusa.org>).

In September 1999, the Arizona Corporation Commission (ACC) instructed utilities to include a Public Benefits Fund in their restructuring plans. The Public Benefits Fund provides \$49.5 million in funding for low-income, demand side management, environmental, renewable and nuclear power plant decommissioning programs (\$25 million spent to expand renewable energy). Over time the Public Benefits Fund has become more focused on renewable energy than on energy-efficiency. In February 2006, the Arizona Corporation Commission (ACC) increased the charge on customers from \$0.000875/kw hour to \$0.004988/kw hour, with the residential cap increased from \$0.35 to \$1.05. ACC Rule R14-2-1608.

## D. Solar Access Laws

The goal of solar access laws is to assure that persons wishing to install solar devices will not have their sunlight blocked by others and will not be restricted by unnecessary laws, ordinances or rules. Arizona does not have a solar easement law to allow neighbors to grant assured solar access, as some other states do. Arizona does have a number of solar access laws that restrict homeowners associations. These regulations and laws are made at the state or local level; homeowner associations (HOA's) can establish their own solar access rules consistent with these laws. Arizona laws include several references to solar access:

- ARS §9-461.05 (C) (1)(d) requires each city to adopt and keep updated a general plan that includes a segment that considers access to solar energy as a part of all land use plans.
- ARS §9-462.01 (A) (3) permits any city to pass an ordinance that regulates access to solar energy. Tucson has not passed such an ordinance.



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- ARS §33-439 invalidates any deed or contract restriction (entered into after 1980) which “effectively prohibits” the installation or use of solar devices, including PV systems and hot water systems.
- ARS §33-1816 prevents home owner associations (HOA’s) from prohibiting the installation or use of solar devices, but allows HOA’s to adopt reasonable rules for solar if they do not impair the functioning of the system or adversely affect cost or efficiency of the solar system. If an HOA breaks this law, the homeowner can sue the HOA and if successful, recover attorney fees and court costs for the suit. For an Arizona Court of Appeal case on this topic, see <http://www.cofad1.state.az.us/opinionfiles/CV/cv000570.pdf>.

## E. Building Energy Standards with Solar Mandates

The goal of solar mandates and energy standards is to assure energy-efficient buildings as an important prelude to solar development. Such mandates should require a large portion of any building’s energy be provided by solar energy. Such regulations could be adopted at the local, state or national level. Tucson has taken steps regarding public buildings but has not adopted requirements that privately owned new buildings be energy efficient or include solar equipment.

The City of Tucson adopted a Sustainable Energy Standard (SES) in 1998, initially for the community of Civano, and later expanded its applicability to all City-funded buildings. The SES is now tied to the 2006 International Energy Conservation Code (IECC) that was adopted by the City of Tucson on June 12, 2007. See Tucson City Mayor and Council Ordinance #10417; [http://www.ci.tucson.az.us/clerks/minutes\\_2007.php](http://www.ci.tucson.az.us/clerks/minutes_2007.php).

The City of Tucson has recently adopted a solar ready ordinance which will require all new houses and duplexes to be built with stub outs so that solar electric (PV) and solar hot water heating can be installed at a later date without significant building modifications. See Tucson City Mayor and Council Ordinance 10549 (June 17, 2008).

All City buildings now must meet LEED Silver certification per Mayor and Council Resolution #20322, adopted April 18, 2006, which could include solar. See [http://www.ci.tucson.az.us/clerks/minutes\\_2006.php](http://www.ci.tucson.az.us/clerks/minutes_2006.php). All city funded commercial buildings must meet a 5% solar requirement which can be met through solar PV, solar water heating or day-lighting or by cogeneration (up to 4%).

The State of Arizona requires all new state buildings to derive 10 percent of their energy from a renewable resource (solar, wind, etc) by Executive Order #2005-05 of the Governor. See [http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=AZ16R&state=AZ&CurrentPageID=1&RE=1&EE=0](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=AZ16R&state=AZ&CurrentPageID=1&RE=1&EE=0)

ARS § 34-452 also requires all public buildings including schools over 6,000 square feet to include a written evaluation of solar features including active and passive solar space heating, solar day-lighting and solar water heating.



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## F. Solar Set Asides in Renewable Programs

The goal of solar set-asides in RPS policies is to assure that solar devices are used to meet a portion of a utility's required renewable portfolio, rather than allowing a utility to meet its full obligation from wind or another renewable resource. In theory, this should be a driving force for more solar installations in a state.

In Docket No. RE-OOOOOC-05-0030, ACC Decision 69127, November 14, 2006, the Commission established the Renewable Energy Standard and Tariff (REST) which ordered all regulated utilities in the state to obtain an increasing amount of their electricity from renewable resources, up to a total of 15 percent of residential load by 2025. Of this percentage, 30 percent (4.5 percent of total retail sales in 2025) must come from distributed renewable (DR) resources by 2012 and thereafter. One-half of the distributed renewable energy requirement must come from residential applications and the remaining one-half from nonresidential, non-utility applications. See <http://www.azcc.gov/divisions/utilities/electric.asp>.

There is no explicit solar set-aside in the Arizona REST. While the distributed generation requirement is likely to be met primarily by solar applications, this is not required by the REST language.

## G. Incentive Programs

The goal of incentive programs is to reduce the cost of solar energy systems for homes and businesses through grants, rebates or performance-based payments. These have been adopted by some states and some utilities as an effective way to make solar more affordable. In the Tucson area, local utilities have provided all of the direct financial incentives other than tax rebates. Because of state and federal caps on tax credits, however, the value of the total rebate and other incentive declines as the cost of the system increases. For 2009, Tucson Electric Power (TEP) offers these incentives in exchange for the renewable energy certificates (REC's) they generate. Incentives are as follows:

- Residential PV (on-grid): \$3.00/W up front payment for qualified systems.
- Residential PV (off-grid): \$2.00/W.
- Non-Residential PV (on-grid): \$2.50/W for systems 20kW or less. Systems greater than 20kW must take a performance based incentive (PBI) and bid for the per kWh payment and duration up to a predetermined level.
- Non-Residential PV (off-grid): \$0.121/kWh of estimated annual production.
- Residential Solar Water Heating and Solar Space Heating: \$0.25/kWh equivalent, plus \$750 up to a maximum incentive of \$1,750. Or residential customers can elect to receive a 10, 15, or 20 year PBI.
- Non-Residential Solar Water Heating and Solar Space Heating: PBI.

See

[http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=AZ15F&state=AZ&CurrentPageID=1&RE=1&EE=0](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=AZ15F&state=AZ&CurrentPageID=1&RE=1&EE=0) and <http://www.tep.com/Green>.





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TRICO Electric Co-op has similar programs and offers rebates for PV systems as well as solar water heating. Through the SunWatts Program, Trico Electric Co-operative offers home and business owners a rebate of \$4/W DC for installing photovoltaic systems and \$0.50 per expected first year kilowatt hour savings for solar water heaters. The incentive can not exceed 50 percent of the total system cost. Eligible PV systems may be either grid-tied or off-grid. See [http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=AZ25F&state=AZ&CurrentPageID=1&RE=1&EE=0](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=AZ25F&state=AZ&CurrentPageID=1&RE=1&EE=0) and [http://www.trico.coop/sunwatts\\_information.html](http://www.trico.coop/sunwatts_information.html).

## H. Loan Programs

The goal of loans for solar devices is to provide another means for homeowners and businesses to handle the high upfront costs of PV systems. These loans may be from a utility, a statewide solar advocacy group, the state or local government itself. There are currently no loan programs available statewide or in the immediate Tucson area from TEP or Trico Electric Co-op, although two other Arizona utilities do offer such programs. Sulfur Springs Valley Electric Co-op provides loans of \$2.00 per watt up to a maximum of 25 percent of the total cost of the project at an interest Rate of 3 percent. See <http://www.ssvac.org/programs/energySunWatts.php>.

## I. Tax Credits

The goal of tax credits, both state and federal, is to provide an additional incentive for taxpayers to purchase solar energy devices by reducing their tax liability. The federal investment tax credit of 30 percent applies to the system cost after utility rebates with no cap. This investment tax credit was recently extended through 2016. For a current listing of federal tax credits and incentives see <http://www.dsireusa.org/library/includes/genericfederal.cfm?CurrentPageID=1&state=us&ee=0&re=1>. The state of Arizona offers a number of tax credits for solar including:

- Commercial/Industrial Solar Energy Tax Program- Income tax credit of 10 percent of installed cost of solar up to \$25,000 per building in the same year and up to \$50,000 in total credits. Maximum statewide credits per year are \$1 million, although this limit has not been approached in any year yet. Perhaps most significantly, this credit can be transferred by a tax-exempt entity to the solar installers, financiers or manufacturers of the system. See ARS 43-1085, 43-1164 and 41-1510.01.
- Residential Solar Energy Tax Credit-Income tax credit equal to 25 percent of the cost of a solar system up to a maximum of \$1,000. See <http://www.revenue.state.az.us/Forms/2006/310%20instructions.pdf> for the appropriate forms to use.
- See also [http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=AZ18F&state=AZ&CurrentPageID=1&RE=1&EE=0](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=AZ18F&state=AZ&CurrentPageID=1&RE=1&EE=0)

## J. Property Tax Incentives

Property tax credits are another incentive to purchase solar equipment. Special rules apply to solar installations.



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- Solar equipment in Arizona is valued at 20 percent of its depreciated value for property tax purposes. See ARS 42-14155
- For property tax assessment purposes, solar equipment is determined by law to add no value to the property. See ARS 42-11054.
- See also:  
[http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=AZ30F&state=AZ&CurrentPageID=1&RE=1&EE=0](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=AZ30F&state=AZ&CurrentPageID=1&RE=1&EE=0) .

## K. Sales Tax Incentives

The goal of removing sales tax from solar equipment is to reduce the effective price to the customer and promote the sales of solar equipment. Arizona provides a 100 percent sales tax exemption on all solar equipment. See,

<http://www.azleg.gov/FormatDocument.asp?inDoc=/ars/42/05061.htm&Title=42&DocType=ARS> ; <http://www.azsolarcenter.com/benefits/solarsalestax.html> ; and [http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=AZ08F&state=AZ&CurrentPageID=1&RE=1&EE=0](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=AZ08F&state=AZ&CurrentPageID=1&RE=1&EE=0) .

## L. Expedited Permitting and Fee Waivers

City of Tucson Building permit fees are waived up to \$1,000 for solar installations. Plan review fees and impact fees are not waived. Building credits under this program shall not exceed 10 percent or \$10,000 for any single project of the credit amount provided under this program. A project shall be defined as lots in subdivisions or Planned Area Developments or buildings or shell buildings under ownership by one entity at the time of application for a permit that contains a solar energy system. A condominium project shall be considered under single ownership.

[http://www.tucsonaz.gov/dsd/Permit\\_Review\\_/Solar\\_Fee\\_Incentive\\_Waiver.pdf](http://www.tucsonaz.gov/dsd/Permit_Review_/Solar_Fee_Incentive_Waiver.pdf) . The City of Tucson has developed a residential photovoltaic template to simplify solar permit applications. [http://www.tucsonaz.gov/dsd/Permit\\_Review\\_/Residential/ResidentialPhotovoltaicElectrical.pdf](http://www.tucsonaz.gov/dsd/Permit_Review_/Residential/ResidentialPhotovoltaicElectrical.pdf)



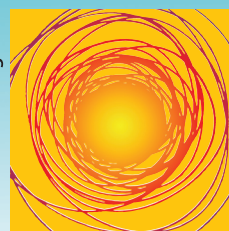
Parks Store  
47.3 kW  
Solyndra  
installation.

