

Solar in Functional Plans

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Town of Arlington, Massachusetts



Arlington Sustainability Action Plan

Volume 1: Climate Action Plan

How the Arlington Community can do its part to improve air quality and the global climate by reducing CO₂ emissions

May 2005

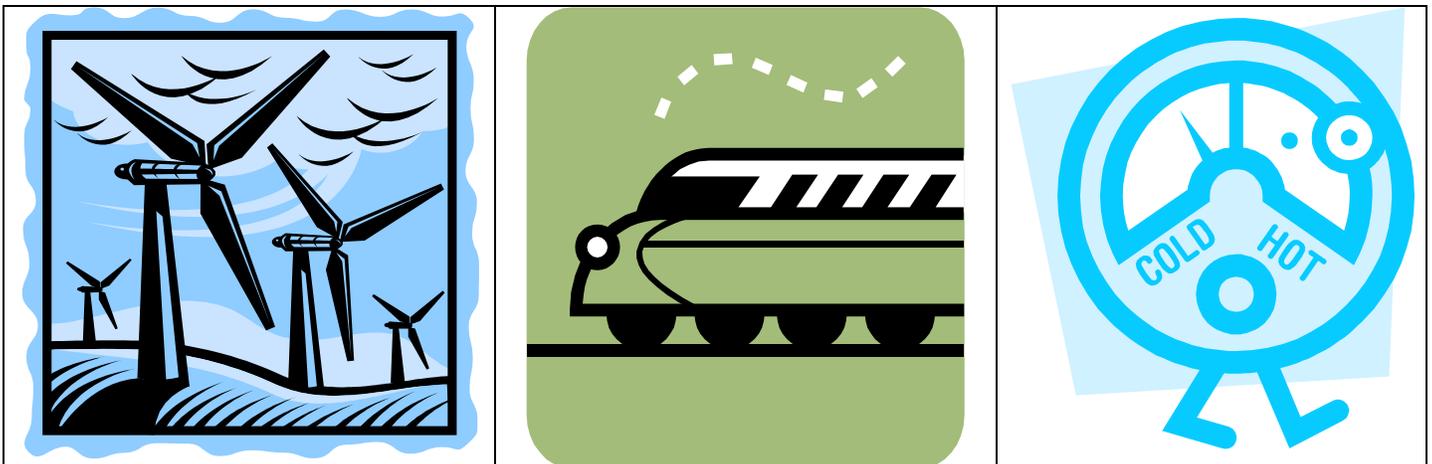


Table 1. Emission reduction measures in the action plan

Measures	Status	Estimated Annual CO₂ Reduction (tons)
Energy Efficiency		
Municipal Measures		
Enforce existing building codes	Proposed	4.7
Enhance existing building codes	Proposed	17.1
Participate in green construction	Proposed	23.6
Purchase of Energy Star products	Proposed	8.5
Participate in audit program	Proposed	15.9
Efficient lighting retrofits (non streetlight)	Proposed	31.8
Residential Measures		
Participate in utility home audit program	Proposed	343
Enforce existing building codes		1
Enhance existing building codes	Proposed	1
Participate in Energy Star Homes	Proposed	1
Adopt weatherization measures	Proposed	11
Adopt efficient appliances	Proposed	57
Adopt efficient lighting measures	Proposed	485
Adopt boiler and programmable thermostat retrofits	Proposed	274
Commercial Measures		
Enforce existing building codes	Proposed	4.1
Enhance existing building codes	Proposed	14.7
Participate in green construction	Proposed	24
Participate in audit program	Proposed	204
Adopt boiler and programmable thermostat retrofits	Proposed	114
Energy Efficiency Total		1635.4
Energy Sourcing		
Municipal Measures		
Installation of a 200kW Wind Turbine in Arlington.	Proposed	186.0
Installation of PV Systems on Municipal Buildings.	Proposed	11.8
Town Demonstration House	Proposed	1.7
Purchase of Clean Electricity (Municipal)	Proposed	306.0
Become a “Solar Boston” Partner	Proposed	N/A
Residential and Commercial Measures		
Installation of PV Systems in Residential and Commercial Buildings	Proposed	293.0
Residential Use of Solar Hot Water Heating	Proposed	41.4
Purchase of Clean Electricity (Community)	Proposed	4890.0
Business Challenge Program	Proposed	N/A
Sustainable Arlington Website	Proposed	N/A
Energy Sourcing Total		5729.9

3 Energy Sourcing

3.1 Introduction

The Arlington community has great opportunity to restrict the emission of greenhouse gases at the source by utilizing renewable energy sources. The electricity generated through the use of renewable sources is known as clean power, or clean electricity. “Renewable” or “clean” power is not generated from the burning of fossil fuels; therefore, it does not produce greenhouse gases and releases less smog-forming (NO_x), acid rain-forming (SO₂) pollutants, carbon dioxide (CO₂) and particulate emissions. Every unit of electricity (kilowatt-hour) that is shifted from conventional fossil fuel and nuclear electricity generation to renewable generation spares damage to the environment and lessens health related problems including respiratory illnesses.



Water, solar, wind, and biomass¹³ are the most commonly used forms of renewable energy. Presently, hydro energy and biomass are the only existing renewable resources providing a significant amount of power to the New England Power Pool (NEPOOL) and even they supply less than 5 percent of the total electricity production.¹⁴

Renewable energy is currently more expensive to consume compared to conventional energy resources. However, it offers price stability and will not be impacted by rising natural gas, oil and coal prices. In addition, Northeastern States are establishing a Regional Greenhouse Gas Initiative (RGGI) that will most likely start with measures to reduce the CO₂ emissions by electric utilities. If such measures (e. g. ‘Carbon Tax’) that raise the cost of using carbon-based fuels were ever to be imposed, renewable energy consumers would be further insulated from these cost increases by using more efficient and carbon-neutral options.

The opportunity to start producing or purchasing renewable energy is growing. Currently, deregulation of the electricity market provides an opportunity to negotiate not only the attributes of electricity supply, but also the price. Towns can become municipal aggregators and negotiate for more clean power as well as for lower prices for their citizens. Arlington's efforts to shift to clean energy sources can be supported, financially and otherwise, through various state programs. The Massachusetts Technology Collaborative (MTC) is the State's development agency for renewable energy. MTC has started providing grants and other financing for clean energy products through Massachusetts Renewable Energy Trust. In collaboration with communities, municipal governments, academia and industry, the MTC seeks to invest in initiatives to develop energy from renewable resources and reduce the state's reliance on coal, oil, and other fossil fuels. The Massachusetts Renewable Energy Trust (MRET), through the MTC, seeks to fund projects and studies in the areas of green buildings, clean power, solar energy, consumer energy awareness, and fuel cells in order to initiate a sustained shift toward the increased use of renewable energy.¹⁵ MTC/ MRET programs are presented in section 1.3.

This chapter considers initiatives that enable Arlington to satisfy municipal, residential and commercial power needs with sources that reduce pollution, carbon dioxide (CO₂) emissions or byproducts that cause health problems and environmental damage. Measures considered include:

¹³ As defined earlier, some forms of biomass are renewable because when plants grow they reabsorb the CO₂ released when the biomass is converted to energy.

¹⁴ Massachusetts Energy Consumers Alliance Home Page [online]. [Cited 10 March 2005]. Available from World Wide Web: <www.massenergy.com>.

¹⁵ Massachusetts Technology Collaborative Home Page [online]. [Cited 10 March 2005]. Available from World Wide Web: <www.masstech.org>.

- Installing Renewable Energy Technologies
- Purchasing Clean Power

Below, recommended actions are proposed for Arlington. Energy sourcing strategies and options are considered for the Town's power requirements as well as residential and commercial initiatives when applicable.

3.2 Summary Findings and Recommendations

Currently, residential and commercial units are the major contributors to the Town's CO₂ emissions in terms of energy sourcing. Therefore, it is necessary for the Town to give priority to the proposed Residential and Commercial measures, particularly clean power purchasing. The current state of energy sourcing in Arlington along with the targeted reductions in CO₂ emissions for municipal, residential and commercial electricity is presented in Appendix E.¹⁶ As it has previously been explained in the introduction section, the marginal CO₂ emissions rate has fallen from 1,484 lb/MWh to 1,179 lb/MWh between 1997 (the baseline year) and 2003.¹⁷ This already accounts for a reduction of 20.6% (21,000 tons) in CO₂ emissions resulting from electricity consumption. The measures proposed in this section will add to these reductions accomplished through decreases in the marginal emissions rate. The Town is currently purchasing its electricity from Trans Canada Power Inc. The contract will expire in September 2006.¹⁸

The following table presents an overview of the measures discussed in this section of the plan. Further information regarding the proposed measures, CO₂ emissions reduction figures, and the calculations made can be found in the following chapters of this section and in Appendix F.

Table7: Proposed CO₂ Reduction Measures.

Measure:	Status:	Estimated Annual CO₂ Reduction: (tons)
Municipal Measures:		
Installation of a 200kW Wind Turbine in Arlington.	Proposed	186
Installation of PV Systems on Municipal Buildings.	Proposed	11.8
Town Demonstration House	Proposed	1.7
Purchase of Clean Electricity (Municipal)	Proposed	306
Become a "Solar Boston" Partner	Proposed	N/A

¹⁶ Predith, Ashley, and Tim Woolf. 2004. CO₂ Reduction Workbook: A Method for Calculating CO₂ Reductions From Electricity Measures in Municipal Climate Change Action Plans. Synapse Energy Economics, Inc..

¹⁷ ISO New England Inc. 2004. 2003 NEPOOL Marginal Emission Rates Analysis [online]. [Cited 8 April 2005] Available from World Wide Web: <http://www.isone.com/Planning_Reports/Emissions/Marginal_Emissions_Analysis_2003.pdf>

¹⁸ Seyhun, Sinan. "Interview with Domenic Lanzillotti, Purchasing Manager for the town of Arlington." (10 March 2005).

Residential and Commercial Measures:		
Installation of PV Systems in Residential and Commercial Buildings	Proposed	293
Residential Use of Solar Hot Water Heating	Proposed	41.4
Purchase of Clean Electricity (Community)	Proposed	4,890
Sustainable Arlington Website	Proposed	N/A
TOTAL	---	5,730

3.3 **Installing Renewable Energy Technologies in Arlington**

Renewable energy installation on municipal buildings, businesses, and homes has been limited due to lack of knowledge about clean energy and high start-up costs. However, programs and funding opportunities, available through the MTC and MRET, have been working to break down these barriers and increase the use of renewable energy throughout Massachusetts.

Wind power and photovoltaic panels (PV) are the most suitable clean energy sources for Arlington to consider and/or install. PV and domestic solar water heating systems can be installed directly on existing homes and businesses to reduce reliance on systems that are dependent on fossil fuels.

3.3.1 Existing Measures

Currently, the Town of Arlington is installing a 2.6 kW photovoltaic system at Arlington High School with financial support from Massachusetts Technology Collaborative's Solar to Market Initiative (see description in section 3.3.2). Given the energy needs of the high school, this is considered merely a PV system for educational purposes. It is strongly recommended that an appropriately-sized PV installation be installed for the high school's true energy requirements.

Arlington's Board of Selectmen approved the installation of a meteorological tower within the Town in order to gather data on wind speed and availability, during its meeting on February 28th, 2005. The data will be used to assess the feasibility of installing a wind turbine to generate clean power for domestic use and sale in the market.

As of January 31, 2005, there were 6 residential solar PV Systems installed with MRET funding in Arlington.¹⁹ A table that lists these residential PV applications and their size can be found in Appendix G.

3.3.2 The Options

While MTC funding opportunities are continually in flux and subject to change, they represent the state's commitment to clean energy development. New programs are also being added. Grants awarded are influenced by merit, commitment by elected officials, breadth of community support and availability of resources. The following are current programs available to the Town²⁰:

¹⁹ Seyhun, Sinan. "Interview with Maria Simoneau, Sustainable Arlington group member." (5 April 2005).

²⁰ Massachusetts Technology Collaborative Home Page [online]. [Cited 10 March 2005]. Available from World Wide Web: <www.masstech.org>.

Table 8: MRET funding opportunities

MRET funding opportunity	Amount/type of funds	Description	Current deadlines
Commercial, Industrial & Institutional Initiative Feasibility Study and Design & Construction Grants	Feasibility grants are available up to a maximum of \$40,000. The <u>Design phase</u> award and <u>Construction phase</u> award not exceed \$150,000 and \$500,000, respectively.	Eligible projects must employ renewable energy technologies with a capacity greater than 10kw (25kw for wind). Also at least half of the renewable power produced must be used onsite.	Ongoing
Green Schools	An Alternative Energy Feasibility Study for Arlington Thompson School was awarded.	Provides information, services and funding for feasibility studies, design, construction and education activities of green public schools employing renewable technologies	Ongoing
Solar to Market Initiative Massachusetts Photovoltaic (PV) Industry Loan Fund (aka MIT Cluster Program)	This fund is making available \$5.3 million in debt financing. Also includes rebates of \$4-5/Watts for solar installations	The purpose of this fund is to provide strategic debt financing to eligible corporations for business development and expansion activities, and to leverage funds from other financial institutions. As such, it could be an opportunity to attract Green Business Development to Arlington	This program is no longer accepting applications. (See Small Renewables Initiative)
Solar to Market Initiative Administered by MIT Cluster Program	50 percent of capital costs for solar installations. 38 cents / kWh is paid to the grant receiver for the first 3 years.	Arlington or MIT-connected residents and small businesses can apply for grants to install PV systems under 60 kW.	Ongoing
Small Renewables Initiative Rebates for Small Scale Renewable Applications	Rebates up to \$50,000	Municipal buildings and schools; commercial, industrial, or institutional facilities; and residential properties including single family homes may apply for rebates for installing renewable energy applications. For this initiative, projects are limited to 10 kilowatts.	Ongoing
Community Wind Collaborative	Funding for capital costs.	This Initiative assists communities with wind potential explore their options for municipal wind energy development.	Ongoing

Service Contracts to Municipalities		Wind maps are available for municipalities on the MTC web site to determine initial feasibility of municipal wind power generation.	
Community Planning Community Outreach, Planning and Siting Initiative	No grants available at this time	This grant assists regional entities, municipalities and non-profits to create tools to assist renewable energy siting.	This grant is currently closed. It is anticipated that when it re-opens it will be for regional planning entities to create specific tools for municipalities

3.3.3 Proposed Municipal Measures

The Town has several options for installing renewable energy technologies:

3.3.3.1 Installation of a Wind Turbine:

The Town should search for possible sites and funding opportunities to install a wind turbine in Arlington. Locations suitable for an installation could be next to communication towers, utility poles, flag poles, water towers and other similar existing structures to avoid aesthetic concerns. An option is for the Town to work with a wind power developer to construct a utility scale or smaller turbine somewhere in Town. McKenzie Bay International is one company that builds wind turbines for communities on a Build – Own – Operate basis where the company covers the initial costs and sells the electricity generated through the facility to the local consumers at a negotiated price. Carbon dioxide emission reductions and the price of electricity depend on location of the turbine, its size and wind availability.

CO₂ Emissions Reduction: 186 tons of CO₂ per year.

3.3.3.2 Installation of PV Systems on Municipal Buildings:

The Town should make use of the available grants for the installation of photovoltaic (PV) systems on municipal buildings. Specifically, the Town should expand the solar project underway at Arlington High School to provide a larger portion of the buildings electricity, conduct associated classroom activities to raise awareness and engage students in the process. The Town should also consider similar systems for other schools. These initiatives can be supported via MTC's **Small Renewables Initiative (SRI)**, which offers rebates for up to \$50,000 and also through MTC's **Commercial, Industrial & Institutional Initiative** which offers grants for feasibility studies, design and construction.

CO₂ Emissions Reduction: 11.8 tons per year.

3.3.3.3 Becoming a of "Solar Boston" Partner:

The Town should become a partner of "Solar Boston", a collaboration of the United States Department of Energy, solar energy businesses, and local community organizations, to promote and facilitate solar energy installations. In order to become a partner, a letter needs to be submitted to the organization explaining the intentions and expectations of the subscribing party for participation.

3.3.3.4 **The Town Demonstration House:**

The Town of Arlington should consider options to convert an existing municipal property into a Demonstration House to educate residents and businesses about renewable energy. The house should be equipped with a 2.6 kW PV system and a solar hot water heating system. The Tufts Climate Initiative at Tufts University in Medford, MA has a green demonstration house that was renovated in 1999.

CO₂ Emissions Reduction: 1.69 tons per year.

3.3.3.5 **Other Recommendations:**

The Town of Arlington has saved \$130,000 in FY2004 due to a number of measures taken to increase energy efficiency in Town buildings, streetlights and traffic signals.²¹ The Town should allocate some of those savings to be used in renewable energy applications on municipal buildings.

Additional funds may be available through the MTC/MRET Commercial, Industrial & Institutional Initiative, which is appropriate for non-school municipal buildings undergoing construction, such as the Park Circle Fire Station.

3.3.4 **Proposed Residential and Commercial Measures**

3.3.4.1 **Installation of Residential PV Systems:**

Residents can take advantage of some of the funds and technical assistance offered by the Small Renewables Initiative. In addition to the MTC's facilitation, there is a program in Massachusetts, called net metering, for those installing renewable energy systems smaller than 60 kW in size (the typical home uses 4-6 kW; local businesses may range from this to beyond 100 kW). If the electricity generated exceeds consumption at any time the electricity meter runs backward. If the customer is a net provider of electricity at the end of the month, the net energy generated for the month is credited at the average monthly market rate to the next month's bill.²²

CO₂ Emissions Reduction: 285 tons.

For PV systems installed under the MIT Cluster Program funded by MTC, keeping track of surplus power generated is easy with the tools provided through the program.

A sample 2.6 kW PV system could:

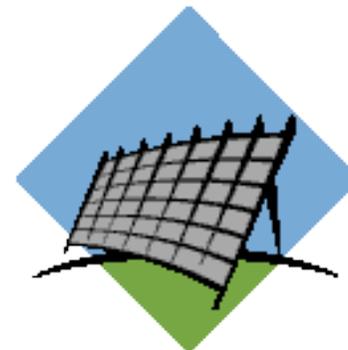
- Reduce monthly electric costs by about 30 percent (based on \$1,200 / year electric bill)
- Produce 2,500 kWh of electricity annually (based on a system in Wrentham MA, calculated using NREL PVWatts2 modeling software and conservative estimates for module and inverter efficiency)
- Prevent emissions of 2,950 lbs CO₂, 4.95 lbs SO₂, and 1.83 lbs of NO_x, annually. (Based on ISO New England's Marginal emissions rates for 2003)¹
- Produce a net positive cash flow of ~\$20/month (5c/kWh REC sales, if financed as part of mortgage at 6 percent over 30 years, \$11,166 MTC up-front grant, 15 percent Mass Income Tax credit).

²¹ Lee, Benjamin. "Interview with George Woodbury, Energy consultant from Light Smart Energy Consulting Services." (1 April 2005).

²² Database for State Incentives for Renewable Energy Home Page [online]. [Cited 8 April 2005]. Available from World Wide Web: <<http://www.dsireusa.org>>.

3.3.4.2 Installation of PV Systems in Commercial Buildings:

Business owners can take advantage of the funds and technical assistance offered by the Small Renewables Initiative and the Commercial, Industrial & Institutional Initiative through the MTC. The Town of Arlington should create and publicize an “Arlington Alliance of Sustainable Businesses” program that encourages local businesses, such as supermarkets, auto dealerships, and other commercial buildings, to take advantage of the rebates and tax deductions that are available for residents who install renewable technologies. The extent of and additional information on “Arlington Sustainable Businesses Program can be found in section 5.4.



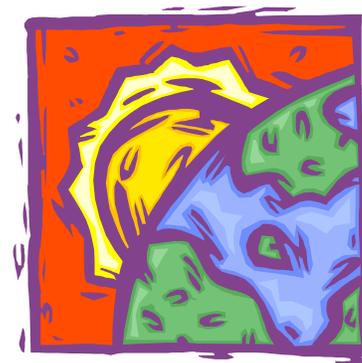
CO₂ Emissions Reduction: 7.4 tons.

3.3.4.1 Purchasing Renewable Energy Credits:

Residents can also help to develop new sites for renewable energy by purchasing Renewable Energy Credits. Currently, all power added to the New England electricity grid is registered and tracked by the New England Power Pool (NEPOOL) through a Generation Information System (GIS). For each unit of electricity added to the grid, NEPOOL issues a GIS certificate attesting this. Those certificates associated with electricity from renewable energy are commonly referred to as “Renewable Energy Certificates” (RECs).²³ At this time, state law requires all utility companies to purchase RECs to match 1.5 percent of the total load they deliver. MTC currently has a Clean Energy Choice Program where consumers pay a premium and the money goes to purchase some of these scarce RECs and take them out of circulation in order to increase pressure on utilities to build new solar, wind facilities. Residential and Commercial options for purchasing ‘Renewable Energy Credits’ will be discussed in section 3.4.4.

3.3.4.4 Residential Use of Solar Hot Water Heating:

Water heating accounts for approximately 14 percent of the average family's home energy consumption in the USA.²⁴ Solar hot water heating systems can help residents cut water heating energy use by 40 to 60 percent. A solar hot water heating system collects thermal energy from the sun to heat the water used to take showers, wash dishes and clean laundry. The Town can start initiatives for the installation of residential use of solar hot water heating systems. Over 1.5 million Americans have invested in solar hot water systems for their homes and businesses, to date, with over 94 percent of these customers considering the investment a wise decision. Prices for a complete solar water heating system range from \$2,000 to \$4,000. On the other hand, the life-cycle cost of a solar water heating system is at least 20 percent lower than a conventional water heater.



CO₂ Emissions Reductions: 41.4 (tons per year).

If a solar hot water heating system is included in the financing for a new home, the typical cost of the system ranges from \$13 to \$20 per month and because the system is included in the home's mortgage, the homeowner can take advantage of a federal income tax interest rate deduction.¹

²³ Massachusetts Technology Collaborative Home Page [online]. [Cited 10 March 2005]. Available from World Wide Web: <www.masstech.org>.

²⁴ US Department of Energy. Small Wind Electric Systems: A Massachusetts Consumer's Guide.

3.3.4.5 The Website: SustainArlington.org

The Town should also collaborate with the Sustainable Arlington group for the creation and maintenance of a website (e.g. www.sustainarlington.org) which will provide information on all clean energy programs available to the residents of Arlington. Further information on the website can be found in the Community Based Social Marketing section.

3.4 Purchasing Clean Power

It is now possible for the Town and community members to purchase renewable energy without necessarily installing renewable technologies in Arlington. By purchasing renewable energy, or clean power, to meet electricity needs, Arlington can displace the CO₂ emissions that would otherwise be produced to provide its electricity. Purchasing clean power is currently the most cost-effective way of mitigating CO₂ emissions from the Town's electricity consumption.

