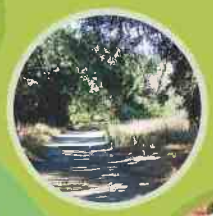
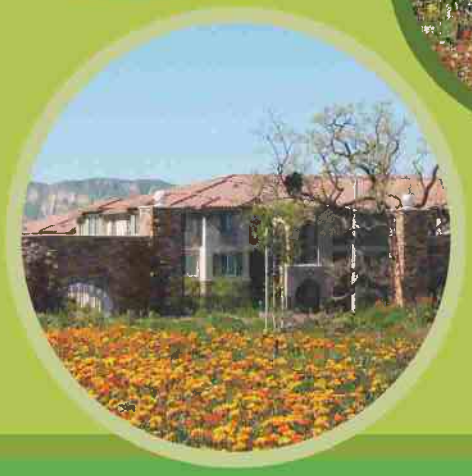
CITY OF SIMI VALLEY





ENERGY ACTION PLAN

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ACKNOWLEDGEMENTS

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This policy supports the California Long Term Energy Efficiency Strategic Plan Goal 3: "Local governments lead by example with their own facilities and energy usage practices." The policy specifically implements Strategic Plan Task 3.2.1: "Develop Energy Action Plan for City." The policy meets the Task 4.B. requirements as described in the "Strategic Plan Strategy Program" Statement of Work as approved by the Simi Valley City Council.

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Table of Contents

EXECUTIVE SUMMARY 1
- Overview 1
- Findings 2

CITY OF SIMI VALLEY ENERGY ACTION PLAN 5
- Introduction 5
- Goals 6
- Implementation Plan 6
- Relation of Energy Action Plan to Other City Policies 8

ENERGY ACTION PLAN BACKGROUND AND PURPOSE 9
- Definition of Energy Action Plan 9
- Benefits of Energy Action Plan 9

ENERGY ACTION PLAN PROCESS 11
- Scope of Analysis 11
- Data Collection Process 12
- Data Quality Control 13
- Calculation Methodology and Assumptions 13

TOTAL MUNICIPAL ENERGY USE 17
- Total Energy Use 17
- Total Electricity Use 19
- Total Natural Gas Use 22

TOTAL MUNICIPAL GREENHOUSE GAS EMISSIONS 25
- Total Energy Related Greenhouse Gases 25
- Total Electricity Related Greenhouse Gases 27
- Total Natural Gas Related Greenhouse Gases 28

MUNICIPAL BUILDING ENERGY USE 29
- Municipal Building Overview 29
- Energy Conservation Measures 36
- City Hall 39
- Cultural Arts Center 53
- Development Services Building 61
- Police Department 71
- Public Services Center 81
- Sanitation/Waterworks 89
- Senior Center 107
- Transit Facility 115

MUNICIPAL NON-BUILDING ENERGY USE 125
- Waterworks District No. 8 125
- Street Lighting 135

Traffic Signal Lighting 137
Landscape Irrigation 141
Other 145
SUMMARY AND CONCLUSIONS 147
Summary of Goals 147
Summary of Key Findings and Future Actions 147
Total Energy 147
Building Energy 151
REFERENCES 166
APPENDIX A – RENEWABLE ENERGY 168
Introduction 168
Solar Photovoltaic Analysis 168
Cogeneration Analysis 170
APPENDIX B - CALCULATIONS 174

EXECUTIVE SUMMARY

Overview

This Energy Action Plan (EAP) was developed to identify the City of Simi Valley's long-term vision for energy efficiency, including strategies and projects that could be implemented in government operations, resulting in lower energy expenditures and setting a leadership example for Simi Valley businesses and residents. The EAP is the roadmap toward achieving the City's energy efficiency and greenhouse gas emission reduction goals as outlined in the adopted 2010 Green Community Action Plan, and the recently adopted 2012 Climate Action Plan and 2012 General Plan. These goals include a 20% reduction from 2006 municipal energy use by 2020, a 15% reduction in 2006 greenhouse gas emissions by 2020, and to carry these objectives out into the community as described in the 2012 General Plan.

Southern California Edison (SCE) funded preparation of the EAP through the technical assistance offered to the City under the Energy Leader Partnership (ELP) program. This assistance is offered to local governments to achieve energy efficiency goals of the California Long Term Energy Efficiency Strategic Plan (CEESP). One of the goals of the ELP program is to advance the City's progress in the ELP, resulting in greater incentives for energy efficiency in municipal projects, and eventually enhanced incentives for the community as a whole. Progress in the ELP is measured by "tiers," such that cities on the lowest tier are eligible for technical assistance, and as cities progress from "Silver" to "Gold" to "Platinum" tiers, they and their residents become eligible for increased assistance, better financial incentives, and more resources to achieve energy efficiency. The goal of the EAP is to identify and implement a sufficient number of cost-effective projects so that the City may advance to the "Platinum" or highest tier, in the ELP program.