# Greater Tucson Solar Development Plan:

*Strategies for Sustainable Solar Power  
Development in the Tucson Region*

*January 2009*

Southern Arizona Regional



**Solar**Partnership





# Greater Tucson Solar Development Plan:

## *Strategies for Sustainable Solar Power Development in the Tucson Region*

January 2009

Developed through the support of a Solar Initiative grant from the U.S. Department of Energy

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"...the Yaqui people aspire to bring new energy into the marketplace while providing financial benefits to the community in an environmentally responsible manner."

— Marcelino Flores, Pascua Yaqui Tribe



## Executive Summary

Solar energy holds great promise for the provision of a significant portion of Arizona's energy needs. While solar energy has been embraced, its full potential has yet to be realized. The Greater Tucson Solar Development Plan was developed to provide a set of discrete and achievable tasks that, if implemented, will create a foundation upon which solar deployment in southern Arizona can be accelerated.

Immediate action to improve the market for solar power is needed in southern Arizona – a region in which nascent solar energy is abundant. While solar power development is rapidly expanding in other areas with comparatively few solar assets, the comparative lack of solar energy development in southern Arizona speaks to the challenge we confront. European countries and states like Oregon and New Jersey have adopted policies and pursued strategies that have resulted in extensive solar energy development. Although Arizona could once boast of having the nation's first renewable energy portfolio requirement, its new standard of 15 percent renewable energy by 2025 is a second-tier requirement, at best, and has been subjected to legal challenge<sup>1</sup>. Business opportunities are being lost and the economic impact is dramatic. The Greater Phoenix Economic Council has estimated the cost to be worth \$1.8 billion of investment and 3,880 lost manufacturing jobs.<sup>2</sup> Clearly, action is needed to better position Arizona and the Tucson region to capitalize on potential strategic economic opportunities.

The Greater Tucson Solar Development Plan identifies a set of recommendations which will, if implemented, correct policy deficiencies that impede solar development. There are twelve strategies highlighted in the plan.

1. Recognize the value of solar energy as a key economic driver and create a policy and regulatory environment that advances solar investment in our region and creates a level "playing field" for competing with other regions
2. Increase market awareness of solar energy technology for all sectors<sup>3</sup>
3. Establish institutional investment and financial incentives in solar energy
4. Secure the participation of the key regional players in developing solar energy projects and creating a solar energy market
5. Improve the ability of municipal governments to facilitate the solar energy development
6. Establish rules and regulations to support healthy solar energy development and markets
7. Support policies that develop healthy solar energy development and markets
8. Establish the financial incentives necessary to support renewable energy investment
9. Develop a conceptual model to foster the further development of solar energy technology and economic development in the region
10. Establish a technical training path for worker participation
11. Develop an effective system to measure performance in achieving plan recommendations
12. Identify an appropriate public-private agency to implement the strategies outlined in this plan and designate a regional solar energy coordinator

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<sup>1</sup> Legal challenge of energy mandate has nothing to do with renewable energy, Goldwater Institute, <http://www.goldwaterinstitute.org/AboutUs/ArticleView.aspx?id=2326>

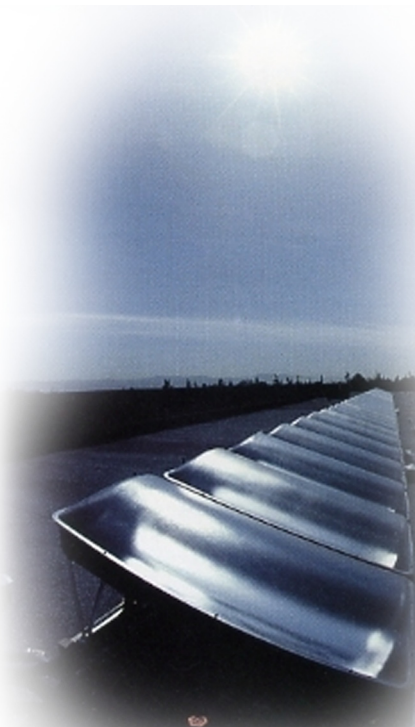
<sup>2</sup> Arizona losing fight for solar jobs among Western states, The Arizona Republic, June 21, 2008, <http://www.azcentral.com/business/articles/2008/06/21/20080621biz-solarincentives0621-ON.html>

<sup>3</sup> The term 'sectors' refers to business and economic sectors such as commercial, retail, industrial, real estate, etc.



It is estimated that up to 16 megawatts (MW) of electric generation capacity, primarily through deployment of solar photovoltaic systems, can be achieved by 2015. With less than 1 megawatt in place locally, this ramp-up in solar deployment would only begin to remedy a deficiency when compared to other locales which will be expanding their own capacity over the same time horizon.<sup>4</sup> The strategies identified in the plan lead to a more competitive policy environment and remedy existing deficiencies. Collectively, they may allow southern Arizona to attract investment and to assume a leadership role in solar deployment. Key among these strategies is the recognition among the region's political and economic leadership that increased solar energy development has economic benefits that far outweigh the costs of any short-term incentives and, perhaps most significantly, that achieving enhanced solar energy development will not be realized without such leadership. This leadership will be evidenced through the recognition that solar energy development can be a principal driver of economic growth and the adoption of a set of policies that encourage solar investment.

Recognizing that solar energy has economic value is a conceptual starting point, a sign post along a path toward a more balanced energy future. With other areas competing aggressively, the region's natural availability of sunlight is eclipsed by more effective marketing and policy choices. The path marked by this plan is essential to achieving a greater utilization of solar power. The task now is to realize the opportunity that solar energy presents in a region that has ample solar resources. While the potential once existed to assume a national leadership role – that potential may now be beyond our reach. Other regions are moving aggressively to become industry and utilization leaders. We have a lot of catching up to do just to stay even with this rapidly expanding industry.



"The solar industry is an important component of TREO's targeted industry business attraction strategy. We've already had some significant wins from solar companies like SOLON America Corporation, Schletter Inc., and Global Solar. We feel it is important to support initiatives that offer tax incentives on solar projects so that we can continue to attract these high-skilled companies and build upon our reputation as a 'Solar America City.'"

– Joe Snell, President & CEO, TREO

<sup>4</sup> Southern Arizona Solar Database of Installed Photovoltaic Solar Capacity, Pima Association of Governments, December 2008

## *I. Introduction*

This plan proposes a course of discrete actions to effectively catalyze increased solar energy deployment throughout the greater Tucson region and concurrently identifies the strategic importance of the solar energy industry as a major economic development driver for the community. It outlines twelve primary strategies to establish a viable market for solar energy, to compete effectively with other western states, to stimulate investment and workforce growth in the region and to secure the participation of key stakeholders.

The plan recommends measurable action-oriented objectives to stimulate programs and initiatives leading to the potential development of over 16MW of solar energy in the region by 2015. The plan is designed to be a framework for all stakeholders and stakeholder groups who are interested in increasing solar energy development in the region. These objectives are supported by overarching strategies in the areas of state and local regulation, policy, market structure, practice and information. Equally, it is important to recognize what this plan is not: it is not a business plan or an engineering plan with detailed milestones, budget allocations and identification of responsibility and accountability. However, it represents a useful starting point for any stakeholder or stakeholder group that feels the need and is interested in making the investment in developing one or more of the objectives described in the plan.

To reach the 16 MW solar development goal identified in this plan, it is necessary to develop a funded, coordinating entity acting in the capacity of an outreach and advocacy organization that will carry out strategic action items. This entity will coordinate actions between public and private organizations to reach the goal of each strategic objective developed in the plan. It also relies heavily on involvement from business, government and educational sectors to manage on-going investment in the region. Establishing strategic investment in solar energy in all sectors is the cornerstone to the advancement of solar energy development in the region. A business model approach that establishes financial incentives and technology dissemination models is recommended to effectively develop community, municipality, and public agency investment options in solar energy.

Of the three main technologies that are readily available to take advantage of solar energy, this plan recognizes that photovoltaic panels (PV) to produce electricity and passive solar water heating are commonly available and can be used at the residential and commercial level with proven success. Solar thermal technology to produce electricity is viable at utility scale. However, it only recently has been embraced for wider application, e.g., Arizona Public Service and Abengoa Solar's planned Solana facility near Gila Bend is the only local example. Newer forms of PV are becoming available including Copper Indium Gallium diSelenide (CIGS) thin-film solar cells. In Tucson, a major manufacturer of these thin-film solar cells is Global Solar which has installed the first commercial-scale (750 kilowatts) deployment of this technology at its Tucson facility.

One area that holds great promise is the use of solar energy to heat water directly. While in common in local use for heating swimming pools, the extent of that application is limited

– only a small percentage of home owners with swimming pools have installed heating systems. In some climates, like that in southern Arizona, solar energy can provide as much as 85 percent of heated water demand. Some commercial applications may realize substantial energy cost savings by adopting solar technology, e.g., commercial Laundromats, hotels, university dormitories and restaurants. The largest known application of solar water heating technology in southern Arizona is the Phoenix Federal Correctional Institution (FCI) located just north of Phoenix. Built in 1998, this solar thermal facility produces up to 50,000 gallons per day of heated water and meets as much as 80 percent of the facility's hot water needs. Total annual energy cost savings average \$67,000 and the financial payback for the investment was eight years. Facilities such as prisons, hospitals and military barracks with large, constant hot water loads are particularly good candidates for this technology which suggests several potential local candidates, e.g., Davis-Monthan AFB, local federal and county correctional facilities, the Veteran's Administration, large swimming pools at athletic centers, and the University Medical Center.

## *II. Goals and objectives of the plan*

The goal of the Greater Tucson Solar Energy Development Plan is to provide a path through which the deployment of solar energy can be accelerated. The framework that is proposed will result in solar energy becoming an important component of commercial, institutional, utility and residential energy generation choices in our region. While solar energy is being used locally, the reality is that southern Arizona is far behind other areas of the country with far less inherent solar availability. By overcoming existing barriers and creating new supporting mechanisms, the expectation is that total solar deployment can reach 16 megawatts (MW) of solar capacity in the region by 2015.

The following objectives of the plan highlight the changes that need to occur to reach the plan goal:

- Provide a policy, economic and regulatory framework that supports the future deployment of solar energy systems.
- Transform financial barriers into opportunities for solar installations by developing and institutionalizing financing techniques for large-scale solar energy installations
- Transform informational barriers into opportunities for solar installations by extending solar energy best practices and outreach to the region.

