

ATTACHMENT ONE

**City of San Diego Framework for the
2010 Climate Mitigation and Adaptation Plan (Climate MAP)**

OVERVIEW

The 2010 Climate Mitigation and Adaptation Plan (Climate MAP) is an update to the current Climate Protection Action Plan approved by the Mayor and City Council. Advancing the 2010 Climate MAP is consistent with the City of San Diego’s commitment to the 2006 US Conference of Mayors Climate Protection Agreement, previously signed in 2006 by the Mayor and Councilmembers. Local government’s responsibilities in the mitigation of greenhouse gas (GHG) emissions and adaptation for climate change are addressed in the California Global Warming Solutions Act of 2006 and subsequent Executive Orders, the California Energy Commission’s Strategic Plan, and the requirements put forth by the State Attorney General for San Diego’s General Plan. This is referenced in the Conservation Element of San Diego’s General Plan, reproduced as Table CE-1, *Issues Related to Climate Change Addressed in the General Plan*.

Funding for staff time and consultant services are allocated in the Energy Efficiency and Conservation Block Grant and the California Public Utilities Commission Local Government Partnership.

TABLE CE-1 Issues Related to Climate Change Addressed in the General Plan

Issues	General Plan Policy		
	Element	Section	Policy
City of Villages Strategy	Conservation	A. Climate Change and Sustainable Development	CE-A.2
		B. Open Space and Landform Preservation	CE-B.1 through CE-B.5
	Land Use and Community Planning	A. City of Villages Strategy	LU-A.1 through LU-A.11
		H. Balanced Communities and Equitable Development	LU-H.6; LU-H.7
		I. Environmental Justice	LU-I.9 through LU-I.11
	Mobility	A. Walkable Communities	ME-A.1 through ME-A.9
		B. Transit First	ME-B.1 through ME-B.10
		F. Bicycling	ME-F.2; ME-F.4; ME-F.5
		K. Regional Coordination and Financing	ME-K.2; ME-K.6
	Urban Design	A. General Urban Design	UD-A.1; UD-A.2; UD-A.3; UD-A.9; UD-A.10
B. Distinctive Neighborhoods and Residential Design		UD-B.5d; UD-B.6	

TABLE CE-1 Issues Related to Climate Change Addressed in the General Plan

Issues	General Plan Policy		
	Element	Section	Policy
		C. Mixed-Use Villages and Commercial Areas	UD-C.1; UD-C.4; UD-C.6; UD-C.7
Greenhouse Gas (GHG) Emissions and Alternative Modes of Transportation	Conservation	A. Climate Change and Sustainable Development	CE-A.1; CE-A.2; CE-A.13
		F. Air Quality	CE-F.1 through CE-F.8
		J. Urban Forestry	CE-J.4
		N. Environmental Education	CE-N.3; CE-N.5
	Land Use and Community Planning	I. Environmental Justice	LU-I.11
	Mobility	A. Walkable Communities	ME-A.8; ME-A.9
		B. Transit First	ME-B.1; ME-B.8; ME-B.9; ME-B.10
		C. Street and Freeway System	ME-C.2e; ME-C.4c
		E. Transportation Demand Management	ME-E.1 through ME-E.8;
		G. Parking Management	ME-G.5
F. Bicycling	ME-F.5		
Urban Design	A. General Urban Design	UD.A-9; UD.A-10; UD-C.4; UD-C.7	
Energy Efficiency	Conservation Element	A. Climate Change and Sustainable Development	CE-A.5; CE-A.6; CE-A.8; CE-A.9; CE-A.11; CE-A.12
		F. Air Quality	CE-F.2; CE-F.3
		I. Sustainable Energy	CE-I.1 through CE-I.13
	Urban Design	A. General Urban Design	UD.A.4; UD.A-5i
Urban Heat Island Effect	Conservation	A. Climate Change and Sustainable Development	CE-A.2; CE-A.5; CE-A.6; CE-A.11; CE-A.12
		E. Urban Runoff Management	CE-E.2c; CE-E.d
		J. Urban Forestry	CE-J.1
	Recreation	A. Park and Recreation Guidelines	RE-A-7
Urban Design	A. General Urban Design	UD-A.8e; UD-A.12	
Waste Management and Recycling	Conservation	A. Climate Change and Sustainable Development	CE-A.2; CE-A.8; CE-A.9; CE-A.10
		C. Coastal Resources	CE-C.7
		D. Water Resources Management	CE-D.1; CE-D.3
		E. Urban Runoff Management	CE-E.6
		F. Air Quality	CE-F.3
		N. Environmental Education	CE-N.4; CE-N.5; CE-N.7
	Public Facilities, Services and	F. Wastewater	PF-F.5
I. Waste Management	PF-I.1 through PF-I.4		

TABLE CE-1 Issues Related to Climate Change Addressed in the General Plan

Issues	General Plan Policy		
	Element	Section	Policy
	Safety		
Water Management and Supply	Conservation	A. Climate Change and Sustainable Development	CE-A.2
		D. Water Resources Management	CE-D.1; CE-D.2; CE-D.4
		I. Sustainable Energy	CE-I.4; CE-I.6
	Public Facilities, Services and Safety	H. Water Infrastructure	PF-H.1 through PF-H.3

The Framework for the Climate MAP is comprised of an outline of topics divided into two sections, mitigation and adaptation. Further, each of those sections contains those actions related to City Operations and those actions related the community as a whole.

A Request for Proposal will be developed to garner technical assistance for completing a Programmatic Environmental Impact Report (PEIR) on the completed Climate MAP, as required by the California Environmental Quality Act. A second Request for Proposal will be issued for a technical review of the GHG emissions inventory and adaptation recommendations included in the Climate MAP. Both contracts will be funded by the EECBG, and must be encumbered before December 2010.

In 2009, the EECBG Ad Hoc Committee recommended that there be a review panel to provide substantive comments on the draft report. This would include a review of City policies and programs that can result in GHG mitigation or climate change adaptation. Environmental Services Department staff will be responsible for grant compliance and the overall administration of the Climate MAP. This is similar to the role that the technical Ad Hoc committee served in 2003 to review the first Climate Action Plan for the City of San Diego.

The current Climate Action Plan is focused primarily on mitigation—that is, measures by which to reduce GHG emissions responsible for measureable changes occurring with the Earth’s climate. Those measures include energy efficiency and renewable energy, reduction in fuel and other transportation efficiencies, reduction in waste and better landfill management, water conservation, and a number of transit programs and policies.

The 2010 Climate Mitigation and Adaptation Plan will discuss mitigation, and will also focus on adaptation—that is, proactively responding to the vulnerabilities that the San Diego Region may have as a result of a changing climate. There have been two seminal studies about the San Diego region focused on impacts and vulnerabilities from climate change:

- San Diego Foundation- Focus 2050 Study (2008)
<http://www.sdfoundation.org/communityimpact/environment/Initiative-focus2050.html>
and
- USD-EPIC- San Diego County Greenhouse Gas Emission Inventory (2008)
<http://www.sandiego.gov/environmental-services/sustainable/pdf/ghginventory.pdf>

Table One, *Climate Change: Potential Impacts and Adaptation for San Diego*, is an excerpt from the Focus 2050 Study, and by no means is all-inclusive. As part of that study, the following summary was provided to elected officials in the San Diego region.

1. Our climate will be hotter and drier.
 2. We could run low on water.
 3. Wildfires may be more frequent and intense.
 4. Our air quality will be increasingly unhealthy.
 5. Sea level may rise by as much as 18 inches in the next 40 years, putting our beaches and coastal communities at risk.
 6. Our native plants and wildlife will be pushed to the brink of extinction.
- ❖ **Localities are on the front lines of climate change impacts, and have a responsibility to respond.** As we work to reduce emissions globally, we must also begin to prepare for the impacts that climate change will have on the San Diego region. Local governments will play a pivotal role.
 - ❖ **State legislation to address climate change has significant implications for local government.** Over the past few years, the state Attorney General's office has compelled a number of cities and counties to address emissions from new development as part of the review process under the California Environmental Quality Act (CEQA). The recently signed Senate Bill 375 has created a process for establishing regional targets for transportation-related emissions.
 - ❖ **Many local governments are already taking action on climate change.** Although some state measures on climate change have been hotly debated, there are also signs of strong local support for state efforts to reduce GHG emissions. A recent survey of 310 California cities revealed that three-quarters of these cities are working on climate change issues.
 - ❖ **Planning for the future can benefit the present.** Many projected climate change impacts are in fact more extreme versions of what communities are already experiencing today as a result of current climate variability and extreme climate events. Climate change, for example, will increase the risk of drought, which our region is already experiencing.
 - ❖ **Proactive planning is more effective and less costly than responding reactively to climate change impacts as they happen.** Taking proactive steps to be flexible and to anticipate and address expected impacts can save money and protect the well being of communities. For instance, investing now in expanded water reuse and efficiency can help ensure that we meet our future water needs and may be less costly than doing so in the future. There are a number of co-benefits for addressing adaptation and mitigation. For example, reducing air pollutants that contribute to global warming also help to protect our region's air quality and public health. A second example is reducing energy and water use can help to ensure that our region has a more stable and secure water and energy supply.

Examples of Adaptation Measures

Water Supply

Expand and diversify water supply

- Enhance existing groundwater supplies through aquifer storage and recovery.
- Develop advanced wastewater treatment capacity for water reuse.

Reduce demand/improve efficiency

- Change building codes to require low flow plumbing fixtures.
- Provide financial incentives for switching to efficient manufacturing processes, irrigation practices, and appliances.

Increase public awareness about climate change impacts on water supplies

- Include information on climate change impacts to water supplies and how residents can reduce water use.