3.4.1 Existing Measures

The Town of Arlington is not purchasing clean power at this time. The Town currently has a contract with Trans Canada Power to supply electricity to the municipal buildings which will expire in September 2006.²⁵ On the other hand, there are currently 14 households in Arlington that participate in the clean energy choice program through the Massachusetts Energy Consumers Alliance.²⁶

3.4.2 The Options

The deregulation of the Massachusetts electricity industry in 1998 has given all electricity customers the option of choosing their electricity supplier. Customers can now purchase electricity from competitive generation companies instead of NSTAR, the local distribution company serving Arlington. Some of these competitive generation companies offer clean power products, which include different amounts and different types of renewable energy as the source of electricity.²⁷ While there are few clean power products available in Massachusetts today, the number and type of products is expected to increase in the next few years. Furthermore, with the establishment of a Generation Information System (GIS) at the New England Power Pool (NEPOOL), clean power purchases can be facilitated through purchases of renewable energy certificates from renewable generators in New England. There are currently four options that can be used to purchase clean power in order to offset CO₂ emissions from electricity consumption:

1. Purchase clean power directly from a competitive electricity supplier:

There are currently very few retail electricity suppliers in Massachusetts, especially for smaller customers. However, more competition is expected in the future, which should include clean power offerings. The Town can issue Request for Proposals (RFP) in order to assess both the financial and environmental implications of direct purchasing from the various competitive generation companies. In the future, community members may also have more opportunities for selection among clean power electricity providers. Other utility companies, such as Massachusetts Electric, Nantucket Electric and Narragansett Electric, are offering clean power products which provide customers with the opportunity to reduce their CO₂ emissions without having to change their supplier.

²⁵ Seyhun, Sinan. "Interview with Domenic Lanzillotti, Purchasing Manager for the town of Arlington." (10 March 2005).

²⁶ Seyhun, Sinan. "Interview with Chad Laurent, Program Coordinator for Massachusetts Energy Consumers Alliance." (14 April 2005).

²⁷ The Clean Energy Choice Program Home Page [online]. [Cited 15 March 2005]. Available from World Wide Web: <www.cleanenergychoice.org>.

²⁷ It is important to note that there are many different types of green power products, and some have greater environmental benefits than others. Those with the greatest amount of benefits include those that meet the following conditions: the renewable generator is new, the renewable generator is located in Massachusetts or New England, there is little or no air emissions, and there is little or no community opposition to the renewable project.

2. Purchase Renewable Energy Credits through a clean power marketer:
It is also possible to purchase clean power by buying renewable energy certificates (RECs), without switching to a different electricity supplier. Clean power marketers can facilitate this sort of clean power purchase. By purchasing large amounts of renewable energy certificates, power marketers are better able to negotiate deals with renewable energy developers. There are currently several companies or organizations that are offering renewable energy certificate sales in New England, including Sun Power Electric, the Mass Energy Consumers Alliance, Native Energy, Sterling Planet, and Community Energy. In addition, NSTAR has proposed a clean power product that customers can purchase without switching off its default service. One of the best examples to date is the City of Newton which purchases \$20,000 per year of clean energy from Mass Energy and therefore receives \$20,000 per year in matching grants from the Massachusetts Technology Collaborative.²⁸
3. Become a municipal aggregator and purchase energy from renewable developers. The Massachusetts Restructuring Act allows towns and cities to become municipal aggregators, which allows the municipality to establish a pool of all electricity customers within the community.²⁹ The main advantage of aggregation is that it allows the municipality to act as an agent for the town residents and negotiate with the electricity supplier to reduce costs for all customers. It also allows the municipality to negotiate for higher shares of clean power in the electricity that its residents receive. To become a municipal aggregator, a municipality must get local authorization via a majority vote at town meeting, town council, or city council. The municipality must also develop an aggregation plan for review by its citizens and for approval by Department of Telecommunications and Energy. The Massachusetts Municipal Association (MMA) has received a grant of \$75,000 to research MMA members' interest in becoming a clean power aggregator.
4. Become a municipal electric company and develop or purchase renewable energy. Historically, 40 Massachusetts municipalities have established their own electric utilities. These municipal electric companies own power plants, purchase their electricity from other community's power plants, or purchase power from other participants in the New England power market. Municipal utilities also set their own electricity rates. They are not subject to rules created by the Massachusetts Restructuring Act, and their activities do not have to be approved by the Department of Telecommunications and Energy. Though becoming a municipal utility provides a municipality with the most control over its power purchases, it is also a long and difficult task to establish the financial, political, and structural requirements.³⁰

These four options are available to the Town with regard to its own electricity purchases. Community members, on the other hand, only have the option of purchasing clean power directly from competitive suppliers or from clean power marketers. Currently, consumers are free to change their electricity provider. However, there are currently no competitive electric suppliers from which residential consumers can choose. Massachusetts Energy Consumers Alliance predicts that by 2010 electricity providers will be able to sell clean energy options that draw electricity from renewable energy sources such as wind power, small hydro or biomass, and that approximately 20 percent of the state's population will opt to purchase the cleaner energy.³¹ If the Town were to become either a municipal aggregator or a municipal electric company, then it could purchase clean power on behalf of all community members, in addition to buying such power for itself.

²⁸ Seyhun, Sinan. "Interview with Chad Laurent, Program Coordinator for Massachusetts Energy Consumers Alliance." (14 April 2005).

²⁹ Though all customers within the community will automatically have access to the electricity purchased by the municipal aggregator, any customer may exit the program at any time to choose their own electricity supplier.

³⁰ Massachusetts Municipal Wholesale Electric Company Home Page. [online]. [Cited 20 April 2005]. Available from World Wide Web: <www.mmwec.org>.

³¹ Town of Brookline. 2002. Local Action Plan on Climate Change [online]. [Cited March 2005] Available from the World Wide Web: <<http://www.townofbrooklinemass.com/Conservation/PDFs/ClimateActionPlanTOB.pdf>>.

3.4.3 Proposed Municipal Measures

The Town should investigate the opportunities available in the short-term for purchasing clean power for its own electricity consumption. The Town should also make sure that it is prepared, and has the flexibility to purchase clean power in the medium- to long-term future, as the Massachusetts electricity market becomes more competitive and the opportunities for clean power expand. To these ends, it is recommended that the Town take the following steps:

3.4.3.1 Municipal Purchase of Clean Power:

The Town should periodically investigate the opportunities for purchasing clean power from clean power marketers. This option is likely to be the most flexible, least risky and most low-cost way of offsetting the CO₂ emissions associated with the Town's electricity consumption, and thus should play a key role in achieving climate change goals. The Town should commit to purchasing 1-3 percent of its power through clean power marketers starting in 2006 and increase this commitment to 5 percent or more by 2010.

CO₂ Emissions Reduction: 306 tons per year.

3.4.3.2 Other Recommendations:

1. Whenever the Town solicits proposals for new generation companies to provide its electricity, it should explicitly request proposals for different levels of clean power, as well as regular undifferentiated power. Such proposals will provide valuable information about the costs and benefits of clean power options.
2. When entering into negotiations for new power supplies, the Town should avoid long-term contracts that would preclude the purchase of clean power products that may become available in the short to medium-term future.
3. The Town should investigate the advantages and disadvantages of becoming a municipal aggregator. This option has important implications for reducing the cost of electricity in general, for promoting energy efficiency within Arlington, and for purchasing clean power. It also has important implications for efficiency and clean power opportunities available to residential and commercial consumers. It therefore requires considerable scrutiny.
4. Purchasing clean power typically costs more than buying undifferentiated electricity. In order to reduce the cost of clean power purchases, the Town should consider subsidizing it by utilizing energy efficiency savings. The Town of Arlington has saved \$130,000 in FY2004 due to a number of measures taken to increase energy efficiency in Town buildings, street lights and traffic signals.³² As the amount of efficiency savings increase over time with increased activities, the amount of clean power purchases could also be increased accordingly.
5. The Town should lobby N-Star to establish a "green check-off program" where the residents can check a box in their utility bill to enroll in a clean energy program offered by the company. Massachusetts Electric currently has a similar "green-up" program.³³

³² Lee, Benjamin. "Interview with George Woodbury, Energy consultant from Light Smart Energy Consulting Services." (1 April 2005).

³³ Massachusetts Climate Action Network Home Page [online]. [Cited 13 April 2005]. Available from World Wide Web: <<http://www.massclimateaction.org/>>.

6. As it was previously proposed, the Town should collaborate with the Sustainable Arlington group for the creation and maintenance of a website which will include information on all clean energy purchasing programs available to the residents of Arlington. Further information on the website can be found in the Community Based Social Marketing Section.

3.4.4 Proposed Residential and Commercial Measures

3.4.4.1 Residential and Commercial Purchase of Clean Power:

The Town should undertake educational and promotional initiatives to encourage Arlington residents to purchase clean power and/or install clean power sources in order to offset the CO₂ emissions of their electricity consumption and to help reach reduced CO₂ goals for the community. The website project that was mentioned in the previous section has the potential of raising public awareness and support for sustainable energy options, by making it easier to learn about available programs. A list of available voluntary clean power products that Arlington residents can purchase is presented in Appendix H.

CO₂ Emissions Reduction: 4890 tons per year.

3.5 Conclusion

As it has been previously mentioned in section 3.2, residential and commercial units are the major contributors to the Town's CO₂ emissions. Residential and commercial buildings are responsible for over 90 percent of the electricity consumption, and therefore the related CO₂ emissions, in Arlington. For this reason, it is necessary for the Town to give priority to the proposed Residential and Commercial measures. The target for the Town has been set to reduce emissions by 10 percent, with respect to 1997 values, by 2010.

Purchasing Clean Power through renewable energy credits seems to be the most promising option available to the Town. As it has been previously explained in sections 3.4.2 and 3.4.3; residential, commercial and municipal consumers can offset 5 percent of the CO₂ emissions resulting from electricity consumption by buying RECs. The total annual costs associated with this measure are \$166,000 for the residential and commercial consumers and \$10,400 for the municipality (See Appendix F).

In addition, as explained earlier in 3.4.1 and 3.4.3, the Town of Arlington is eligible for grants from the MRET, matching its expenditure on RECs. Hence, the Town will be eligible for a grant of up to \$10,000 from the MRET. We have also proposed in this section that the money saved through energy efficiency measures be used in installing renewable energy applications and purchasing clean power. These measures have the potential to create over \$140,000 of annual funding to be used for the installation of renewable technologies and clean power purchases.

Although residential and commercial sources are responsible for a high percentage of the CO₂ emissions, it is essential that the Town take an initiative on **incorporating renewable energy** into Arlington and lead by example. For this reason, the Town should also consider the proposed municipal measures to be implemented by 2010. As it was proposed in the previous section, the Town should appoint a "Sustainability Program Manager" and establish an "Energy Management Workgroup", whose task will include preparing an emissions inventory and coordinating the Town's efforts in installing renewable energy applications and purchasing clean electricity.

Community Energy Plan





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Chapter 1: Context for the Plan

Vision Statement

To become a sustainable community, Arlington must rethink the way it uses, generates, and distributes energy.

Energy is fundamental to our lives and livelihoods. Energy use keeps us warm in winter and cool in summer. Energy powers technologies that preserve food, provide health care, and entertain us. Energy powers many of our transportation options, and energy is essential to economic transactions. Without energy, our modern economic system would collapse.

Still, our present use of energy leaves us vulnerable to multiple risks:

- The burning of fossil fuels is a major contributor to global climate change, which threatens to alter our economy and way of life.
- Severe weather is causing more frequent electric power outages.
- Rising demand for electricity is straining our regional power grid.
- International affairs cause significant fluctuations in the price of electricity, oil, and other fossil fuels.
- Rising global demand and shrinking availability of fossil fuels dictate long-term energy price increases.

This Community Energy Plan (CEP) seeks to mitigate those risks by (a) improving the reliability of energy sources by localizing energy generation, (b) reducing price volatility and the long-term cost of energy through efficiency and diversification, and (c) reducing the environmental impact of energy

use through efficiency and cleaner sources of energy.

This CEP can be a catalyst for new economic development and sustainable growth in Arlington. A growing number of businesses are focused on the energy sector, on both the supply and demand sides of the equation. Clean energy and innovations in efficiency are among the fastest growing economic sectors today; this sector can be an important element of a diversifying and sustainable economic base for Arlington. Our vision is to distinguish Arlington and create the most desirable and competitive commercial, residential, and retail market in the region or country. The sustained implementation of this plan is intended to provide a competitive development environment, lower operating costs, enhanced energy reliability, and fewer service disruptions for businesses.

The Arlington Community Energy Plan is a roadmap for transforming how we obtain and use energy in all respects. The CEP envisions an Arlington in which our residents and businesses save money by owning and operating more energy efficient buildings; in which we breathe healthier air by using cleaner sources of energy and a variety of alternatives to driving; in which electricity is more reliable and energy prices are less volatile; and in which new businesses and residents are attracted to a higher quality of life supplied by cleaner and more reliable energy.

Purpose of the Plan

The purpose of this Community Energy Plan is to define the energy goals and describe the energy policies that will help Arlington remain economically competitive, environmentally committed, and have secure energy sources. Arlington County has set a carbon emissions target of 3.0 metric tons (mt) of carbon dioxide equivalent (CO₂e) emissions per capita per year by 2050, to match current emissions world benchmark cities such as Copenhagen. CO₂e emissions are used as a proxy for energy productivity. The Plan establishes the framework for reducing greenhouse gas (GHG) emissions in the County from 2007 carbon emissions level of 13.4 mt CO₂e/capita/year, a reduction of over 70%.

The CEP serves as the Energy element of Arlington's Comprehensive Plan, which sets forth the broad goals and policies of a sustainable community over the next thirty to forty years. It is intended to assist in ensuring that development in the County occurs in a coordinated, economically competitive, energy secure, and environmentally committed manner that best promotes the health, safety, prosperity and general welfare of the County's residents and businesses. Accompanying the CEP is the Community Energy Plan Implementation Framework (CEP Implementation Framework). The CEP Implementation Framework lays out the strategies that the County will deploy as well as the tools – both existing and potential – that could be used to advance the goals and policies of the CEP. The County will work with stakeholders to ensure CEP implementation improves Arlington's economic competitiveness, energy security, and environmental commitment.

This Comprehensive Plan element will be updated as conditions warrant. At a minimum, the element will be reviewed and revised as necessary once every five years.

The CEP and CEP Implementation Framework employ the following terms:

Goals are the six primary areas around which the County will implement the Community Energy Plan and form the basis of the CEP and CEP Implementation Framework;

Policies are the statements of intent or commitments made by County leadership governing the implementation of the CEP-related projects. Policies are explained in detail in the CEP, whereas in the CEP Implementation Framework the policies are provided in summary format for context;

Strategies, explained in the CEP Implementation Framework, represent approaches for implementation of policy and should evolve over time as new tools emerge, new processes are designed, and the benefits and risks associated with a concept change in response to changes internal or external to the County; and

Tools provide the mechanisms to carry out the strategies. Examples of existing and potential tools are explained in the text of the CEP Implementation Framework and a longer list of tools is summarized in Appendix B of the CEP Implementation Framework. However, neither list of tools is intended to be exhaustive or prescriptive; they are an illustrative set of examples of how the strategies could be accomplished. The tools described herein will require the application of resources—whether human or capital—to realize the CEP's goals.

The Benefits of a Community Energy Plan

Economic Competitiveness

The Community Energy Plan can improve economic competitiveness at the local level in several ways. Improved energy efficiency results in lower utility bills and other benefits to building owners and homeowners.

Communities that can show they have lower costs of doing business and have a healthy workplace may be able to attract new businesses, residents, and motivated employees.

Second, energy efficiency creates net new jobs. Every \$1 million invested in building energy efficiency improvements supports approximately 20 jobs. This is a better “bang for the buck” than if that same money had been invested into the economy as a whole.

Third, energy efficiency supports economic growth by generating savings. Businesses and citizens that spend less on energy have more to invest in other activities that boost local economies.

Environmental Commitment

Energy efficiency is the cheapest, fastest, and cleanest way to reduce greenhouse gas pollution in the near term. In 2008, Americans avoided greenhouse gas emissions equivalent to those of 29 million cars through choices they made with energy-saving measures and energy-efficient homes.

Additionally, reducing energy usage means cleaner local air, which will make Arlington a healthier, more pleasant place to live and work.

Energy Security

Energy efficiency measures can improve the reliability of a local electric system by lowering peak demand and reducing the need for additional generation and transmission assets. Energy efficiency also diversifies utility resource portfolios and can be a hedge against uncertainty associated with fluctuating fuel prices and other risk factors.

District energy (DE) and combined heat and power (CHP) improve energy security by generating electricity, heating, and cooling locally, thus taxing the electric grid less. Additionally, a variety of fuel sources such as natural gas, biomass, and solar thermal are available for CHP generation. This fuel flexibility means more stable prices, since consumers can react to price shocks by choosing other fuel options.

Renewable energy, especially solar photovoltaics (PV), helps flatten the demand on the electric grid because the sun tends to shine brightest when electricity demand is the highest. This results in increased capacity for local power plants. Photovoltaics also reduce stress on the grid by generating electricity locally.

Chapter 4: Goals and Policies

Buildings

Goal 1 (G1): Increase the energy and operational efficiency of all buildings

Residential and non-residential buildings currently use about three quarters of all energy in Arlington. 26% is consumed by residential homes and 53% is used by commercial buildings. The single largest improvement that can be made to ensure the County meets its greenhouse gas emission reduction goals will be improving the overall energy efficiency of the construction and operation of buildings. Reducing energy use will also reduce utility costs for businesses and residents.

***Policy 1 (P1.1):** By 2050, residential buildings should use 55% less energy on average (per square foot) as compared to 2007 levels of energy use (63 kBTU per square foot). Milestones include:*

- **2020:** 5% less on average than 2007 levels
- **2030:** 25% less on average than 2007 levels
- **2040:** 40% less on average than 2007 levels

***Policy 2 (P1.2):** By 2050, the non-residential building stock should use 60% less energy on average (per square foot) as compared to 2007 levels of energy use (98 kBTU per square foot). Milestones include:*

- **2020:** 5% less on average than 2007 levels
- **2030:** 25% less on average than 2007 levels
- **2040:** 45% less on average than 2007 levels

By 2015, the applicable building code for residential and non-residential buildings is likely to be the International Energy Conservation Code (IECC) 2012, which will ensure that new buildings and major renovations, in the aggregate, are approximately 30% more efficient than the 2004 Virginia building code. Future building codes are likely to continue improving energy efficiency requirements. Typically, 2-3% of the nation's building stock is renovated each year. On that basis, by 2050 all or most of Arlington's existing residential and non-residential buildings will be expected to have been either renovated or demolished. Coupled with innovations in technology, building code upgrades will play a significant role in achieving the CEP goals.

Energy efficiency improvements are achieved through careful design and selection of building envelopes, windows, insulation, lighting, and heating, ventilation, and air conditioning (HVAC) systems. Because it is generally easier to optimize these efficient technologies into commercial office buildings (due to centralized HVAC systems and overall control of building operations and management), the efficiency targets for non-residential buildings are slightly more ambitious than for residential construction (multi-family and single-family buildings). Effective landscaping, site design and other factors can also help reduce building energy usage.

Each sector of the building stock requires a different approach. For example, residential buildings owned or rented by senior citizens,

people with disabilities and lower-income Arlingtonians may pose unique challenges.

The use of advanced design, materials, and renewable energy technologies can dramatically improve the energy performance of buildings. It may be possible for a building to be connected to the power grid yet capable of generating enough energy from renewable sources to compensate for the project's own energy use. To this end, Arlington County will facilitate creation of a net-zero energy development to demonstrate net-zero energy concepts in a relatively large-scale project.

Policy 3 (P1.3): Reduce the amount of carbon produced from energy use from buildings, using source energy as the standard measure

There are two ways to measure total energy use in buildings. "Site" energy is defined as the amount of energy (electricity, natural gas, and fuel oil) consumed by a building as reflected in the property's utility bills. "Source" energy represents the total amount of raw fuel that is required to operate the building (i.e., fuel used to generate electricity at the power plant, as well as natural gas and fuel oil burned on site). Thus, the source energy calculation incorporates all the transmission, delivery, and production losses involved in generating and delivering the electricity to the building. Source energy calculations provide a more complete assessment of a building's energy costs and carbon emissions. Throughout this Plan it is source energy, not site energy, that is the reference point.

The amount of greenhouse gas attributable to a building is directly related to the types of fuel used to heat, cool, and power the

building. The factors that contribute to a building's carbon generation due to energy use include: 1) The type of fuel(s) used to provide the building's electricity, (e.g., coal, natural gas, nuclear, and/or renewable energy); and 2) How much of a fuel source's total energy potential is actually used by the building for heating, cooling, and electricity.

Reducing the carbon emissions associated with buildings can be achieved in several ways. First, using lower carbon fuels at the power plant, (e.g., switching from coal to natural gas) reduces the overall carbon generated by electricity production across the grid.

Second, selecting building equipment (furnaces, boilers, etc.) based on energy efficiency and fuel source impacts carbon emissions from building operations. For example, buildings that heat and/or cool using natural gas generate fewer carbon emissions than buildings heating and cooling with electricity. Also, renewable systems, such as **solar photovoltaic arrays and solar hot water systems** generate carbon-free electricity and hot water onsite.

Finally, generating power specifically for a building onsite with a combined heat and power (CHP) system nearly eliminates transmission losses and allows the use of residual heat for building heating and cooling. This can be established on an individual building basis or on a broader community basis by developing a local district energy system. CHP and district energy systems can operate using lower carbon fuels (e.g., use of biomass and solar thermal energy in the St. Paul (MN) district energy system) thus reducing carbon emissions further.

Renewable Energy

Goal 3 (G3): Increase locally generated energy supply through the use of renewable energy options

Policy 1 (P3.1): Become a solar leader with installation and use of 160 megawatts (MW) of solar electricity by 2050.

Policy 2 (P3.2): Increase the use of renewable energy technologies in the public, private, and non-profit sectors.

The use of renewable energy, particularly solar photovoltaics (solar electricity) and solar water heating (solar thermal) can reduce operating costs for businesses and homes. Solar energy contributes zero greenhouse gas emissions. In addition, since solar photovoltaics (PV) generate electricity largely coincident with summer cooling demands, the use of solar PV helps reduce the summer peak demand for electricity.

Many technology options could lead to shaving peak electric demand, such as thermal energy storage and solar PV. In addition to horizontal rooftop systems, solar PV can also reduce peak electric demand when mounted on vertical south- and west-facing facades. At today's PV panel efficiencies, generating 160 MW would require about 14 million square feet of surface area; however, solar panel efficiencies are improving rapidly and the surface area needed for this target will likely be smaller. Arlington's buildings

provide ample opportunities for mounting solar PV in a variety of configurations, both horizontal and vertical.

For sense of scale of power output, according to Dominion Virginia Power, the 'average' residential customer has a peak demand of about 4 kW. Therefore, 160 MW is equivalent to the peak power needs of about 40,000 households. However, much of the solar PV installations are likely to be on larger, multistory buildings, where large roof and wall surfaces are available and unobstructed by trees and other shading.

In addition, the County could provide zoning incentives to support the use of various renewable energy technologies, including solar thermal water and space heating systems, and increased use of daylighting in architecture. Small-scale wind power generation is generally not effective in Arlington, but advances in technology may make that more feasible, and the County may help remove barriers.



**City of Cleveland Heights
Strategic Development Plan 2011
June 3, 2011**



CLEVELAND
HEIGHTS

CLEVELAND HEIGHTS STRATEGIC DEVELOPMENT PLAN 2011

INTRODUCTION

The Strategic Development Plan 2011 has been prepared as a guide for action for the Planning Commission, Administration, City Council and all who invest and develop in Cleveland Heights.