These objectives will be realized through the implementation of thirteen primary strategies:

**Strategies to secure sustainable solar energy growth:**

RECOGNIZE the value of solar energy as a key economic driver and create a policy and regulatory environment that advances solar investment in our region and create a level “playing field” for competing with other regions

INCREASE market awareness of solar energy technology for all sectors

ESTABLISH institutional investment and financial incentives in solar energy

SECURE the participation of the key regional players in developing solar energy projects and creating a solar energy market

IMPROVE the ability of municipal governments to facilitate the deployment of solar energy

ESTABLISH rules and regulations to support healthy solar energy deployment and markets

SUPPORT policies that develop healthy solar energy deployment and markets

ESTABLISH the financial incentives necessary to support renewable energy investment

DEVELOP a conceptual, action-oriented model to foster the further deployment of solar energy technology and economic development in the region

ESTABLISH a technical training path for worker participation

DEVELOP an effective system to measure performance in achieving plan recommendations

IDENTIFY an appropriate public-private agency to implement the strategies outlined in this plan and designate a regional solar energy coordinator



### *III. Strategies for solar energy deployment in the region*

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#### **STRATEGY ONE**

*Recognize the value of solar energy as a key economic driver and create a policy and regulatory environment that advances solar investment in our region and create a level “Playing Field” for competing with other regions*

Solar energy is a renewable energy resource that has the transformative power to reorder the prevailing energy utilization paradigm this is based on petroleum and coal. The potential of solar energy is widely understood but only in the past few years has the technology for generating electricity from photovoltaic panels and the policy framework been in place to reach a tipping point. As traditional sources of energy continue to increase in cost, concerns about emission of carbon dioxide grow and new opportunities arise to transition away from petroleum-based fuels for vehicles, the momentum has perceptibly shifted toward solar energy. Over the past several years, the adoption of renewable energy standards by state governments has provided an imperative to use solar to meet the new requirements. In turn, solar businesses have prospered and new technological innovations are frequently announced.

Solar energy has “arrived” and regions that embrace the new technology will benefit most. A commitment to solar energy deployment will not only provide a source of renewable energy to a community but it also will attract investment by solar energy firms seeking a home that embraces their vision. A strong demand for solar technology will engender a desire from the business community to invest locally to provide services and products. The presence of solar businesses and research institutions will complement each other providing mutually reinforcing mechanisms of support.

Realizing this supportive environment will require a concerted and focused effort. Specific actions required will include:

- Understanding the broad market context and advocate for an appropriate balance between incentives, guidelines and requirements to advance solar energy.
- Attracting financial investment in solar energy.

The adoption of solar-friendly policies can provide incentives that can make the critical difference in the deployment of solar energy systems in a community. When faced with unnecessary or onerous regulatory hurdles a decision to deploy solar energy may be deferred or canceled. Several strategies can be employed to reduce barriers allowing a clear path to deployment. These include:

1. Elimination of restrictions on power purchase agreements.
2. Elimination of restrictions on long-term energy contracting.

3. Expedite institutional procurement of solar energy.
4. Establish permitting and grant fee waivers.
5. Reduce or remove barriers restricting affordable access to public lands for renewable energy generation leases.
6. Investigate policies that allow renewable energy companies to receive cost benefits for energy generation.

*Anticipated Results:*

Key stakeholders will consider establishing, as part of their planning process, solar energy incentives, minimum standard requirements, mandates, or resolutions for new applicable initiatives (i.e., existing and new housing, existing and new real estate developments, existing and new commercial projects, existing and new government buildings, utility energy portfolios, etc.)

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## **STRATEGY TWO**

*Increase market awareness of solar energy technology*

Solar energy is a free resource that can be accessed through investment in systems that allow the conversion of solar energy, either radiant or thermal, into usable forms of energy, i.e., electricity or by directly heating water for an end use. While solar energy is widely understood to be available and desirable, the practical aspects of how solar energy systems work and a quantification of their value, as compared to other options, is not widely understood. The need exists to educate key players about the advantages and benefits of solar photovoltaics (PV), solar daylighting<sup>5</sup> and solar hot water systems. Outreach to the following sectors would improve the community's receptivity to solar energy development:

- Utilities
- Real estate agencies and associations
- Commercial and industrial leaders
- Small business owners
- Fixed-income home owners
- New home owners
- Elected officials

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<sup>5</sup> Solar daylighting allows you to capture the light of the sun to illuminate a building instead of using artificial lighting that uses electricity.

- City and county managers
- Property developers
- Loan and mortgage providers
- Facility managers
- Existing owners of buildings greater than 50,000 sq. ft.
- Existing customers

To be effective, targeted content for each sector should be developed. By clearly identifying the value of solar energy systems in given contexts, the choice of solar energy system deployment can be made in a cost-benefit matrix. The specific elements of an outreach program should identify sector stakeholder goals and barriers to success and articulate the benefits and advantages of utilizing solar PV, solar daylighting and solar hot water. In preparing materials for the outreach campaign the following resources can be used:

- Data and reports from the National Renewable Energy Laboratory (NREL)
- The Solar Advisor Model (SAM)
- Solar energy industry associations (see Strategic Partners), and other credible sources for benefits and advantages of utilizing solar energy technologies.
- Interviews and surveys of sector stakeholders and strategic partners to identify goals and barriers.
- Link group energy investments to energy surety and security.
- Illustrate how solar energy creates a hedge against rising energy costs and keeps the majority of energy expenditures from leaving the state of Arizona.

To be effective, a solar energy outreach campaign must be developed with a strategic outlook identifying the target of the campaign, the identification of clear messages to convey, and the creation of a comprehensive “game plan” for implementation. In developing the outreach campaign, the following elements should be incorporated:

1. Establish a permanent campaign presence.
2. Collaborate with Pima Association of Governments (PAG) to define the solar energy campaign content and its measurements for success.
3. Use media opportunistically to promote solar commercial applications and to increase awareness for the residential market.
4. Obtain the support of area solar system vendors to help promote the campaign.
5. Design and implement a Web site to promote the event online.

A broad range of strategic partners should be identified to support the development of an energy outreach campaign.

1. Potential partners would include regional organizations such as Tucson Regional Economic Opportunities, Inc. (TREO), Southern Arizona Leadership Council (SALC), Southern Arizona Homebuilders Association (SAHBA), Tucson Metropolitan Chamber of Commerce, Metropolitan-Pima Alliance, Arizona Builder's Alliance (ABA), Tucson Utility Contractors Association (TUCA), and the Tucson Hispanic, Northern Pima County, and Marana Chambers of Commerce, among others.

Any outreach campaign requires resources. A key challenge will be to identify funding. Several immediate steps could be taken including:

1. Identify and recruit AZ Department of Commerce energy office -allocated DOE funds and matching funds from industry and key stakeholders.
2. Review federal and foundation solicitations and funding guidelines for opportunities for more comprehensive and integrated education campaigns.
3. Inventory related initiatives and pursue opportunities to piggy-back on existing solar energy education activities.
4. Identify potential in-kind support opportunities.

Encourage private sector outreach campaign activities by establishing a solar energy component in energy analysis and consultation services. Many companies carry out regular energy audits and consult on ways to mitigate high energy use and costs. Ensuring that solar energy is a component in energy audits, building inspections and appraisals creates an outreach role for the private sector performing these services.

#### **Examples for Specific Campaigns**

- To increase the use of Tucson Electric Power's (TEP) Guaranteed Heating & Cooling Program and its solar hot water appliance option, review opportunities for promoting this program with regional utilities. Identify other developers that can incorporate solar energy into the Guaranteed Heating and Cooling program and facilitate the relationship with the utility.
- To design and conduct a solar pool heating campaign for municipalities, review successful regional municipal campaigns, develop a set of protocols and tools to analyze and develop the campaign. By documenting this process and testing a campaign, a case study can be produced that may be used for commercial and residential pool markets and for adoption by other communities.

#### *Anticipated Results:*

Increased awareness of and desirability of deploying solar energy systems to provide a hedge against increasing utility costs and to reduce carbon footprints.



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## STRATEGY THREE

### *Establish institutional investment and financial incentives in solar energy*

Identify potential business models and research applicable technology dissemination models. In conducting this assessment consider the following elements:

1. Direct incentives, loan programs, tax credits, property tax incentives and sales.
2. The value of state renewable energy certificates associated with the Renewable Energy Standard Tariff (REST) and other state, local and federal incentives available to reduce the installed cost of solar energy.
3. 3rd party ownership options.
4. General obligation and energy revenue bonds for potential solar energy deployment on public property.
5. Group investment in solar energy through “co-op rates,” “power partners” or aggregate Power Purchase Agreement (PPA) programs for mixed communities; residential, commercial, technology parks.
6. Low-interest, fixed-rate long-term loans.
7. Master metered facilities for solar energy appliances.
8. Community-buy down program for regional utilities to incorporate in their response to the Arizona REST requirements.
  - a. Construct a viable business model for the region based upon research (including factors and models that apply to the region and excluding models that are not supportable).
9. Homeowner Association and Commercial/Industrial Association organizational documents, CCRs, design guidelines, lot owner assessments.

Potential commercial participants can be identified using a business model approach. Visible and influential commercial applications for solar energy are listed in the Inventory of Regional Solar Market Opportunities and Prioritization of Opportunities tables (Section VIII) in this plan. From this listing, it should be possible to identify the businesses that have the most to gain from solar energy investment in terms of commitment to green values and to identify those businesses that have concerns about power quality or dependability. Those that fall into these categories may be considered as prospects for solar energy applications.

From the attributes of the business model examined above, it should be possible to develop community, municipality, and public agency investment strategies as well as options for financing solar energy technologies. To foster these strategies, it will be necessary to develop

a clear policy for communities to institutionalize the financing options, identify specific prospects and present an investment plan for solar energy to key sectors.

*Anticipated results:*

Increase interest by funding institutions to support financing for deployment of solar energy systems.

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## **STRATEGY FOUR**

*Secure the participation of the key regional players in developing solar energy projects and creating a solar energy market.*

A Solar Pioneers program should be created to recognize and acknowledge individuals, companies and governmental bodies in the region who have been early adopters of solar energy systems and/or who have acted in an advocacy role for renewable energy. Public awareness and recognition of Solar Pioneers can be achieved through the issuance of certificates from the Mayor's office or from the Pima County Board of Supervisors, recognition by other regional public agencies, information placement on solar Web sites and/or participation at regional solar energy events.

To ensure success, Solar Pioneers should be encouraged to participate in neighborhood, city and regional public education awareness programs. Those recognized as Solar Pioneers can play an important role to secure public recognition and awareness through meetings with leaders in business, governmental and educational institutions.

*Anticipated results:*

The recognition of individuals and organizations that promote solar energy with a consequent result being the enhancement of solar power as a desirable strategy for addressing energy needs.

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## **STRATEGY FIVE**

*Improve the ability of municipal governments to facilitate the development of solar energy*

Municipalities and public agencies should adopt solar programs that include solar energy protocols in standard inspection procedures, identify and provide incentives for solar energy in permitting processes, and which include property and tax incentives policies. To foster an effective solar program, policies to encourage land leasing for solar energy installations should be developed. To support these programs, governmental jurisdictions

should encourage the League of Cities and Towns and the Arizona Association of Counties to advocate at the state level for passage of policies that will support further solar energy development. Awareness of these programs can be assisted by developing outreach workshop seminars for key regional players. Lessons learned from these workshops can be incorporated within the market awareness campaign strategy.

*Anticipated Results:*

Newly developed policies and resolutions in the region for solar energy development.

A market-based and voluntary solar energy development activity independent from mandated investments.