Stormwater and Floodwater Management

Increase capacity to manage stormwater

- Modify urban landscaping requirements to reduce stormwater runoff.
- Preserve ecological buffers (e.g. wetlands).

Reduce property damage from stormwater and flooding

- Change zoning to discourage development in flood hazard areas.
- Update building codes to require more flood resistant structures in floodplains.

Improve information used to manage stormwater and flood events

- Increase the use of climate and weather information in managing stormwater and flood risk.

Coastal Ecosystems

Reduce shoreline erosion

- Preserve ecological buffers to allow for inland beach migration.
- Enhance shoreline protection where retreat and accommodation are not possible.

Reduce property damage from erosion, flooding events, sea level rise

- Incorporate climate change impacts into design requirements for coastal structures.
- Move or abandon shoreline infrastructure.

Table One: Climate Change: Potential Impacts and Adaptation for San Diego

Climate Change for the City of San Diego: Potential Impacts and Adaptation Options			
Climate Change Stressor	Vulnerable Area	Potential Impact on City of San Diego	Adaptation Options
Sea Level Rise	Buildings and Infrastructure	Inundation of coastal property and infrastructure	Implement hazard avoidance policies for future development; design and engineer buildings and infrastructure for structural resilience
	Coastal resources and ecosystems	Wetland habitat and biodiversity loss; beach, cliff, and bluff erosion	Create natural buffer zones to protect coastline and allow beach/wetland migration inland (e.g., thru setbacks, density restrictions, land purchases); assisted species migration
	Coastal aquifers	Saltwater intrusion adversely impacting groundwater supply quality	Build natural buffers to protect coastline; design and engineer infrastructure (e.g. injection wells as barriers) to minimize intrusion
	Coastal water quality	Diminished water quality from wetland loss and more concentrated urban runoff	Wetland habitat restoration to improve filtration; create buffer zones between habitat and built environment to allow plant and animal species to migrate inland
Rising Temperatures	Energy	Increased cooling demand during summer months; rise in peak energy demand; greater vulnerability to widespread power outages	Encourage or require energy efficiency retrofits in all City buildings and residential and commercial buildings to optimize energy efficiency; optimize use of smart grid technologies; encourage distributed generation from renewable sources
Drier Conditions and Declining Snowpack	Water	Increased water demand during summer months; diminished water supplies; increased competition for water	Alter irrigation practices and switch to drought-tolerant landscaping for City facilities; use incentives to encourage water conservation and reuse and discourage water waste among residents; retrofit all City buildings to optimize water efficiency

**City of San Diego Framework for the
2010 Climate Mitigation and Adaptation Plan (Climate MAP)
OUTLINE**

I. Introduction

- a. Definition of scope and goals for the Climate MAP, including trends, impacts and vulnerabilities to San Diego
- b. Greenhouse gas emissions data: 1990-2008

II. Integration of City Policy and Plans into the Climate MAP

a. City Operations

i. Short-term (2010-2013)

1. Adoption of City Energy Strategy.
2. Adoption of City Solar Implementation Plan.
3. Adoption of Transportation and Fuel Reduction Administrative Regulation (AR).
4. Adoption of Green Building Policy (600-27) with incentives for the private sector.
5. Implementing the Clean Generation Program with a goal of being fully subscribed.
6. Implementing the 2010 Sustainable Building Policy with a goal of being in 100% compliance (900-14).
7. Implementing additional energy efficiency retrofits at City facilities with a 50 MW reduction goal, using 2004 as a baseline
8. Implementing additional retrofits and renewable energy systems at City facilities to reach the 50 MW installations.
9. Implementing procedures to decrease the fugitive methane gas emissions from City facilities with a 60% reduction goal, using 2004 as a baseline.
10. Adhering to the 2008 Environmentally Preferable Purchasing AR with an increase of 30% compliant materials, using 2008 as a baseline.
11. Monitoring GHG reduction efforts as a component of City and regional efforts underway, including SANDAG's Sustainable Community Strategy.
12. Establishing a mechanism to require amendment to the Climate MAP if the monitoring reveals that the plan is not achieving specified levels.

13. Establishing a City procedure to include GHG emissions as part of EIR review.
14. Advancing the Indirect Potable Reuse Demonstration Project and other measures to increase source water in San Diego by 30%, using 2004 as a baseline.
15. Establishing an Urban Heat Island Reduction AR.
16. Continuing outreach and education to City staff.

ii. Mid-term (2014-2020)

1. Continue actions to reduce greenhouse gas emissions to reach AB 32 goals, which are meeting 1990 GHG levels.
2. Increase the number of electric vehicles in City Fleet to at least 10% of passenger vehicles.
3. Increase goal for renewable energy to 100 MW.
4. Increase energy efficiency at City facilities to 100 MW, using 2004 as a baseline.

iii. Long-term (2020-2050)

1. Convert City fleet to all electric or alternative fuel vehicles.
2. Retrofit City buildings to be net-zero energy.

b. Communitywide Plan

i. Short-term (2010-2013)

1. Increase residential energy efficiency.
2. Review subdivision findings in the Land Development Code for site design and building orientation requirements to ensure that the design of subdivisions minimizes energy use.
3. Provide environmental review of the Climate MAP to develop and analyze mitigation measures to reduce Greenhouse Gas Emissions that can be implemented on a project-by-project basis.
4. Form a multi-disciplinary team to review the state-adopted California Green Building Standards, and participate in subsequent rule-making. Determine whether implementation of the state standards should be accelerated, or if mandatory standards should also be required for non-residential new construction. Additionally, review whether green building standards should be applied to the existing building stock upon major remodels. Evaluate costs and benefits of alternatives.

5. Identify a process for pursuing government funding and supportive legislation in the Energy Conservation and Management Program and Comprehensive Plan (ECMPCP); address and coordinate alternative and renewable energy source objectives and research.
6. Provide an opportunity for property owners to obtain financing for renewable-energy installations and energy-efficiency retrofits through the San Diego Clean Generation Program.
7. Using state protocols, develop local guidelines for determining the value of tree planting as mitigation for air pollution emissions, control of storm water runoff and assistance with other environmental impacts as appropriate.
8. Actively participate in workshops, studies and conferences regarding climate change issues.
9. Consult with and include climate science experts in policy and program discussions regarding climate change issues.
10. Participate in future state and federal efforts to address climate change, fuel efficiency, the use of alternative fuels and efforts to reduce greenhouse gas emissions.
11. Continue to expand the recycled water distribution system per Phase II of the Recycled Water Master Plan Update 2005. Continue to connect additional infill recycled water users along the established distribution network.
12. Evaluate the opportunities to make more efficient use of gas from landfills and explore waste processing technologies that produce fuels.
13. Collaborate with SANDAG to improve incentive programs for the use of alternative transportation methods.
14. Implement the Energy Conservation and Management Program and Comprehensive Plan (ECMPCP) which includes an educational outreach strategy.
15. Continue to pursue external funding (i.e. grants) for providing renewable energy and improving energy efficiency.

ii. Mid-term (2014-2020)

1. Increase penetration of renewable energy and distributed generation systems.
2. Increase the usage and availability of public transportation.
3. Support the usage of alternative fuels and facilitate the development of electric charging stations.
4. Require all new residential development to be net-zero energy.

5. Collaborate with others to develop and consider methodology for calculating environmental impacts on a per capita basis (efficiency-based significance threshold).
 6. Identify funding and stakeholders to investigate City operations related to fuel efficiency and develop and implement a fuel efficiency policy or ordinance to address reduced use of fossil fuels.
 7. Develop new development standards to help reduce urban heat island effects.
 8. Evaluate the need to update various departments' Environmental Management Systems.
 9. Develop a program and funding source to maintain desired trees and plant additional trees.
 10. Evaluate the adequacy of regulations to address power generation and design.
- iii. Long-term (2020-2050)
1. Develop communities that are pedestrian orientated, compact, and utilize mixed development.
 2. Increase resource conservation and environmental awareness by through a focused education campaign.
 3. Require all existing and new commercial development to be net-zero energy.

III. Integration of City Policy and Plans into a Climate Change Adaptation Strategy

a. City Operations

- i. Short-term (2010-2013)
 1. Review all City policies to assure consistency with the Climate MAP.
- ii. Mid-term (2014-2020)
 1. Require all City landscape to use xeroscape or no potable water for irrigation.
 2. Increase urban forestry to provide a buffer against increased temperatures.
 3. Prepare adaptation plans for those buildings and assets that are in areas vulnerable to the effects of climate change.

- iii. Long-term (2020-2050)
 - 1. Consider project alternatives that avoid significant new development in areas that cannot be adequately protected (planning, permitting, development, and building) from flooding, wildfire, sea level rise and erosion due to climate change.
 - 2. Develop wild fire risk and response plans that account for increased wildfire risk due to climate change.
 - 3. Identify land use measures to ensure that wetlands migrate as sea level rises in some areas.
 - 4. Increase energy efficiency and demand response measures to handle increased electricity demand during peak demand periods.

b. Communitywide Plan

- i. Short-term (2010-2013)
 - 1. Support farmer's markets and local food consumption including community gardens.
- ii. Mid-term (2014-2020)
 - 1. Reduce solid waste going to landfills through increased residential and commercial recycling and composting citywide.
- iii. Long-term (2020-2050)
 - 1. Fully integrate all building systems into the Smart Grid to increase residential and commercial energy efficiency and demand response.
 - 2. Facilitate urban redevelopment projects to promote more efficient land use patterns that encourage active transportation, support transit and reduce GHGs.

IV. Environmental Documentation

- a. Analyze and identify mitigation for the significant effects of greenhouse gas emissions through a programmatic environmental impact report.