Since the 1993 Strategic Development Plan, the City has seen investment in new housing and commercial development at an impressive pace. Over \$300 million of private investment has occurred. Both a summary and detailed description of development activities since 1993 are **included in the appendices. Many of the 1993 goals remain critical to the City's prosperity.**

It will be essential to continue to maintain, upgrade and promote our unique housing stock, to invest in our stable commercial districts, to retain and attract persons of diverse economic, racial and religious backgrounds, to support the arts, and to provide diverse recreational activities. A summary of existing conditions is included in the first part of this document.

However, the focus of the Strategic Development Plan 2011 is on goals and strategies to address the most critical challenges now facing our community. Unfortunately, the recent downturn in the economy is making it difficult to obtain financing for large and small development projects. The national financial crisis has dramatically impacted our housing market, resulting in foreclosed properties and a larger number of rental properties. The plan recommends development that provides significant tax revenues to the City. This increased tax revenue will be from new residents as well as redeveloped retail, housing and job creation districts.

This document provides perspective on how best to plan for, encourage and prioritize future development and community initiatives in conjunction with private investments. A strong **public-private investment partnership that facilitates new development will work to augment the city's** tax base and build upon our accomplishments. As a management strategy, the plan is envisioned to:

- Establish goals and tactics;
- **Identify community and development issues;**
- **Prioritize these issues;**
- **Provide a vehicle for progress measurement and process monitoring; and**
- **Establish a time line and initiatives to move the city forward.**

This plan is to be reviewed as needed, annually at a minimum to allow for adjustments due to changing conditions. It is also envisioned as one basis for measuring ongoing economic development activity and planning efforts.

GOAL SEVEN: ENCOURAGE SUSTAINABLE PRACTICES FOR DEVELOPMENT ACTIVITIES INCLUDING ENERGY STRATEGIES, GREEN BUILDING DESIGNS AND DEVELOPMENT PRACTICES (SUCH AS LEED PROGRAMS)

Sustainable new construction and retrofits are necessary for the future of our world. The City should promote and encourage residents to implement strategies which reduce carbon-based pollution and increase energy conservation. The City is taking a leadership position seeking alternative approaches to accomplish its activities with minimal impact on natural resources and the environment. In the coming months, the City will comprehensively revise our Zoning Code to include sustainable practices and discourage unsustainable development. The following would mitigate the undesirable affects of our existing densely developed city and of future development:

Strategies:

- Implement a sustainable Zoning Code that incorporates community standards;
- Develop policies that encourage sustainability, discourage waste, and conserve energy; use the City website, publications, lectures, public access channel, and other effective methods to increase public awareness of successful technologies including:
 - o bioretention basins
 - o geothermal heating and cooling
 - o green roofs
 - o green building materials
 - o green streets
 - o multi-modal streets
 - o native species
 - o permeable pavement
 - o photovoltaic panels
 - o rain barrels
 - o rain gardens
 - o solar power
 - o straw bale construction
 - o wind power
- Support the development of the First Suburbs Development Consortium's "Solar and Geothermal SID," a mechanism for interested households to join a Special Improvement District and assess themselves for the cost of a residential photovoltaic or geothermal installation;
- Require streets and parking lots to be designed to minimize their ecological impact;
- Encourage third-party-certified green construction, like the LEED system;
- Minimize energy consumption at City-owned buildings;
- Encourage permeable paving and bioretention basins in public and private parking lots;
- Promote shared parking so parking lots are used to their fullest extent, fewer buildings are demolished for surface lots, and tax revenues are maximized in a densely developed pattern;
- Encourage new development that combines building preservation and new construction to save embodied energy and improve buildings for 21st century lifestyles;
- Protect and restore natural streams, waterways and landscapes;
- Replace public area lighting with LED products to reduce energy consumption 80%, as economically feasible;
- Develop design guidelines for more ecological public infrastructure work;
- Work to implement the League of American Bicyclists' recommendations to improve cycling in the community and become a designated Bicycle Friendly Community; and
- Develop a policy of incentives that are tied to green energy improvements such as photovoltaic and geothermal as well as LEED certified construction practices and design.

Evanston Climate Action Plan

November 2008



Evanston Climate Action Plan

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Evanston Climate Action Plan

Energy Efficiency and Buildings - Total Potential Greenhouse Gas Emission Reductions	86,788 – 181,044 MTCO₂E
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Renewable Energy Resources

Renewable energy is any form of energy that is naturally replenished. Examples include: wind, solar, geothermal, and hydroelectric. As opposed to fossil fuel-based energy, renewable resources are "clean" and do not produce GHG emissions. Renewable energy could help reduce not only our emissions but also our dependence on fossil fuels. A cornerstone of the ECAP, this set of recommendations could involve all levels of the community, from individual citizens to city government.

Recommended strategies focus on: use of biofuels (E85 ethanol, biodiesel, vegetable oil, methane from landfills, etc); use of wind and solar energy (offshore Lake Michigan wind turbines, solar photovoltaic [electricity producing], solar thermal [water heating device], and zoning changes to encourage use); off-peak thermal storage (esp. for large buildings, store energy for cooling at off-peak electric or gas hours); and converting waste to energy. While these are lofty goals, they are important to investigate for possible use because of their enormous potential for reducing Evanston's overall GHG emissions.

	Recommended Strategy	Potential GHG Reduction	Partners for Implementation
	Reduce emissions related to motor fuel use in commercial and residential applications through the use of bio-fuels.	13,522-29,748 MTCO₂E	
	a) Support efforts to make biodiesel commercially available to residents and businesses.		COE, IL DCEO
	b) Encourage residents to switch from regular gasoline and diesel fuels to bio-fuels if feasible.		COE, IL DCEO
	c) Investigate the feasibility of purchasing bio fuels for use in not only municipal vehicles, but also by Evanston residents and businesses as well.	13,522-29,748 MTCO ₂ E	COE, IL DCEO
★	Continue to reduce emissions related to motor fuel use by City fleet through the use of bio-fuels.	101 MTCO₂E	
	a) Investigate the feasibility of retrofitting fleet vehicle fuel tanks and heating systems to run on waste vegetable oil (WVO).	101 MTCO ₂ E	COE Fleet
★	Reduce emissions related to electric and gas use in buildings through the use of renewable energy.	91,789-128,993 MTCO₂E	
★	a) Investigate the feasibility of offshore wind power generation in Lake Michigan.	43,175-80,379 MTCO ₂ E per 10 turbine	City Council, COE, IL DCEO, US DOE

Evanston Climate Action Plan

		array	
★	b) Encourage residents to consider and install solar thermal panels for hot water heating at their homes.	6,048 MTCO ₂ E (3-panel systems)	COE Community Development
	c) Investigate the feasibility of purchasing solar power through a solar energy service provider as a way to finance solar electricity generation at City facilities.	1,951 MTCO ₂ E	COE Facilities
	d) Encourage businesses and institutions to install solar PV systems as feasible.	40,604 MTCO ₂ E	COE Community Development
	e) Consider the installation of solar thermal panels at City facilities that use large quantities of hot water, such as fire stations.	11 MTCO ₂ E	COE Facilities, IL DCEO, IL CECF
★	f) Address zoning and permitting barriers to the installation of renewable energy applications in the residential and commercial building sectors.		City Council, COE Community Development
	Reduce emissions related to electric and gas use in commercial and municipal buildings through the use of off-peak thermal storage.	1588 MTCO₂E	
	a) Support efforts to utilize peak thermal storage systems, which provide a means for storing thermal energy acquired from electricity purchased at off-peak demand times and from other fuel sources such as waste heat and solar energy, at commercial, institutional and municipal buildings.	1588 MTCO ₂ E	COE Community Development
	Reduce emissions related to electric and gas use in commercial and municipal buildings by converting waste to energy.	1,900 MTCO₂E	
	a) Investigate the feasibility of utilizing a thermal-to-energy (plasma arc gasification) conversion system to provide electricity to multiple buildings in Evanston.	1,900 MTCO ₂ E	COE Public Works
	b) Investigate the feasibility of utilizing a non-thermal (anaerobic digestion) conversion system to provide electricity to multiple buildings in Evanston.		COE Public Works
	Renewable Energy Resources - Total Potential Greenhouse Gas Emission Reductions	108,900-162,330 MTCO₂E	



October 8, 2009

Approach for Reducing Waste-Related Emissions

- 1. Reduce Waste**
Avoid creating waste when possible.
- 2. Reuse and Recycle what you can**
If you have to create waste, use things that can be reused or recycled – and be sure you can actually reuse or recycle.
- 3. Decrease amount of organics going to landfill**
If you have to create organic waste, avoid sending organics to the landfill where organics decompose into methane: a potent global warming gas.

Emissions Reductions Strategies

In Section 5, the CAP presents the nine strategies for reducing emissions in Hayward. Each strategy contains several actions that Hayward can deploy to reduce GHG emissions.

Strategy 1 – Transportation and Land Use: Reduce Vehicle Miles Traveled

The goal of Strategy 1 is to reduce vehicle miles traveled (VMT) by encouraging residents to use alternative modes of transit, by improving the effectiveness of the transportation circulation system, and through land-use and zoning mechanisms. In the context of this report, alternative mode of transit means any mode that is not driving alone. This could include walking, biking, carpooling, or riding public transit.

Strategy 2 – Transportation: Decrease the Carbon-Intensity of Vehicles

The goal of Strategy 2 is to decrease GHG emissions from motor vehicles by reducing the carbon-intensity, or emissions per mile traveled, of vehicles driven on Hayward’s roads. The Strategy targets all vehicles traveling in Hayward, including private, commercial, and City-owned vehicles.

Strategy 3 – Energy: Improve Energy Performance of Existing Buildings

The goal of Strategy 3 is to reduce GHG emissions associated with energy consumed in existing buildings through education programs, regulations, and incentives that aim to reduce electricity and natural gas use.

Strategy 4 – Energy: Improve Energy Performance of New Buildings

The goal of Strategy 4 is to minimize GHG emissions associated with energy consumed in new buildings by setting minimum energy and environmental performance standards for all newly constructed buildings.

Strategy 5 – Energy: Use Renewable Energy

The goal of Strategy 5 is to reduce GHG emissions associated with electricity use by increasing the amount of electricity supplied by renewable sources.

Strategy 6 – Solid Waste: Increase Waste Reduction and Recycling

The goal of Strategy 6 is to reduce GHG emissions associated with the disposal of solid waste. This will be achieved by continuing to implement waste reduction and recycling programs.

Strategy 7 – Sequester Carbon

The goal of Strategy 7 is to encourage activities, such as planting trees, which will maximize the amount of carbon sequestration taking place in the City.

Strategy 8 – Climate Change Adaptation

This Strategy will eventually address ways for Hayward to adapt to the rising sea level. The three member agencies of the Hayward Area Shoreline Planning Agency (City of Hayward, Hayward Area Recreation and Park District, and the East Bay Regional Park District) have contracted with a consultant to prepare a Sea Level Rise Study. The study will evaluate the potential impacts of sea level rise on the Hayward shoreline and the feasibility of making improvements to prevent or mitigate potential flooding. At the time of this writing, the study was not yet available. Staff expects to include a summary of the study in a future version of the CAP.

Strategy 9 – Engage and Educate Community

Hayward’s residents and businesses will have to play an active role in reducing emissions. Strategy 9 focuses on specific actions Hayward plans on using to engage residents and businesses in the necessary and vital effort to reduce community-wide emissions.

Community-wide Actions - in order of priority

Table 1: Proposed actions for reducing community-wide emissions: listed in order of priority

Action Number	Short Description	Estimated Annual Emissions Reductions (metric tons CO2e)		Priority
		2020	2050	
Community-wide Actions - potential emissions reductions calculated and City has direct control over implementation				
Action 3.9	offer energy efficiency financing program for commercial buildings	1,630	132,025	1
Action 3.3	develop and implement Commercial Energy Conservation Ordinance	5,164	105,152	2
Action 3.7	energy efficiency financing program for single-family homes	181	40,248	3
Action 3.8	offer energy efficiency financing program for multiple-family homes	126	33,617	4
Action 5.2	offer renewable energy financing program for commercial buildings	10,768	22,822	5
Action 6.3	improve construction and demolition debris program	1,953	15,634	6
Action 4.2	continue to implement private development green building ordinance for commercial buildings	4,493	77,925	7
Action 5.3	add solar requirement into private development green building ordinance	2,980	24,660	8
Action 4.1	continue to implement private development green building ordinance for residential buildings	979	18,836	9
Action 1.8	prioritize traffic-flow management practices to reduce idling time	23,061	21,875	10
Action 3.1	develop and implement Residential Energy Conservation Ordinance for single-family homes	639	39,304	11
Action 3.2	develop and implement Residential Energy Conservation Ordinance for multiple-family homes	983	33,033	12
Action 6.2	increase participation in food-scraps collection programs	1,495	11,963	13
Action 6.1	increase participation in recycling programs	15,916	38,216	14
Action 5.1	offer renewable energy financing program for residential buildings	850	2,149	15
Action 1.4	expand public transit services to encourage reductions in vehicle travel	3,062	15,199	16
Action 5.4	increase portion of electricity provided by renewable energy		30,779	17
Action 1.2	assist businesses in establishing car share / bike-share programs	416	7,283	18
Action 6.6	encourage waste reduction and promote recycling participation at multi-family properties	253	304	19
Action 7.1	maximize carbon sequestration within City		284	20
Action 1.1	assist businesses in providing commuter benefits programs	2,286	8,106	21
Action 1.5	continue to implement bike master-plan	2,419	7,610	22
Action 1.3	update parking policies to encourage reduction in vehicle travel		9,471	23
Action 1.6	develop and implement pedestrian master-plan	1,394	7,121	24
Action 6.4	ban certain materials from landfills	2,487	2,986	25
Community-wide Actions - potential emissions reductions not calculated, or City does not have direct control over implementation				
Action 3.4	actively participate in low-income weatherization programs	emissions reductions not quantified		1
Action 2.2	collaborate the state and federal government on policies that promote low-carbon vehicles and low-carbon fuels	129,060	532,735	2
Action 2.1	provide incentives for low-carbon vehicles and low-carbon fuels	129,060	532,735	3
Action 1.10	align zoning policies to minimize vehicle travel	emissions reductions not quantified		4
Action 3.5	promote a voluntary commitment for businesses and residents to reduce energy consumption	emissions reductions not quantified		5
Action 6.7	prefer waste management strategies that maximize the useful value of waste streams	emissions reductions not quantified		6
Action 6.5	require residents / businesses to participate in recycling programs	emissions reductions not quantified		7
Action 1.11	increase availability of affordable housing for people employed in Hayward	emissions reductions not quantified		8
Action 9.1	create green-portal website	emissions reductions not quantified		9
Action 9.2	develop and implement plan to engage residents in emissions reductions activities	emissions reductions not quantified		10
Action 9.3	develop and implement plan to engage businesses in emissions reductions activities	emissions reductions not quantified		11
Action 3.6	promote use of home energy monitors	emissions reductions not quantified		12
Action 1.7	update the Circulation Element of the General Plan to evaluate expansions of appropriate modes of transit	emissions reductions not quantified		13
Action 1.9	encourage high density, mixed-use, smart-growth development in areas near public transit stations	emissions reductions not quantified		14
Action 1.12	incentivize filling local jobs with local residents	emissions reductions not quantified		15
Action 8.1	<i>Place holder - no actions defined for climate change adaptation</i>	not evaluated		--

Note: Emissions reductions were not estimated for several actions due to their overlapping effects with other actions and to prevent double-counting

Municipal Actions - listed in order of priority

Table 2: Proposed Actions for reducing municipal emissions: listed in order of priority

Action Number	Short Description	Estimated Annual Emissions Reductions (metric tons CO ₂ e)		Priority
		2020	2050	
Municipal Actions - potential emissions reductions calculated and City has direct control over implementation				
Action 3.10	upgrade streetlights to LEDs	969	1054	1
Action 2.3	procure fuel-efficient and low-carbon fuel vehicles for municipal fleet	54	108	2
Action 3.12	audit city buildings and identify energy savings opportunities	330	1542	3
Action 3.11	prepare and implement energy conservation plan for municipal buildings	330	1542	4
Action 2.4	negotiate alternative-fuel and fuel economy requirements into new contracts and franchise agreements	54	108	5
Action 6.9	implement food scraps collection programs in city buildings	73	163	6
Action 5.5	audit city buildings and identify buildings best-suited for solar	76	2227	7
Action 5.6	install renewable generation on municipal property	76	2227	8
Action 4.3	continue to implement municipal green building ordinance	47	328	9
Action 7.2	maximize carbon sequestration on municipal property	5	32	10
Action 6.8	implement recycling programs in city buildings	27	28	11
Municipal Actions - potential emissions reductions not calculated, or City does not have direct control over implementation				
Action 1.13	provide commuter benefits to government employees	emissions reductions not quantified		1
Action 1.15	prefer facilities with convenient access to public transit	emissions reductions not quantified		2
Action 9.4	offer climate education programs to City employees	emissions reductions not quantified		3
Action 4.4	ensure new city buildings are built with photovoltaics and solar hot-water whenever possible	emissions reductions not quantified		4
Action 9.6	when awarding contracts, request applicants provide information about sustainability practices	emissions reductions not quantified		5
Action 9.5	demonstrate leadership by setting municipal reduction targets. Work to achieve these targets	emissions reductions not quantified		6
Action 6.10	develop environmentally friendly purchasing program	emissions reductions not quantified		7
Action 1.14	develop car-share and/or bike-share program for city employees	emissions reductions not quantified		8
Action 8.2	<i>Place holder - no actions defined for climate change adaptation</i>	emissions reductions not quantified		9

Note: Emissions reductions were not estimated for several actions due to their overlapping effects with other actions and to prevent double-counting

Approach for Reducing Transportation-Related Emissions

1. **Reduce Vehicle Miles Traveled**
When you don't have to drive, don't drive
2. **Improve Fuel Efficiency of Vehicles**
If you have to drive, drive in a vehicle that does not emit a lot of greenhouse gases.

Reducing Energy-related Emissions from Buildings

Review of energy-related emissions sources

In light of California's stringent building energy efficiency policies, it is not surprising that per capita energy consumption in both the County of Alameda and the City of Hayward are significantly lower than the U.S. average level. In 2005, Hayward's per capita electricity consumption is 6.31 MWh/person whereas the U.S. average was 12.4 MWh/person (see Figure 18 and 19). This statistic indicates that Hayward has effectively slowed the growth of per capita energy consumption as compared to the rest of the United States.

The State of California has been committed to energy efficiency since the mid 1970s when legislation passed in response to the 1973 oil embargo. In the past 30 years California has set aggressive energy efficiency standards and has strictly enforced these standards.⁴¹ As a result, California has enjoyed about 9 gigawatts of electricity savings. This amount of savings is equivalent to preventing the construction of eighteen average-sized power plants. Figure 19 illustrates that California's per capita electricity consumption has remained relatively constant since the mid 1970s while the US average per capita electricity consumption has continued to increase. In addition to saving electricity, efficiency standards have also minimized the amount of natural gas consumed in the state.

Greenhouse gas emissions reductions for electricity can be achieved in two ways: by reducing the total electricity used, and by reducing the carbon intensity of the electricity sources. As the per capita electricity use in California is significantly lower than the rest of the country, similarly, the average carbon intensity of the electricity resource mix in California (604 lbs/MWh in 2006)⁴² is also significantly lower than that of the rest of the country (1334 lbs/MWh in 2006⁴³). This is partly due to the aggressive Renewable Portfolio Standard that was adopted by the state in 2002, and amended in 2003 and 2006, which requires that 20 percent of retail electricity sales shall be served with eligible renewable energy resources by 2010. Governor Schwarzenegger has set a longer-term state goal of 33 percent by 2020, and currently the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC) are considering ways to achieve that goal. Eligible renewable resources include solar thermal electric, photovoltaics, landfill gas, wind, biomass, geothermal electric, municipal solid waste, anaerobic digestion, small hydroelectric, tidal energy, wave energy, ocean thermal, biodiesel, and fuel cells using renewable fuels.

⁴¹ The California's Appliance Efficiency Program (Title 20) was established in 1976 and the California's Energy Efficiency Standards for Residential and Nonresidential Buildings (Title 24 Standards) were established in 1978. www.energy.ca.gov

⁴² http://www.eia.doe.gov/cneaf/electricity/st_profiles/sep2006.pdf

CA net generation 2006 = 216,798,688

CO₂ = 59,389 thousand MTCO₂

⁴³ http://www.eia.doe.gov/cneaf/electricity/st_profiles/sep2006.pdf

US net generation 2006 = 4,064,702,227 MWh

CO₂ = 2,459,800 thousand MTCO₂

The definitions of eligibility for many of these resources (especially landfill gas, biomass, municipal solid waste, anaerobic digestion, small hydroelectric, biodiesel, fuel cells, and renewable fuels) are subject to clear restrictions, for greenhouse gas emissions accounting purposes. See the CEC RPS Eligibility Guidebook for more information⁴⁴. Renewable electricity is considered to produce net zero greenhouse gas emissions, so all state progress towards the RPS target will continue to reduce the carbon intensity of electricity. This will contribute to reducing the carbon intensity of electricity in Hayward as well.

The majority of electricity and natural gas consumed in Hayward is used for space heating and cooking. Pumping water is also a major electricity user; reducing the use of water therefore also saves energy. Many homes in Hayward are now more than 20 years old and thus are equipped with older less efficient fixtures and appliances. The Pacific Institute estimates that while great progress has been made in California, “Indoor residential use could be reduced by approximately another 40%... by replacing remaining inefficient toilets, washing machines, showerheads, and dishwashers, and by reducing the level of leaks, even without improvements in technology.”⁴⁵

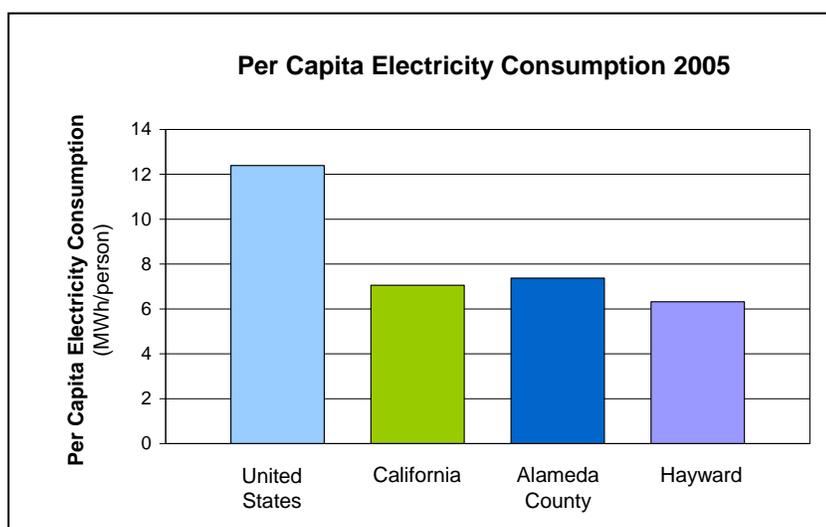


Figure 18: Per capita electricity consumption in 2005

Sources: (1) EIA. Electric Power Annual with data for 2006. Current and Historical Monthly Retail Sales, Revenues, and Average Retail Price by state and by Sector (Form EIA-826). Released 2007. (2) U.S. Census Bureau, Population Division, Interim state Population Projections, 2005. Internet Released 2005. (3) U.S. Census Bureau. California Population of Counties by Decennial Census: 1900 to 1990. Released 1995.(4) California Energy Commission. Electricity Consumption by County. 2006. <http://ecdms.energy.ca.gov/elecbycounty.asp> (5) Association of Bay Area Governments. Projections 2007: Forecasts for the San Francisco Bay Area to the Year 2035. (6) ICLEI. Hayward Baseline Emissions Inventory. 2005.