The EAP uses information developed as part of the City's Benchmarking, Retro-commissioning, and Greenhouse Gas (GHG) Inventory Policies to calculate specific measures that will reduce energy use, defined as the purchased electricity and natural gas consumed by municipal operations, and each measure's expected return on investment. It measures historic energy use and energy conservation measures (ECMs) implemented between 2006-2011, and identifies potential ECMs for future implementation.. Energy use is further subdivided into "building" and "non-building" categories. GHG emissions tied to energy use are also calculated.

The EAP includes the 2006 baseline energy use for each of the City's eight main facilites, and identifies potential energy saving measures that could be implemented in each of the facilities. These measures will be prioritized by City staff from the Public Works, Administrative Services, and Environmental Serives Departments, and implemented according to lowest cost after utility incenitves, greatest energy savings, fastest payback period, and time required to implement the projects.

By establishing an EAP and implementing ECMs, the City is leading an effort that will assist other local governments and the community of Simi Valley in reducing energy usage, GHG emissions and costs. This process is consistent with the City's commitment to lead by example. A summary of the energy use analysis and savings potential is presented in the next section.

Findings

In 2011, electricity accounted for 66% of the City's total energy usage and 75% of its total GHG emissions, while natural gas accounted for 34% of total energy usage and 25% of total GHG emissions. A 7.1% reduction in electricity use has been achieved since 2006, while natural gas use increased 7.9% (Table 1, below). The factors driving these trends are outlined in greater detail in the body of the EAP.

Table 1. Simi Valley Energy Use Trends 2006 and 2011.

	2006	2011	Percent Change from 2006
Total Energy Use (MMBTU/yr)	120,010	117,026	-2.5%
Building Energy Use (MMBTU/yr)	76,904	77,645	1.0%
Total Electricity Use (kWh/yr)	24,339,679	22,611,915	-7.1%
Building Electricity Use (kWh/yr)	11,737,474	11,075,116	-5.6%
Total Natural Gas Use (Thermos/yr)	369,599	398,709	7.9%
Building Natural Gas Use (Thermos/yr)	368,544	398,548	8.1%

Water use accounted for 66% of total electricity use in 2011, split approximately evenly between the conveyance of potable water and the treatment of wastewater. Therefore, efforts to conserve water are instrumental in reducing energy use.

Natural gas use for public transit accounted for 69% of natural gas use, resulting from the conversion of the City's diesel fueled bus fleet to compressed natural gas (CNG), and from the opening of the Transit CNG fueling facility to other public transit agencies.

Combinations of ECMs and on-site renewable energy systems that will meet the City's energy and GHG reduction goals have been identified (Tables 2 and 3). Table 2 demonstrates the progress made in reducing electricity usage in City facilities and the potential to make further reductions. The City will include energy efficiency projects in future facility maintenance budgets to continue to implement the measures in the EAP through the year 2020. The City prioritizes the implementation of ECMs based on a combination of fast payback period and the size of the energy use reduction, as indicated in Tables 75 - 79. All implemented and proposed ECMs will be documented using a standardized template (Table 17). Renewable energy will be considered only after feasible ECMs have been implemented. Overall, ECMs that have the potential to reduce 4% of total energy use and 12% of electricity use in City facilities have been identified, with renewable energy the reduction potential increases to 41% and 70%, respectively.

Retro-commissioning will also play a role in identifying and implementing low and no-cost ECMs. Further information can be found in the City's Retro-Commissioning Policy. The City will measure progress towards energy and GHG reduction goals on an annual basis, using ENERGY STAR Portfolio Manager accounts established for the 8 facilities listed in Table 2. Further information can be found in the City's Benchmarking Policy.

Table 2. Facility based historic and potential ECMs and renewable energy potential (electricity).