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## **STRATEGY SIX**

*Establish rules and regulations to support healthy solar energy development and markets*

The availability of newly adopted rules and regulations provides a refreshed context in which to encourage solar energy development.<sup>6</sup> Most of the following action steps can be incorporated within the market awareness campaign strategy.

1. Facilitate the implementation of Net Metering.
  - a. Facilitate regional transition to upcoming state-mandated net metering standard.
  - b. Create a plan with regional stakeholders that explains ways to utilize net metering standards.
  - c. Identify areas that strengthen use of net metering and distributed generation.
  - d. Ensure the rules are transparent, uniformly applied and communicated.
2. Establish standard interconnection protocol.
  - a. Identify interconnection implementation challenges for large and small generators including cost, procedure, time to implementation and equipment standardization.
  - b. Develop policy refinement with utilities and jurisdictions for interconnection standards.
3. Establish solar access laws.
  - a. Identify current easement and access laws; develop strategy to overcome gaps in the existing regulations for solar energy.

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<sup>6</sup> Many of these rules and regulations already are established in the region (See Appendix).

- b. Develop strategy to influence policy-makers and homeowner associations.
  - c. Prepare debriefing for stakeholders on current and proposed rules particularly in the planning phase of development.
4. Establish building energy standards that incorporate solar energy.
- a. Create regional solar energy standards building on the Pima County and City of Tucson's planned voluntary standards.
  - b. Link energy efficiency and solar energy in the existing and newly constructed single or multi-family housing, manufactured housing, market-rate housing, work force/affordable housing, and custom or individual site built home markets.
  - c. Develop a Regional Solar Energy Initiative in a public and private partnership to offer financial and administrative support for solar energy projects (convene suppliers, contractors, permitting agencies, etc.).
  - d. Establish solar energy recommendations in housing master plans and commercial building that provide guidelines for new housing and commercial buildings and briefings on solar energy requirements and benefits in conjunction with stakeholders.
    - Develop a partnership with area utilities and regional town and county governments to identify new custom home developments.
    - Develop a program via these organizations to create solar energy standards with real estate developers and home builders.
    - Develop a media campaign to ensure awareness of solar energy expectations in existing homes and standards in new housing developments.
  - e. Incorporate solar energy technologies into the traditional building trades and facilitate the development of "energy facilitators."
  - f. Introduce resolutions for all new residential and commercial developments to incorporate LEED<sup>7</sup> objectives and solar-ready standards.

*Anticipated Results:*

- Newly developed incentives, mandates and resolutions in the region for solar energy development.
- Installation of solar energy in new, non-residential developments.
- Expansion in the conveyance infrastructure for renewable solar energy.

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<sup>7</sup> Leadership in Energy and Environmental Design (LEED) is a certification offered by the U.S. Green Building Council. Pima County is the only governmental agency in the country authorized to issue a LEED certification.



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## STRATEGY SEVEN

*Support policies that develop healthy solar energy deployment and markets*

1. Building on the City of Tucson's existing plans for solar and Renewable Energy Standard and Tariff (REST) funds, create regional solar energy policies for use of these funds in new developments.
2. Establish solar energy policy standard guidelines and disseminate as a model for use by other communities.
3. Promote the designation of a percentage of the Renewable Energy Standard as being composed of solar energy.

*Anticipated Results:*

- Newly developed solar energy expansion plans that include financing models.
- Expansion of diverse sector support for solar energy expansion and financing plans.

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## STRATEGY EIGHT

*Establish the financial incentives necessary to support renewable energy investment*

1. Identify appropriate financial incentives to encourage the deployment of solar energy systems.
  - a. Develop a financial incentive concept proposal for policy development.
  - b. Introduce the solar energy financing and a policy concept to key stakeholders and decision-makers.
  - c. Encourage the participation of Arizona solar advocacy groups and associations to assist in the development and adoption of policies.
  - d. Adopt resolutions that incorporate incentives in city and county plans.
  - e. Incorporate financial incentives into a solar energy business plan model.
  - f. Inform the broader community on the availability of incentives and how to access them.

*Anticipated Results:*

- Newly developed incentives, guidelines, resolutions and mandates for regional communities to deploy solar energy.

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## STRATEGY NINE

*Develop a conceptual model to foster the further development of solar energy technology and economic development in the region*

Understanding the solar industry and creating local conditions that reduce barriers and invites proactive behavior can create a favorable environment in which solar development can be encouraged. Each industry is a complex set of interrelationships between suppliers, manufacturers, service providers and customers. This interrelationship can be quantified through the development of a value chain analysis. As a product passes through the various steps, i.e., the chain, that lead to its completion, the product gains some value over and above the cost of the individual steps, resulting in more added value than the sum of added values from each of the individual steps required to manufacture the product. A value chain also can be observed from a macro level, identifying the interrelationships between individual companies and organizations. In this context, the value chain is comprised of the key players in the solar energy sector. It is a model that is used to analyze specific activities through which the region can create value and a competitive advantage. The key players in the solar energy value chain are: energy generators and distributors → manufacturers, integrators and installers → economic development organizations, municipalities and public agencies → businesses, property owners and end-users.

By developing this comprehensive understanding of sector interrelationships, it is possible to identify and target business opportunities to promote economic development. A more integrated solar energy sector in the region results in synergistic effects – with the result of the region possessing attributes that encourage existing businesses to stay and new businesses to consider relocation or siting in the region. The following actions are required to implement this strategy:

1. Identify and map out the regional solar energy sector value chain.
2. Map out the value chain of the regional solar energy industry.
3. Identify areas of strength and weakness in the value chain and identify approaches to capitalize on opportunities and eliminating constraints.
4. Target businesses based upon the value chain evaluation to attract investment in the region.
5. Identify key stakeholder organizations/ individuals for regional solar economic development.
6. Create a briefing campaign and prepare briefings for key stakeholders.
7. Incorporate concepts in TREO briefings for potential financial investment in the region.

### *Anticipated Results:*

Identification of businesses to target to achieve greater integration of the solar industry sector in the Region.

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## STRATEGY TEN

### *Establish a Technical Training Path for Worker Participation In Solar Energy Job Opportunities*

Attracting solar energy businesses and deploying solar energy systems requires the availability of a trained workforce. This strategy highlights the need to ensure that training opportunities exist related to the needs of the solar energy sector. To respond to this need, Pima Community College has established a training program for photovoltaic installers which positions students to receive the requisite industry-standard certification. Specific action items include:

1. Identify universities, community colleges, JTED, K – 12, Solar Energy International and solar installers with solar energy teaching and training programs.
2. Identify electrical journeyman unions such IBEW Local 570.
3. Develop an outreach program to connect potential solar energy workers with training and teaching programs.
4. Work with teaching institutions to further develop curriculum and community involvement.
5. Integrate information into broad distribution networks, such as Arizona Solar Center Education link and the North American Board of Certified Energy Practitioners (NABCEP).

### *Anticipated Results:*

- Increased enrollment in classes offered and an available workforce for Arizona's renewable energy industry.
- Increased awareness of Tucson as a multi-tiered solar education center.

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## STRATEGY ELEVEN

### *Develop an effective system to measure performance in achieving action plan items*

1. Identify meaningful criteria, e.g., comparisons of energy used, energy saved, jobs created, CO2 emissions avoided, solar installed, business siting.
2. Develop a method for identifying all contractors/ organizations/ and utilities installing solar to more accurately record community installations.
3. Identify meaningful measures that translate the number of systems into community assets.
4. Investigate the level of market penetration necessary to establish solar as a viable energy alternative.

*Anticipated Results:*

- Measure short-term community success through performance metrics
- Provide leverage to support continued progress in solar deployment.
- Benchmarks created to measure success of the plan and where adjustments need to be made

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## **STRATEGY TWELVE**

*Identify an appropriate public-private agency to implement the strategies outlined in this plan and designate a regional solar energy coordinator*

The number of discrete tasks identified in this plan and the importance of securing a strong solar energy presence in the region suggests the need for a designated entity to coordinate information and advocate for further development of solar energy. With responsibility comes accountability. The ability of the region to effectively develop a solar energy sector would be enhanced through the designation of a single entity with the resources to effectively pursue the strategies outlined in this plan. Specific tasks required to designate or establish a focus for this effort include:

1. Develop agency implementation plan including funding requirements.
2. Establish management structure and responsibility that provides for a regional solar energy coordinator.
3. Determine the most effective location for this responsibility. Potential homes include the City of Tucson, Pima County, Pima Association of Governments (PAG), TREO, Tucson Metropolitan Chamber of Commerce.
4. Develop plans for agency management to act in the advocacy position and as solar ombudsman for the community in resolving solar permitting issues and other conflicts with local government involving solar energy.
5. Gather community support for the development of the agency, starting with Metropolitan Energy Commission (MEC), City and County solar advocates and local solar installers and business leaders.
6. Identify funding sources and begin fundraising campaign.
7. Develop criteria for solar energy information gathering and outreach plan, particularly development of educational and job training courses information offered in the region.

*Anticipated Results:*

- Effective implementation of the Greater Tucson Solar Development Plan



## IV. Risks and Opportunities

Arizona has experienced tremendous growth in recent years and, following the conclusion of the current economic downturn, is projected to grow even more in the next decade. Population growth naturally means more energy demand and Arizona has experienced growth in the consumption of electricity “significantly faster” than the national average, at about 3.4 percent per year (1).<sup>8</sup>

The primary fuel sources of electrical energy in this region are coal and natural gas. It is likely that in the next three to four years, regional or national regulations on greenhouse gas emissions will be in place that will impact the cost of traditional fuels. An investment and commitment to solar energy in the region provides a hedge against rising energy costs in the future but it also provides a significant economic opportunity for the region in the form of financial investment, keeping many Arizona-generated dollars in the state and developing a local workforce to meet the upcoming demand.

*“Pima County is committed to supplying at least 15 percent of the energy needs of County facilities with the use of renewable resources by 2025, and the deployment of solar energy will play a critical role in achieving this goal.”*

*— Honorable Richard Elias, Pima County Board of Supervisors Chairman*



<sup>8</sup> Powering Arizona, a draft study assessing Arizona's energy future. ASU and The Communications Institute, 2008.

A strategically placed outreach organization to secure financing and to champion many of the objectives laid out in this plan would improve prospects for reaching the 10 percent solar energy goal in the region by 2015. The absence of such an organization that can effectively coordinate these activities will delay many of the critical pieces of the plan. While investment in solar energy installations will continue to grow without the support of a leading entity, the pace of that growth is unlikely to reach identified targets in the next 10 years.

Several assumptions have been identified that are vital to the development of this plan and are listed below. These assumptions describe the current market and political environment and what needs to be in place to take advantage of the opportunity for the region:

- A funded, coordinating entity acting in the capacity of an outreach organization will be established to carry out strategic action items.
- Funds for Arizona utility purchase of renewable energy credits are limited by collected Renewable Energy Standard and Tariff ("REST") funds by Arizona utilities.
- Most, if not all, of the renewable energy credits ("REC") generated in Arizona will be purchased by Arizona utilities.
- Carbon taxes, emissions trading and other market mechanisms will not be fully implemented and influencing market development until 2012.
- Preference for Arizona-based resources will continue to grow but will not dominate on a megawatt hour (MWh) basis until 2012.
- Financing will remain the critical concern for solar energy deployment.
- Financing availability will expand within markets and across markets, beginning with the nonresidential market.
- The nonresidential sector will dominate energy development on a kilowatt hour (kWh) basis until 2012.
- The political will to support solar energy generation will increase steadily both locally, regionally, nationally and internationally.
- Incentive mechanisms will increase in market-based orientation.
- Arizona and southeastern Arizona municipalities and public agencies, towns and communities will continue to identify and remove obstacles and barriers in law, practice and procedures.
- Place-specific solar energy-related economic development is driven by local market active deployment of solar energy systems.
- Training, education and research from installation to development of core components of the plan will be critical to leveraging regional deployment into sustainable and diverse economic benefits.
- Community management of multi-year solar energy investment includes leadership from the business, government and educational sectors.