V. Implementation Summary of Goals, Milestones, and Time Lines

VI. References

- a. Reference 2005 City Action Plan - <http://www.sandiego.gov/environmental-services/sustainable/pdf/100401ActionPlan.pdf>

- b. Reference 2008 San Diego Foundation- Focus 2050 Study
<http://www.sdfoundation.org/communityimpact/environment/Initiative-focus2050.html>
- c. Reference 2008 USD-EPIC- San Diego County Greenhouse Gas Emission Inventory
<http://www.sandiego.gov/environmental-services/sustainable/pdf/ghginventory.pdf>
- d. Reference City of San Diego General Plan-
<http://www.sandiego.gov/planning/genplan/pdf/generalplan/gpexecsummarymar2008.pdf>
- e. Reference City of San Diego General Plan Action Plan
- f. Reference City of San Diego General Plan Monitoring Report

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The sustainability of the region requires an energy infrastructure that is diversified, reliable, and as self-contained as possible. The City of San Diego is California's second largest city and is the eighth largest in the nation. Between 1990 and 2004, the City's population increased by 16% to nearly 1.3 million residents. During that same time, the energy used in the residential sector increased nearly 45%, the commercial sector by nearly 108%, and the industrial sector by 2%. According to the San Diego Association of Governments (SANDAG) regional growth forecast, regional population is expected to increase by almost one million people (32 percent), four hundred thousand housing units (26 percent), and add nearly half a million jobs (32 percent) by 2030, which will increase demand for energy.

San Diego has a choice. It can face a crisis of unsustainable resource use or follow an energy strategy for a sustainable future. San Diego chooses the latter, and has a plan for 100 MW clean energy capacity by achieving a 50 megawatt (MW) increase in renewable energy use by 2013¹ and by implementing energy efficiency measures that reduce consumption by 50 MW by 2020. The focus of this report will be on increasing the use of solar power within the City. This is one component of a comprehensive City Energy Strategy.

Approximately two-thirds of the electric power used in the San Diego region is currently generated by coal-fired (12 percent) and natural gas-fired (53 percent) combustion sources. The power is imported along existing transmission lines or is generated by local power plants. Virtually all of the local power generation sources burn natural gas. The price of natural gas has nearly tripled since 2002, and remains highly volatile. The high price of natural gas has made renewable energy sources more-cost effective when compared to natural gas-fired power generation sources.

In 2006, Governor Schwarzenegger signed into law Senate Bill 1, an amended version of the "Million Solar Roofs" program. The upgraded program is entitled "California Solar Initiative" (CSI). CSI has provided incentives for commercial PV applications up to one megawatt (MW) as well as residential systems. CSI relies on \$3.35 billion in incentives to add 3,000 MW of rooftop PV in California by 2017. It is anticipated that approximately 300 MW of PV will be added in the San Diego area as a result of this solar legislation. As stated in a recent report entitled "San Diego Smart Energy 2020" (*Bill Powers and Associates*), a core element is to add over 2,000 MW of PV locally by 2020.

California has also implemented comprehensive energy policies affecting residents, the economy, and the environment, including landmark legislation to address global climate change,

adoption of a preferred loading order (Table One) for meeting new energy needs and addressing climate change, and recommendations from the state to integrate energy considerations into land use and transportation planning. As a result, the state, through agencies like the California Public Utility Commission (CPUC) and Energy Commission and utilities like SDG&E has significant authority over electricity and natural gas end uses (e.g., space and water heating) in the San Diego region. In addition, local governments have significant energy-related authorities through their role in areas like land use planning, transportation planning and funding, and building permitting.

TABLE ONE: The California Preferred Loading Order

1. Increase energy efficiency.
2. Increase demand response – temporary reduction or shift in energy use during peak hours.
3. Meet generation needs with renewable and distributed generation resources.
4. Meet new generation needs with clean fossil-fueled generation and infrastructure improvements.

The City has made significant strides to increase energy efficiency and to use renewable energy, as is shown in **Appendix One**. In fact, in 2009, the City of San Diego had more solar energy generation than any other city in the nation.

The existing energy infrastructure for transmission and distribution is rapidly reaching the end of its useful life. The decisions the city makes in addressing these challenges define the nature of its energy infrastructure needs for decades.

The Citywide Solar Energy Implementation Plan includes the following sections:

- I. Inventory of all City Facilities and Solar Potential;
- II. Property Assessed Clean Energy Programs (PACE)
- III. Solar Energy as a Driver of Economic Development
- IV. Legislative Issues and Imperatives
- V. Emergency Preparedness Analysis
- VI. Relationship between Increasing Solar Capacity and Greenhouse Gas Emission Reduction
- VII. Identification of Needs in Partnership Expansion, and Education and Outreach to Community Sectors
- VIII. Pathway to Meeting Goals

I. Inventory of City Facilities and Solar Potential

BACKGROUND

Approximately 20 Megawatts of renewable energy is produced at City facilities. This is a benefit to the City and also decreases the energy load on the SDG&E system. The Miramar Landfill and the Metro Biosolids Center provide methane gas for the cogeneration facility, resulting in 10.2 MW of energy. This meets the needs of the North City Water Reclamation Plant and the excess energy is sent to the power grid. The Point Loma gas utilization facility produces 4.6 MW and the Point Loma hydroelectric system produces 1.35 MW. There is also a 1.2 MW dual-fueled backup generator. The City also operates 2.0 MW of photovoltaic (solar) systems. The combined generation produces 153,617 megawatt-hours (MWh) of renewable power on an annual basis. This is equal to 50% of the total City's municipal electric use. Installation of a new 800 kilowatt photovoltaic system was recently placed in operation at the Otay Mesa Water Facility

OBJECTIVES:

1. Reach grid parity, meaning that renewable electricity is equal to or cheaper than the cost of power from the grid;
2. Increase solar energy capacity and be less reliant on fossil fuels; and
3. Reduce the region's carbon footprint.

ACTIONS:

- Continue to develop renewable energy projects at facilities with high energy use;
- Conduct pilot tests of emerging technologies; and
- Evaluate whether to participate in a State of CA or Federal cap and trade system for Renewable Energy Credits and carbon trading credits beginning in 2013.

SHORT –TERM PROJECTS (2009-2012)

1. Design and install landfill gas to power generation systems at the Arizona Street and South Chollas landfill, resulting in 7,000 megawatt-hours (MWh) in 2010 and decreasing over time to approximately 5000 MWh in 2024;
2. Design and install of 800 kWh photovoltaic system at Otay Mesa Water Treatment Plant, resulting in generation of 1,350,000 kWh annually; (Completed December 2009)
3. Complete the Strategic Plan for Solar Energy and the associated deliverables as part of the Department of Energy Solar America Cities grant (2007-2009); and
4. To the extent practicable, implement solar projects to “green” Balboa Park, resulting increases in renewable energy generation.

5. Initiate the Mayor's Clean Generation program that provides financing for residential energy efficiency and self generation with payments made through property taxes.

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LONGER-TERM PROJECTS (2012-2020)

- Pursue additional renewable opportunities, including, but not limited to:
 - 500 kWh Photovoltaic system at the Rancho Bernardo Reservoir, resulting in generation of 900,000 kWh's annually;
 - 0.5-1 MW at City-operated water treatment facilities;
 - 0.5-1 MW on a City parking structure; and
 - 0.5-1 MW at other newly constructed City buildings.

II. Property Assessed Clean Energy (PACE) Programs

BACKGROUND:

In December 2008, the City of San Diego announced that it would pursue a Property Assessed Clean Energy program (PACE) to assist property owners in the City of City Diego to finance renewable energy, energy efficiency improvements and water conservation measures through loans that would be repaid by special assessments on a property owner's tax bill. The program will be known as the San Diego Clean Generation program. In addition to financing solar photovoltaic systems, the program will also provide financing for several types of energy and water conservation measures including: Insulation, heating and cooling systems, whole house fans, hot water heaters, windows, doors, pool pumps and solar thermal water systems, solar photovoltaic systems, wind, hydrogen fuel cells as well as drought tolerant plants, reclaimed water systems and water efficient irrigation.

OBJECTIVES:

- To educate San Diego property owners on the benefits of energy efficiency, renewable energy and water conservation measures;
- Increase solar energy capacity and be less reliant on fossil fuels; and
- Reduce the region's carbon footprint.

ACTIONS:

1. Develop a Property Assessed Clean Energy Program allowing property owners finance the installation of renewable energy on their properties targeting single family homes.
2. Provide education and outreach programs funded by ARRA funds to assist and educate San Diego property owners on best practices for the solar industry.

SHORT –TERM PROJECTS (2009-2012)

- The City of San Diego will create and sponsor a PACE program –“The City of San Diego Clean Generation Program”. This program will be administered by a third party program administrator for the purpose of developing, implementing and to provide financing up to 20 million dollars to San Diego property owners to finance renewable energy, energy efficiency improvements and water

conservation measures during the first year of the program (beginning in mid year 2010 thru 2011). The first year pilot will target single-family homes and multi-family homes up to four units.

LONGER-TERM PROJECTS (2012-2020)

1. Expand of the City of San Diego Clean Generation Program to included Multi-family (5 units and larger) and small business in the City of San Diego and increase to amount of capital available from 20 million dollars to 60 million dollars during the second and third year of the program.
2. Increase the amount of capital available beyond the third year of the program, and access other financing markets to allow large commercial installation of solar.

III. Solar Energy as a Driver for Economic Development

BACKGROUND:

The competition for jobs will only increase as other states and nations attempt to lure innovative local companies. The existing strengths of San Diego will attract the attention of prospective companies, but innovative City policies, dedicated resources, aggressive advocacy at the state and federal level, and a renewed focus on assisting companies at every stage of growth will be necessary to ensure the long-term growth of the Clean Technology industry in San Diego.