Site Name	Measured Total Electricity Use (kWh: 2006)	Measured Percent Change 2006-2011 (%)	Potential ECM Percent Reduction from 2006 Baseline (%)	Total Percent Reduction from 2006 Baseline with Past and Future ECMs (%)	Potential Solar PV Percent Reduction from 2006 Baseline (%)	Potential Cogen Percent Reduction from 2006 Baseline (%)	Total Percent Reduction from 2006 Baseline with Past and Future ECMs and Renewables (%)
City Hall	1,062,012	-8.6%	-15.2%	-23.8%	-70.2%	NA	-94.0%
Cultural Arts Center	234,720	-15.8%	-2.5%	-18.3%	0.0%	NA	-18.3%
Development Services	439,400	-1.3%	-2.4%	-3.7%	-78.1%	NA	-81.8%
Police Department	1,504,738	-4.9%	-14.4%	-19.3%	-50.3%	NA	-69.6%
Public Services Facility	NA	NA	NA	NA	NA	NA	NA
Sanitation/ Waterworks	7,891,940	-6.6%	-3.9%	-10.5%	-2.0%	-47.9%	-60.4%
Senior Center	445,120	12.5%	-10.1%	2.4%	-100.5%	NA	-98.1%
Transit Facility	159,544	4.1%	-26.4%	-22.3%	-135.8%	NA	-158.1%
Totals	**11,737,474**	**-5.6%**	**-6.7%**	**-12.4%**	**-24.9%**	**-32.2%**	**-69.5%**

Table 3. Facility based historic and potential ECMs and renewable energy potential (total energy).

Site Name	Measured Total Energy Use (kBTU: 2006)	Measured Percent Change 2006-2011 (%)	Potential ECM Percent Reduction from 2006 Baseline (%)	Potential Solar PV Percent Reduction from 2006 Baseline (%)	Potential Cogen Percent Reduction from 2006 Baseline (%)	Potential Total Percent Reduction from 2006 Baseline (%)
City Hall	4,260,247	1.4%	-12.9%	-59.7%	-	-71.2%
Cultural Arts Center	970,799	-16.4%	-2.0%	0.0%	-	-18.5%
Development Services	1,918,072	10.2%	-13.1%	-61.0%	-	-63.9%
Police Department	7,868,671	-2.8%	-9.4%	-32.8%	-	-45.0%
Public Services Facility	413,100	-22.2%	NA	-212.8%	-	-235.0%
Sanitation/Waterworks	30,745,191	1.7%	-3.4%	-1.7%	-61.8%	-65.3%
Senior Center	2,479,095	4.0%	-6.2%	-61.6%	-	-63.8%
Transit Facility	28,259,224	1.2%	-0.5%	-2.6%	-	-1.9%
Totals	**76,914,399**	**1.0%**	**-3.8%**	**-13.0%**	**-24.7%**	**-40.5%**

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CITY OF SIMI VALLEY ENERGY ACTION PLAN

Introduction

The City of Simi Valley has long been a champion of energy efficiency, by demonstrating a commitment to reducing energy use in its own facilities, and leading by example in the community. The City's commitment includes finding better ways to improve the energy performance of its operations and reduce spending on energy. The City of Simi Valley is currently participating in the Energy Leader Partnership Program (ELP) with Southern California Edison (SCE), which is funded by ratepayer dollars through the California Public Utilities Commission (CPUC). This program was developed so that SCE could provide technical and financial support for local governments to improve the energy efficiency of municipal operations, including energy used in buildings, and energy used to deliver services, such as water and street lighting, to the community. By modeling the cost savings and quality of life improvements that can result from energy efficiency and conservation, the City can lead the community to consider similar actions.

This Energy Action Plan (EAP) is a product of the technical assistance provided through the ELP, under the Local Government Strategic Plan Program to support the California Long-Term Energy Efficiency Strategic Plan (CEESP) and centered on the four long-term goals of the CEESP. These goals are: "1) All new residential construction in California will be zero net energy by 2020; 2) All new commercial construction will be zero net energy by 2030; 3) The HVAC industry and market will be transformed to ensure that HVAC energy performance is optimal for California's climate; and, 4) All eligible low-income customers will be given the opportunity to participate in energy efficiency programs by 2020."

Simi Valley's Strategic Plan program includes developing strategies and policies that encompass all four of the CPUC strategic plan goals. As part of the development of these strategies and policies, the City incorporated suggestions and recommendations from several stakeholder groups including all Simi Valley Neighborhood Councils, the Planning Commission, the Sustainable Simi Valley Committee, the Ventura County Contractors Association, and staff members from all City Departments. These valuable insights have resulted in an EAP that focuses on cost-savings, includes a wide range of energy efficiency projects, and capitalizes on actions that will have long-lasting results.

Through implementation of the EAP, the City of Simi Valley will take advantage of incentives offered through the ELP. By integrating energy efficiency and demand reduction strategies described in the EAP, the City's standing in the ELP will improve. As City's progress in the ELP advances, it will result in greater incentives for energy efficiency in municipal projects, and eventually enhanced incentives for the community as a whole.