⁴⁴ <http://www.energy.ca.gov/2007publications/CEC-300-2007-006/CEC-300-2007-006-ED3-CMF.PDF>

⁴⁵ Pacific Institute for Studies in Development, Environment, and Security, “Waste Not, Want Not: The Potential for Urban Water Conservation in California.” November 2003

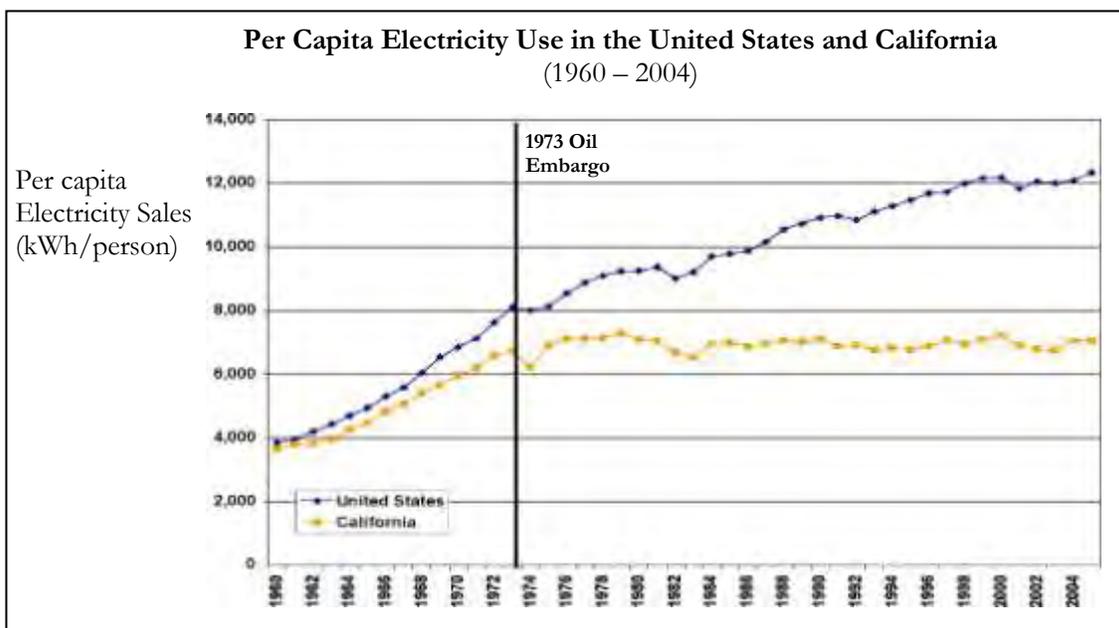


Figure 19: Per capita electricity use in United States and California

Source: California Energy Commission. 2007 Integrated Energy Policy Report. December 5, 2007. Publication # CEC-100-2007-008-CMF.2005c

Approach for reducing energy-related emissions

There are several steps to reducing emissions resulting from energy used in buildings. The cost-effectiveness of different emissions reduction strategies have been quantified in many historical state-sponsored technical studies. Since 2003, California's energy policy has recognized a *loading order*⁴⁶ as the preferred sequence for meeting growing electricity needs. The loading order specifies that the first resources that should be added are energy efficiency and demand response; next would be renewable energy and distributed generation; and third, clean fossil-fueled sources and infrastructure improvement. This strategy helps to reduce CO₂ emissions and diversify sources of energy supply.⁴⁷

Energy Efficiency

Energy efficiency is the least expensive strategy for meeting climate goals. Energy should be conserved by minimizing the amount of unnecessary energy consumption. For example, the energy used to heat homes will be used more efficiently if weather-stripping is added to drafty windows to prevent leakage of warm air before heating the room. Next, when consuming energy for necessary functions, energy should be used as efficiently as possible, for example through the use of more efficient lighting fixtures.

Renewable Energy

Renewable resources are essential for meeting greenhouse gas emissions reduction goals, especially for the emissions from energy use that cannot be avoided through other efficiency measures. Over the last three decades, the state has built one of the largest and most diverse renewable generation portfolios in the world. Currently, about 11 percent of the state's electricity is from renewable energy sources such as

⁴⁶ The loading order, adopted as the state's energy policy, is the accepted protocol that describes the priority sequence for actions to address increasing energy needs.

⁴⁷ CEC Integrated Energy Policy Report 2007. <http://www.energy.ca.gov/2007publications/CEC-100-2007-008/CEC-100-2007-008-CMF-ES.PDF>

solar, wind, geothermal, and biomass. Renewable energy can be used to meet on-site energy needs – for example, solar arrays and wind turbines can be installed on building sites. Electricity from such renewable sources produces no greenhouse gas emissions, whereas in 2005, the emission factor of electricity from the local utility was 429 pounds of CO_{2e} per MWh.⁴⁸ On-site renewable electricity can provide the deep emissions cuts for energy use that cannot be avoided with traditional efficiency measures.

If it is not possible to produce electricity on-site, the next approach is to produce renewable electricity off-site. Because the City may own some sites with high renewable energy potential, but low energy demand, and some other sites with high energy demand, but low renewable energy potential, it may be attractive to install remote renewable energy facilities on resource-rich sites. California AB 2466, which was signed into law in September 2008 and became effective in January 1009, allows local governments to produce up to 1 MW of renewable energy on one site within its geographic boundaries and generate offsets that can be used to credit one or more electricity meters within the same geographic boundary. This legislation gives local governments some flexibility in how they can meet renewable generation goals.

The City can also add its voice to efforts to increase the amount of renewable energy supplied by the local utility. California has set a State-wide goal of having 33 percent of electricity generated from renewable sources by 2020.⁴⁹ It is not yet clear whether the utilities will reach this state-mandated renewable energy target by 2020. While the utilities' progress toward their state goal is out of the City's control, there are still actions that can be taken on a local scale to ensure real local progress. Whether or not the utilities reach their state-mandated renewable procurement target, the City can set its own independent target, for generating a certain fraction of municipal or City-wide building energy use from local renewable energy sources such as on-site solar and wind, within the same time frame. This helps mitigate the risk of not achieving the state's renewable energy goals, because if the utilities do not meet their target, at least the local target was reached, and if the utilities succeed in meeting their target, local generation will compound the success. This strategy also sets an example for the state, demonstrating that it is possible to make significant steps towards 100 percent renewable electricity generation, and would pre-empt any state-level arguments that may be made to the contrary.

Water Conservation and Energy Savings

In 2005, Hayward used 8.5 GWh of electricity and 29,000 therms of natural gas to pump water, maintain consistent water supply, and to treat water. This does not include energy used to heat water in Hayward's buildings. If Hayward reduces the amount of water it uses, the energy requirements associated with water use will decrease. This energy savings will also translate to emissions savings. For the purpose of this plan, the City grouped water conservation with energy conservation. It is assumed that the energy conservation goals established in this Plan will be achieved, in part, by conserving water.

Water-related emissions are a larger portion of the Municipal GHG footprint: The City's water and wastewater systems contribute 21 percent of the municipal GHG production. With the exception of the waste management fleet, water-related emissions are the largest contributor to the Municipal footprint. In addition, there may be additional indirect GHG impacts due to chemical usage and biosolids disposal. Based on audit results of over one hundred water and wastewater systems, 10-20 percent savings in energy and chemicals can be achieved by thoroughly optimizing processes. The City could also realize

⁴⁸ ICLEI. Hayward Baseline Emissions Inventory.

⁴⁹ Governor Arnold Schwarzenegger signed Executive Order S-14-08 on November 11, 2008. The executive order aims to streamline California's renewable energy project approval process and increase the state's Renewable Energy Standard to 33 percent renewable power by 2020.

benefits of cost savings. The water and wastewater systems represent 38 percent of the City's energy costs and are by far the largest single energy sub sector of the municipal system.

Approach for Reducing Energy-Related Emissions

1. **Conserve Energy**
When you don't need the energy, don't use it
2. **Increase Energy Efficiency**
When you do need energy – use it efficiently.
3. **Use On-site Renewable Energy**
Use energy generated from low-emissions or no-emissions sources like solar, wind, or geothermal, that are attached to the building (on-site).
4. **Use Off-site Renewable Energy**
When you can't produce needed energy on-site, produce low-or no-emissions energy elsewhere (off-site).

Reducing Solid Waste-Related Emissions

Review of solid-waste-related emissions sources

Hayward has responded to the mounting pressure to extend the useful life of local landfills by implementing a variety of recycling programs available to residents and businesses. Hayward has committed to reducing waste sent to the landfill by 75 percent and has deployed a number of strategies toward this goal. Hayward's diversion rates have increased from 41 percent in 1995 to 65 percent in 2006 (see Figure 20). Recycling programs significantly reduce the transportation costs and the energy required to manufacture products made of recycled content, rather than manufacturing and shipping products made only of virgin materials. In general, manufacturing products made of recycled materials require less energy than extracting and processing raw materials, such as the savings realized when recycling aluminum cans. Composting programs reduce the amount of organic material in the landfill and thereby help reduce methane production in the landfill. Methane is a greenhouse gas that is 21 times more potent than carbon dioxide in its ability to cause warming. Although landfills attempt to capture methane, much of the methane generated in landfills finds its way into the atmosphere. Programs that divert organic materials from the landfill also reduce GHG emissions from the landfill because the amount of methane generated in a landfill is proportional to the amount of organic material deposited in the landfill.

Methodologies for quantifying solid-waste-related emissions from the waste sector are not well refined. ICLEP's methodology calculates emissions from methane that is created when organic materials break down in landfills, but the standard methodology does not account for emissions, and potential emissions savings, that occur upstream from the landfill.⁵⁰ For example, aluminum does not create any methane when it decomposes in the landfill, so there are no emissions associated with disposing of the can in the landfill. However, less energy is required to manufacture a can made out of recycled aluminum rather than virgin aluminum. Thus, the emissions benefit of recycling the can is linked to materials production, but these benefits are not accounted for in current emissions quantification methodologies. Better

⁵⁰ EPA has studied the impacts of landfilling versus recycling, composting and source reduction, but these emissions and emissions savings have not been incorporated into ICLEP's calculation methods yet. The source for EPA's study is: EPA. Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks. Third edition. 2006.

Strategy 5: Energy: Use Renewable Energy

Goal

The goal of Strategy 5 is to reduce GHG emissions associated with electricity use by increasing the amount of electricity being supplied from renewable sources. The long-term goal is to achieve 100 percent of renewable energy generation by 2050. This means that all electricity consumed in Hayward would be generated from renewable sources. Renewable energy would not only help reduce emissions from electricity, but by transitioning natural gas appliances to electricity, it would also help offset emissions from natural gas.

Ease of implementation

Renewable energy economics

The most significant barrier to implementing Strategy 5 actions is cost. Although the cost of renewable energy technologies have historically continued to decrease over time, and current federal and state incentive programs have helped improve the cost-effectiveness of renewable energy, the levelized cost of energy from solar is still typically higher than average retail electricity rates. Placing a price on carbon emissions will help make renewable energy more cost competitive. At the time of writing, the country is beginning a debate on what federal-level carbon legislation will be most effective at reducing emissions. The discussion tends to focus on whether a cap-and-trade system or a carbon tax will be a more effective policy.^{86, 87} Regardless of what policy makes it through the house and senate (cap-and-trade, carbon tax, or something different), it is critical that carbon is assigned a monetary value. Further, the value of carbon needs to be set high enough so citizens and businesses make a concerted effort to reduce emissions. When the true value of carbon is realized, renewable energy projects will be cost competitive without state and federal incentive programs. It is recommended that the City of Hayward advocate for a federal carbon policy that aims to help citizens and businesses realize the true value of carbon.

In the absence of a mechanism to value carbon, federal and state incentive programs help address the economic barriers to renewable energy implementation, these incentives have been subject to cycles of expiration and renewal. These cycles have historically caused boom-and-bust cycles in the renewable energy industries. At the time of this writing, state and federal incentive programs are in full swing, so it is an optimal time for the City to implement its own local incentive programs because the overall effectiveness of City programs could be enhanced by combination with the existing state and federal programs. City financing can improve the economic feasibility of renewable energy far more when combined with federal and state incentives, than if the City program was implemented alone without federal and state incentives. At the time the CAP was written, federal tax credits for residential solar were expected to expire in 2016, the same year state-sponsored rebates for solar were expected to expire.^{88, 89} The frequent expiration and renewal, and start-and-stop cycles of federal and state programs have created boom-and-bust cycles for the renewable energy industries. City programs should be designed to avoid such pitfalls.

⁸⁶ Yale Environmental 360. *Putting a Price on Carbon: An Emissions Cap or A Tax?*. May 7, 2009. <http://e360.yale.edu/content/feature.msp?id=2148>

⁸⁷ Thomas Friedman. *Show us the Ball*. New York Times Opposition and Editorial. April 8, 2009. Page A25 of New York edition. http://www.nytimes.com/2009/04/08/opinion/08friedman.html?_r=2

⁸⁸ The Emergency Economic Stabilization Act of 2008 extended the federal tax credit for residential solar PV to 2016.

⁸⁹ California Solar Initiative. State Wide Trigger Point Tracker. www.csi-trigger.com

Achieving 100 percent renewable energy

To meet its 2050 target, most electricity in Hayward will have to be procured from renewable sources. The City has several options for achieving 100 percent, or near 100 percent, renewable electricity. These options include: using community choice aggregation (CCA) to procure renewable energy for resale to businesses and residents, creating a community-owned utility, advocating for more stringent state-wide renewable portfolio standards (RPS) so that electricity from conventional utilities may contribute toward Hayward's goals, and installing renewable energy on all viable city-owned sites, to power municipal agencies. Any of these programs can be implemented in conjunction with a solar financing program.

Community Choice Aggregation

The CCA program was established by the California legislature in 2002 (AB 117) to give cities and counties the authority to procure electricity in bulk for resale to customers within their jurisdictional boundaries. Unlike traditional utility services, the administrator of the CCA would determine the source of electric supply and the price of electricity generation services. The utility company would still provide electricity delivery services to the end-use customer, and the utility would continue to read the electric meters and issue monthly bills to customers enrolled in the CCA program. Customers would have the choice of being automatically enrolled in the CCA program following a notification process or opting out of the CCA program and keeping regular utility services.⁹⁰ The Sustainability Committee considered CCAs at its April and May meetings and decided to monitor progress on the development of CCAs in other jurisdictions, but not to take steps to further study a CCA for Hayward at this time.⁹¹ For more information, see the Committee staff reports on CCAs available at www.hayward-ca.gov/citygov/meetings/csc/ccsc.shtm.

Community-Owned Utility

Hayward has the option of creating a city-owned electricity and natural gas utility. The community-owned utility model empowers communities to have more control over the source from which electricity is generated than it has when purchasing electricity from a private utility such as PG&E. There are over 2,000 community-owned utilities in the United States, so Hayward would have a well established model to follow. The American Public Power Association is a service organization for American public utilities and could be a valuable resource if Hayward chooses to switch to a community-owned utility.⁹² The City of Palo Alto could also serve as a model for Hayward. Palo Alto has increased the amount of renewable energy supply by purchasing electricity from wind, solar, landfill gas, and hydroelectric projects. Palo Alto has helped fund its renewable energy procurements by offering a program, PaloAltoGreen, in which rate payers have an option of paying a higher rate for renewable energy. Palo Alto still relies on Western Area Power Administration, which is not as aggressive at producing electricity from renewable sources, to supply the deficit of electricity that Palo Alto's community-owned utility cannot currently supply from its own renewable projects.^{93, 94}

Advocating for a State or Federal RPS of 100% by 2050

A more stringent statewide renewable portfolio standard (RPS), or a federal RPS, could contribute to Hayward's progress toward its local renewable energy targets. Currently the statewide RPS is set at 33

⁹⁰ <http://www.communitychoice.info/>

⁹¹ For more information, see the Committee staff reports on CCAs available at <http://www.hayward-ca.gov/citygov/meetings/csc/ccsc.shtm>.

⁹² American Public Power Association. <http://www.appanet.org>

⁹³ City of Palo Alto Utility. <http://www.cityofpaloalto.org/depts/utl/default.asp>

⁹⁴ <http://www.City.palo-alto.ca.us/depts/utl/default.asp>

percent renewable generation by 2020. If the state increased the RPS to 100 percent renewable generation by 2050, Hayward could meet its own goal of 100 percent renewable generation without altering its current method of purchasing electricity from PG&E. A federal RPS would have the same effect. In addition to setting long-term RPS goal, it is critical that the state or federal government work with utilities to accomplish the goals. Utilities will face a substantial challenge in achieving aggressive RPS goals, and these utilities may need support, both legislative and financial, to meet the RPS goals.

Because the costs associated with advocating for aggressive state-level or federal RPS standards are relatively low, the CAP recommends that Hayward continue to advocate for more aggressive RPS goals.⁹⁵ However, the City should not rely upon the state to adopt a target this stringent, as the political feasibility of such a strong target is greater at the local than the state level. The City should work towards its local renewable energy target independently and in parallel with state-level efforts. The City's progress and leadership actions may serve as a demonstration to the rest of the state.

Renewable Energy Municipal Financing Program

The City should identify the financing method that is best-suited for Hayward's social, political, and economic needs. There are a number of ways to develop a renewable energy financing program, but if the program is not specifically tailored to Hayward's residents, the financing program will not be effective. One program the City may consider is a program like CityFIRST, which allows property owners to install renewable energy systems or make energy efficiency upgrades with no upfront cost then pay back the capital cost through property taxes.⁹⁶ The financing program should aim to provide funding for a number of renewable energy technologies including solar water heating, solar electricity generation, and wind energy. The City may consider requiring efficiency improvements as a pre-requisite for building owners to qualify for solar financing. Generally speaking, renewable energy tends to generate more public appeal than energy efficiency, so if Hayward can leverage the appeal of renewable energy to encourage simultaneous investments in efficiency, it will result in even larger emissions reductions.

Political Feasibility of Recommended Strategies

The City is currently exploring the possibility of participating in a regional or state-wide program such as the one being established by the California Statewide Communities Development Authority (or California Communities®) which is a joint powers authority sponsored by the California State Association of Counties and the League of California Cities and whose mission is to provide local governments and private entities access to low-cost, tax-exempt financing for projects that provide a tangible public benefit, contribute to social and economic growth and improve the overall quality of life in local communities throughout California.⁹⁷ Another program of interest is the Renewable Fund, which offers a turnkey administration and financing package for renewable energy.⁹⁸ The American Reinvestment and Recovery Act of 2009 authorized the allocation of \$2.5 billion of Qualified Energy Conservation Bonds, zero interest bonds that may be used to issue loans or grants for capital improvements that reduce energy use and where capital costs are recouped over time. Hayward may

⁹⁵ Renewable Portfolio Standards require a specified percentage of electricity generated from renewable sources such as solar, wind, and geothermal.

⁹⁶ CityFIRST is the program Berkeley is using to finance renewable energy. CityFIRST is administered by Renewable Fund. www.renewfund.com.

⁹⁷ California Statewide Communities Development Authority. www.cacommunities.org

⁹⁸ Renewable Fund. www.renewfund.com

consider the using Qualified Energy Conservation Bonds as part of its renewable energy and energy efficiency financing package.

When the City Council Sustainability Committee discussed a solar financing program in December 2008, the group enthusiastically endorsed moving forward with a financing program. Council discussed solar financing programs in a work session in February. The Sustainability Committee's support is an indication that Strategy 5 has political support, and this will facilitate implementation.

Estimated GHG Emissions Reductions

If program goals are achieved, it is estimated that Strategy 5 actions will result in an annual emissions savings of approximately 14,598 metric tons CO₂e/year in 2020 and 80,409 metric tons CO₂e/year in 2050, as measured from BAU projections. It is estimated that emissions savings from Strategy 5 will contribute 9.4% percent of the emissions reductions needed to meet the 2020 target and 7.5 percent of the emissions reductions needed to meet the 2050 target. Estimated annual emissions reductions from specific actions are presented in Appendix B.

Costs and Additional Benefits

Cost

The cost of installing renewable energy systems would be met through the proposed renewable energy financing program.

The cost of advocating for state and federal programs and policies that will increase the amount of renewable energy utilities use to generate electricity as well as the cost of investigating other options for increasing the percentage of renewable electricity provided through the grid would be borne by the City.

To achieve the level of participation on the part of businesses and residents in the renewable energy financing program that is necessary to meet aggressive emissions reductions goals, the City will have to support the cost of ongoing outreach, education, and marketing.

Additional Benefits

Installing more renewable energy will increase the demand for local solar panel vendors and installers. This may result in significant job creation for the City. Renewable electricity also displaces electricity from conventional fossil fuel generation, thereby reducing emissions of criteria pollutants such as NO_x (which causes urban smog), SO_x (which causes acid rain) and particulate matter or soot (which is a carcinogen), in addition to reducing greenhouse gas emissions.

Strategy 5 Actions

Community-wide actions

- Action 5.1 Develop a program for the financing and installation of renewable energy systems on residential buildings including single and multiple family residential buildings and mobile homes.

- Action 5.2 Develop a program for the financing and installation of renewable energy systems on commercial buildings.

- Action 5.3 Incorporate a renewable energy requirement into Private Development Green Building Ordinance and the Residential and Commercial Energy Conservation Ordinances.

- Action 5.4 Increase the renewable portion of utility electricity generation by advocating for increased state-wide renewable portfolio standards; and consider participating in community choice aggregation, or other means.

Municipal Actions

- Action 5.5 Conduct a city-wide renewable energy assessment to estimate the total renewable energy potential and costs and benefits of developing that potential within City bounds. Develop a plan for capturing all cost-effective opportunities.

- Action 5.6 Ensure that all new City owned facilities are built with renewable energy (i.e. PV and/or solar hot water) systems as appropriate to their functions.