As of mid-2009, there are 625 Clean Technology companies in San Diego County, 100 of them located within the City of San Diego. Renewable Energy Generation & Energy Efficiency categories include:

- Energy Production: solar, biomass
- Energy Storage: next generation of rechargeable battery technologies, ultra capacitors and thermal energy storage
- Energy Efficiency Technology/Materials and Energy Management Solutions: energy-management software, advanced construction materials, bio-mimetic and smart metering infrastructure

As stated in a recent report entitled –San Diego Smart Energy 2020” (Bill Powers and Associates, power generated from PV systems, when combined with sufficient solar incentives, current federal tax credits, and current accelerated depreciation, is less expensive than conventional power purchased directly from the utility. For example, the City of San Diego pays \$0.12 per kilowatt-hour (kWh) to a third party provider for the power generated by the 965 kilowatt PV array at the City’s Alvarado Water Treatment Plant under a long-term power purchase agreement. In contrast, the City pays approximately \$0.17 per kWh to SDG&E for conventional purchased power. The capital cost PV is expected to drop 40 percent by 2010 due

to an increase in manufacturing capacity worldwide. SDG&E will install electronic –smart” electric meters throughout the San Diego area by 2011. PV systems generate power during the day when electricity prices are highest. These smart meters will precisely track when PV systems are sending power to the grid. This in turn will enable fair compensation for the high value electricity being produced, further enhancing the economics of PV power generation.

OBJECTIVES:

The Mayor’s Clean Technology strategy has three key desired outcomes: creating jobs, generating additional revenue for the City through new economic activity, and improving environmental quality. More specifically, these benefits include:

- Creation of new –green-collar” job opportunities for local residents
- Better services for citizens through generation of new revenues for the City
- Environmental benefits, including reduction of greenhouse gas emissions
- Increased demand for research and development at our local universities
- Creation of new business and research opportunities for our local biotechnology and telecommunications sectors
- Creation of opportunities for entrepreneurship

ACTIONS:

Establish a Green Economy and Sustainable Development Working Group. Given the wide range of issues associated with fostering a Clean Technology sector and the linkage with environmental sustainability, the mayor has established a working group with broad representation from the private sector, academic and research institutions, the military and environmental/community groups. The working group, which is composed of members from the local community, works with the Mayor to help guide the City’s Clean Technology strategy. The working group provides input and advice to the city on the following initiatives:

1. Determining long-term economic and sustainable development goals and policies
2. Developing a green workforce strategy that supports the local Clean Technology industry
3. Developing a plan to facilitate the commercialization and adoption of new clean technologies
4. Increasing the flow of capital investment in the region
5. Developing a Clean Technology branding and marketing strategy
6. Collaborative opportunities in the Clean Technology arena

SHORT –TERM ACTIONS (2010-2012)

1. Ensure a Favorable Regulatory Climate for Clean Technology Startups. The City is exploring ways to facilitate permitting and approval processes for Clean Technology projects and facilities, including:

- a. Conduct a citywide survey of light and heavy industrial zones to explore the viability of establishing an “overlay zone” for Clean Technology companies to help streamline local permitting requirements.
 - b. Conduct a full assessment of existing City-owned parcels to determine if any are potentially suitable for Clean Technology companies.
 - c. Examine various “lease-to-purchase” incentive models for City-owned assets that may benefit Clean Technology startups.
 - d. Support Clean Technology-focused business plan competitions in partnership with local business schools and the organizations that assist Clean Technology businesses in the region.
 - e. Strengthen the City’s role in pursuing new strategic opportunities that will help grow a local Clean Technology cluster, such as the proposed California Institute for Climate Solutions and large U.S. government research/development awards that support the local development of Clean Technology innovations.
2. Advocate for the continuation of California's existing incentive programs. The Mayor will advocate for the continuation and expansion of existing government incentives that benefit the Clean Technology industry, including:
 - a. tax credits for Clean Technology research and development activities
 - b. manufacturing tax exemption for Clean Technology products
 - c. expansion of Enterprise Zones, which offer tax benefits to companies located in economically depressed areas.
 3. The Mayor also will advocate for the creation of Clean Technology-targeted incentives that currently do not exist in California, such as special tax credits or reduction of sales tax for certain clean technologies.

LONGER-TERM ACTIONS (2012-2020)

1. Create 10,000 new Clean Technology jobs in the San Diego region
2. Generate 260 MW of renewable energy citywide (public and private properties)
3. Build/retrofit 50 million square feet of green buildings
4. Reach 10 percent net-zero-energy homes within the City

IV. Legislative Issues and Imperatives

BACKGROUND:

The legislative and regulatory activity around renewable energy self-generation has been continuous. It is challenging to balance compensation to individuals for investment in self-generation versus the need to maintain a rate structure that does not shift cost to those without self-generation. This has created an environment where a system installed one year may face

significant changes in cost recovery over the life of the system ownership. The basis for customer compensation since 2001 has been net metering of system output that allows the customer to export power during the day and credit that power against use in the non-generation hours.

Appendix Two is a Rate Analysis of two photovoltaic systems in San Diego. The comparison is based on rates available in San Diego at the time of data collection and include proportionately small to large demand charges (relative to volumetric consumption), and varying on- and off-peak times. Findings are twofold for these large commercial systems: 1) transferring costs into demand charges does not result in savings and 2) changes in peak times do not result in a major cost difference during the course of a year. While lessons learned and discussions on rate components are based on the findings, the applicability is limited to buildings with similar systems, environments, rate options, and loads.

New activity is now underway at the California Public Utilities Commission to create a feed in tariff structure that will guarantee cost recovery to system owners over the expected lifetime of the system. Additionally, a tariff is being established that will allow the Utilities to pay a customer for the excess generation of the customer's system. This will provide better cost recovery for the system owner while provide incentive for customers to install larger systems that may help reduce the peak energy usage of the grid. The new rates will also interact with new activity to create a smart grid or micro grids in a community. Using the customer's self generation the utility may be able to develop a micro grid that could support the local community and provide increased reliability to the entire system. The ultimate goal of all the legislative and regulatory support is the assist the solar industry in reaching grid parity in the cost of power produced by solar self generation when compared to other power purchased from base-load power plants connected to the grid.

OBJECTIVES:

- Support legislation and regulations that provide long term cost recovery for individuals that install self-generation systems.

ACTIONS:

SHORT –TERM ACTIONS (2010-2012)

1. Participate in the SDG&E rate case proceeding
2. Participate in CPUC proceedings related to the feed in tariff
3. Participate in CPUC hearings related to compensation for the excess self generated power.

LONGER-TERM ACTIONS (2012-2020)

1. Support legislation that increases the amount of self generation capacity that the Utilities must provide net metering is increased to at least 30 percent of peak system demand.

2. Support legislation to create a feed in tariff that provides compensation to self generation owners that are net metered to the grid.
3. Support legislation and regulations that provide active integration of self generation into the smart grid or micro grid design arrangements.

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V. Emergency Preparedness Analysis

BACKGROUND:

The City of San Diego's experience with the energy crisis in 2001 highlighted the need for emergency operation of the electric grid. While there was back-up generation for water and sewage operations, the rolling blackouts caused regional traffic disruptions. This and other public works problems posed a threat to the safety of the community. The extreme wildfires experienced by the San Diego region in 2003 and then again in 2007 were further examples of the need to have a safe, reliable system that would guarantee emergency responders a location to serve as a central command station.

The best method to achieve an energy island is to have appropriate automatic or manual transfer switches and on-site storage that allows complete disconnection from the grid. Overall, distributed self-generation can provide stability in grid operations. It should be considered as a key component of smart-grid and micro-grid systems.

OBJECTIVES:

- Create a demonstration project to test the ability of solar and advanced battery storage at several City-owned locations to test the energy island concept in case of an emergency.

ACTIONS:

SHORT –TERM ACTIONS (2010-2012)

1. Apply for assistance from the Department of Energy in creating a test location for a energy island design to test viability of establishing a refuge location in the event of loss of regional grid power.

LONGER-TERM ACTIONS (2012-2020)

1. Create micro grid locations to test self generation as an emergency power provider in the event of regional power grid outages.

VI. Relationship between Increasing Solar Capacity and Greenhouse Gas Emission Reduction

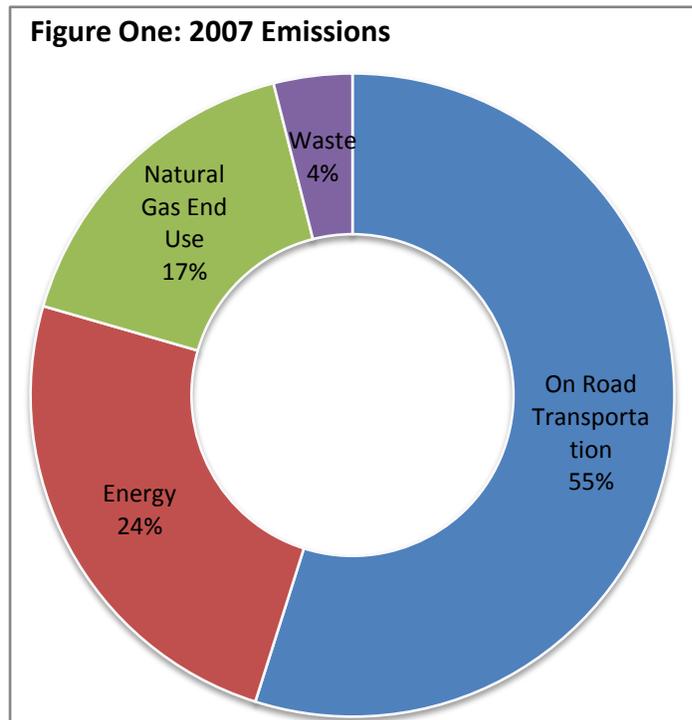
BACKGROUND:

Coupling projected growth in the population and economy, total electricity demand by 2050 is projected to increase by approximately 60 percent, and peak loads by 70 percent. Climate change accounts for approximately 2 percent of the expected rise in electricity consumption by 2050,

and up to 7 percent of the increase in peak demand. Additional peak demand will be primarily due to the need for more cooling in the summer, especially in inland areas where both regional population growth and temperature increases will be highest. Additionally, the possible implementation of seawater desalination to diversify water supplies is likely to boost overall electricity use in the region by 1-1.5 percent by 2030.