## *V. Strategic Partners*

The region benefits from a network of community stakeholders that have been in existence for many years. Alliances and partnerships with energy, sustainability, and economic development stakeholders throughout the state have developed over time and represent the most effective strategic partners to drive the growth of solar energy in the region. The proposed activities described in this plan seek to transform these alliances and partnerships to create a level of integration that will embed solar energy as a major source of economic value in the region. These organizations and their identified contribution are listed below.

- Arizona Department of Commerce (AZDOC) Energy Office – incentives for solar energy business expansion, retention and recruitment and assistance with federal and state grants.
- Arizona Association of Distributed Generation (AADG), SWEEP, Arizona Energy Advocates, AZ PIRG – research and opinion insight and coordinated outreach activities.
- Congresswoman Giffords Community Solar Working Group – outreach activities.
- Tucson Electric Power (TEP) – locating and integrating a large volume of solar energy installations.
- Arizona Corporation Commission (ACC) – solar-friendly policies in net metering and interconnection standards and other utility-related regulations.
- Pima Association of Governments (PAG) – dissemination of tools, such as a solar energy database of installations, and aggregated knowledge of solar energy to the region.
- Greater Tucson Coalition for Solar Energy – job and economic development impact analysis; outreach and briefing to other municipalities, public agencies and target markets.
- Arizona Research Institute for Solar Energy (AzRISE) (University of Arizona) – technology development and deployment, economic and policy analysis and outreach activities including the Solar Decathlon house and Solar racing car teams.
- Pima County – establishing a 15 percent renewable energy goal for County facilities; continuously seeking to expand solar energy deployment on County-owned lands; adopting the region's first "Residential Green Building Rating System" which awards rating points for the installation of solar PV and thermal hot water systems; and for serving as the first public agency authorized to provide "LEED for Homes" certifications on behalf of the U.S. Green Building Council.
- Tucson- Pima Metropolitan Energy Commission (MEC) – outreach and briefing to other municipalities, public agencies and target markets

- City of Tucson – solar installations on city property, expanded use of renewable energy in city facilities, mandates for LEED silver standards, requirements for city buildings to meet 5 percent energy needs through solar energy, reducing building permit fees for solar installations, and Solar America City award.
- Regional economic development agencies, especially Tucson Regional Economic Opportunities (TREO) – development of economic opportunities in the region associated with solar energy particularly increase in workforce and manufacturing capabilities.
- Regional utilities including TEP, TRICO, AEPCO, and APS – development of key financial incentives and programs for solar energy and the investment and installations of solar energy within the region.
- Solar energy industry associations (SEIA, ARISEA, Solar Alliance) – industry forecasts, costs and expectations.
- Tohono O’odham Nation and Pascua Yaqui Tribe – solar development on nearby reservation land and casinos.
- ASEA public and key stakeholders – awareness programs and solar home tours conducted by ASEA affiliates
- Business and industry leaders and organizations – commitments to investment in solar energy installation.



At the state level, economic incentives must be established to attract solar manufacturing and installation companies, instead of letting them set up shop in neighboring states. We need a statewide economic plan to move forward in a coordinated effort from all sectors of the business, political and solar energy communities. There is no time to waste. We are truly entering a new era of energy policy and Arizona is poised to lead the way.

– Gabrielle Giffords, Congress Member, 8th District of Arizona



## V. Performance Indicators and Timeline

Objective	Timeline							Coordinator	Strategic Partners	Performance Indicator
	2009	2010	2011	2012	2013	2014	2015			
Market Awareness	→							City of Tucson	ARISEA, AZDOC, Advocacy associations, PAG, AzRISE, MEC, ASEA	Number of key stakeholders reached
Institutional Investment	→							Public-Private Agency	AZDOC, TEP, TRICO, ACC, PAG, AzRISE, MEC, TREO	# MWh of solar production
Regional Participation	→							Public-Private Agency	PAG, Pima County, Trico, AzRISE, Sahba, Metro Chamber, MPA, TAR, ABA, SALC, etc.	# MWh of solar production
Net Metering, Interconnection	→							Public-Private Agency	AZDOC, TEP, TRICO, ACC, PAG, AzRISE, MEC, ARISEIA	# MW deployed
Renewable energy standards	→							Public-Private Agency	AzDOC, TEP, TRICO, ACC, MEC, Advocacy Associations, universities, Sahba, Metro Chamber, MPA, TAR, ABA, SALC, etc.	# MWh of solar production
Financial Incentives	→							Public-Private Agency	ARISEA, AZDOC, Advocacy associations, PAG, AzRISE, MEC, TEP, TRICO, Business Organizations	\$ \$ allocated toward incentives & resolutions
Financial Investment	→							Public-Private Agency	AZDOC, TEP, TRICO, ACC, PAG, AzRISE, MEC, TREO	# MWh of solar production
Economic Development	→							Public-Private Agency	ARISEA, AZDOC, Advocacy associations, PAG, AzRISE, MEC, TREO, business and industry leaders and organizations – Chambers of Commerce, Sahba, and MPA	# of solar jobs # of solar businesses % of representation of value chain
Technical Training	→							Outreach organization	COT, PAG, Pima County, TRICO, TEP, solar installers AzRISE, Pima Community College, JTED	Number of training programs and curriculum developed
Measurement	→							Public-Private Agency	COT, PAG, Pima County, TRICO, TEP, solar installers AzRISE	Completion and establishment of measurement system
Public-Private Agency	→							Public-Private Agency	All partners	Agency established

## VI. Inventory of Regional Solar Market Opportunities

The following communities have been identified in the greater regional Tucson area as having the greatest potential for deployment of over 16 MW of solar energy in the next seven years.

Region	Approximate Opportunity in kW/MW
City of Tucson	1 – 6 MW
Pima County	2 - 6 MW
Davis-Monthan AFB	1 MW (min) 27 MW (potential)
Town of Marana	1 MW
Town of Oro Valley	900 kW
Town of Sahuarita	1 MW
Pascua Yaqui Tribe	200 kW
Tohono O'odham Nation	10 – 50 kW

### A. CITY OF TUCSON

Since 1999 the City of Tucson has installed 220 kW of solar on City buildings and land, installed several solar water heating systems and has been the regional leader among governmental entities concerning solar. The City has committed funds for solar installations each year and was recognized as a Solar America City by the U.S. Department of Energy in 2007. The City has adopted a policy requiring all new city-funded buildings to meet LEED Silver standards and meet at least 5 percent of the building's energy requirements from solar. The City of Tucson has signed on to the U.S. Mayor's Climate Protection Agreement and other similar documents which has led to the City's Framework for Sustainability which commits the City to greater use of renewable energy. The City received an allocation of Clean Renewable Energy Bonds in the amount of \$7.7 million in 2006.

The City also has recently adopted an ordinance requiring all new homes to be solar ready for both PV and solar water heating. The City of Tucson will continue to install daylighting and solar water heating systems in City facilities.

The City is exploring the possibility of other solar installations on City buildings, land, closed landfill sites and parking lots in conjunction with Energy Performance Contracts and/or Power Purchase Agreements.

A map of all solar installations in the greater Tucson area is being developed as a part of a Green Mapping Project. The City Energy Office Web site, as well as the PAG Web site, highlight public and commercial solar installations.

### **1) Solar Market Opportunity:**

- a) Plans are under way to install approximately 5 - 7 MW on city property beginning in 2009:
  - A 1 - 5 MW solar PV farm in the Avra Valley on Tucson Water property to be built in 2009, which could eventually be expanded to 100 MW, possibly using concentrating solar technology.
- b) Approximately 1 MW of solar on seven city sites in 2009 financed through the future sale of CREBs bonds.
- c) PV at the new Sun Tran Bus Maintenance Facility (40 kW).
- d) Phase 4 at the Thornydale Reservoir site (44 kW).
- e) Rooftop system at the Golf Links Library and Police Substation( 44kW) (dates uncertain depending on financing).

### **2) Key Stakeholders**

- a) City of Tucson solar energy coordinator.
- b) City of Tucson energy manager.
- c) City of Tucson Office of Conservation and Sustainable Development.
- d) City of Tucson Procurement

### **3) Potential Barriers**

- a) TEP tariff restrictions and penalties for large scale solar.
- b) City financial constraints.
- c) Legal issues regarding PPAs in Arizona.
- d) Limited funding from TEP through REST collections.

### **4) Rooftop Square Footage – 800,000**

### **5) Open Land Acreage – 20,000**

## 6) Next Steps

- a) Complete issuance of CREBs bonds.
- b) Finalize contracts for CREBs sites. Complete construction.
- c) Finalize contracts for CAVSARP PPA and complete construction.
- d) Select sites for new solar locations using solar PV or solar hot water PPAs and/or ESCOs or City-owned solar equipment on existing City facilities.
- e) Integrate additional PV and solar water heating into all new and existing City buildings, parking lots and land where feasible.
- f) Apply for New CREBs funds in 2009.
- g) Adopt and implement City of Tucson Solar Integration Plan.

## B. PIMA COUNTY

In January 2008, Pima County announced a Request for Information (RFI) to meet a newly mandated resolution calling for 15 percent of all electrical energy consumption to be generated by renewable energy by 2025. This resolution was established to assist the County in meeting new sustainability initiatives. Along with this resolution Pima County has expressed an interest in projects that combine energy efficiency with renewable energy and expanding the percentage of renewable energy by 2025 to go beyond the 15 percent goal to accommodate as much as is feasible.

### 1) Solar Market Opportunity

- a) Pima County Regional Wastewater Reclamation Department has approximately 12 MW of peak load and is currently generating over 20 percent of their energy from renewable sources. The department is evaluating the economic benefits of installing solar power at multiple wastewater reclamation facilities, including the future Regional Optimization Master Plan facilities at Roger Road and Ina Road.”
- b) Pima County has acquired approximately 150 acres of open space to protect the departure corridor of Davis-Monthan Air Force Base from urban encroachment. Pima County plans to explore the use of these properties for public benefit, which could potentially include the development a solar energy generating facility.
- c) Pima County’s southwest area has been identified by County planners as a potential and strategic growth area. Ryan Airfield located in the western portion for the County has large areas of vacant land. Land ownership in the area is widespread and diverse, including the federal government, the State of Arizona, Pima County, the Arizona Board

of Regents, and Tribal Nations. Many of these owners are anticipated to release all or portions of their property to development. The Pima County Southwest Infrastructure Plan (SWIP) includes plans for the development of 30,000 homes over a 70 square mile area. There are currently 17,000 homes in this area. The SWIP area also includes the Roger Road Wastewater and Avra Valley Wastewater treatment facilities. Both of these facilities are some of the largest County electricity users and are being expanded.