Summary Table

Table 7: Strategy 5 – Energy: Use Renewable Energy

Action #	Description	Notes on implementation	Model Programs & References	Notes on Cost and Benefits
Community-wide Actions				
Action 5.1	Develop a program for the financing and installation of renewable energy systems on residential buildings including single and multiple family residential buildings and mobile homes.	<ul style="list-style-type: none"> Model financing methods exist, though many of the programs have been developed for large communities. Citizens are eager to develop a solar financing program: in drafting the CAP, there were many requests to incorporate a solar financing program. State and federal financial incentives are available right now. Hayward should take advantage of these incentive programs now. Financing is a clear barrier that is preventing both businesses and residents from installing solar. The financing program will help address this barrier. The American Reinvestment and Recovery Act (Stimulus Bill) authorized the allocation of \$2.5 billion of Qualified Energy Conservation Bonds, zero interest bonds that may be used to issue loans or grants for capital improvements that reduce energy use and where capital costs are recouped over time. Hayward may consider a program similar to the CityFIRST program that allows property owners to install solar systems and energy efficiency upgrades with no upfront cost. CityFIRST is financed by taxable municipal bonds providing participants with low interest rates, fixed for 20 years. www.renewfund.com 	<ul style="list-style-type: none"> Recommendations from Staff to City of Hayward City Council Sustainability Committee January 7, 2009 Agenda and Report. Proposed Solar and Energy Efficiency Financing for Residential and Commercial, and mandatory Solar for New Residential, Commercial Development; and Industrial Development. http://www.hayward-ca.gov/citygov/meetings/csc/ccsc/2009/CS-C-CSC010709.pdf US DOE Solar America Cities Partnership: www.solaramericacities.energy.gov GoSolar.org: CEC & CPUC sponsored website for solar financing information applicable to California. http://www.gosolarcalifornia.org Database of State Incentives for Renewables and Efficiency (DSIRE) is a comprehensive source of information on state, local, utility, and federal incentives that promote renewable energy and energy efficiency. www.dsireusa.org DOE. <i>Clean Energy Resources Database for Local Governments</i>. http://cfpub.epa.gov/ccird/index.cfm?fuseaction=local_search_js#category_criteria Berkeley FIRST is a solar financing program offered by the City of Berkeley: http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=26580, www.renewfund.com 	<p>Costs</p> <ul style="list-style-type: none"> Cost to City to pay for staff to manage financing programs. Depending on the in-house expertise and budget available at the time, Hayward could hire consultant to help develop program. If there is enough of an investment opportunity for a private company, the City may be able to contract a private company to design, finance, and operate program. Cost to City to pay for staff to maintain, implement, and administer financing program. Cost to City, bank, or private lender to finance seed funding for program. Cost to City for education and outreach associated with program Cost to borrowers to pay interest on loans, though ideally these costs are covered through the financing program. <p>Additional Benefits</p> <ul style="list-style-type: none"> Lenders can make money on interest. Borrowers can gain access to capital. PV installations may create local ‘clean tech’ jobs. May increase value of buildings.
Action 5.2	Develop a program for the financing and installation of renewable energy systems on commercial buildings.			
Action 5.3	Incorporate a renewable energy requirement into Private Development Green Building Ordinance and the Residential and Commercial Energy Conservation Ordinances.	<ul style="list-style-type: none"> This action has huge potential for reducing emissions A number of citizens are excited about Community Choice Aggregation, though this program is relatively new so it would likely require a significant effort to get a program off the ground. State and federal action may result in increased Renewable Portfolio Standards. Hayward should work with other communities to advocate for state and federal action to increase RPS. 	<ul style="list-style-type: none"> Local Government Commission – Community Choice Aggregation Implementation Plan http://www.lgc.org/cca/ CEC Renewable Portfolio Information: http://www.energy.ca.gov/portfolio/ San Francisco Energy Resource Plan: Choosing San Francisco’s Energy Future. www.sfenvironment.org 	<p>Cost</p> <ul style="list-style-type: none"> Cost to the City for advocating for increased renewable portfolio standards very low. Cost to the City for developing a Community Choice Aggregation program is higher: includes the need to pay staff to work with other communities to develop program, for implementing, maintaining, and administering program. Most cities interested in CCA program have also contracted a study to evaluate costs and benefits of the CCA program. These costs would be reduced if the study could be for multiple jurisdictions.

Action #	Description	Notes on implementation	Model Programs & References	Notes on Cost and Benefits
				Additional Benefits <ul style="list-style-type: none"> Better air quality if electricity is produced from renewables instead of fossil fuels.
Action 5.4	Increase the renewable portion of utility electricity generation by advocating for increased state-wide renewable portfolio standards; and consider participating in community choice aggregation, or other means.	<ul style="list-style-type: none"> It is not likely that a PV requirement will be incorporated into the Green Building Ordinance in the near future. Initially the requirement could be to build new buildings “solar ready” so that solar systems can be more easily installed later. 	<ul style="list-style-type: none"> The City of Vancouver, BC requires Pre-piping for Roof-mounted Solar Energy Generation: http://vancouver.ca/commsvcs/cbofficial/greenbuildings/greenhomes/solarenergy.htm City of Tucson, AZ adopted an ordinance in June 2008 requiring solar ready: http://www.tucsonaz.gov/dsd/What_s_New/GET_READY_FOR_SOLAR.pdf 	Costs <ul style="list-style-type: none"> Cost to City to pay staff to update Green Building Ordinance Cost to developers to pay for PV in new developments though with financing program, these costs may be covered. Additional Benefits <ul style="list-style-type: none"> PV installations may create ‘clean tech’ jobs
Municipal Actions				
Action 5.5	Conduct a city-wide renewable energy assessment to estimate the total renewable energy potential and costs and benefits of developing that potential within City bounds. Develop a plan for capturing all cost-effective opportunities.	<ul style="list-style-type: none"> California AB 2466, which was signed into law in September 2008 and became effective in January 1009, allows local governments to produce up to 1 MW of renewable energy on one site within its geographic boundaries and generate offsets that can be used to credit one or more electricity meters within the same geographic boundary. This legislation gives local governments some flexibility in how they can meet renewable generation goals. http://www.leginfo.ca.gov/pub/07-08/bill_asm/ab_2451-2500/ab_2466_bill_20080928_chaptered.pdf 	<ul style="list-style-type: none"> Energy Watch provides free energy services to Cities. Historically, the program has focused on energy efficiency, but Hayward could encourage the program to expand services to renewable energy. http://www.abag.ca.gov/abagenergywatch/index.html 	Costs <ul style="list-style-type: none"> Cost to City to pay for assessment Additional Benefits <ul style="list-style-type: none"> Identify opportunities for energy and water savings
Action 5.5	Ensure that all new City owned facilities are built with renewable energy (i.e. PV and/or solar hot water) systems as appropriate to their functions.	<ul style="list-style-type: none"> City should be aware of the cost of renewable energy and make efforts to balance costs (to both the City and to residents and businesses) with benefits of reduced GHG emissions from energy use. City may start by establishing a means of determining whether or not a renewable energy project is cost effective. When developing a protocol, City should use metrics like life-cycle costs (instead of simple payback) and should place value (monetary or other) on environmental and health benefits like reduced emissions and improved air quality. If renewable energy is not cost-effective at the time of construction, new buildings and major retrofits should be designed “renewable-energy ready,” or with electrical systems suitable for renewable energy. Incorporating renewable energy into new buildings and major building retrofits is a highly visible means of showing leadership in renewable energy – especially if the City showcases technologies in high-traffic buildings and educates public on costs and benefits of renewable energy. 	<ul style="list-style-type: none"> Energy Watch provides free energy services to Cities. Historically, the program has focused on energy efficiency, but Hayward could encourage the program to expand services to renewable energy. http://www.abag.ca.gov/abagenergywatch/index.html 	Costs <ul style="list-style-type: none"> Cost to City to develop ordinance. Cost to City to pay for PV panels. Eventual cost savings from reduced energy bills, only after panels are paid back. Additional Benefits <ul style="list-style-type: none"> Reduced dependency on local utility to provide electricity. More predictable electricity costs.

Strategy 5: Energy: Use Renewable Energy

Overall Strategy 5 Goal

1. 100 percent renewable electricity generation by 2050

Estimated Annual Emissions Reductions

Action Number	Full Description	Estimated Annual Emissions Reductions (a) (metric tons CO2e)		Percent contribution to target reductions (b)	
		2020	2050	2020	2050
Total (community-wide actions implemented and long-term Strategy goals achieved)		14,598	80,409	9.4%	7.5%
Community-wide Actions					
Action 5.1	Develop a program for the financing and installation of photovoltaic renewable energy systems on residential building including single and multiple family residential buildings and mobile homes. Set a target for total MW to be installed.	850	2,149	0.5%	0.2%
Action 5.2	Develop a program for the financing and installation of photovoltaic renewable energy systems on commercial buildings. Set a target for total MW to be installed.	10,768	22,822	7.0%	2.1%
Action 5.3	Incorporate a renewable energy requirement into Private Development Green Building Ordinance.	2,980	24,660	1.9%	2.3%
Action 5.4	Increase the renewable portion of utility electricity generation by advocating for increased state-wide renewable portfolio standards; and consider participating in community choice aggregation, or other means.		30,779	0.0%	2.9%
Municipal Actions					
Action 5.5	Conduct a city-wide renewable energy assessment to estimate the total renewable energy potential and costs and benefits of developing that potential within City bounds. Develop a plan for capturing all cost-effective opportunities.	76.4	2,226	7.4%	23.8%
Action 5.6	Ensure that all new City owned facilities are built with PV and/or solar hot water systems as appropriate to their functions.	76.4	2,226	7.4%	23.8%
<p>(a) Annual estimated emissions reductions assume that program goals, which are presented in Appendix C, are achieved. Assumes Scenario 2 business-as-usual projections for fleet-average fuel economy and renewable energy generation</p> <p>(b) Assuming Scenario 2 business-as-usual projections, Hayward needs to reduce community-wide emissions by 154,652 and 1,070,189 metric tons annually in 2020 and 2050, respectively.</p>					

- During Phase 2, the projected electricity consumption without the program is 0.04796 MMBTU per square foot. With a program, the projected electricity consumption is 0.01199 MMBTU per square foot. Projected electricity savings are 318,803 MMBTU. The projected natural gas consumption without the program is 0.0334MMBTU per square foot. With a program, the projected natural gas consumption is 0.0234 MMBTU per square foot. Projected natural gas savings are 86,792 MMBTU. The estimated annual emissions savings is 20,043 metric tons of CO_{2e} by the end of the second phase.
- During Phase 3, the projected electricity consumption without the program is 0.04796 MMBTU per square foot. With a program, the projected electricity consumption is 0.0 MMBTU per square foot. Projected electricity savings are 1,215,403 MMBTU. The projected natural gas consumption without the program is 0.0334 MMBTU per square foot. With a program, the projected natural gas consumption is 0.0084 MMBTU per square foot. Projected natural gas savings are 555,739 MMBTU. The estimated annual emissions savings is 84,004 metric tons of CO_{2e} by the end of the third phase.

Strategy 5

Overall Strategy 5 Goal

1. 100 percent renewable electricity generation by 2050

Assumptions Applicable to Every Action within Strategy 5

- It is assumed that Hayward receives 2103.5 hours of full sun per year.¹¹⁹
- It is assumed that the solar de-rating factor is 33 percent.¹²⁰ The de-rating factor accounts for losses due to temperature, dirt and dust, wiring losses and mismatch, and DC to AC conversion.
- It is assumed that the size of the average photovoltaic system installed will gradually increase due to the future potential for consumers to sell electricity back into the grid.

Action 5.1 – Offer renewable energy financing program for residential buildings

Action-specific Assumptions

No action-specific assumptions

Program Goals

- **Phase 1** (2010 – 2015) – The goal of the first phase of this program is to have an average capacity of 3 kW per system installed. The goal is to get 0.4 % of new residential units constructed during the phase to participate in the program.
- **Phase 2** (2016 – 2020) – The goal of the second phase of this program is to have an average capacity of 3.5 kW per system installed. The goal is to get 2 % of new residential units constructed during the phase to participate in the program.
- **Phase 3** (2021 – 2035) – The goal of the third phase of this program is to have an average capacity of 4 kW per system installed. The goal is to get 5 % of new residential units will participate in the program during this phase.

Program Impacts

- During Phase 1, the projected total capacity installed will be 605 kW and the percent of electricity demand offset by PV systems will be 0.1%. The estimated annual emissions savings is 160 metric tons of CO_{2e} by the end of the first phase.

¹¹⁹ Source: National Renewable Energy Laboratory. Solar Radiation Data Manual for Flat Plate and Concentrating Collectors.

¹²⁰ California Energy Commission. Guide to Photovoltaic System Design and Installation. June 2001

- During Phase 2, the projected total capacity installed will be 2,936 kW and the percent of electricity demand offset by PV systems will be 0.5%. The estimated annual emissions savings is 850 metric tons of CO_{2e} by the end of the second phase.
- During Phase 3, the projected total capacity installed will be 6,458 kW and the percent of electricity demand offset by PV systems will be 1.1%. The estimated annual emissions savings is 2,274 metric tons of CO_{2e} by the end of the third phase.

Action 5.2 - Offer renewable energy financing program for commercial buildings

Action-specific Assumptions

Hayward data on commercial space was used in calculation. It includes floor space used for offices, warehouses, retail, research and development, and manufacturing. Assumption made that 10% of commercial space is appropriate for solar installation. One caveat is that the estimated roof space is a very rough approximation. It may be necessary to conduct a City-wide survey in order to obtain more accurate percentage of usable space. Potential emissions reductions are subject to change based on further analysis. Analyses assumes average system size will be 1 kW/100 square feet roof space for Phase 1 and Phase 2 and 1kW/80 square feet roof space for Phase 3. This assumes that system efficiency will improve over time.

Program Goals

- **Phase 1** (2010 – 2015) – 5 % percent of commercial square footage that has roof top available is participating in program during this phase.
- **Phase 2** (2016 – 2020) – 8 % percent of commercial square footage that has roof top available is participating in program during this phase.
- **Phase 3** (2021 – 2035) – 10 % percent of commercial square footage that has roof top available is participating in program during this phase.

Program Impacts

- During Phase 1, the projected total capacity installed will be 26,35 kW and the percent of electricity demand offset by PV systems will be 3.6%. The estimated annual emissions savings is 6,985 metric tons of CO_{2e} by the end of the first phase.
- During Phase 2, the projected total capacity installed will be 18,514 kW and the percent of electricity demand offset by PV systems will be 5.8%. The estimated annual emissions savings is 10,768 metric tons of CO_{2e} by the end of the second phase.
- During Phase 3, the projected total capacity installed will be 61,323 kW and the percent of electricity demand offset by PV systems will be 11.7%. The estimated annual emissions savings is 24,153 metric tons of CO_{2e} by the end of the third phase.

Action 5.3 – Add renewable energy requirement into private development green building ordinance

Action-specific Assumptions

It is assumed that a higher percentage of energy will be provided from renewable sources which will lead to a lower electricity emission factor. It is also assumed that a mandatory program will not start until 2013 and only assumes 80% adoption rate due to the fact that not all buildings will be appropriate for solar, some may fall under specified thresholds, etc.

Program Goals

- **Phase 1** (2013 – 2025) – 75 percent of newly constructed buildings will be constructed with PV. The average PV size is 3 kW for residential buildings and 1kW/100 square feet roof space for commercial buildings.
- **Phase 2** (2026 – 2050) – 75 percent of newly constructed buildings will be constructed with PV. The average PV size is 5 kW for residential buildings and 1kW/80 square feet roof space for commercial buildings.

Program Impacts

- By the end of Phase 1, the projected total capacity installed will be 68,229 kW. The estimated annual emissions savings is 15,877 metric tons of CO_{2e} by the end of the first phase. (This calculation is based on a start date of 2018. As directed by the Planning Commission and City Council, the City's goal will be to start this program in 2013, which will result in additional annual emissions savings in both Phases.)
- By the end of Phase 2, the projected total capacity installed will be 114,745 kW. The estimated annual emissions savings is 25,859 metric tons of CO_{2e} by the end of the first phase.

Action 5.4 – Increase portion of electricity provided by renewable energy**Program Goals**

- **Phase 1** (2015 – 2020) – to have 33 percent of electricity supplied from renewable sources by the end of the phase.
- **Phase 2** (2021 – 2050) – to have 100 percent of electricity supplied from renewable sources by the end of the phase.

Program Impacts

- By the end of Phase 1, the projected total the estimated annual emissions savings is 32,026 metric tons of CO_{2e}.
- By the end of Phase 1, the projected total the estimated annual emissions savings is 77,414 metric tons of CO_{2e}.

Recommendations for Chapter 6: Community Facilities and Amenities

The Chapter provides a background for discussion of the community facilities and amenities, both existing and desired, in the Hayward area. Community facilities include public schools, libraries, and parks, as well as community and cultural centers. Amenities include historic resources and the surrounding open space that provides the visual setting for the City.

The following recommendations address the Community Facilities and Amenities Element:

Excerpt from General Plan	Recommendations
<p>Schools</p> <ul style="list-style-type: none"> The increase in student enrollment, in conjunction with the state-mandated reduction in classroom size for the lower grades, has greatly exacerbated the overcrowding of existing school facilities and sites. In addition, all of the District's schools are more than 40 years old. They lack many of the facilities required for a quality education, such as modern libraries, comprehensive computer capabilities, and science and math labs. 	<p>93. Review latest Facilities Study to determine the potential for addressing sustainability issues at the macro scale (e.g., siting relative to walkability, proximity to student services, etc.).</p> <p>94. Create a Safe Routes to School Program (SR2S) combined with more progressive school siting to allow most children to walk or bike to school, or at least use public transit.</p>
<p>Facilities</p> <ul style="list-style-type: none"> The continued use of relocatables can have significant impacts on individual sites... Construction of new permanent buildings would address these concerns and also create a better learning environment and improve the overall aesthetic appearance of the site. 	<p>95. Consider designing and building durable, flexible-use, multiple-story buildings that can accommodate a diversity of educational venues, and adapt to business and other uses over time without replacement, and conserve building energy more effectively.</p>
<p>Consideration of Surplus Sites</p> <ul style="list-style-type: none"> The District is currently evaluating the possibility of reopening school facilities on various sites now used for other purposes. 	<p>96. Revisit the siting and reuse criteria to determine: a) the types of buildings should serve as the most innovative, adaptable, and energy-efficient facilities in the long term; b) the sites should provide adequate connectivity to the neighborhoods they serve and daily needs required by the users, and greatly reduce the need for motor vehicle transportation and parking; c) the sites should serve as community models of adaptive, sustainable reuse economically, environmentally, and socially.</p>
<p>Schools as Community Centers</p> <p>At the same time the District is focusing on efforts to accommodate the need for additional classroom facilities, desires have been expressed by various segments of the community to have the schools enhance their function as community centers.</p>	<p>97. Minimize or eliminate minimum parking requirements.</p> <p>98. Provide transit alternatives to driving and parking, and/or parking and shuttle ride lots.</p> <p>99. Maximize on street parking wherever feasible.</p> <p>100. Revise zoning and development standards to permit the building and rebuilding of facilities for an appropriate diversity of uses.</p>
<p>Park Sizes and Uses</p> <p>It may be desirable to consider more, smaller parks to adequately serve existing neighborhoods as well as new infill housing developments.</p>	<p>101. Revise park and open space standards and uses to allow both private and public gardens</p> <p>102. Revise park and open space standards to allow a range of sizes, including 'pocket parks' and other lot scale facilities within a two minute walk of most neighborhood homes.</p>
<p>Historic Preservation</p> <ul style="list-style-type: none"> Historic preservation can play an important role in enhancing the character of the community. Some buildings have been officially recognized as architecturally and/or historically significant structures. 	<p>103. Well-built, traditional buildings represent a timeless model of efficient, adaptable, and carbon-conserving structures that should be protected for their economic and environmental value, beyond their architectural significance.</p>

MISSION VIEJO SUSTAINABILITY ACTION PLAN

March 2013



Mission Viejo Sustainability Action Plan

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		Responsibility
A	Work with the water districts to implement conservation programs identified within the 2010 UWMPs	Public Works
B	Prioritize public buildings for water fixture upgrades and identify upgrades to be made	Public Works
Progress Indicators		Year
+	Reduce urban water use by 20% per capita below the average baseline of three water districts serving Mission Viejo	2020
+	Reduce urban water use by 20% per capita below the average baseline of three water districts serving Mission Viejo	2035
General Plan Policies		
Conservation/Open Space Element		5.2, 5.3, 5.4, 5.6, 10.1, 10.2

Measure 3 – Clean & Efficient Energy

The consumption of electricity for appliances, lighting, and cooling, and combustion of natural gas for heating, cooking, and other processes within residential, commercial, and industrial buildings generated 38% of Mission Viejo’s communitywide GHG emissions in 2008. These emissions can be reduced by improving energy efficiency and increasing the amount of electricity and heat generated from renewable energy sources.

In Mission Viejo, approximately 54% of the housing stock was built before California’s energy code, Title 24 Part 6, was implemented in the 1980s. Consequently, this pre-Title 24 building stock offers considerable opportunity for cost-effective energy efficiency retrofits to decrease the use of electricity and natural gas. The City plans to focus on this opportunity to achieve building energy efficiency improvements in existing buildings through a combination of education and incentives.

SCE and SDG&E are Mission Viejo’s electricity providers, and Southern California Gas Company provides all of the natural gas for residential, commercial, industrial, and municipal uses. SCE and SDG&E generate electricity at hydroelectric, nuclear, renewable, natural gas, and coal facilities. SCE reported to the California Energy Commission (CEC) that, in 2010, natural gas facilities provided 37% of the total electricity supply by SCE; nuclear plants provided 19%; hydroelectric operations provided 6%; renewable energy facilities, including solar, geothermal, and biomass, provided 18%; and coal provided 7%. The remaining 13% of SCE’s electricity cannot be traced to a specific generation sources since it was purchased from a power pool or exchange. This fuel source portfolio is similar for SDG&E based on information provided by the CEC.

Under the provisions of SB 107, investor-owned utilities such as SCE and SDG&E were required to generate 20% of their retail electricity using qualified

renewable energy technologies by the end of 2010. This goal was increased to 33% by 2020 with the passage of the California Renewable Energy Resources Act (SB X1-2) in 2011. In compliance with this mandate, SCE and SDG&E expanded their renewable generation portfolio from 12% and 8%, respectively, in 2008 to 21% in 2011. They will continually increase this percentage until they reach the goal of 33% by 2020.

To further increase the portion of Mission Viejo's energy provided from renewable sources, the City will encourage communitywide installation of rooftop solar photovoltaic (PV) and solar water heater (SWH) systems, both of which are effective technologies in the sunny climate of Mission Viejo. In efforts to reduce electrical bills and GHG emissions and lead by example, the City installed a 12,000-square-foot solar PV system on City Hall in 2010.

The total GHG emissions reduction potential of the Energy Strategy is 4,025 MT CO₂e per year by 2020 and 9,743 MT CO₂e per year by 2035, or about 3% of total 2020 reductions and 4% of total 2035 reductions achieved by the SAP.

Action 3A: Energy Efficiency & Renewable Energy

2020 GHG Reduction Potential: 4,025 MT CO₂e per year

2035 GHG Reduction Potential: 9,743 MT CO₂e per year

Energy Efficiency

According to U.S. Census data, nearly 54% of Mission Viejo's housing stock was constructed prior to implementation of Title 24 standards requiring statewide energy efficiency standards for residential and nonresidential buildings. Residential units constructed prior to 1980 frequently have minimal insulation, antiquated furnace systems, single-pane windows, and gaps in the building envelope. Energy efficiency improvements to residential structures can reduce energy bills for owners and reduce communitywide GHG emissions.

The California Public Utilities Commission (CPUC) set an ambitious goal of reducing the usage of grid-provided energy in 100% of existing homes by 2020. To achieve this goal, the state and federal governments created several programs, such as the Energy Upgrade California program and the PowerSaver Loan program. Energy Upgrade California is a statewide program to help homeowners retrofit and renovate homes with more energy-efficient appliances, heating/cooling systems, and other improvements by offering rebates based on percent increase in energy efficiency to lower the cost barrier of making improvements. Retrofits are generally done as part of a "package" of options, such as sealing leaks in air conditioning/heating systems and installing insulation in walls and ceilings. The PowerSaver Loan program is designed to spur the financing of energy efficiency improvements through the use of federally provided mortgage insurance to lower the interest rate for homeowners who want to make loans with private financial institutions.