The City of San Diego’s Emission Portfolio

San Diego’s citywide emissions in 2007 measured a total of 13.43 million metric tons of CO₂e. Based on our 1990 baseline, we have seen a generally increasing trend in emissions. 2007 marked the highest emission levels of the years measured, coming in at 13% above 1990 levels. Compared to 2004, the previous year measured, emissions increased by about 1.3%. Figure One breaks down 2007 emissions by IPCC category.



The On Road Transportation category has shown the largest increases since 1990, with emission levels more than 39% above the baseline. Electricity emissions have only increased by approximately 4% since 1990, though consumption (kWh use) has increased by 28.5%. Natural gas end use emissions have managed to steadily decrease, with 2007 emissions coming in at 23% below 1990 levels. Similar to natural gas, waste sector emissions have also managed to drop below 1990 levels, measuring in at 3% below baseline levels.

Despite that we’ve seen an overall increase in emissions, the emission levels are starting to come under control. Progressive policies and actions in the waste sector, such as increased recycling

and composting, has helped to bring waste emissions under control; emissions from the energy sector have dropped below 1990 levels and as the renewable portfolio standard continues to make power cleaner and energy efficiency measures continue to decrease the amount of power each individual consumes emissions will continue to decrease. And while transportation sector emissions have continued to increase, new local, state and federal requirements such as increased fuel efficiency standards, and the low-carbon fuel standard are coming online and will help reduce emissions.

On the whole, there has been a steady increase in electrical consumption, with the commercial sector showing the largest increase over time. Industrial usage has tracked very closely with population growth; however, residential sector usage has outstripped population growth and increased by 29% since 1990. This increase in consumption has been mitigated by a slightly cleaner power supply as San Diego Gas & Electric brings more renewable energy, nuclear, and large hydro into the power mix.

Natural gas end-use, or the use of natural gas for activities other than generating electricity, has been decreasing since 1990. The most significant decrease, in volume and percentage, has come in the industrial sector, where 2007 usage represent only 70% of what was used in 1990. San Diego's commercial sector has also shown a drop of 30% below 1990 values, while the residential sector has reduced usage to 7% below 1990 levels.

Looking at the emissions that resulted from both natural gas and electricity use, we see that overall emissions have decreased 9% below 1990 levels. This can be attributed to the significant reductions in the natural gas sector and a cleaner supply of power in the San Diego region.

California has been and continues to be at the forefront of environmental protection in America. In 2006, California Governor Arnold Schwarzenegger signed the Global Warming Solutions Act (AB 32), establishing statutory limits on greenhouse gas emissions in California. AB 32 seeks to reduce statewide emissions to 1990 levels by the year 2020. AB 32 also directs the California Air Resources Board to develop regulations and establish a reporting and monitoring system to track global warming emissions levels currently known as the Climate Change Scoping Plan.

Prior to the passage of AB-32 but in direct support of it, in 2005, Governor Schwarzenegger signed Executive Order S-3-05, which establishes long-term targets for greenhouse gas emissions reductions to levels 80% below 1990 levels by 2050. While this reduction target is not law, it is generally accepted as the long-term target of California regulations.

OBJECTIVES:

- Meet and/or exceed California's standards for greenhouse gas emissions (1990 levels by 2020) and renewable energy power generation (33% by 2020).

ACTIONS:

SHORT –TERM ACTIONS (2010-2012)

1. Provide a framework for the collection of greenhouse gas emissions from all activities in the region.
2. Develop recommendations to reduce the total emissions from the energy sector in the region.
3. Promote the SOLAR MAP as a means to advance more installation of solar panels.

LONGER-TERM ACTIONS (2012-2020)

1. Provide incentive to reduce the emissions from normal operation by assisting the construction community in integrating self generation into all residential and commercial building construction.

VII. Identification of Needs in Partnership Expansion, and Education and Outreach to Community Sectors

BACKGROUND:

Reliable, consistent electric power is essential for normal operations in all sectors of the community. As the method of generation and deliver of this power modifies in the future it will become increasingly difficult to isolate and components elements from central monitoring. The non-dispatchable nature of self-generation from solar systems will result in a mixed grid capability that should be better understood by the community members. Current system operation does not encourage or discourage energy use in the residential community in any way. The newer mixed grid will require knowledge of energy use by everyone. The education and outreach to the community will be vital to smooth operation of power delivery. **Appendix Three** is a summary of the report that highlights the results of both the public survey as well as a series of Focus Group meetings, all of which are related to the barriers and solutions for installing more solar photovoltaic systems in San Diego. The good news is that the barriers presented by property owners, real estate and associated professionals and municipal permit review staff are NOT insurmountable. As noted in the report, each of the challenges had a realistic recommendation that is achievable. Marketing, targeted education and outreach, as well as financial incentives and financing mechanisms are the backbone for expanding solar PV installations.

Appendix Four describes an educational tool that has proven to be very successful. The San Diego Solar Map tracks and maps solar photovoltaic (PV) and solar water heating (SWH) installations in the San Diego region. The purpose of the map is to expand the use of solar technology in the San Diego region by providing tools and information to businesses and home owners and demonstrating its widespread adoption. To date, the San Diego Solar Map has had over 6,200 site visits from 63 countries, 43 states, and nearly 300 cities in California.

OBJECTIVES:

- Close co-operation with local utility efforts will be required to effectively educate the public in recognizing the effects of their own individual power use patterns.
- Additional support from the Department of Energy in testing new methods for power delivery will be vital to properly evaluating the best practices in delivery of power to a local community.

ACTIONS:

SHORT –TERM ACTIONS (2010-2012)

1. Apply for additional grant opportunities to support smart grid and micro grid design and operation.

LONGER-TERM ACTIONS (2012-2020)

1. Coordinate with SDG&E and other Cities in the region to optimize operational capability of the local power grid systems.

VIII. Pathway to Meeting Goals

BACKGROUND:

The rapid integration of numerous small self generation systems throughout the local community is providing a challenge to the basic design of grid systems that provide power to regional customers. All aspects of the traditional system will require significant change with the integration into the available self-generation. A smart grid or micro grid will be able to monitor all generation and usage on a close to real time measure and will dispatch additional resources to fill the needs of the community.

OBJECTIVES:

- Streamline permitting
- Promote Solar to all sectors of the community (Reference Solar Survey)
- City Programs (Clean Gen., etc)
- Assistance from Utility

ACTIONS:

SHORT –TERM ACTIONS (2010-2012)

1. ESD to provide training for City staff (DSD, E&CP, Fire) to understand solar installations and to promote the use of the Solar Map and other educational tools;
2. As per the detailed solar survey –Barriers and Solutions”, provide tailored presentations to the Real Estate industry
3. Promote the Mayor’s Clean Generation Program
4. Coordinate with SDG&E and other cities within the utility’s region to create more incentives for broad scale solar installations.

LONGER-TERM ACTIONS (2012-2020)

1. Coordinate with SDG&E and other Cities in the region to optimize operational capability of the local power grid systems.

**** end ****

REFERENCES

1. RESOLUTION NUMBER R-298412, ADOPTED ON SEPTEMBER 23, 2003
RESOLUTION REGARDING SUSTAINABLE ENERGY GOALS FOR THE CITY OF
SAN DIEGO.
2. Barriers and Solutions: A Detailed analysis of Solar Photovoltaics in San Diego
<http://www.sandiego.gov/environmental-services/sustainable/index.shtml>

APPENDICES

1. Appendix One: 2003-2009 City of San Diego Accomplishments in Energy Efficiency
and Renewable Energy
2. **Appendix Two:** Rate Analysis of Two Photovoltaic Systems in San Diego
3. **Appendix Three:** *Barriers and Solutions-* A Detailed Analysis of Solar Photovoltaics in
San Diego
4. **Appendix Four:** Summary of the Solar Map Project

Appendix One: 2003-2009 City of San Diego Accomplishments in Energy Efficiency and Renewable Energy

Sectors	Accomplishments	Awards
ENERGY EFFICIENCY AND RENEWABLE ENERGY	1995- Completed the City’s Green Building Demonstration Project (Environmental Services Department Headquarters) that was used as a pilot project for the USGBC LEED rating system and was selected as an AIA top ten green building.	The nation’s first EPA Energy Star Award for Buildings
	2002- Adopted the City’s Sustainable Building policy (900-14) that requires all City buildings greater than 5,000 sq ft to meet LEED Silver Rating equivalent and encourages private development to meet Green Building standards. Developed and Implemented Sustainable Building Permit Expedite Program - 2003. After 5 years over 1000 residential and commercial units have added energy efficiency and solar photovoltaic systems to their projects This incentive has been responsible for nearly 2 MW of new solar power since inception.	
	18 MW Methane (Biogas) from Municipal Landfill and Municipal Wastewater Treatment Plant	1997 San Diego County Tax Payer’s Association Golden Watch Dog Award for Installation of Landfill and Digester Gas Fueled 6.4 MW Cogeneration System
33.3 MW solar in region (commercial and residential), with 1.2 MW at City facilities	2005 Green Power Purchaser (DOE and EPA) 2005 Flex your Power (State of California)	

Sectors

Accomplishments

Strategic incorporation of energy efficiency measures in City facilities such as lighting retrofits and HVAC improvements, and installation of photovoltaic and co-generation systems
2007- One of the initial cities selected by the DOE as a “Solar America City”
Contract in place to use Biogas at POTW for fuel cell power generation.