- d) Pima County is currently developing a database of all County-owned land greater than one acre in size, and outside the regional Conservation Land System (CLS), that may be suitable for renewable energy facilities. Possible solar energy installations and developments can be incorporated into the County map as an overlay to assist in the identification of solar energy opportunities.
- e) Plans are being formulated for the development of solar energy demonstration plans within the County that include the installation of PV solar energy systems on newly constructed libraries and community buildings with monitors to display real-time information about the system. These demonstration sites will be used to develop job training and a community education program.
- f) Plans are currently under way to install solar PV panels at the County's new Jackson Employment Center in cooperation with the Tucson Electric Power Company.

## **2) Timelines**

- a) All key managers will submit their land use plans within the next three years.

## **3) Key Stakeholders for the Pima County Renewable Energy Planning**

- a) Pima County Administration
- b) Deputy County Administrator
- c) Sustainability Manager
- d) Environmental Quality Manager
- e) Energy Manager
- f) Procurement Department

## **4) Potential barriers**

- a) Financing for new residential housing solar installations



## **5) Next Steps**

- a) Identify strategies to establish solar energy as a part of all county land use plans.
- b) Identify square footage for solar energy installations on rooftops and open space
- c) Identify key federal and state legislative policies that Pima County administration can support.

## **C. DAVIS-MONTHAN AIR FORCE BASE.**

Solar Market Opportunity. Davis-Monthan Air Force Base. Davis-Monthan Air Force Base is operational throughout the year. Privatized housing will be separated from the base grid by spring 2009. After housing separation, an estimated minimum of 5.8 MW of power will be required to continuously operate the facilities and operations of the Base (termed base load) and the estimated peak demand on a summer afternoon could reach 16.5 MW. The Energy Policy Act of 2005 establishes renewable energy requirements for the federal government ( $\geq 3\%$  for FY 2007 – 2009;  $\geq 5\%$  for FY 2010 – 2012;  $\geq 7.5\%$  for FY 2013 and thereafter). A Request for Proposal (RFP FA4877-08-R0017 ) was issued by Davis-Monthan Air Force Base in July 2008 for a PPA for ground-mounted solar PV array(s). Approximately 275 acres is available – which could potentially support about 27 MW. A minimum of 1 MW is required per the RFP.

## **D. TOWN OF MARANA**

### **1) Solar Market Opportunity**

- a) Marana is a part of the “sun corridor,” a corridor that runs along the Interstate 10 corridor. The Sun Corridor is projected to become one of the nation’s ten emerging regional super-sized metropolitan areas of the future.
- b) Villages of Tortolita extending into Pinal County on newly annexed 440 acres (potential for a 6,500 unit new housing development).
- c) Marana’s single central business district anchored by a new municipal complex with 80 residential units, hotel, 157,400 sq ft. of commercial space, 118,700 sq. ft. of office space a library and information center (pending designation).
- d) Large anchor stores locating in the Town of Marana; Costco, Wal-Mart, Home Depot, Target, and Lowes.
- e) Marana is planning major build-outs of the Marana Regional Airport and Pinal Air Park with large employment centers. Future development around the airports will include development for industrial, commercial and hospitality use as well as transportation hubs.
- f) Marana has plans for a new wastewater treatment facility in Pinal County and expansion of mining in the region.

g) Plans for development of state trust lands are being developed.

## **2) Timelines**

All of the solar market opportunities are under different stages of development between the fall of 2007 and extending through 2020.

## **3) Key Stakeholders for the Town of Marana Renewable Energy Planning**

- a) Town of Marana administration
- b) Mayor's office
- c) Town planner
- 4) Potential barriers

Financing and policy model for the Town of Marana to use for new solar energy installations planning

## **5) Next Steps**

- a) Identify state land leasing opportunities and potential barriers
- b) Identify policy and financial tools for the Town of Marana to consider in planning effort
- c) Identify permitting strategies for Marana solar energy developments
- d) Identify solar energy opportunities in new housing developments strategies for the Town of Marana. Assist the Town of Marana in development of a solar energy plan for master-planned communities, mining, wastewater treatment plant and airport expansion and commercial big box stores.

## **E. TOWN OF ORO VALLEY**

On Aug. 23, 2007, Oro Valley Mayor Paul Loomis signed into law the City Council's Resolution #07-94 requiring that all new Town buildings and additions to existing town buildings be built to achieve a minimum of LEED Silver. The resolution directs the Town administration to achieve LEED Gold or LEED Platinum as project resources and conditions permit. Although housing development has slowed for Oro Valley, the potential exists for 250 new homes per year of growth in addition to the planned communities listed below.

## **1) Solar Market Opportunity**

- a) Oro Valley Innovation Park - has over ten high-tech firms and growing. Sanofi-Aventis, a French pharmaceutical company in the park, is building a 110,350 sq-ft building to meet the LEED certification that includes solar energy installation and is scheduled to be completed in June 2009. New Oro Valley administration buildings are scheduled to be built in the park. Solar parking lot lights are under development (85 watts)
- b) Arroyo Grande – Arizona State Land Department is conceptually planning a multi-purpose planned community on 11,547 acres north of Rancho Vistoso that will combine residential housing, community commercial uses, a professional technology business park, and retail developments mixed with open space preservation. All new buildings will need to meet LEED specifications. The plan includes 2,787 acres of master-planned large developments, 440 acres of commercial and office space, 400 acres of mixed-use, 80 acres for a resort and over 3,000 acres for residential development.
- c) Oro Valley marketplace located on Oracle and Tangerine to be completed on September 2008 will include large retail outlets; Wal-Mart, Best Buy, and Cost Plus developed by Vestar Development Co. of Phoenix.

## **2) Timelines**

All of the solar market opportunities are under different stages of development between the fall of 2007 and extending through 2020.

## **3) Key Stakeholders for the Oro Valley Renewable Energy Planning**

- a) Town of Oro Valley administration
  - i) Mayor's office
  - ii) Assistant town manager
  - iii) Special projects coordinator
  - iv) Economic development director
  - v) State Land Development office
- b) Pulte Homes and SAHBA (Southern Arizona Home Builders Association)

## **4) Potential Barriers**

Financing and policy model for the Town of Oro Valley to use for new solar energy installations.

## **5) Next Steps**

- a) Identify state land leasing opportunities and potential barriers
- b) Identify policy and financial tools for the Town of Oro Valley to consider in planning efforts
- c) Identify permitting strategies for Oro Valley solar energy developments
- d) Assist the Town of Oro Valley in development of a solar energy plan for master-planned and technology parks.

## **F. TOWN OF SAHUARITA**

### **6) Solar Market Opportunity**

### **7) Timelines**

### **8) Key Stakeholders for Sahuarita Renewable Energy Planning**

- a) Town of Sahuarita administration
  - i) Mayor's office
  - ii) Assistant town manager
  - iii) Special projects coordinator
  - iv) Economic development director
  - v) State Land Development office
- b) SAHBA (Southern Arizona Home Builders Association)

### **9) Potential Barriers**

Financing to install new solar energy installations.

## 10) Next Steps

- a) Identify state land leasing opportunities and potential barriers
- b) Identify policy and financial tools for the town of Sahuarita to consider in planning efforts
- c) Identify permitting strategies for Sahuarita solar energy developments
- d) Assist the town of Sahuarita in development of a solar energy plan for master planned communities and technology parks.

## G. PASCUA YAQUI TRIBE

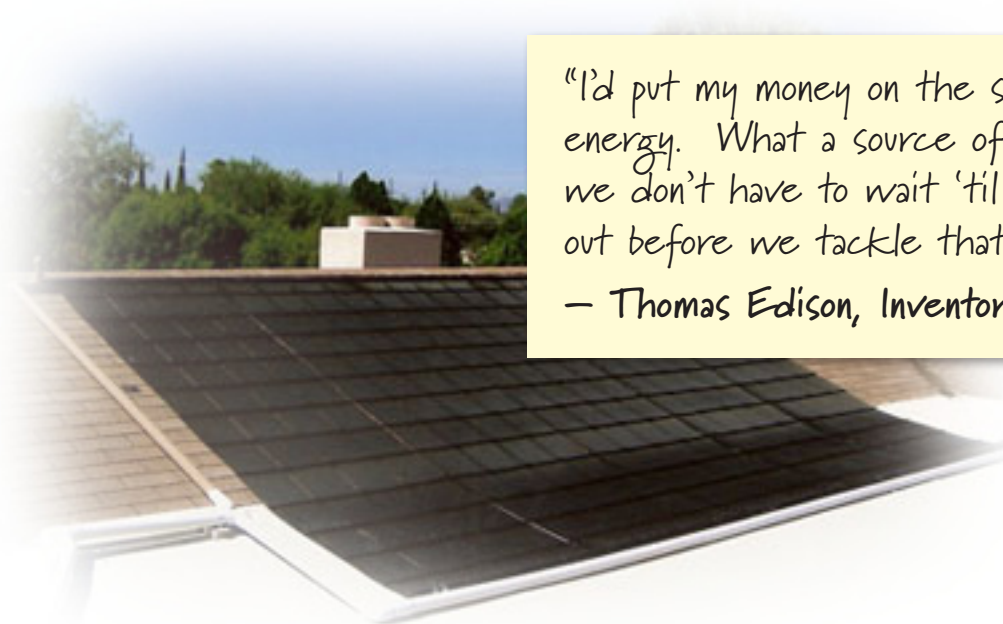
### 1) Solar Market Opportunity

- a) Casino del Sol and administration buildings are being evaluated for potential solar energy installations by the BIA (Bureau of Indian Affairs) under a grant.

## H. TOHONO O'ODHAM NATION

### 1) Solar Market Opportunity

- a) Potential for 2.5 – 10 kW of PV on information technology and development buildings in the next 3 -6 months. Solar installation will include training by the installer for the community to develop an installation skill set. Further development to political districts being considered.
- b) Desert Diamond Casino solar energy installations for solar hot water and PV.



"I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait 'til oil and coal run out before we tackle that."

— Thomas Edison, Inventor



## VII. *Prioritization of Opportunities*

The opportunities described in this section highlight the communities that have already developed or are in the process of developing local active strategies for the deployment of solar energy and are seeking input on establishing incentive mechanisms and action plans. These communities are located in the fastest growing areas of the region for the commercial, large-scale, and residential sectors. Priorities are placed on areas that have larger non-residential markets with access to financing availability. They also represent the communities that have actively begun to identify and remove obstacles and barriers to solar energy development and identified specific areas for solar energy growth.