The City developed a Green Building Program that provides educational information and incentives, in the form of building permit fee waivers and expedited permit review, to help residents make their homes more energy efficient. The City also offers an income-based housing rehabilitation program that provides interest-free loans and grants for improvements such as dual-pane windows, insulation, weather stripping, and other energy conservation

measures. The City will leverage these existing programs to reach out to residents and encourage them to participate in programs such as Energy Upgrade California and other energy efficiency programs provided by their local utility. These programs include Energy Saving Assistance programs, which provide free energy efficiency improvements to income-qualified customers; Summer Saver programs, which allow SDG&E and SCE to turn off or cycle participants' air conditioning systems in peak demand periods; and other rebate programs designed to help residents upgrade existing appliances and equipments to more energy-efficient models.

The City established a goal of reaching 10% of existing residential homes with an energy efficiency retrofit by 2020. This goal, which is more conservative than the state's goal, is based on investor-owned utility program implementation plans that are more conservative than statewide goals. The City assumed that, as the Energy Upgrade California program is further implemented, it will transform the home improvement and retrofit industries, which will enable existing contractors to produce more retrofits that will reduce energy usage. The City anticipates 25% of existing homes will have completed an energy efficiency retrofit by 2035, with a higher percentage of the retrofits being high-efficiency retrofits.

Along with an older residential building stock, Mission Viejo also has commercial buildings that consume energy. Energy efficiency improvements to nonresidential structures can increase business profits by reducing energy bills, while also reducing GHG emissions. The City will continue to partner with SCE and SDG&E, as well as community organizations, to conduct public education and outreach campaigns that encourage businesses to voluntarily complete energy efficiency improvements and to take advantage of low-cost energy efficiency retrofit and financing programs. Utility programs include a nonresidential audit program, rebate and incentive programs, a direct install program (which works with small businesses to provide energy efficiency improvements at no cost), and a continuous improvement program to help commercial customers create and implement long-term plans to reduce energy usage. According to the program implementation plans submitted to the CPUC by the utilities, these programs will combine to save an estimated 1 billion kilowatt-hours (kWh) in SDG&E and SCE's service territory by 2014. Based on the number of commercial meters in Mission Viejo compared to the entire service territories of the utilities, this would result in an estimated reduction of 5 million kWh by 2014. The state has also set a longer-term goal calling for 50% of existing buildings to be equivalent to zero net energy buildings by 2030.

As part of the City's outreach program, the City will enhance its website by linking to information regarding existing energy efficiency rebates and other financial incentives, including utility incentives to businesses for energy efficiency improvements. The website will also contain or link to local case studies of businesses that have completed cost-effective energy efficiency improvements. Financing is a critical component to ensuring the success of energy efficiency programs; therefore, the City will continue to assess the feasibility of developing an energy efficiency financing program, such as a PACE program, to further promote energy efficiency retrofits, which would allow qualified nonresidential property owners to repay the cost of energy efficiency retrofits on their property tax bills.

Renewable Energy

Once residents and businesses have completed energy efficiency retrofits, the next step in reducing their carbon footprint is generating renewable energy. The most prevalent form of renewable generation on residential and commercial buildings in California is solar PV and SWH systems. These systems allow residents and businesses to prevent energy bills from increasing when energy rates go up. In fact, studies show that SWH systems have a quick payback period. However, the high capital cost of water heater upgrades and PV installation can pose a financial burden to building owners. To overcome this barrier, the City will continue to actively promote and facilitate, through its Green Building Program, the installation of SWH and PV systems on residential and commercial buildings. The City will use this existing outreach program to provide information about the benefits of SWH and PV systems, as well as incentives and financing that make them economically feasible to install.

One of the main programs that the City will leverage in its outreach will be the California Solar Initiative program, which has a goal of retrofitting 300,000 homes with SWHs and installing 2,000 megawatts (MW) of solar PV panels on residential and commercial buildings across California. The 2020 goal for this measure was developed using a population-based proportion of the statewide goal for the City. By participating in this program, residents can receive incentives of up to \$3,750 for installing SWHs on a single-family home and up to \$500,000 per system on a multi-family or commercial building. Residents and businesses have already received or reserved almost \$2.5 million in incentive payments for installing solar PV systems, and will continue to use this program to bring down the cost of installing solar systems. Additionally, according to the National Renewable Energy Laboratory, the price of installing solar PV panels in California has decreased by 39% since 1998. This decrease in price will make solar PV systems more economically feasible.

To further promote PV and SWH installations, the City will collaborate with SCE, SDG&E, and nonprofit organizations to identify various local, state, and national financing options that will be promoted in City outreach efforts. These financing programs will allow residents and businesses to overcome the high up-front cost of installing renewable energy systems. Options could include on-bill financing, low-interest loans, energy efficiency mortgages, or an energy efficiency Local Improvement District.

Responsibility

A	Maximize existing outreach efforts that encourage residents and businesses to participate in existing energy efficiency retrofit programs and renewable energy systems	Community Development
B	Consider funding to continue, or update and expand if funding is available, the Green Building Program and income-based rehabilitation programs as technology, policies, and programs change	Community Development

Progress Indicators	Year
+ Retrofit 2% of existing residential units with a “high” energy efficiency retrofit (1% reduction in electricity and 10% reduction in natural gas usage) and 8% of residential units with “low” energy efficiency retrofits (3% reduction in natural gas)	2020
+ Install SWHs on 2% of single-family residential units and 1% of commercial and multi-family properties	2020
+ Install solar PV systems on 3% of existing residential homes, and install 2 MW or 100,000 square feet of solar PV panels on nonresidential properties communitywide (total)	2020
+ Retrofit 5% of existing residential units with a “high” energy efficiency retrofit (1% reduction in electricity and 10% reduction in natural gas usage) and 20% of existing residential units with “low” energy efficiency retrofits (3% reduction in natural gas)	2035
+ Install SWHs on 5% of single-family residential units and 3% of commercial and multi-family properties	2035
+ Install solar PV systems on 7% of existing residential homes and install 5 MW or 250,000 square feet of solar PV panels on nonresidential properties communitywide (total)	2035
General Plan Policies	
Conservation/Open Space Element	9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 10.1, 10.2, 10.3
Housing Element	Policy 4.3; Strategies 2, 19

Measure 4 – Solid Waste Reduction

Solid-waste-related GHG emissions result from product consumption and disposal, and from pre-consumer commercial and industrial processes. In Mission Viejo, only 2% of GHG emissions are associated with solid waste generation and disposal in landfills. Solid waste disposal creates emissions when organic waste (e.g., food scraps, yard clippings, paper, and wood) is buried in landfills and anaerobic digestion takes place, emitting methane. Additionally, extracting and processing raw materials for consumer products, distributing them to consumers, and disposing of them creates GHG emissions.

The City currently contracts with a private contractor to provide citywide waste and recycling collection. Presently, most solid waste-reduction practices focus on diverting solid waste products from landfills through recycling.

CLEAN AND EFFICIENT ENERGY

3A Energy Efficiency & Renewable Energy

The GHG reduction potential of Measure 3A is based on retrofits of existing residential units with low and high efficiency, the installation of solar water heaters in single- and multi-family residential units and commercial buildings, and the installation of solar photovoltaic (PV) systems to existing residential homes.

Retrofits in Existing Buildings: Residential & Commercial

2020

Performance Measure	Participation Rate	Electricity Reduced (kWh/Year)	Natural Gas Reduced (kBtu/Year)	GHG Reductions (MT CO ₂ e/Year)	Scaled Measure Performance (Reduction in GHG Emissions)
Energy Efficiency Retrofits in Existing Buildings: Residential	10%	1,422	4,501,210	239	0.2%
Energy Efficiency Retrofits in Existing Buildings: Commercial		1,098,049	0	338	0.2%
Total		1,099,471	4,501,210	578	2%

kWh/Year = kilowatt hours per year

kBtu/Year =kilo British Thermal Units per year

2035

Performance Measure	Participation Rate	Electricity Reduced (kWh/Year)	Natural Gas Reduced (kBtu/Year)	GHG Reductions (MT CO ₂ e/Year)	Scaled Measure Performance (Reduction in GHG Emissions)
Energy Efficiency Retrofits in Existing Buildings: Residential	25%	3,556	11,253,028	598	0.2%
Energy Efficiency Retrofits in Existing Buildings: Commercial	30%	2,745,122	0	846	0.3%
Total		2,748,678	11,253,028	1,444	0.5%

Renewable Energy

2020

	Participation Rate	Electricity Generated (kWh/Year)	Natural Gas Reduced (kBTU/Year)	GHG Reductions (MT CO ₂ e/Year)	Scaled Measure Performance (Reduction in GHG Emissions)
Photovoltaics: Single-Family Residential	3%	6,110,223	0	1,882	
Photovoltaics: Commercial and Multi-Family Residential	2 MW	3,628,328	0	1,118	
Subtotal		9,738,551	0	3,000	1%
Solar Water Heaters: Single-Family Residential	2%	0	83,152	441	
Solar Water Heaters: Commercial	3%	0	90,292	6	
Subtotal		0	83,152	447	1%
Total		9,738,551	83,152	3,447	

2035

	Participation Rate	Electricity Generated (kWh/Year)	Natural Gas Reduced (kBTU/Year)	GHG Reductions (MT CO ₂ e/Year)	Scaled Measure Performance (Reduction in GHG Emissions)
Photovoltaics: Single-Family Residential	7%	14,257,211	0	4,392	
Photovoltaics: Commercial and Multi-Family Residential	5 MW	9,070,821	0	2,795	
Subtotal		23,328,031	0	7,187	3%
Solar Water Heater: Single-Family Residential	5%		207,881	1,103	
Solar Water Heaters: Commercial	3%		1,580	8	
Subtotal		0	209,462	1,112	0.4%
Total		23,076,709		9,743	



greenNR

The New Rochelle Sustainability Plan 2010 - 2030



Vision and Action for a
Healthier Community



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Action Plan Summary:

Energy & Climate

Reduce local energy consumption and greenhouse gas emissions while transitioning to **renewable sources of energy** and adapting to probable climate changes.

GOALS BY 2030:

- Reduce annual per capita energy consumption by at least 20%, from 125 MMBtus to 100 MMBtus
- Reduce annual per capita CO₂e emissions by at least 20%, from 9.0 metric tons to 7.2 metric tons.
- Reduce municipal energy use, GHG emissions, and costs for lighting by at least 40% and for buildings by at least 15%.
- Increase the average gas mileage of the municipal fleet by 50% from 10 mpg to 15 mpg.
- Align with New York State objectives to obtain at least 30% of energy from renewable sources.

SUMMARY OF INITIATIVES

- 1.1 Green Building Standards:** Adopt requirements and guidelines to promote energy efficiency and conservation in the construction, renovation, and operation of buildings, with distinct standards for structures of different size and use.
- 1.2 Exterior Lighting Efficiency:** Replace or retrofit municipally owned exterior lights to fully utilize energy efficient and cost-saving lighting technology.
- 1.3 Municipal Building Efficiency:** Enhance the energy efficiency of municipal buildings through physical and operational improvements.
- 1.4 Green Fleet:** Replace or convert City vehicles to improve average gas mileage, utilize alternative fuel technology, and reduce the emission of air pollutants.
- 1.5 Renewable Energy Generation:** Facilitate the generation of renewable energy by addressing impediments in the local building and zoning codes and by exploring opportunities for energy production on public lands.
- 1.6 GreeNR Seal:** Establish a certification program to recognize the sustainable design or retrofit of properties and to acknowledge sustainable practices in the business sector.
- 1.7 Mid & High Rise Building Campaign:** Conduct an informational campaign to reduce energy consumption and waste generation in existing commercial or multi-family mid-rise and high-rise structures.
- 1.8 Efficiency & Conservation Loans:** Implement a local loan program to make energy efficiency improvements more affordable by enlisting lenders to provide favorable financing terms, secured by property tax obligations and paid back through energy savings.



Action Plan – Part I:

Energy & Climate

Reduce local energy consumption and greenhouse gas emissions while transitioning to renewable sources of energy and adapting to probable climate changes.

GOALS BY 2030:

- Reduce annual per capita energy consumption by at least 20%, from 125 MMBtus to 100 MMBtus
- Reduce annual per capita CO₂e emissions by at least 20%, from 9.0 metric tons to 7.2 metric tons.
- Reduce municipal energy use, CO₂e emissions, and costs for lighting by at least 40% and for buildings by at least 15%.
- Increase the average gas mileage of the municipal fleet by 50% from 10 mpg to 15 mpg.
- Align with New York State objectives to obtain at least 30% of energy from renewable sources.



Per capita CO₂ emissions vary enormously based on living standards, land use patterns, housing stock, transportation options, sources of energy, regional climate and other factors. Consider the variations in metric tons of emissions per capita for: the United States (19.8), the United Kingdom (9.7), France (6.6), New York State (10.9), Westchester County (13.1), and New York City (6.4).*

*Statistics should not be compared to New Rochelle, because of variations in calculation methods especially related to transportation.



Westchester County's Climate Action Plan sets a goal of reducing greenhouse gas emissions by 80% by 2050 with an interim target of 20% by 2015. GreeNR seeks generally to align New Rochelle's goals with those of the County, but also includes variations based on timetables and differing emissions baselines.



Initiative I.1: Green Building Standards

DESCRIPTION:

Adopt requirements and guidelines to promote energy efficiency and energy conservation in the construction, renovation, and operation of buildings, with at least four categories of action: (a) for new construction or major renovation exceeding 10,000 square feet, mandate comprehensive energy efficient design more rigorous than current State requirements, based, but not explicitly reliant, upon LEED certification standards; (b) for the construction or major renovation of all buildings, establish minimum standards for energy efficient lighting; (c) for new construction or reroofing of multi-family and commercial buildings, consider standards for efficient roofing that is cool/reflective, white, or landscaped or roofs with solar panels or other renewable energy sources; and (d) for new municipal construction, abide by the applicable foregoing requirements, incorporate sustainable engineering and design elements, and strive to attain the highest LEED rating that is economically feasible.

GOAL:

Reduce the community's per capita energy consumption and greenhouse gas emissions, by cutting the energy use per square foot in new construction or major renovation by at least 25% relative to the current community average. Contribute significantly to overall energy and greenhouse gas emission goals. Enhance the marketability of new and renovated residential and commercial structures in New Rochelle, while reducing operating and maintenance costs. Stimulate green job growth by generating demand for services.



The new Wellness Center at the College of New Rochelle incorporates many green design features.

PAST ACTIONS & ACHIEVEMENTS:

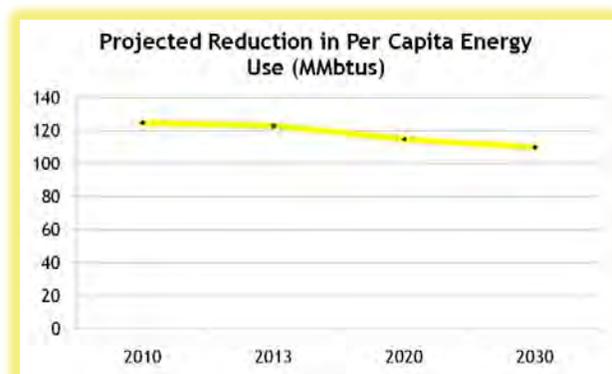
New Rochelle enforces the New York State Energy Conservation Construction Code and has devised an innovative checklist/affidavit system for monitoring compliance. New Rochelle has also adopted a density bonus that awards additional FAR to new construction with LEED silver, gold and platinum certification.

CURRENT STATUS:

New Rochelle has not adopted enhanced local green building standards. State law permits municipalities to adopt local energy efficiency standards stricter than the State's, but does not allow similar local flexibility on other aspects of sustainable construction and design.



In the United States, buildings account for 38% of CO₂ emissions and 70% of electricity consumption.



RECOMMENDED ACTIONS

SHORT-TERM RECOMMENDATIONS - COMPLETE BY YEAR 3

- (1) Develop local energy efficiency, lighting, and roofing standards, modeled when applicable on the LEED framework. Evaluate these standards for possible legal challenges.
- (2) For new municipal construction, establish and codify City intent to require a cost-benefit analysis of LEED attainment and to achieve the highest economically feasible LEED standard.
- (3) Adopt a penalty provision or require a bond to ensure the enforceability of LEED density bonuses in the New Rochelle zoning code.

MEDIUM-TERM RECOMMENDATIONS – COMPLETE BY YEAR 10

- (1) Adopt and implement new green building standards, with comprehensive energy efficiency requirements for construction or major renovations above 10,000 square feet in size, efficient lighting standards for new and major renovations of residential and commercial buildings, and roofing requirements for applicable structures of any size.
- (2) Establish administrative procedures for overseeing and enforcing new standards, with the following general framework for issuance of approvals: a building permit for acceptable design, a temporary certificate of occupancy upon confirmation of compliance, and a final certificate of occupancy for demonstration of operations.
- (3) Ensure that new requirements and standards are integrated into all relevant City reviews and approvals and, to the extent possible, create fast-track procedures for building applications featuring green design.
- (4) Update local requirements, if necessary, to reflect evolving standards and technologies.
- (5) Work with other municipalities to advocate for improved statewide energy efficiency and sustainability standards in new construction and major renovation.

LONG-TERM RECOMMENDATIONS – COMPLETE BY YEAR 20

- (1) Continue evaluating green building policy for possible challenges or amendments, and update local requirements, if necessary, to reflect evolving standards and technologies.
- (2) If State law permits, expand green building standards to encompass features beyond energy use.

PROGRESS TRACK

Year:	2011	2014	2020	2030
Local Large Green Building Law Adopted:	0	0	1	1
Local Roofing Requirement Adopted:	0	0	1	1
Local Lighting Requirement Adopted:	0	0	1	1
Municipal Building Policy Adopted:	0	1	1	1
New Construction/Renovation Compliant w. Standards:	0	0	100%	100%
Annual Energy Use Per Capita (MMBtu)*	125	123	115	100
Annual CO ₂ e Emissions Per Capita (Metric Tons)*	9.0	8.8	8.3	7.2

* Includes effects of all initiatives related to energy use and greenhouse gas emissions.

Primary Departmental Responsibility: Sustainability, Buildings, Development, Law

Potential Partners: LEED-Accredited Professionals in the Community, Pace Land Use Law Center

Potential Municipal Costs: Possible Higher Construction Cost for Municipal Construction (Offset by Operating Savings)

Potential Outside Funding Sources: NA



Initiative 1.5: Renewable Energy Generation

DESCRIPTION:

Facilitate within New Rochelle the generation of renewable energy, such as wind, solar, fuel cell technology, and geothermal, by addressing impediments in the local building and zoning codes and by exploring opportunities for renewable energy production on public land and in public buildings. Code amendments should seek to balance renewable energy opportunities with the constraints associated with suburban and urban land use patterns. In addition, advocate for utility and State purchase of renewable energy.

GOAL:

Reduce greenhouse gas emissions, limit depletion of finite resources, cut public and private energy costs, and create green jobs associated with renewable energy production and installation.



Solar panels have been installed at the Hugh Doyle Senior Center.

PAST ACTIONS & ACHIEVEMENTS:

The City has installed photovoltaic solar panels on a portion of the roof of the Hugh Doyle Senior Center. These panels generate 10.2 MMbtu annually.

CURRENT STATUS:

The New Rochelle Building Code permits the installation of solar collectors, but does not address other renewable energy options. To date, no thorough analysis has been conducted to consider possible amendments. Less than ten properties in New Rochelle are estimated to have renewable energy installations. Aside from the Doyle Center solar panels, there are no other renewable energy generators on public property within New Rochelle.



The New York State Public Service Commission has established a Renewable Portfolio Standard calling for New Yorkers to receive 30% of their energy from renewable sources by 2015.

RECOMMENDED ACTIONS

SHORT-TERM RECOMMENDATIONS - COMPLETE BY YEAR 3

- (1) Examine renewable energy technologies to determine which are appropriate for private installation and use in New Rochelle. Ensure input from experts and neighborhood association representatives. Also define dimensional screening restrictions necessary to limit visual or noise impacts.
- (2) Amend the New Rochelle building and zoning codes to accommodate the forms of renewable energy production deemed appropriate.

MEDIUM-TERM RECOMMENDATIONS – COMPLETE BY YEAR 10

- (1) Conduct an inventory of public buildings and public land to identify locations that may be suitable for renewable energy generation. Conduct feasibility and financial analyses to determine the costs and benefits of City-funded renewable energy projects. Also explore options for leasing or licensing public property to private energy producers, including solar power purchase agreements. Adopt and begin to implement a renewable energy generation plan based on these analyses. Reach out to the School District to gauge interest in a similar analysis of School buildings and properties.
- (2) Consider the creation of an electric CHP (Combined Heat & Power), solar-powered or wind-powered charging station at the New Rochelle Transit Center to facilitate the use of electric vehicles by commuters and other drivers. If feasible, then implement as local resources and/or the availability of grants permit.
- (3) Continue reviewing local Building and Zoning Codes to determine whether new amendments are required to address evolving renewable energy technology.
- (4) Advocate for the purchase of renewable energy by utilities and State authorities.

LONG-TERM RECOMMENDATIONS – COMPLETE BY YEAR 20

- (1) Continue reviewing local Building and Zoning Codes to determine whether new amendments are required to address evolving renewable energy technology.
- (2) Continue to implement plans for renewable energy production on public land and in public buildings.

PROGRESS TRACK

Year:	2011	2014	2020	2030
Revised Renewable Energy Code Adopted	0	1	1	1
Public Land Renewable Energy Plan Adopted	0	0	1	1

Primary Departmental Responsibility: Buildings, Public Works, Sustainability, Law

Potential Partners: School District, NYPA, ESCOs, Renewable Energy Companies, Neighborhoods, Solar Power Purchase Agreement Vendors

Potential Municipal Costs: Purchase, Installation and Maintenance of Renewable Energy Equipment (Offset by Operating Savings)

Potential Outside Funding Sources: Federal, State, NYPA, ESCOs



Source: CPS Energy

CITY OF SAN ANTONIO SOLAR DEVELOPMENT PLAN



Source: Dow Solar



Source: Petra Solar



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DOCUMENT OVERVIEW

The City of San Antonio’s “Solar Development Plan” identifies a set of stakeholder-recommended strategies, concepts, goals, and action steps that will increase San Antonio’s leadership in the solar industry and will help guide the region’s activities in deploying solar technologies and in growing various aspects of the solar industry in the near-, middle-, and long-term (defined as 2015, 2020, and 2030 respectively).