Awards

Five ENERGY STAR awards for City buildings

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Appendix Two: Rate Analysis of Two Photovoltaic Systems in San Diego

Rate Analysis of Two Photovoltaic Systems in San Diego

Elizabeth Doris, Sean Ong, and Otto Van Geet

Prepared under Task No. PVC7.92LA

Abstract

Analysts have found increasing evidence that rate structure has impacts on the economics of solar systems (e.g., Wiser et al. 2007, Borenstein 2007). This paper uses 2007 15-minute interval photovoltaic (PV) system and load data from two San Diego City water treatment facilities to illustrate impacts of different rate designs. The comparison is based on rates available in San Diego at the time of data collection and include proportionately small to large demand charges (relative to volumetric consumption), and varying on- and off- peak times.

Findings are twofold for these large commercial systems: 1) transferring costs into demand charges does not result in savings and 2) changes in peak times do not result in a major cost difference during the course of a year. While lessons learned and discussions on rate components are based on the findings, the applicability is limited to buildings with similar systems, environments, rate options, and loads.

Conclusions/Discussion

This report provides analysis of different utility rates on two PV systems in San Diego, California. It provides a study of two relatively same-sized, co-located systems on buildings with different load profiles. Rates available during the time of system measurement, as well as a proxy rate illustrating increased demand charges relative to volumetric charges, are evaluated. Findings indicate that changes in peak timing did not have a major effect on the economics of the system over the course of a year, and that increased demand charges relative to volumetric charges do not increase the economic value of these two solar systems.

The results support existing literature on the importance of relative sizing of PV systems and the load being served (Wiser et al. 2007). The system installed at 5530 Kiowa is oversized relative to peak load, and 5540 Kiowa is sized to meet peak demand. As a result, the 5540 Kiowa system, under all rates tested, offsets more of the energy costs of the building.

Regarding the most beneficial rate structures, those that exhibit the greatest benefits all have lower demand charges and time-of-use rates, which peak during peaks in PV production. Typically, a utility will provide a TOU rate that has a high peak charge and a low off-peak charge. Such rate structures encourage customers to shift their electricity use to off-peak times, making it a good demand-side management tool for the utility. Solar PV system owners benefit

from TOU rates because of the low off-peak charges and because a PV system typically reduces their electricity imports during peak hours. A rate structure that peaks during the hours of PV production will have the greatest benefit to the system owner.

For a TOU rate to be beneficial, the PV system needs to be designed to provide the bulk of the electricity load for the building. If not, the high-price electricity purchased on-peak will offset the savings provided by the system. It is the combination of low off-peak rates and low energy use during peak hours (due to the PV system's contribution) that results in the savings. However, even if the system is undersized relative to building load, the high peak prices have the benefit of increasing the value of the PV production and reducing system payback periods.

Finally, demand charges are not an effective benefit for PV system owners because the charge is based on the maximum use during a billing period (usually a month). Even one cloud passing over a PV system during peak building load may cancel the effect of demand-charge savings. Consider, for example, a PV system that reduces a building's peak demand 29 days out of a 30-day billing period; the customer will be charged for their peak demand, which occurred on the one day that the PV system had reduced function (perhaps due to cloud cover). Thus, the 29 days that the PV system did reduce the customer's peak load, becomes irrelevant. Only the highest use is billed. In reality, it may only take a 15-minute cloud cover for this effect to be true.

Appendix Three: Barriers and Solutions- A Detailed Analysis of Solar Photovoltaics in San Diego

Introduction

What does it take to increase the number of solar photovoltaic (PV) panel installations on residential and commercial buildings? Who do people listen to when considering solar energy as a viable option? How much value does a solar installation add to a home? How is the permit review process perceived by the public? What can municipal policies do to encourage the use of solar energy? When are state and federal incentives enough to make a difference? Who are the champions for solar installations and how can they expand the market?

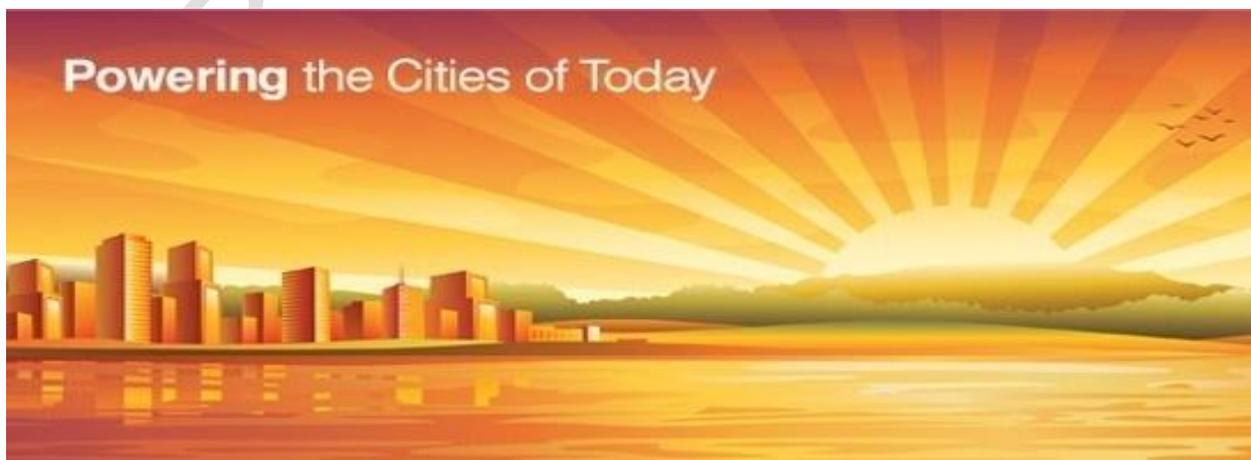
These and other questions were among the topics recently explored by the City of San Diego. This city was acknowledged as having the most solar installations in the State in 2009. The goal of the study was to identify challenges and opportunities to advance residential and commercial solar installations.

Information for this report is from two sources: 1) a city-wide Solar Survey of property owners with solar PV installations; and 2) three Focus Groups of specific market segments. The Survey provides a broad brush overview of the experiences of more than 641 people who have solar PV installations. The three Focus Groups delve deeper into what impediments exist from the perspective of real estate and associated professionals, municipal permit review staff, and the residents who are using solar power.

Appendix One is the detailed results from the Solar Survey and **Appendix Two** is the outcome from the three Focus Group meetings.

Conclusion

The good news is that the barriers presented by property owners, real estate and associated professionals and municipal permit review staff are NOT insurmountable. As noted in the report, each of the challenges had a realistic recommendation that is achievable. Marketing, targeted education and outreach, as well as financial incentives



and financing mechanisms are the backbone for expanding solar PV installations.

How can the recommendations in this report be implemented? What are the roles of municipal, state and federal agencies? What is the role of non-governmental organizations (NGOs)?

1. The state can mandate that the solar PV incentives are linked to completion of a HERS rating, which is more rigorous than the current requirement in CSI. Secondly, the state can mandate that a HERS rating is required as part of the disclosure information for sale of a property. This removes the inconsistency between regions.
2. Establishing partnerships between municipalities and NGO's can capitalize on the strengths of each. This is especially true for education and outreach programs, which are clearly needed for the contractors, property owners, real estate and associated professions, and municipal permit review staff.
3. The federal government must maintain the tax incentives in place for distributed renewable energy systems, and potentially expand support for states to continue their programs.

What can we gain from these efforts?

If 10 percent of the power in San Diego came from solar energy, it would reduce GHG emissions by 100,000 metric tons, the equivalent of removing 20,000 cars from the road, and would provide enough power for 10,000 homes (www.epa.gov/RDEE/energy-resources/calculator.html).

As is evident, switching from traditional power to solar provides significant positive impacts for the economy and the environment. Increased financing options are increasing the accessibility of solar power to a broader group of people. Government rebates and utility incentives continue to help shorten the payback. Most importantly, the growth of solar represents how the collective impact of individual action can make a BIG difference.

* * * * *

Appendix Four: The San Diego Solar Map Project

San Diego Solar Map

Background

The San Diego Solar Map is a Department of Energy (DOE) -funded project to track and map solar photovoltaic (PV) and solar water heating (SWH) installations in the San Diego region (Figure 1). The map, developed by Critigen (formerly CH2MHill) with support from the City of San Diego Environmental Services Department (ESD) and California Center for Sustainable Energy (CCSE), was officially unveiled in July of 2009. The purpose of the map is to expand the use of solar technology in the San Diego region by providing tools and information to businesses and home owners and demonstrating its widespread adoption. To date, the San Diego Solar Map has had over 6,200 site visits from 63 countries, 43 states, and nearly 300 cities in California.