<b>A. City of Tucson</b>	<b>Approximate Opportunity</b>	<b>New Developments</b>
Avra Valley	1 – 5 MW (possible 100 MW) CSP	Tucson Water project
New Housing Ordinance	TBD PV	New single-family houses and duplexes solar ready
CREBs Bonds	1 MW PV	Seven city sites
	40kW PV	Sun Tran Transportation Facility
Phase 4	44kW PV	Thornsdale reservoir
	44kW rooftop PV	Golflinks library and police station
	Solar hot water and pool heating	City pools and fire stations
<b>B. Pima County</b>	<b>Approximate Opportunity</b>	<b>New Developments</b>
Regional Wastewater Reclamation Facilities	Under evaluation	Regional optimization master plan facilities at Roger and Ina Roads. Multiple wastewater reclamation facilities.
Departure Corridor Open Space Properties near Davis-Monthan AFB	Under evaluation	150 acres of open space
SWIP	105 kW homes	30,000 New Homes Roger Road Wastewater Avra Valley Wastewater
New Libraries and community buildings	TBD	PV Rooftop with real-time monitoring
Jackson Employment Center	TBD	Solar PV panel installation in cooperation with Tucson Electric Power
<b>C. Davis-Monthan AFB</b>	<b>Approximate Opportunity</b>	<b>New Developments</b>
Davis-Monthan AFB	2 MW	Housing and administrative building rooftops Base buffer zones

<b>D. Town of Marana</b>	<b>Approximate Opportunity</b>	<b>New Developments</b>
Villages of Tortolita	TBD	6,500 new residences
Business District	965 kW	80 residential units Commercial Space Office Space
Library/Information Center		
Town of Marana	TBD	Large retail stores – Costco, Wal-Mart, Home Depot, Target, Lowes
Marana Regional Airport Pinal Air Park	TBD	Major build-outs with development around airports for industrial, commercial, transportation hubs
Marana Wastewater facility	TBD	Expansion
Marana State Land	TBD	Development plans under construction
<b>E. Town of Oro Valley</b>	<b>Approximate Opportunity</b>	<b>New Developments</b>
Town of Oro Valley	TBD	250 new homes/year
Oro Valley Innovation Park	800kW – rooftop 85 W – parking lights	Oro Valley Administrative Buildings Solar Parking Lots High – Tech business
Arroyo Grande	TBD	3000 acres residential 440 acres commercial/office 80 acres resort
Oro Valley Marketplace	TBD	Large Box Stores – WalMart, BestBuy, Cost Plus
<b>F. Pascua Yaqui Tribe</b>	<b>Approximate Opportunity</b>	<b>New Developments</b>
	Solar hot water and PV 200 kW	Casino del Sol Administration Buildings
<b>G. Tohono O’odham Nation</b>	<b>Approximate Opportunity</b>	<b>New Developments</b>
	2.5 – 10 kW Solar hot water and PV	Information Technology buildings Desert Diamond Casino

## *VIII. Action Steps – What to do first*

These action steps represent a course of action to effectively facilitate increased solar energy implementation throughout the community and establish solar energy in the region.

- A. Define the Public/Private agency as the funded, coordinating entity that must be formed to carry out this plan. Describe how it will be funded, requirements for the business plan and the time frame for development.
- B. Secure the foundation for healthy solar markets by establishing rules and regulations to support healthy solar energy development and markets and support policies that generate healthy solar energy markets, establish financial incentives, and attract financial investment in solar energy.

### **INITIATIVE**

- Finalize Rule Making on Net Metering
- Finalize Rule Making on Standard Interconnection
- Institutionalize solar energy financial incentive and regulations requirements

### **ACTIVITIES**

- Organize business and government support for solar-friendly policies into testimony/ speakers bureau/ community conversation.
  - Increase presence and variety of voices for the Solar Value message.
  - Support solar advocate groups engaged in the regulatory efforts.
  - Formulate a core group of business and community leaders to be “Solar Ambassadors” to testify at hearings, talk to Rotary, etc.
- C. Secure solar energy development in the region, increase market awareness, establish institutional investment in solar energy in all sectors, secure the participation of key regional players, and develop an effective model for further deployment of solar energy technology and economic development.

### **INITIATIVE**

- Market Education – increase awareness in key sectors.
- Government Incentives, Guidelines, Policies, Requirements and Mandates – establish institutional investment and secure participation of key stakeholders.
- Expand Market Responsive Innovation by selecting a best-of-class model developed in strategy H.

### **ACTIVITIES**

- Facilitate the expansion of renewable energy credit purchases and funding.

- D. Develop a plan to support the local establishment of primary solar industries and

actively encourage development of related industries, establish a technical training path for worker participation, enhance implementation by creating more meaningful measurement system of success, institutionalize the solar energy coordinator position in the region.

## **ACTIVITIES**

- Inventory solar energy value chain, research assets and business sector capacity.
  - Establish workforce development resources and plan.
  - Identify a regional solar energy facilitator.
- E. Continue to identify and update the solar energy opportunities in the region by sector.
- This includes the opportunities already identified in this report and opportunities identified in the Arizona Economic Renewable Organization (AERO) solar task force report that demonstrates that Arizona has the potential to become an exporter of solar energy electricity to regional states. Other economic reports being developed by the Arizona Research Institute for Solar Energy (AzRISE) also describe the in-state potential for solar energy development in the next twenty years.
  - Examine ways to resolve water use and energy generation in the region, identify what role solar energy plays in the growing needs of the area.
  - Examine how deployment of energy efficiency standards and mandates will impact the effectiveness of solar energy use in the region.
  - Work with local partners to identify and develop a “green” workforce plan for the region that identifies appropriate agencies, stakeholders and potential workers to recruit a workforce to the region and develop training courses.
- F. Develop an in-depth assessment for the region that identifies:
- Existing institutions and organizations promoting solar development.
  - Best practices of solar energy advocacy and investment strategies.
  - The number of solar energy companies operating, or planning to operate, in southern Arizona.
  - The actual number of solar energy MW deployed (and representative projects).
  - Solar energy educational and job training courses offered through community colleges, UA, trade unions, publicly-funded employment centers.
  - Annual fairs, events and expositions that highlight solar energy advances and opportunities.
- G. Conduct a regional assessment, in conjunction with local public utilities, to determine the feasibility of utility-scale deployment of solar energy in the region.

## *Appendix: Rules, Regulations & Policies*

These rules, regulations and policies represent areas that the U.S. Department of Energy (DOE) has determined to be important components in the initiative to create a sustainable solar infrastructure. A guide for Solar America Cities like Tucson to use in developing solar implementation plans was developed by DOE. That template is located at [http://www.solaramericacities.energy.gov/PDFs/Solar\\_Implementation\\_Guide\\_for\\_Cities.pdf](http://www.solaramericacities.energy.gov/PDFs/Solar_Implementation_Guide_for_Cities.pdf)

These rules and regulations are described in a way that supports the Arizona market. This information is current as of November 2008.

- A. Net Metering**
- B. Standard Interconnection**
- C. Public Benefit Funds**
- D. Solar Access Laws**
- E. Building Energy Standards with Solar Mandates**
- F. Solar Set Asides in Renewable Energy Programs**
- G. Incentive Programs**
- H. Loan Programs**
- I. Tax Credits**
- J. Property Tax Incentives**
- K. Sales Tax Incentives**
- L. Expedited Permitting and Fee Waivers**

### **A. Net Metering**

Net metering provides full retail price or an equivalent amount of kilowatt hours for all solar-generated power. The goal is to have all solar-generated power (not a limited amount) fully compensated at full retail rates, including excess production beyond the needs of the house or building where the power is generated. The rules are set by the Arizona Corporation Commission (ACC). The federal Energy Policy Act of 2005 (EPAct 2005) requires state regulatory authorities and certain non-regulated utilities to consider a net-metering standard by August 2008. On October 2008 the ACC adopted a Net-Metering rule.

The rule has the following highlights:

- Utilities must connect with Net Metering Facilities.
- Excess kilowatt hours generated during any month will be rolled over to next month to offset the next month's bill
- At the end of the year, the utility must issue a check or billing credit to customers whose



generated amounts exceed their demand for the past year at the utility's avoided cost (not the full retail amount).

- Each utility will submit a Net Metering Tariff in January 2009
- There is no limit to the size of the net metering facility.
- To stay up to date with this proposed regulation , see [http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=AZ01R&state=AZ&CurrentPageID=1&RE=1&E=0](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=AZ01R&state=AZ&CurrentPageID=1&RE=1&E=0)
- The ACC Docket on this matter is 07-0608
- For a thorough overview of net metering issues and examples of model rules and best practices, see Chapter 4 of the Interstate Renewable Energy Council's (IREC's) Connecting to the Grid Handbook (2007) found at: <http://www.irecusa.org/index.php?id=86>.

## **B. Standard Interconnection**

Interconnection between solar facilities and the electric utility grid is necessary to deliver the solar-generated power. Having a standardized and simplified interconnection agreement is important so that solar installers can easily work with different utilities. Goals for such agreements include different levels of review to match the size and complexity of the solar system, standardized application forms, no external disconnection switch requirement, and no requirement of utility insurance or indemnification. As of now, Arizona has no statewide standard interconnection agreement.

The Interstate Renewable Energy Council's (IREC's) Connecting to the Grid Handbook (2007) found at: <http://www.irecusa.org/index.php?id=86> summarizes the status of interconnection policy:

A stakeholder group has met for over a year under the auspices of the ACC to develop an Arizona interconnection standard. To review the current status of this project, see ACC Decision 69674 (June 28, 2007) with draft rules and ACC Docket No. E-00000A-99-043; <http://www.azcc.gov/divisions/utilities/electric/dg.asp>.

## **C. Public Benefit Funds**

Public benefit funds (PBF) are state-level programs typically developed during electric utility restructuring by some states in the late 1990s to ensure continued support for renewable energy resources, energy efficiency initiatives and low-income energy programs. These funds are most commonly supported through a very small surcharge on electricity consumption (e.g., \$0.002/kWh). This charge is sometimes referred to as a system benefits charge (SBC). PBFs commonly support rebate programs for renewable energy systems, loan programs,

research and development, and energy education programs (Database of state incentives for renewable energy and energy efficiency, <http://www.desireusa.org>).

In September 1999, the Arizona Corporation Commission (ACC) instructed utilities to include a Public Benefits Fund in their restructuring plans. The Public Benefits Fund provides \$49.5 million in funding for low-income, demand side management, environmental, renewable and nuclear power plant decommissioning programs (\$25 million spent to expand renewable energy). Over time the Public Benefits Fund has become more focused on renewable energy than on energy-efficiency. In February 2006, the Arizona Corporation Commission (ACC) increased the charge on customers from \$0.000875/kw hour to \$0.004988/kw hour, with the residential cap increased from \$0.35 to \$1.05. ACC Rule R14-2-1608.

#### **D. Solar Access Laws**

The goal of solar access laws is to assure that persons wishing to install solar devices will not have their sunlight blocked by others and will not be restricted by unnecessary laws, ordinances or rules. Arizona does not have a solar easement law to allow neighbors to grant assured solar access, as some other states do. Arizona does have a number of solar access laws that restrict homeowners associations. These regulations and laws are made at the state or local level; homeowner associations (HOA's) can establish their own solar access rules consistent with these laws.

Arizona laws include several references to solar access:

- ARS §9-461.05 (C) (1)(d) requires each city to adopt and keep updated a general plan that includes a segment which considers access to solar energy as a part of all land use plans
- ARS §9-462.01 (A) (3) permits any city to pass an ordinance which regulates access to solar energy. Tucson has not passed such an ordinance.
- ARS §33-439 invalidates any deed or contract restriction (entered into after 1980) which "effectively prohibits" the installation or use of solar devices, including PV systems and hot water systems
- ARS §33-1816 prevents home owner associations (HOAs) from prohibiting the installation or use of solar devices, but allows HOAs to adopt reasonable rules for solar if they do not impair the functioning of the system or adversely affect cost or efficiency of the solar system. If an HOA breaks this law, the homeowner can sue the HOA and if successful, recover attorney fees and court costs for the suit. For an Arizona Court of Appeal case on this topic, see <http://www.cofad1.state.az.us/opinionfiles/CV/cv000570.pdf>.