The recommended strategies, concepts, goals, and action steps have been organized into the following chapters:

- 1. Continuing Momentum in Utility-Scale Development***
- 2. Further Integrating Solar Technologies within Residential and Commercial Infrastructure***
- 3. Fostering Solar Energy Research and Development***
- 4. Establishing a Solar Energy Economy***
- 5. Providing Comprehensive Training/Education Assistance Programs***
- 6. Expanding Public Outreach to Engage San Antonians***
- 7. Improving Public Policy***
- 8. Expanding Financing Opportunities***
- 9. Building Effective Partnerships***
- 10. Reaching San Antonio’s Overarching Solar Goals***

The Solar Development Plan integrates with the City of San Antonio’s “Mission Verde” Sustainability Plan, which outlines a vision for the City of San Antonio’s major sustainable policies and programs (www.sanantonio.gov/oep/SustainabilityPlan/Mission%20Verde.pdf), as well as with SA 2020, the City’s comprehensive future visioning document (www.sa2020.org). It also builds on CPS Energy’s forward-looking Vision 2020 plan (www.cpsenergy.com/files/Vision_2020.pdf) and “New Energy Economy” initiatives (www.cpsenergy.com/About_CPS_Energy/Who_We_Are/New_Energy_Economy/index.asp).

This plan was produced under a Solar America Cities grant from the U.S. Department of Energy and has considered the internal and external costs and benefits related to the economy, the environment, and society. The project was managed by the City’s Office of Sustainability (OS) in coordination with Solar San Antonio, Build San Antonio Green, CPS Energy, the Mission Verde Alliance, and the consulting firm of Good Company Associates. Our thanks go to the Department of Energy as they continue to support the City of San Antonio’s progress as a solar industry leader.

A description of the stakeholder engagement process used on this project can be found on the following page.

STAKEHOLDER ENGAGEMENT PROCESS OVERVIEW

The Solar Development Plan was developed through a stakeholder process that involved a series of stakeholder meetings and project management team reviews. It also built on the prior deliverables created under the Solar America Cities grant and other relevant San Antonio area initiatives.

Three workshops/roundtables were held to solicit stakeholder input, and additional comments were solicited via phone and email communications. The first stakeholder meeting was held at the City of San Antonio Office of Sustainability on February 3, 2012. The second stakeholder meeting was held at the San Antonio Central Library on February 15, 2012. The third stakeholder meeting was held at the Alamodome on March 7, 2012.

The following organizations contributed to the Solar Development Plan:

- *Alamo Area Council of Governments (AACOG)*
- *Alamo Colleges*
- *Borrego Solar*
- *Build San Antonio Green (BSAG)*
- *CAM Solar*
- *Citizen's Environmental Advisory Committee (CEAC)*
- *Cinco Solar*
- *The City of San Antonio, including the Office of Sustainability (OS)*
- *CPS Energy*
- *Dow*
- *FTL Solar*
- *Good Company Associates*
- *Grubb & Ellis*
- *HelioVolt*
- *Hill Electric*
- *Iberdrola Renewables*
- *Ideal Power Converters*
- *Keeping PACE in Texas*
- *Lincoln Renewable Energy*
- *Meridian Solar*
- *Merrill Lynch / Bank of America*
- *Mission Verde Alliance*
- *National Center for Appropriate Technology (NCAT)*
- *Panasonic*
- *Parsons Corporation*
- *Petra Solar*
- *RES Americas*
- *RRE Solar*
- *San Antonio Clean Energy Incubator*
- *San Antonio Clean Technology Forum*
- *San Antonio Water System (SAWS)*
- *Solar Reserve*
- *Solar San Antonio*
- *SolarBridge Technologies*
- *SolarCity*
- *Sologen Systems*
- *South-central Partnership for Energy Efficiency as a Resource (SPEER)*
- *Southwest Research Institute*
- *Sun Freedom America*
- *SunCap Financial*
- *SunEdison/MEMC*
- *SunPower*
- *Suntech*
- *Texas A&M University-San Antonio*
- *Toshiba*
- *University of Texas-Austin*
- *University of Texas-San Antonio (UTSA)*
- *URS*
- *UR Solar Power*
- *US Army*
- *US Business Council for Sustainable Development (USBCSD)*
- *US Green Building Council (USGBC)*
- *USAA*
- *ISolTech*

Thank you again to each of the stakeholders who contributed to this plan.

The strategies, concepts, goals, and action steps recommended by stakeholders for each topic can be found on the following pages.

CHAPTER 1:

CONTINUING MOMENTUM IN UTILITY-SCALE DEVELOPMENT



Source: HelioVolt



Blue Wing Solar Installation, Source: Juwi Solar

San Antonio has established itself as a utility-scale solar leader with the 44.4 MW of utility-scale solar it currently has under contract (14.4 MW Duke Energy Blue Wing project; 30 MW in SunEdison projects) and the recent Memorandum of Understanding to develop an additional 400 MW of solar capacity and associated manufacturing facilities. The City and CPS Energy should be commended for being on track to surpass many of their solar goals years ahead of schedule, which may present some interesting challenges in dealing with success. The solar goals laid out in SA 2020, Vision 2020, and the Mission Verde Plan will need to be reassessed, if they are indeed reached ahead of schedule. In certain cases, the goals will have served their purpose of developing a self-sustaining market and will no longer be necessary, while other goals will need to be increased, and some new goals may be needed. The public should be actively involved in these discussions, with both the City and CPS Energy. Additionally, to ensure the regional economy is not dependant on a particular company, technology, or technology development path, San Antonio must continue to develop a robust solar market, solar generation portfolio, and continuously add new industry members. The industry is evolving rapidly, and so must San Antonio's solar market.

Even with the current commitments to utility-scale solar, there are opportunities to continue the established momentum in utility-scale development, possibly with the military, other regional municipalities/utilities, and within CPS Energy's generation portfolio. CPS Energy could be a regional provider of solar power to surrounding areas that cannot make solar investments on their own, and CPS Energy may want to take advantage of market conditions in the short-term, as circumstances may drive solar prices upward after 2016 (e.g., the possible expiration of the federal Investment Tax Credit). San Antonio is rightfully proud of its utility-scale solar accomplishments and recognizes a much greater solar market and industry cluster will develop in the region with the appropriate set of strategies and goals in place. The City also realizes that utility-scale solar growth should not come at the expense of growth in distributed solar. Both areas should develop in tandem and are key parts of San Antonio's solar future.

PLAN DETAILS: CONTINUING MOMENTUM IN UTILITY-SCALE DEVELOPMENT

Strategies and Concepts Recommended By Stakeholders:

- Create a true solar market/industry
- Increase communications with regional military entities to identify opportunities for utility-scale solar development to serve them and their mandates, including on-site solar within micro-grids
- Leverage regional demand to encourage more utility-scale development led by CPS Energy
- Continually assess CPS Energy rate structures and policies to eliminate potential barriers so ratepayers, including large customer accounts, will support continued solar investment
- Maximize use of existing transmission and distribution infrastructure to site smaller-scale, utility-scale solar projects (10 MW or less) within CPS Energy service territories, but also consider acquiring solar from promising West Texas/CREZ areas with higher insolation, if cost-effective
- Ensure there is a clear zoning/variance process for the installation/development of renewable facilities; consider pre-designating desirable renewable development zones within the City
- Maximize federal incentives, such as the Investment Tax Credit (ITC), while they last to reduce ratepayer costs, and continue to support policies that encourage growth in utility-scale solar
- Leverage utility-scale development to benefit development of distributed resources, when possible

Existing Goals:

- 2020: 1,500 MW of renewable capacity in CPS Energy's generation portfolio (~20% of projected capacity), with at least 100 MW of solar (SA 2020/Vision 2020)
- 2020: Be the statewide leader in renewable energy generation (SA 2020)
- 2020: Increased customer participation in Windtricity and Solartricity (Vision 2020)
- 2020: Residential rates remain affordable and competitive compared to those across Texas (Vision 2020)

Additional Goals/Performance Metrics Suggested By Stakeholders:

- 2015: Get on US EPA's "Top 20 Local Government" Green Power Partnership List through increased municipal purchases/onsite use of green power (<http://www.epa.gov/greenpower/toplists/top20localgov.htm>)
 - Investigate possibility of 100% municipal purchase of renewable power by 2020
- 2020: Investigate increasing solar carve-out goal, given current solar commitments
- 2030: Continue goal of 20% renewables in projected portfolio and investigate increasing (e.g., 30%+)

Recommended Actions:

- Continue to actively engage additional solar industry companies, including those not chosen for the 400 MW RFP and additional foreign players looking for US operations in light of international tariff issues
- Engage the leadership of regional military entities and national military leaders to determine if there are local opportunities for utility-scale solar development to serve them, including on-site within micro-grids
- Continue to engage other Texas municipalities/utilities and offer CPS Energy solar capacity
- Investigate costs and benefits of increasing current solar goals in an open and transparent way; consider explicit goals to encourage distributed solar generation
- Take actions to get the City of San Antonio and local businesses on EPA's Green Power Partnership Lists
- Continuously assess CPS Energy rate structures and policies to identify and remove any potential barriers for customers to support continued solar investment
- Assess current zoning/variance processes for renewable development and make improvements as needed
- Consider releasing another solar RFP and/or pursue other purchases of solar by CPS Energy
- Identify ways to leverage utility-scale solar development to benefit development of distributed resources

CHAPTER 2:

FURTHER INTEGRATING SOLAR TECHNOLOGIES WITHIN RESIDENTIAL AND COMMERCIAL INFRASTRUCTURE



Source: SunPower



Source: University of Texas at San Antonio

While great strides have been made in utility-scale solar in San Antonio, it is clear that sustained efforts and formal plans are needed to continue to move “distributed” solar forward in the area. Just because San Antonio is a leader in utility-scale solar does not mean it will become a leader in distributed solar. There have been positive signs for the growth of distributed generation (DG) in the region over the last few years, with the number of rebated distributed solar installs going from 5 units in FY 2008 to over 260 in FY 2012, but this success also brings challenges for CPS Energy and others as to how to appropriately address the financial implications of managing increasing demand while continuing to foster industry growth. Another significant challenge with distributed generation is how to equitably recover the costs of maintaining the existing infrastructure, such as poles, wires, transformers, substations, and power plants, to have “standby” power available for when the solar panels are not producing energy and to provide the power quality and reliability to which customers have become accustomed.

A consensus view expressed in stakeholder meetings was that the three most crucial items to the growth of the distributed solar industry are: 1) stable, predictable rebate/incentive levels, 2) continued customer education/marketing efforts, and 3) the use of innovative financing mechanisms to stretch incentive dollars and unleash customer demand. Some explicit solar DG goals might be useful, but not as critical as the three items listed above, and the formal establishment of any solar DG goals will require additional study and discussion that could not be accommodated in the timeline of this project. San Antonio’s forward-looking net-zero carbon building codes for 2030 are also beneficial, and there was support expressed for additional dedicated incentives and programs that would help increase the availability of solar-enabled, energy efficient homes. Stakeholders also supported plans that would specifically target schools and commercial customers, as these markets have particular attributes that make them appealing for distributed solar at a significant scale. While San Antonio is not currently a national leader in DG deployment, there are clear opportunities for the region to establish leadership in next generation “distributed” resources, such as building integrated photovoltaic (BIPV) technologies.

PLAN DETAILS: FURTHER INTEGRATING SOLAR TECHNOLOGIES IN INFRASTRUCTURE

Strategies and Concepts Recommended By Stakeholders:

- **Build a 21st century urban energy infrastructure in SA with distributed energy (Mission Verde Initiative #1 and January 2009 CPS Energy Board of Trustee’s Sustainability Energy Policy Statement)**
- **Establish effective, predictable, and transparent rebate programs**
 - Differentiate between residential and commercial customers, but include both
 - Performance-Based Incentives (PBIs) and “indexed” rebates should be considered
- **Utilize innovative financing mechanisms/sources, including third-party financing options and public-private partnerships, to make rebates go further and lower costs for ratepayers**
- **Continue trusted, targeted community outreach/education programs to increase awareness of solar**
- **Address issues identified during Solartricity pilot (e.g., appraisal issues, interconnection issues)**
- **Consider increasing net metering rates**
- **Develop plans and incentive packages that specifically target large commercial customers and schools**
- **Continue to adopt/enhance high-performance green building codes, green retrofit programs, and related incentive programs**
- **Address the unique challenges of San Antonio’s prevalent rental markets**
- **Ensure there is a clear zoning/variance process for the installation of renewable facilities; consider pre-designating desirable renewable development zones within the City**
- **Quantify the potential for distributed generation in the San Antonio region**
- **Make an early commitment to building integrated photovoltaics (BIPV)**

Existing Goals:

- **Adopt green, high-performance building codes for new residential & commercial construction (Mission Verde Initiative #5) - NOTE: Since passage of the Mission Verde Plan, high-performance codes were studied and adopted, including net-zero carbon codes for 2030**
- **Build a “Green Retrofit” program for existing homes and buildings (Mission Verde Initiative #6) - NOTE: Since passage of the Mission Verde Plan, Build San Antonio Green has established a comprehensive, nationally-recognized Green Retrofit program for single family and multifamily projects**
- **2015: Implement Solartricity pilot (CPS Energy Sustainability Report)**
- **2020: 771 MW of demand reduction via the Save for Tomorrow Energy Plan (STEP) at a cost of ~\$849M, which includes solar rebates (Vision 2020)**
- **2030: Building codes for new residential and commercial construction that result in net-zero carbon (MV)**

Additional Goals/Performance Metrics Suggested By Stakeholders:

- **Formalize floor for solar rebates in STEP (i.e., >6% ~ >\$4.2M annually)**
- **Possible distributed generation goals that should be explored include:**
 - **2015 (status quo): Double the amount of DG in San Antonio**
 - **2015 (modest): Triple the amount of DG in San Antonio**
 - **2020 (modest): 1% of homes and businesses with DG (~5,000 homes & ~600 businesses)**
 - **2020 (aggressive): Formalize Mission Verde assumptions of 250 MW of DG by 2020 (~50,000 homes @ 3kW each and ~6,000 businesses @ 16kW each)**
 - **2030 (aggressive): Power plant worth of DG (771 MW)**

Recommended Actions:

- **Hold additional meetings to investigate appropriate distributed generation (DG) goal(s) that could be adopted by the City Council and/or the Board of CPS Energy** - the timeline of this project was too short for formal consensus to be reached, so further action is required; possible goals that should be explored include:
 - **2015 (status quo): Double the amount of DG in San Antonio**
 - Would sustain Fiscal Year (FY) 2012 levels of investment and would require >200 residential installs and >30 commercial installs in both FY 2013 and FY 2014
 - **2015 (modest): Triple the amount of DG in San Antonio**
 - Would sustain current level of 50% growth in FY 2013 and FY 2014 and would require >800 residential installs and >150 commercial installs
 - **2020 (modest): 1% of homes and businesses with DG (~5,000 homes & ~600 businesses)**
 - Would match current number of installs in San Diego and would require 50% growth in FY 2013 & FY 2014, 25% growth in FY 2015, and 10% growth FY 2016-2019
 - Alternative metric = 1% of projected capacity ~ 75 MW
 - **2020 (aggressive): Formalize Mission Verde assumptions of 250 MW of DG by 2020 (~50,000 homes @ 3kW each and ~6,000 businesses @ 16kW each)**
 - Would be 3.3% of projected capacity (250 MW of 7,500 MW) and is consistent with current goals in CO, NM, and AZ, but would require ~96% growth in residential installs and 80% growth in commercial installs each year between FY 2013 - FY 2019
 - **2030 (aggressive): Power plant worth of DG (771 MW)**
- **Hold rebate stakeholder meeting(s) and formalize future rebate levels to establish effective, predictable, and transparent rebate programs**
 - Establish predictable forward-year rebate plan
 - Differentiate between residential and commercial customers, but include both
 - Consider Performance-Based Incentives (PBIs) and rebates that are “indexed” to other price indicators
 - Investigate a rebate policy of supporting DG at some fixed % of actual cost, such that rebate rises and falls based on price of solar installations and CPS Energy’s share of cost remains roughly fixed, e.g. 35%
 - Determine true value of distributed solar to CPS Energy ratepayers and rebate accordingly
 - Commercial rebates should be based on real time information on what level of return will attract commercial adopters
 - Supplement CPS Energy rebates with other rebate/financing sources
- **Investigate and remove barriers to third-party providers operating in municipally-owned utility areas of Texas while not opening all municipally-owned utilities up to full retail competition**
 - SunShot Rooftop Challenge grant activities should help move this forward
 - City Council and CPS Energy Board Resolutions in formal support of third-party financing options should be considered
 - City/CPS Energy legal and government relations departments should begin working on acceptable language and bill drafts in advance of the next legislative session
- **Investigate implementing other innovative financing programs**
 - e.g., assess opportunities for new commercial sector Property Assessed Clean Energy (PACE) models backed with external funding to avoid some of the issues previously encountered
- **Continue trusted, targeted community outreach/education programs**
 - Communicate more accurate information about project economics in the market

- **Continue to adopt/enhance high-performance green building codes, green retrofit programs, and related incentive programs**
 - **Regionally harmonize codes and programs, if possible**
 - **Work with the local Green Building program in their efforts to certify new construction and retrofit net-zero carbon buildings and homes**
 - **Ensure incentives are adequate for production builders and commercial customers**
- **Develop targeted and dedicated incentive packages for large commercial customers and schools**
- **Address specific challenges of rental market and find unique solutions**
- **Include solar hot water technologies in incentive packages and increase awareness of solar hot water technologies and their benefits**
 - **Distinguish between solar hot water and solar photovoltaic technologies**
- **Inventory buildings/homes suitable for solar installations and retrofits to quantify actual potential**
- **Evaluate Solartricity pilot results, address issues identified (e.g., property tax issues, interconnection issues, etc.), and consider readdressing Solartricity, net metering rates, and other performance-based incentives**
 - **SunShot Rooftop Challenge grant will address some of these**
 - **City/Energy legal and government relations departments should begin working on acceptable language and bill drafts in advance of the next legislative session**
- **Assess current zoning/variance processes for renewable development and make improvements as needed**
- **Make an early commitment to building integrated photovoltaics (BIPV)**
- **Collaborate/communicate with other Texas regions and non-profit/advocacy groups to harmonize rebate levels, building codes, interconnection policies, etc. as feasible**



Source: Dow Solar

CHAPTER 3:

FOSTERING SOLAR ENERGY RESEARCH AND DEVELOPMENT



Source: University of Texas at San Antonio



Mission Verde Center at Cooper, Source: Texas A&M

While there is active and impressive solar energy research and development already occurring all over the world, San Antonio still has niches it can carve out in solar R&D, especially with the future potential of building-integrated photovoltaics (BIPV), advanced balance of system components (e.g., microinverters, advanced power control systems), and in managing the challenges of successfully integrating large quantities of renewable energy onto the electric grid. The \$50 million “Energy Research Alliance” between CPS Energy and UTSA has garnered international attention and continues to attract interest from new solar industry partners on a regular basis.

And while “research” is often the focus of R&D efforts, San Antonio has the opportunity to seize significant leadership in the “development” portion as well, which should not be overlooked. Solar panels and related technologies are being tested in actual southwestern conditions at the Blue Wing solar installation and by Texas A&M personnel at the Mission Verde Center at Cooper. Both could become internationally respected solar energy deployment/testing sites, especially with involvement of national labs and organizations like EPRI.

Joint Base San Antonio (JBSA) and other regional military assets also provide huge deployment opportunities, given federal mandates and national security concerns regarding “operational energy.” Other community members, such as USAA, have expressed a willingness to test technologies at their facilities. Southwest Research Institute is also a tremendous asset that has yet to be fully utilized.



Source: FTL Solar



Source: FTL Solar

PLAN DETAILS: FOSTERING SOLAR ENERGY RESEARCH AND DEVELOPMENT

Strategies and Concepts Recommended By Stakeholders:

- Host recurring R&D conferences and educational summits to establish San Antonio's leadership in emerging areas such as BIPV and microinverters
- Continue/increase support of UTSA's Texas Sustainable Energy Research Institute (TSERI) and other regional educational institutions
- Continue/increase support of the Mission Verde Center at Cooper and make it one of many respected solar energy deployment/testing sites in the region
- Continue to develop partnerships with national labs and research entities (e.g., Sandia, NREL, EPRI)
- Leverage/expand/promote capabilities of Southwest Research Institute
- Do not overlook opportunities for R&D related to advanced balance of system components and system controls (e.g., microinverters , power control systems) – solar R&D is not just about solar panels
- Expand solar industry partnerships (SunEdison, IPC, etc.) and engage their associated “clusters”
- Attract military energy research centers/projects (e.g., microgrids with solar, energy storage)
- Attract other federal research centers/projects
- Attract respected professors and corporate R&D centers, leveraging the Emerging Technology Fund
- Do not just focus on technologies that work in San Antonio - for example, even though concentrating solar power (CSP) may not be ideal in San Antonio, any CSP intellectual property developed at San Antonio educational institutions could be widely exported to other areas of the world, such as Saudi Arabia

Existing Goals:

- 2020: Up to \$50 million of investment in the UTSA-CPS Energy Research Alliance

Additional Goals/Performance Metrics Suggested By Stakeholders:

- 2015: At least three national conferences/summits on emerging solar technologies held in San Antonio
- 2015: At least two world-class solar research centers established
- 2015: Formal partnership(s) established with at least one national lab and/or national research entity
- 2020 and 2030: Additional world-class solar research centers established
- 2030: Another \$50 million investment in UTSA (i.e., continue \$5M/year investment level beyond 2020)

Recommended Actions:

- Investigate the establishment of world-class solar research centers (examples include, but are not limited to: microinverters, advanced power control systems, BIPV, water-energy nexus, and solar hot water)
- Identify, plan, and host recurring conferences on emerging solar technologies (ex. BIPV, microinverters)
- Host educational summits to showcase statewide solar research and provide networking opportunities
- Promote the Mission Verde Center at Cooper as a technology demonstration site
- Find additional areas of the CPS Energy grid to establish additional testing areas as well as infrastructure on regional military installations and local companies; remove any policy and/or operational barriers that may exist
- Continue to develop partnerships with national labs, EPRI, etc.
- Continue to develop regional partnerships with military entities, Texas A&M, UT-Austin, etc.
- Continue to develop partnerships with additional industry players
- Develop a comprehensive strategy to attract future federal R&D investments

CHAPTER 4:

ESTABLISHING A SOLAR ENERGY ECONOMY



Source: Sierra Club



Source: SolarWorld

San Antonio will build a thriving solar energy economy by employing a number of strategies, including attracting new companies, sustaining the industry that the region already has, expanding the markets of existing companies into new areas, and incubating new companies. The region has had much success recently in attracting solar companies and should use these relationships to attract “cluster” companies, such as advanced inverter and power control system companies. San Antonio also strives to build a true solar economy in the region, not just develop a handful of favored companies, to diversify its solar market so it is not dependant on the success of any one particular technology or technology development path. At the same time, San Antonio will not overlook its existing employers, both in the solar industry and other incumbent companies that could expand into solar markets. For example, a local company benefited from the steel racking equipment required for the SunEdison solar projects, and there will be opportunities for many other companies, such as glass manufacturers, especially if building-integrated technologies become more prevalent.

The City will also focus on generating greater public demand for solar, which will in turn help develop a thriving industry, as will be discussed in a subsequent chapter. Innovative incentives should also be explored. CPS Energy offers solar rebates in order to reduce peak energy demand, but CPS Energy need not be the only source of rebates and peak energy reduction is not the only reason to offer solar rebates. Almost every industry that creates jobs is offered economic development incentives, so if certain solar industry companies would prefer direct-to-customer rebates rather than traditional tax abatements, then this should be considered. The number of solar jobs supported by a community is directly related to customer demand, which is currently affected by rebates, therefore direct-to-customer rebates should be viewed as potential economic development tools/incentives.