Figure 1 – Screenshot of <http://sd.solarmap.org>

Projects Statistics

At the time of its launch, the solar map consisted of nearly 6,000 projects from the state's PV rebate programs, including the Emerging Renewables Program

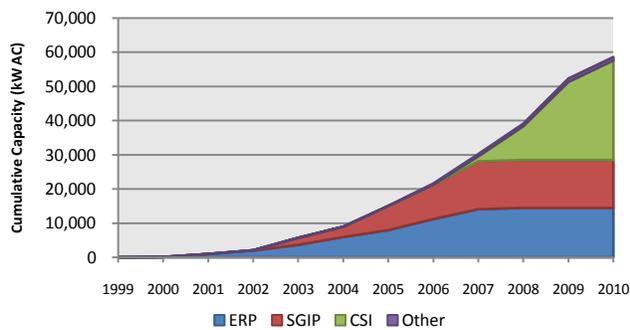


Figure 2 – Cumulative Capacity in SD Solar Map

(ERP), Self Generation Program (SGIP), California Solar Initiative (CSI) and regional solar water heating pilot program and other smaller programs. Since that time regional installations have expanded significantly and the project team is now in the process of updating the map with more than 2,000 additional projects bringing the total to more than 8,000, representing over 58.5 MW AC of capacity (Figure 2). The team is also developing a process for more frequent updates to the map so that residents, business and governments can have access to more up-to date information on installed capacity.

Site Enhancements

Since its launch, the Solar Map has gone through a series of enhancements, including the addition of an Electric Rate Analyzer, numerous new solar installations and Web 2.0 functionality. As part of its strategic marketing plan for the CSI, CCSE secured an additional \$100,000 in ratepayer funding for further enhancements. With these funds, the project team plans to further expand the site’s Web 2.0 functionality and complete detailed assessments of PV generation potential at large commercial and government buildings in the San Diego Gas and Electric (SDG&E) service territory (Figure 3). Depending on costs, the team would like to extend this analysis to as many properties as possible, including smaller commercial buildings and residents.

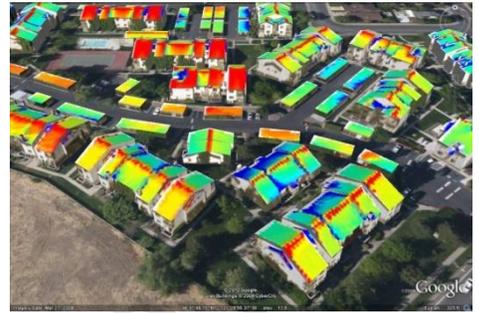


Figure 3 – PV Production Model Output

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Attachment Three►City of San Diego ENERGY STRATEGY FOR A SUSTAINABLE FUTURE

The sustainability of the region requires an energy infrastructure that is diversified, reliable, and as self-contained as possible. The City of San Diego is California's second largest city **and is the eighth largest in the nation. Between 1990 and 2004, the City's population** increased by 16% to nearly 1.3 million residents. During that same time period, the energy used in the residential sector increased nearly 45%, the commercial sector by nearly 108%, and the industrial sector by 2%. San Diego has a choice-- face a crisis of unsustainable resource use or follow an energy strategy for a sustainable future. San Diego chooses the later, and has a plan for 100 MW clean energy capacity by achieving a 50 megawatt (MW) increase in renewable energy use by 2013¹ and by implementing energy efficiency measures that reduce consumption by 50 MW by 2020².

Currently, California has regulations in place that will result in more efficient energy use and a strategic plan with aggressive goals for energy efficiency and renewable energy generation. The Federal government is providing incentives to achieve similar goals³. The **State's requirements** include, but are not limited to:

- 2008 updates in the California Green Building Standards Code, Part 11, Title 24, giving authority to State agencies to require specific green building measures;
- 2008 [Executive Order S-14-08](#) requiring that California utilities reach the 33% renewable energy goal by 2020;
- 2008 CA Public Utilities Commission Strategic Plan identifying targets in the public and private sector, including net-zero energy use in residential buildings by 2020 and for commercial buildings by 2030, and promoting renewable energy; and
- 2006 CA Global Warming Solutions Act (AB 32) aiming to reduce greenhouse gas (GHG) emissions by pursuing all cost-effective energy efficiency options and increasing clean energy generation.

The **City of San Diego's Energy Plan for a Sustainable Future (Plan)** has six objectives to achieve more sustainable generation and use of energy:

1. ENERGY CONSERVATION- All City employees will be aware of and implement energy conservation measures by 2010;
2. ENERGY EFFICIENCY- Reduce energy use 10% by 2012, using 2000 as a baseline.
3. RENEWABLE ENERGY- Increase megawatts (MW) of renewable energy used at City facilities to 17 by 2012, and to 25 by 2020;
4. MANAGEMENT OF SDG&E ENERGY BILLS- Continue the use of the Electronic Data Interchange (EDI);
5. POLICY DEVELOPMENT AND IMPLEMENTATION- Guide City efforts by institutionalizing policies and programs that increase energy conservation, efficiency and the use of renewable energy; and
6. LEVERAGE RESOURCES- Ensure that State and Federal funds are leveraged to the extent possible with existing programs such as California Energy Commission loans and the California Public Utilities Commission Partnership funds.

ENERGY STRATEGY FOR A SUSTAINABLE FUTURE

ENERGY CONSERVATION

Conservation efforts include simple actions that reduce energy demand, and this remains the most cost effective way to manage energy budgets. Employee education and outreach have been successful, including the use of newsletters, the “Watts Up” campaign, and electronic monitoring of HVAC systems.

OBJECTIVES:

1. By 2010, all City employees will understand the importance of energy conservation and will take actions at work and at home to reduce energy use;
2. By 2012, all residents in San Diego have the information available to make well-informed decisions about how to conserve energy; and
3. By 2020, *per capita* residential, commercial and industrial energy use is reduced by 50% using 2000 as a baseline.

ACTIONS:

1. Continue outreach programs to employees, including award programs for staff in buildings or departments with significant reductions in energy consumption; and
2. Expand outreach to the community through the use of City TV, working with existing community groups, adding an “energy page” to telephone books, and updating the City’s websites.

SHORT –TERM PROJECTS (2009-2012)

- Promote various workshop educating City staff involved in energy conservation and sustainable building design. Increasing the knowledge of City staff will enhance energy conservation and sustainable building efforts.

LONGER-TERM PROJECTS (2012-2020)

- Identify and implement new programs and conservation measures using emerging technologies. Continue to promotion conservation goals to City staff, especially policy and decision makers involved with procurement decisions.

ENERGY EFFICIENCY

Energy efficiency is the use of technologies that provide the same or better service while using less energy. In 2007, the City used 14 million kilowatt hours less electricity than in 2000. Examples of energy efficiency include: replacement of City Administration building chillers that are 30 % more efficient; replacement of T-12 florescent lamps with magnetic ballasts to T-8 bulbs with electronic ballasts that are 50% more efficient; replacement of incandescent traffic signal bulbs with LED bulbs that use 90% less energy and have a 5 to 7 year life compared to 18 months for incandescent bulbs; replacement of rooftop air conditioning packages that are 30% more efficient; and installation of active day lighting systems in large buildings, thus reducing the need for artificial lighting during most daylight hours.

OBJECTIVES:

1. Reduce energy use by 10% in 2012, using 2000 as a baseline; and
2. Ensure that all lighting in City facilities is more efficient than traditional lighting.

ACTIONS:

1. Replace aging package roof top units on aging City facilities;
2. Convert 50% of the street lights from High Pressure Sodium to induction lighting; and
 - a. Continue to identify and manage energy system upgrade projects in city owned facilities and implement a Smart Energy Management and Monitoring System (SEMMS) that will manage and monitor energy use at City Facilities with larger consumption and demand. The system will be interfaced with the SDG&E Demand Response program

SHORT –TERM PROJECTS (2009-2012)

- Lighting Efficiency Conversion resulting in 150,000 kWh reduction per year
- HVAC Conversion resulting in 225,000 kWh reduction per year
- Implement a pilot project for Smart Energy Management and Monitoring System (SEMMS) with anticipated saving of 80,000 kWh per year and 25,000 kW associated with participating in demand-side reduction programs.
- Implement projects to “green” Balboa Park, which is anticipated to save 250,000 kWh annually.

LONGER-TERM PROJECTS (2012-2020)

- Expand broad spectrum lighting conversion for Street Lights and install second-generation LED Traffic Signal Lighting, resulting in approximately 1,000,000 kWh savings annually.
- Install energy saving measures in City owned facilities, resulting in anticipated savings of 250,000 kWh annually.
- Expand Smart Energy Management and Monitoring Systems to gain an additional 80,000 kWh savings.

- Continue to improve the energy efficiency of Balboa Park, resulting in 200,000 kWh savings per year.

RENEWABLE ENERGY

Approximately 19 Megawatts of renewable energy is produced at City facilities. This is a benefit to the City and also decreases the energy load on the SDG&E system. The Miramar Landfill and the Metro Biosolids Center provide methane gas for the cogeneration facility, resulting in 10.2 MW of energy. This meets the needs of the North City Water Reclamation Plant and the excess energy is sent to the power grid. The Point Loma gas utilization facility produces 4.6 MW and the Point Loma hydroelectric system produces 1.35 MW. There is also a 1.2 MW dual-fueled backup generator. The City also operates 1.2 MW of photovoltaic (solar) systems. The combined generation produces 152,617 megawatt-hours (MWh) of renewable power on an annual basis. This is equal to 50% of the total City's municipal electric use. Installation of a new 800 kilowatt photovoltaic system is planned in 2009 to power the City's South Bay water treatment facility.

OBJECTIVES:

4. Reach grid parity using renewable energy;
5. Become energy independent and less reliant on fossil fuels; and
6. Reduce the region's carbon footprint.

ACTIONS:

- Continue to develop renewable energy projects at facilities with high energy use;
- Conduct pilot tests of emerging technologies;
- Complete the Strategic Plan for Solar Energy, as per the Department of Energy Solar America Cities grant (2007-2009); and
- Participate in a State of CA or Federal cap and trade system for Renewable Energy Credits and carbon trading credits beginning in 2013.