## **E. Building Energy Standards with Solar Mandates**

The goal of solar mandates and energy standards is to assure energy-efficient buildings as an important prelude to solar development. Such mandates should require a large portion of any building's energy be provided by solar energy. Such regulations could be adopted at the local, state or national level. Tucson has taken steps regarding public buildings but has not adopted requirements that privately owned new buildings be energy efficient or have solar equipment.

The City of Tucson adopted a Sustainable Energy Standard (SES) in 1998, initially for the community of Civano, and later expanded its applicability to all City-funded buildings. The SES is now tied to the 2006 International Energy Conservation Code (IECC) which was adopted by the City of Tucson on June 12, 2007. See Tucson City Mayor and Council Ordinance 10417; [http://www.ci.tucson.az.us/clerks/minutes\\_2007.php](http://www.ci.tucson.az.us/clerks/minutes_2007.php).

The City of Tucson has recently adopted a solar ready ordinance which will require all new houses and duplexes to be built with stub outs so that solar electric (PV) and solar hot water heating can be installed at a later date without significant building modifications. See Tucson City Mayor and Council Ordinance 10549 (June 17, 2008).

All City buildings now must meet LEED Silver certification per Mayor and Council Resolution 20322, adopted April 18, 2006, which could include solar. See [http://www.ci.tucson.az.us/clerks/minutes\\_2006.php](http://www.ci.tucson.az.us/clerks/minutes_2006.php).

All city funded commercial buildings must meet a 5 percent solar requirement which can be met through solar PV, solar water heating or day-lighting or by cogeneration (up to 4%).

The State of Arizona requires all new state buildings to derive 10 percent of their energy from a renewable resource (solar, wind, etc) by Executive Order 2005-05 of the Governor. See [http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=AZ16R&state=AZ&CurrentPageID=1&RE=1&EE=0](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=AZ16R&state=AZ&CurrentPageID=1&RE=1&EE=0)

ARS § 34-452 also requires all public buildings including schools over 6,000 square feet to include a written evaluation of solar features including active and passive solar space heating, solar daylighting and solar water heating.

## **F. Solar Set Asides in Renewable Programs**

The goal of solar set-asides in RPS policies is to assure that solar devices are used to meet a portion of a utility's required renewable portfolio, rather than allowing a utility to meet its full obligation from wind or another renewable resource. In theory, this should be a driving force for more solar installations in a state.

In Docket NO. RE-00000C-05-0030, ACC Decision 69127, November 14, 2006, the Commission established the Renewable Energy Standard and Tariff (REST) which ordered all regulated utilities in the state to obtain an increasing amount of their electricity from renewable resources, up to a total of 15 percent of residential load by 2025. Of this percentage, 30 percent (4.5 percent of total retail sales in 2025) must come from distributed renewable (DR) resources by 2012 and thereafter. One-half of the distributed renewable energy requirement must come from residential applications and the remaining one-half from nonresidential, non-utility applications. See <http://www.azcc.gov/divisions/utilities/electric.asp>.

There is no explicit solar set-aside in the Arizona REST. While the distributed generation requirement is likely to primarily be met by solar applications, this is not required by the language of the REST.

## G. Incentive Programs

The goal of incentive programs is to reduce the cost of solar energy systems for homes and businesses through grants, rebates or performance-based payments. These have been adopted by some states and some utilities as an effective way to make solar more affordable. In the Tucson area, local utilities have provided all of the direct financial incentives other than tax rebates. Because of state and federal caps on tax credits, however, the value of the total rebate and other incentive declines as the cost of the system increases. Tucson Electric Power (TEP) offers these incentives in exchange for the renewable energy certificates (REC's) they generate. Incentives are as follows:

- Residential PV (on-grid): \$3.00/W up front payment for qualified systems.
- Residential PV (off-grid): \$2.00/W
- Non-Residential PV (on-grid): \$2.50/W for systems 20kW or less. Systems greater than 20kW must take a performance based incentive (PBI) and bid for the per kWh payment and duration up to a predetermined level
- Non-Residential PV (off-grid): \$0.121/kWh of estimated annual production
- Residential Solar Water Heating and Solar Space Heating: \$0.25/kWh equivalent, plus \$750 up to a maximum incentive of \$1,750. Or residential customers can elect to receive a 10, 15, or 20 year PBI.
- Non-Residential Solar Water Heating and Solar Space Heating: PBI

See [http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=AZ15F&state=AZ&CurrentPageID=1&RE=1&EE=0](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=AZ15F&state=AZ&CurrentPageID=1&RE=1&EE=0) and <http://www.tep.com/Green/>.

TRICO Electric Co-op has similar programs and offers rebates for PV systems as well as solar

water heating.

Through the SunWatts Program, Trico Electric Co-operative offers home and business owners a rebate of \$4/W DC for installing photovoltaic systems and \$0.50 per expected first year kilowatt hour savings for solar water heaters. The incentive can not exceed 50 percent of the total system cost. Eligible PV systems may be either grid-tied or off-grid. See [http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=AZ25F&state=AZ&CurrentPageID=1&RE=1&EE=0](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=AZ25F&state=AZ&CurrentPageID=1&RE=1&EE=0). and [http://www.trico.coop/sunwatts\\_information.html](http://www.trico.coop/sunwatts_information.html).

## H. Loan Programs

The goal of loans for solar devices is to provide another means for homeowners and businesses to handle the high upfront costs of PV systems. These loans may be from a utility, a statewide solar advocacy group, the state or local government itself. There are currently no loan programs available statewide or in the immediate Tucson area from TEP or Trico Electric Co-op, although two other Arizona utilities do offer such programs. Sulfur Springs Valley Electric Co-op provides loans of \$2.00 per watt up to a maximum of 25 percent of the total cost of the project at an interest Rate of 3 percent. See <http://www.ssvvec.org/programs/energySunWatts.php>. Arizona Public Service offers its residential customers its GeoSmart financing program with an interest rate between 7.99 percent and 12.99 percent and terms of 10-, 15- & 20-year. See [http://www.egia.com/APS/APS\\_Index.aspx](http://www.egia.com/APS/APS_Index.aspx) and [http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=AZ32F&state=AZ&CurrentPageID=1&RE=1&EE=0](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=AZ32F&state=AZ&CurrentPageID=1&RE=1&EE=0)

## I. Tax Credits

The goal of tax credits, both state and federal, is to provide an additional incentive for taxpayers to purchase solar energy devices by reducing their tax liability. The federal investment tax credit of 30 percent applies to the system cost after utility rebates with no cap for PV and \$2,000 cap for solar hot water. This investment tax credit was recently extended through 2012. For a current listing of federal tax credits and incentives see <http://www.dsireusa.org/library/includes/genericfederal.cfm?CurrentPageID=1&state=us&ee=0&re=1>

The state of Arizona offers a number of tax credits for solar including:

- Commercial/Industrial Solar Energy Tax Program- Income tax credit of 10 percent of installed cost of solar up to \$25,000 per building in the same year and up to \$50,000 in total credits. Maximum statewide credits per year are \$1 million, although this limit has not been approached in any year yet. Perhaps most significantly, this credit can be transferred by a tax-exempt entity to the solar installers, financiers or manufacturers of the

system. See ARS 43-1085, 43-1164 and 41-1510.01.

- Residential Solar Energy Tax Credit-Income tax credit equal to 25 percent of the cost of a solar system up to a maximum of \$1,000. See <http://www.revenue.state.az.us/Forms/2006/310%20instructions.pdf> for the appropriate forms to use
- See also [http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=AZ18F&state=AZ&CurrentPageID=1&RE=1&EE=0](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=AZ18F&state=AZ&CurrentPageID=1&RE=1&EE=0)

## **J. Property Tax Incentives**

Property tax credits are another incentive to purchase solar equipment. Special rules apply to solar installations.

- Solar equipment in Arizona is valued at 20 percent of its depreciated value for property tax purposes. See ARS 42-14155
- For property tax assessment purposes, solar equipment is determined by law to add no value to the property. See ARS 42-11054.
- See also: [http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=AZ30F&state=AZ&CurrentPageID=1&RE=1&EE=0](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=AZ30F&state=AZ&CurrentPageID=1&RE=1&EE=0)

## **K. Sales Tax Incentives**

The goal of removing sales tax from solar equipment is to reduce the effective price to the customer and promote the sales of solar equipment. Arizona provides a 100 percent sales tax exemption on all solar equipment. See, <http://www.azleg.gov/FormatDocument.asp?inDoc=/ars/42/05061.htm&Title=42&DocType=ARS;> <http://www.azsolarcenter.com/benefits/solarsalestax.html>; and [http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=AZ08F&state=AZ&CurrentPageID=1&RE=1&EE=0](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=AZ08F&state=AZ&CurrentPageID=1&RE=1&EE=0).

## **I. Expedited Permitting and Fee Waivers**

- City of Tucson

Building permit fees are waived up to \$1,000 for solar installations. Plan review fees and impact fees are not waived. Building credits under this program shall not exceed 10 percent or \$10,000 for any single project of the credit amount provided under this program. A project shall be defined as lots in subdivisions or Planned Area Developments or buildings or shell buildings under ownership by one entity at the time of application for a permit that contains a solar energy system. A condominium project shall be considered under single ownership. [http://www.tucsonaz.gov/dsd/Permit\\_Review\\_/Solar\\_Fee\\_Incentive\\_Waiver.pdf](http://www.tucsonaz.gov/dsd/Permit_Review_/Solar_Fee_Incentive_Waiver.pdf)



The City of Tucson has developed a residential photovoltaic template to simplify solar permit applications. [http://www.tucsonaz.gov/dsd/Permit\\_Review\\_/Residential/ResidentialPhotovoltaicElectrical.pdf](http://www.tucsonaz.gov/dsd/Permit_Review_/Residential/ResidentialPhotovoltaicElectrical.pdf)

- City of Marana

Building permit fees reduced by \$1,000 for solar on new single family residences; no permit fee for solar installations on existing single family residences. See Marana City Ordinance 2006.07, Ex A p 18.

- City of Bisbee

All permit fees for solar installations are waived. [http://www.cityofbisbee.com/documents/ActionAgendaRegularSession091807\\_000.doc](http://www.cityofbisbee.com/documents/ActionAgendaRegularSession091807_000.doc)

"Honeywell works with its customers to find the right mix of retrofits, service and renewable energy to cut costs and drive sustainability. And that's why we're excited about the Development Plan. It will help make solar technology a more economically viable option for the cities, school districts and other organizations we work with. The end result: more clean, green energy in southern Arizona."

- Kent Anson, Vice President of Global Energy, Honeywell Building Solutions

Analyzing both the advantages and disadvantages of existing policies can suggest what parts of the current policy should be kept or strengthened and what parts should be changed. The Greater Tucson Solar Development Plan will help communities create and improve policies that develop the use of solar energy in an effective manner.

— Vivian Harte, Chair, Arizona Solar Energy Association