Finally, collaboration between the various entities involved in solar industry economic development in the region should be increased for the benefit of companies that the region hopes to attract/grow (and the citizens of San Antonio). This is a very complex industry that is evolving quickly, so effective coordination is critical.

PLAN DETAILS: ESTABLISHING A SOLAR ENERGY ECONOMY

Strategies and Concepts Recommended By Stakeholders:

- Use the City’s economic development strategies to foster development of a 21st Century sustainable economy (Mission Verde Initiative #4)
 - “Attract” strategy: Continue/expand “New Energy Economy” initiatives and expand efforts to proactively engage solar industry companies
 - “Sustain” strategy: Support programs for local network of current solar installers, etc.
 - “Expand” strategy: Work with the San Antonio Manufacturing Association (SAMA) to develop a networking group for incumbent manufacturers looking to get into new markets
 - “Create” strategy: Support the San Antonio Clean Energy Incubator to help identify and grow new solar industry companies locally
- Make sure all citizens benefit from opportunities in the solar energy economy
- Generate increased demand for solar products through customer education, outreach, marketing, etc.
- Foster increased interaction/communication between various regional economic development entities, using the Mission Verde Alliance as focal point
- Promote/increase existing incentives for solar companies and other “New Energy Economy” companies
- Offer supplemental customer rebates in lieu of some traditional economic development incentives and/or offer additional innovative incentives for solar industry companies
- Recognize the difference between the STEP program’s goal of demand reduction, in which the solar rebate is one of fifteen tools for achieving reductions, and the goal of establishing a thriving distributed solar industry as a contribution to the green energy economy and economic development generally
- Create a multi-tech venture capital (VC) fund in San Antonio (Mission Verde Initiative #2)

Existing Goals:

- 2020: 10% job growth in “New Energy Economy” industries (SA 2020)

Additional Goals/Performance Metrics Suggested By Stakeholders:

- 2015: Clean tech manufacturing network established
- 2015: Multi-tech venture capital fund established
- Determine appropriate metrics to ensure all quadrants of the city benefit from new jobs and to ensure significant opportunities are created for minority/women owned businesses

Recommended Actions:

- Investigate establishing supplemental/innovative economic development rebates for the solar industry
- Launch a formal solar industry cluster initiative in San Antonio and expand efforts to proactively engage additional solar industry companies
- Support the Mission Verde Alliance as coordination point for solar economic development activities
- Work with SAMA to establish a clean tech manufacturing network for incumbent manufacturers looking to get into new vertical markets (e.g., glass manufacturers, steel manufacturers)
- Determine appropriate metrics to be tracked to ensure all quadrants of the city benefit from new jobs and to ensure significant opportunities are created for minority/women owned businesses
- Re-visit establishment of multi-tech VC fund
- Make the neighborhood around the Mission Verde Center a sustainable model for the rest of the City
- Take actions identified in other chapters that result in increased economic development

CHAPTER 5:

PROVIDING COMPREHENSIVE TRAINING/EDUCATION ASSISTANCE



Source: Alamo Colleges

A critical component of successfully developing any industry is having a skilled workforce, and this is especially true in the complex and rapidly evolving solar industry. From manufacturing plant workers to solar installers to executive positions, San Antonio will need to have a steady supply of available talent and flexible, nimble training programs that can keep employees' skills up-to-date. Luckily, San Antonio has proven its ability to quickly attract and train high-quality employees, as demonstrated with Toyota and other major employers that have recently entered the region, and the City has already taken proactive steps to create comprehensive training programs for companies in the New Energy Economy. The Mission Verde Plan highlighted the need for a comprehensive Green Jobs Training program back in 2009, and the region has responded.

Alamo Colleges has developed a Green Jobs Institute and has participated in a regional "I-35 Green Corridor Collaborative" that aims to improve the consistency and portability of skills among trained professionals in Texas. The Collaborative's "modular" approach to curriculum development in which "green" skills are layered into existing programs rather than being offered as stand-alone programs maximizes the likelihood that the job training will result in stable employment. By developing an electrician with PV skills, rather than just a PV installer, the trained employee can more easily respond to industry conditions. The region's unions, contractor associations, and other entities have also developed impressive training and educational assistance programs, and the State of Texas also provides impressive resources to train workers, including the Skills Development Fund and other resources from the Texas Workforce Commission.

As industry evolves, San Antonio should exert leadership in developing trainings and best practices for emerging technologies, such as BIPV. San Antonio should also continue to ensure that opportunities for local talent are provided on regional solar installations, as the lack of on-the-job opportunities can be key barriers to obtaining certain solar industry certifications. The region should also take additional steps to develop career pathway programs that integrate with local high schools and provide opportunities for returning military personnel. Finally, the area should improve forecasting capabilities to ensure synchronization between trainings and actual demand.

PLAN DETAILS: PROVIDING COMPREHENSIVE TRAINING/EDUCATION ASSISTANCE**Strategies and Concepts Recommended By Stakeholders:**

- Continue modular approach to training (i.e., train electricians with PV skills, not just PV installers)
- Continue regional coordination of trainings to ensure consistency and allow portability of skills
- Do not just focus on multi-year degree programs; flexible, shorter-term programs are also needed
- Improve job growth forecasting in green jobs sector to ensure synchronization with job training
- Leverage upcoming local solar installations to provide experience/opportunities for local talent
- Leverage union programs, IEC programs, and other apprenticeship training programs
- Leverage/promote State-provided resources, such as the Skills Development Fund
- Encourage greater high-school/ISD integration
- Establish veteran training programs
- Stake out leadership in building-integrated photovoltaic (BIPV) trainings as the industry evolves

Existing Goals:

- Create a Green Jobs Program in San Antonio (Mission Verde Initiative #3) - NOTE: Since passage of the Mission Verde Plan, Alamo Colleges has established a Green Jobs training program

Additional Goals/Performance Metrics Suggested By Stakeholders:

- Develop metrics to synchronize trainings with job creation

Recommended Actions:

- Continue modular approach to training
- Continue coordination with “I-35 Green Corridor Collaborative” and other regional collaborations
- Continue to work with local employers to determine future training needs and appropriate duration/frequency of trainings
- Develop/improve job growth forecasting and metrics to ensure synchronization of job creation with training
- Ensure upcoming local solar installations, such as the 400 MW RFP project(s), provide experience/opportunities for local talent
- Promote resources available to employers, such as the Skills Development Fund
- Establish better defined career pathway opportunities for military personnel and high school students
- Explore college/high school joint credit options
- Stake out leadership in trainings and best practices for emerging solar technologies, such as BIPV, as the industry evolves

CHAPTER 6:

EXPANDING PUBLIC OUTREACH TO ENGAGE SAN ANTONIANS



Source: Solar San Antonio

Effective public outreach will be critical to the successful development of the solar industry in San Antonio. Generate consumer demand, and industry growth will naturally follow. An NREL study completed under the Solar America Cities grant in 2009 showed high levels of interest in solar by the public, but also that a significant amount of additional education was needed. A survey by Build San Antonio Green also completed under this grant clearly showed that builders would be willing to build greener homes (including solar-ready homes) if there was adequate public demand, but that customer awareness of these offerings and their benefits and costs were limited. The recent success of the Bring Solar Home campaign (www.bringsolarhome.com) demonstrates that there is significant public demand for solar in the region that can be unlocked, if just given the appropriate encouragement from a trusted source. Consequently, public outreach efforts and targeted customer campaigns should be significantly increased to successfully develop the solar industry in San Antonio. Existing advocacy groups should continue to be supported and additional “solar champions” should be recruited who are trusted individuals in the community that will personally promote solar through their networks and educate the public about its benefits and actual costs.

In addition to current outreach efforts, stakeholders specifically mentioned the need to target programs at local educational institutions and commercial customers. There was consensus that a need for more communication around current project economics and that the public should be more actively engaged in discussions about regional energy policy. As communication mediums and tools continue to evolve between now and 2030, stakeholders should not hesitate to utilize new effective methods.

PLAN DETAILS: EXPANDING PUBLIC OUTREACH TO ENGAGE SAN ANTONIANS

Strategies and Concepts Recommended By Stakeholders:

- Use green “One-Stop Center(s)” to coordinate sustainability efforts and to provide information to residents and businesses (Mission Verde Initiative #9)
- Continue coordinated marketing campaigns from trusted sources to generate demand and educate the public about the benefits/costs of solar (e.g., Bring Solar Home, BSAG initiatives, USGBC programs)
- Continue support of local non-profits/advocacy organizations that conduct public outreach efforts, such as Solar San Antonio, Build San Antonio Green, Mission Verde Alliance, and the local USGBC chapter
- Identify additional “solar champions” who are trusted individuals in the community that will personally promote solar through their networks and educate the public about its benefits and actual costs
- Develop outreach programs targeted at commercial customers
- Develop outreach programs targeted at students in schools (who then influence their parents, peers, etc.)
- Develop outreach programs targeted at members of the military (e.g., USAA partnership)
- Develop coordinated rebate/incentive packages that specifically support targeted outreach programs (e.g., commercial solar rebate for commercial customers, solar for schools rebate, production builders, etc.)
- Develop an outreach program to promote this plan
- Encourage more public participation in energy policy development with the City and CPS Energy
- Utilize additional effective communication mediums and tools as they evolve

Existing Goals:

- Create green one-stop center(s) (Mission Verde Plan Initiative #9) - NOTE: the Mission Verde Center at Cooper was created after the passage of the Mission Verde Plan to serve this role and is still under development

Additional Goals/Performance Metrics Suggested By Stakeholders:

- Steadily increase level of familiarity with solar applications in the home beyond the 52% indicated in the 2009 NREL study
- Establish targeted outreach and dedicated rebate programs for schools, commercial customers, etc.
- Create widespread community awareness of this plan and the Mission Verde Plan

Recommended Actions:

- Continue/expand Bring Solar Home Campaign and create other related programs for schools and commercial customers, for example, if sufficient rebates/incentives exist to support such efforts
- Develop dedicated rebate/incentive packages that specifically support targeted outreach programs (e.g., commercial solar rebate programs, solar for schools rebates, production builder programs, etc.)
- Continue to support the Mission Verde Center as a green One-Stop and investigate creating others
- Continue support of local non-profits/advocacy organizations that conduct public outreach efforts, such as Solar San Antonio, Build San Antonio Green, Mission Verde Alliance, and the local USGBC chapter
- Identify and engage additional network of trusted individuals to serve as local “solar champions”
- Conduct additional survey(s) with the same questions as the 2009 NREL survey and assess progress
- Expand outreach efforts to encourage more public participation in energy policy development
- Develop an outreach plan to promote this plan
- Utilize additional effective communication mediums and tools as they evolve

CHAPTER 7:

IMPROVING PUBLIC POLICY



Texas Capitol, Source:www.capitol.state.tx.us



Solar Installation on the White House, Source: Solar Now America

Effective and supportive public policy is critical to the development of the solar industry. Other regions have definitively shown that supportive policy environments significantly increase solar industry development, and unfortunately San Antonio is operating at a significant disadvantage to its peers given the lack of state support in Texas for specific policies and incentives beneficial to the solar industry and the lack of overall national support compared to efforts being undertaken in other countries. In this regard it is not really fair to compare San Antonio to peer cities operating in California, Colorado, China or Germany, but the reality is that those locales are San Antonio's competitors.

On the bright side, the Texas market is too large for the solar industry to ignore (both in terms of solar insolation potential and potential product sales). And given the economic benefits this industry could bring to the State of Texas, local public policy should not ignore it either. San Antonio's supportive leadership, low cost of doing business, high quality of life, and our recent bold actions in the solar industry makes the San Antonio region a preferred destination for potential solar industry participants in Texas. As the seventh largest city in the nation and one with a municipally-owned vertical utility, San Antonio can establish significant solar goals and establish a supportive local policy environment that others will not.

Over the past few years, some policy and legal barriers to the growth of the solar industry have been identified that could be addressed at the state, local, and national levels. Some of the issues will be addressed by efforts under the SunShot Rooftop Challenge grant (e.g., net metering, interconnection and financing), and some issues are ultimately out of San Antonio's control; however San Antonio should be a strong advocate for supportive policies and incentives at the state and national levels. This is an excellent leadership opportunity that should be seized.

PLAN DETAILS: IMPROVING PUBLIC POLICY

Strategies and Concepts Recommended By Stakeholders:

- Enact improvements to local solar policies (working with CPS Energy as appropriate); examples include:
 - Further investigate and codify solar goals identified in this plan
 - Items to be explored under the SunShot Rooftop Challenge grant (e.g., interconnection standards, net metering policies/rates, financing barriers)
- Actively advocate for improvements to state-level solar policies; examples include:
 - Extend the current appraisal exemption for solar devices to include devices that are not used solely for onsite consumption (to help allow the Solartricity program to move forward)
 - Create an explicit, limited exemption in the Public Utility Regulatory Act (PURA) to allow third-party financiers/service providers to operate in municipal areas without opening the areas to full retail competition
 - Clarify ambiguities in the Property Assessed Clean Energy (PACE) financing statute
 - Support other statewide policies that would encourage further growth of the solar industry, such as statewide rebates, Renewable Portfolio Standard (RPS) requirements, etc.
- Actively advocate for improvements to federal solar policies; examples include:
 - Extending/expanding tax credits and other financial incentives (ITC, loan guarantees, etc.)
 - Support sustained/increased solar research and development funding
 - Support other federal policies that would encourage further growth of the solar industry, such as a clean energy investment entity, PACE, a national renewable energy standard, etc.
- Encourage more public participation in energy policy development at the City, County, and CPS Energy
- Work with regional entities and coalitions to “harmonize” appropriate solar policies

Goals/Performance Metrics Suggested By Stakeholders:

- Fulfill terms of SunShot Rooftop Challenge grant
- Support relevant state and federal policy items
- Create legislative drafts for items identified above prior to legislative sessions

Recommended Actions:

- Investigate and address local policy items in future efforts, such as the SunShot grant and the creation of the next CPS Energy Sustainability Report
- Codify identified solar goals in City Council meetings and CPS Energy Board meetings, as appropriate
- State-level solar policy items should be put on City, County, and CPS Energy agendas for the upcoming legislative session as appropriate
- City/County/CPS Energy legal and government relation departments should create acceptable bill drafts and language before the next legislative session, including an option for an explicit exemption under PURA for municipalities that want to use 3rd party financing without opening themselves up to full retail competition and clarifications to Texas PACE statute (Local Government Code Chapter 376)
- Federal-level solar policy items should be put on the Chamber of Commerce’s federal agenda, and comprehensive federal strategies (including a strategy to attract future federal R&D investments) should be developed collaboratively with the appropriate San Antonio entities
- San Antonio entities should join and actively support relevant coalition activities (e.g., SunShot, SPEER, PACE, Energia Mia, Sierra Club)
- More public participation in energy policy development should be encouraged

CHAPTER 8:

EXPANDING FINANCING OPPORTUNITIES



Source: SunCap Financial

A consensus view expressed at the industry stakeholder meetings was the use of innovative financing mechanisms to stretch incentive dollars and unleash customer demand is one of the three most crucial items to the growth of the distributed solar industry in the San Antonio region. The other two were stable, predictable rebate/incentive levels and continued customer education/marketing efforts. There are many innovative and effective financing options available, and a consensus view was that multiple options should be explored simultaneously. Different models have been shown to appeal to different customers, maximizing opportunities to make solar readily available to as many people in San Antonio as possible.

Opportunities discussed included the expansion of traditional lending and refinancing options, third-party “leasing” models, transferable “property assessed clean energy” (PACE) financing that is included with property tax bills, transferable on-bill financing options, and “community solar” options. As the industry and utility business models evolve, there will likely be additional opportunities. It is important to note that the reduction of upfront costs is not the only goal of these options; for example, “transferrable” financing options were discussed that address situations in which homeowners move before a certain payback period is reached. In certain cases, there may need to be policy changes (for example, to allow third-party ownership of systems in certain municipal areas of Texas—either permanently or for a limited time—to maximize tax benefits that cannot be realized by a municipal entity), but this should not preclude consideration in San Antonio. Policies and business models can, and should, change if it benefits the people of San Antonio.

While there may be some hesitancy to allow third-party financing of distributed generation or other third-party service providers, these additional financing options must be made available in San Antonio to unleash customer demand, reach additional customer segments that do not respond to traditional rebates, and alleviate the financial burdens on CPS Energy as the solar industry continues to grow in the region.

PLAN DETAILS: EXPANDING FINANCING OPPORTUNITIES

Strategies and Concepts Recommended By Stakeholders:

- Multiple ownership/financing options should be explored simultaneously
- Expand traditional lending and refinancing options for solar installations (e.g., SACU loan options from Bring Solar Home, net-zero loans)
- Provide new third-party financing/leasing options (e.g., SolarCity, SunCap Financial, SunRun)
 - Be sure to explore leasing models that could provide revenue streams for local schools and businesses that provide roof-top space
- Provide other transferable financing options (e.g., PACE, on-bill, equity share purchases)
- Provide “community solar” purchase options
- Explore other innovative financing options
- Be mindful that the right mix of rebates, net metering policies, appraisal exemptions, and other policies would encourage additional private sector investment/financing
- Consider developing online an solar calculator that helps explain financial implications of different models

Goals/Performance Metrics Suggested By Stakeholders:

- Investigate and launch multiple pilot programs as soon as feasible
- If necessary, create legislative bill drafts that would enable financing options prior to legislative sessions

Recommended Actions:

- City and CPS Energy legal and government relations departments should begin working on acceptable language and bill drafts in advance of the next legislative session, including an option for an explicit exemption under PURA for municipalities that want to use 3rd party financing without opening themselves up to full retail competition and clarifications to Texas PACE statute (Local Government Code Chapter 376)
- Engage multiple financing providers to explore the feasibility of implementing programs in the San Antonio area and create an action plan for program implementation
 - If barriers are identified, take immediate action to remove the barriers
 - Potential long-term revenue and operational impacts to CPS Energy should be considered as should the effectiveness of the programs to make solar readily available to as many people in San Antonio as possible and successfully grow the local solar industry
- Consider formal City Council and CPS Energy Board Resolutions in support of innovative financing options
 - Especially given their ability to alleviate financial burdens of providing incentives to a rapidly growing solar industry and their proven effectiveness in fostering the industry growth
- Support policy initiatives and additional stakeholder meetings that would help expand financing opportunities (e.g., SunShot Rooftop Challenge grant)
- Support other policies and actions that would encourage additional private sector investment by major customers of CPS Energy (e.g., Solartricity, increasing net metering rates, etc.)
- Expand marketing and outreach campaigns about the costs of solar and incentives/financing available
- Investigate possibility of an online solar calculator

CHAPTER 10:

REACHING SAN ANTONIO'S OVERARCHING SOLAR GOALS



Source: Bayat Energy



Source: SunPower

To achieve our overarching solar goals, some of which are on track to be exceeded years in advance, and to realize our region's true solar potential, San Antonio stakeholders will need to continue to work together to strategically develop appropriate goals and plan future activities. The Mission Verde Plan, SA 2020, Vision 2020, this Solar America Cities grant, and other regional planning efforts have been extremely successful, but continued vigilance is needed to accomplish great things for the local solar industry and our region's economy in general.

Through bold actions over the last few years, San Antonio has become an international utility-scale solar leader and a beacon for solar energy research. Although distributed solar generation has also seen rapid growth over the past few years, due to focused community efforts under the Solar America Cities grant and elsewhere, the distributed generation market is still in a phase of development. In order for solar to be a key sector in San Antonio's future, utility-scale solar sector and the distributed generation market should develop in tandem.

As stated in the Mission Verde Plan, the path of sustainability for the City of San Antonio is a path that leads to the future, one in which San Antonio invests in itself, generates its own energy, creates its own jobs, and builds a vibrant 21st Century economy. There is potential for San Antonio to become a leader in this new world, and for the solar industry to drive this change. All that remains is for us to act on that potential.



Solar Installation on Ft. Sam Houston, Source: Meridian Solar



Source: Pure Energy Systems

Tucson, Arizona

Greater Tucson Solar Development Plan:

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

January 2009

Southern Arizona Regional



SolarPartnership

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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 challenge¹. 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.² 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 sectors³
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

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

² 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>

³ 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.⁴ 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

⁴ 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

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.)

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 daylighting⁵ 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

⁵ 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.

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.

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.

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.

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.⁶ 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.

⁶ 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 LEED⁷ 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.

⁷ 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.

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.

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.

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.

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.

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

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).⁸

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



⁸ 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			
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

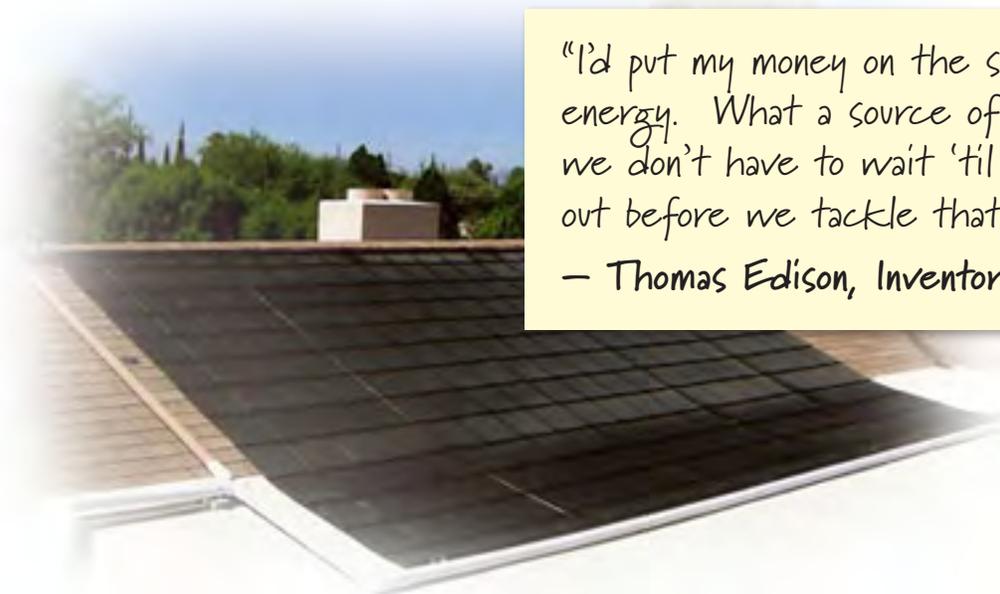
1) Solar Market Opportunity

- 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.

A. City of Tucson	Approximate Opportunity	New Developments
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	Golfinks library and police station
	Solar hot water and pool heating	City pools and fire stations
B. Pima County	Approximate Opportunity	New Developments
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
C. Davis-Monthan AFB	Approximate Opportunity	New Developments
Davis-Monthan AFB	2 MW	Housing and administrative building rooftops Base buffer zones



D. Town of Marana	Approximate Opportunity	New Developments
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
E. Town of Oro Valley	Approximate Opportunity	New Developments
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
F. Pascua Yaqui Tribe	Approximate Opportunity	New Developments
	Solar hot water and PV 200 kW	Casino del Sol Administration Buildings
G. Tohono O’odham Nation	Approximate Opportunity	New Developments
	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

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
- 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.

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.

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

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 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. and 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 and 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

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

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.

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



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

- 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

"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