SHORT-TERM PROJECTS (2009-2012)

- Design and install landfill gas to power generation systems at the Arizona Street and South Chollas landfill, resulting in 7,000 megawatt-hours (MWh) in 2010 and decreasing over time to approximately 5000 MWh in 2024;
- Design and install of 800 kWh photovoltaic system at Otay Mesa Water Treatment Plant, resulting in generation of 13, 500,000 kWh annually;
- Complete the Strategic Plan for Solar Energy and the associated deliverables as part of the Department of Energy Solar America Cities grant (2007-2009); and
- To the extent practicable, implement solar projects to "green" Balboa Park, resulting in increases in renewable energy generation.

LONGER-TERM PROJECTS (2012-2020)

- Pursue additional renewable opportunities including the design and installation of 500 kWh Photovoltaic system at the Rancho Bernardo Reservoir, resulting in generation of 9,000,000 kWh's annually.

MONITOR AND MANAGEMENT UTILITY ENERGY ACCOUNTS

Beginning in 2002, the conversion was made from the paper billing process, which was labor intensive and inefficient, to Electronic Data Interchange (EDI) for electronic payments to San Diego Gas and Electric (SDG&E) for all 2,840 City electric and gas accounts. With this more efficient system, unused accounts were identified, saving \$9,700 annually. Analysis also resulted in tariff changes, saving another \$30,000.

OBJECTIVES:

1. Process energy invoices more efficiently and accurately; and
2. Analyze energy bills to evaluate the proper rate and tariffs.

ACTIONS:

1. Continue to perform bill analysis; and
2. Continue to expand the City real time metering and monitoring capabilities to monitor energy performance.

SHORT –TERM PROJECTS (2009-2012)

- Develop software analysis tools to review and identify anomalies in energy bill data. The software will flag spikes so investigations can be performed to identify the cause of the increased consumption;
- Review trend data captured in the Smart Energy Management and Monitoring System (SEMMS) and compare with actual consumption data.

LONGER-TERM PROJECTS (2012-2020)

- Implement and refine the energy monitoring programming for SEMMS (identified above) so the software monitors both energy bills and energy consumption data captured through SEMMS;
- Integrate an automated system to identify and flag 95% of profiles that exceed normalized energy values;
- Automate individual SEMMS building systems with SDG&E Demand Response Program for seamless integration of demand reduction calls.

POLICY and PROGRAM DEVELOPMENT and IMPLEMENTATION

Following the 2001 energy shortages in Southern California, the San Diego City Council adopted a comprehensive resolution, R-2001-1112, establishing a centralized coordination program for the City that is charged with advancing energy efficiency, conservation and renewable energy systems in all City departments and to provide outreach to the community. The program resides in the Environmental Services Department.

The City's General Plan, adopted in March 2008, integrates energy efficiency and renewable energy into an overarching framework of reducing greenhouse gas emission (GHG) and is the foundation of how the City will grow in the next 20-30 years. Achieving the Mayoral goals of 50 MW of solar power by 2013 and the 50 MW (900 MWh) reduction in energy use by 2020 are critical to a more sustainable energy future, resulting in 100 MW of clean energy capacity.

OBJECTIVES:

1. Create a more informed City workforce by providing training opportunities for City planners and project managers that will lead to more sustainable practices;
2. Establish a revolving loan fund for City projects that are repaid to the fund through the cost-savings in the utility bills, similar to SDG&E's on-bill-financing program.
3. Reduce greenhouse gas emissions to 1990 levels by 2020, as per the CA Global Warming Solutions Act of 2006 (AB 32) with a suite of programs, including: a) incentives and/or mandates for energy efficiency and renewable energy in new construction and major renovations in the public and private sectors; b) a community fuel reduction and transportation efficiency policy; and c) use of planning and technology that reduce the urban heat island effect in the city; and
4. Encourage the installation of renewable energy in the commercial and residential sectors through innovative financing programs.

ACTIONS:

1. Evaluate the financial mechanisms in place that will support a revolving loan program;
2. Evaluate the success of the AB 811 pilot project and if appropriate, design a citywide program that includes financing for energy and water retrofit programs in addition to solar energy installation;
3. Update the City's Climate Protection Action Plan and GHG emissions inventory every two years and use this as a tool for evaluating the effectiveness of existing actions and to set priorities for future actions;
4. Provide at least one quarterly training for City staff that highlights more sustainable practices, including energy and water conservation and "green building" technology;
5. Update the City's Sustainable Building Policy (900-14) every two years to ensure that it remains a viable instrument to advance the best practices and technologies;
6. No later than 2010, implement a community fuel reduction and transportation efficiency policy and an urban heat island reduction policy; and
7. In concert with a nonprofit organization(s), design a program that would assist disadvantaged neighborhoods with home energy audits and upgrades.

SHORT -TERM PROJECTS (2009-2012)

- Increase the knowledge base of City staff in “green building,” sustainable design, and opportunities for GHG reductions ;
- Consider the development of an Assessment District to finance the installation of solar for San Diego Residents, including solar hot water systems, with anticipated annual savings of 500,000 kWh and 300,000 Therms.
- Begin a residential assistance program to identify energy conservation measures with incentives for residential energy enhancements;
- Implement a special energy plan check section to recommend energy conservation measures on all projects plan checked by Development Services Department.

LONGER-TERM PROJECTS (2012-2020)

- Review, revise, and redirect the above programs, and expand the successful ones;
- Expand Assessment District to include financing for energy efficiency, water conservation

LEVERAGE RESOURCES

The City receives funding for a variety of energy projects through State and Federal grants and low-interest loans.

- The “Partnership” between the City, CA Public Utilities Commission and SDG&E is funded through utility rate-payers, and the current 2009-2011 program cycle provides nearly \$4 million for a broad range of energy projects;
- The Solar America City grant from the U.S. Department of Energy provides \$200,000 from October 1, 2007 to September 30, 2009;
- Low interest loans are available through the CA Energy Commission for upgrades to City facilities and infrastructure; and
- The CA Department of Conservation will be funding a community outreach program in San Diego in 2009-2010 for energy and water conservation.

OBJECTIVES:

1. Identify priority projects and determine all appropriate funding sources; and
2. Engage other entities, such as San Diego Gas and Electric, to help leverage resources through their rebate programs as well as on-bill-financing.

ACTIONS:

1. No later than April 2009, define the projects that will be implemented within 2-years;
2. No later than January 2010, define mid-term projects that will be implemented by 2015; and
3. Continue to evaluate new state and federal mandates in order to ensure that the City organization is in compliance and that the community is aware of changing regulations.

SHORT –TERM PROJECTS (2009-2012)

- Develop a City task force to identify comprehensive water and energy savings, and combined sustainable power using funding from the CPUC Partnership Program, CEC loan program, and the CA Department of Conservation.

LONGER-TERM PROJECTS (2012-2020)

- Expand distribution infrastructure for reclaimed water program.

REFERENCES

3. RESOLUTION NUMBER R-298412, ADOPTED ON SEPTEMBER 23, 2003
RESOLUTION REGARDING SUSTAINABLE ENERGY GOALS FOR THE CITY OF
SAN DIEGO.
4. I am not finding the resolution for this— the goal is referenced in various reports, but the
source document is not listed. Bummer.
5. The Energy Efficiency and Conservation Block Grant Program (EECBG) provides grants to U.S. local governments, states, territories, and Indian tribes to fund programs and projects that reduce energy use and fossil fuel emissions and improve energy efficiency. The Program represents a Presidential priority to deploy the cheapest, cleanest, and fastest energy sources. EECBG was authorized in Title V, Subtitle E of the Energy Independence and Security Act (EISA), signed into law on December 19, 2007, and is modeled after the [Community Development Block Grant Program](#) administered by the Department of Housing and Urban Development (HUD).

Appendices

5. Appendix One: 2003-2009 City of San Diego Accomplishments in Energy Efficiency and Renewable Energy

DRAFT July 2010

Appendix One: 2003-2009 City of San Diego Accomplishments in Energy Efficiency and Renewable Energy

Sectors	Accomplishments	Awards
ENERGY EFFICIENCY AND RENEWABLE ENERGY	1995- Completed the City’s Green Building Demonstration Project (Environmental Services Department Headquarters) that was used as a pilot project for the USGBC LEED rating system and was selected as an AIA top ten green building.	The nation’s first EPA Energy Star Award for Buildings
	2002- Adopted the City’s Sustainable Building policy (900-14) that requires all City buildings greater than 5,000 sq ft to meet LEED Silver Rating equivalent and encourages private development to meet Green Building standards.	
	Developed and Implemented Sustainable Building Permit Expedite Program - 2003. After 5 years over 1000 residential and commercial units have added energy efficiency and solar photovoltaic systems to their projects. This incentive has been responsible for nearly 2 MW of new solar power since inception.	
	18 MW Methane (Biogas) from Municipal Landfill and Municipal Wastewater Treatment Plant	1997 San Diego County Tax Payer’s Association Golden Watch Dog Award for Installation of Landfill and Digester Gas Fueled 6.4 MW Cogeneration System
33.3 MW solar in region (commercial and residential), with 1.2 MW at City facilities	2005 Green Power Purchaser (DOE and EPA)	2005 Flex your Power (State of California)

Sectors

Accomplishments

Strategic incorporation of energy efficiency measures in City facilities such as lighting retrofits and HVAC improvements, and installation of photovoltaic and co-generation systems
2007- One of the initial cities selected by the DOE as a “Solar America City”
Contract in place to use Biogas at POTW for fuel cell power generation.

Awards

Five ENERGY STAR awards for City buildings

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