The EAP is the roadmap toward achieving the City's energy efficiency and greenhouse gas emission reduction goals as outlined in the Green Community Action Plan, Climate Action Plan, and General Plan. The EAP uses information developed as part of the City's Benchmarking, Retro-commissioning, and Greenhouse Gas Inventory Policies to calculate specific measures that will reduce energy use and each measure's expected

return on investment. The EAP will be used by City staff from the Public Works, Administrative Services, and Environmental Services Departments, and decision makers, to select specific energy efficiency projects that could be implemented in the near future, and in the long-term, for City facilities. The EAP includes a compilation of suggested projects, methods to determine cost-effectiveness to achieve maximum energy savings, and greenhouse gas emission (GHG) reductions. The EAP takes the additional step of identifying renewable energy projects that could be undertaken after maximizing the energy efficiency of the City's buildings and services.

Goals

The EAP recognizes energy efficiency as a high-priority, cost-effective energy resource, and makes a strong, long-term commitment to implementing energy efficiency projects. The EAP communicates the benefits and opportunities to reduce demand for energy, and eventually to supplement purchased power with on-site renewable resources, so that the City may generate some of the power it uses.

The goals of the EAP are also found in the goals of the City's Green Community Action Plan (GCAP), Climate Action Plan (CAP) and General Plan, as well as the Energy Leader Partnership (ELP) program. These goals include cutting energy use by 20 percent over the baseline year of 2006, which will meet Objective EE-1 in the GCAP, meet the CAP goal of municipal energy decrease by 15 percent by 2020, and fulfill General Plan policies NR-7.1, NR-7.3, NR-7.4 and NR-8.2, which are all focused on energy efficiency and greenhouse gas reductions. In future General Plan updates, the goals of the EAP will be added to appropriate sections of the Natural Resources, Mobility and Infrastructure, and Community Development chapters to strengthen the efficient use of energy resources in the community.

Progress in the ELP is measured by "tiers," such that cities on the lowest tier are eligible for basic technical assistance, and as cities progress from there to "Silver," "Gold," and "Platinum" tiers, they and their residents become eligible for increased assistance, better financial incentives, and more resources to achieve energy efficiency. The goal of the EAP is to identify and implement a sufficient number of cost-effective projects so that the City may achieve a 20 percent reduction in energy use and advance to the "Platinum" or highest tier, in the ELP program.

The EAP provides an understanding of historic energy use and describes energy conservation measures (ECMs) that were implemented from 2006-2011. Additional ECMs that can be implemented in future years are identified. An implementation plan describes the process by which the objectives of the EAP will be executed.

An additional goal of this effort is to serve as an example that other local governments and the community of Simi Valley can use in reducing energy usage, GHG emissions and costs.

Implementation Plan

The City will implement the Energy Action Plan (EAP) so that it can fulfill the goals of a 20% energy use reduction, on an aggregate basis for its facilities, by 2020 as compared to 2006. The EAP actions apply to eight City facilities: City Hall, Cultural

Arts Center, Development Services, Police Department, Senior Center, Sanitation/Waterworks, Public Services Facility and Transit Facility.

Beginning with 2012, the City will measure and compare annual energy use to the baseline year of 2006. Energy use will be measured at both the individual facility and aggregate levels (ENERGY STAR Portfolio Manager accounts will be used. See the City of Simi Valley's Benchmarking Policy for further details).

1. The city will establish a working group of City staff with expertise, based on the existing Green Team of City staff to identify and prioritize the energy conservation measures identified in the report. Staff will consider rapid deployment, energy savings, and potential rebates and other utility programs in the priority of projects. The City will schedule the initial deployment of energy conservation measures (ECMs) to occur over the 2013-2014 fiscal year budget cycle, prioritized by project economics and starting with those ECMs such as the projects identified in Table 75 – Table 79.

2. Prioritization of the energy efficiency and conservation measures will initiate the implementation of the EAP no later than April 2013, the priority list will include at least one measure in each of the eight facilities. This priority list will be used to report to the City Manager with recommendations for implementation.

3. Implementation of the EAP will include the development of a budget line item to implement energy efficiency measures as part of the Public Works facility maintenance budget beginning with the 2013-2014 fiscal year, based on costs of prioritized projects identified by the City's Green Team working group.

4. Municipal retrofit projects that will constitute meeting the "Implementation" requirement to reach the goal of 20% reduction by 2020 will include implementation of at least one measure in each of eight facilities, and will incorporate at least 50% of the identified lighting and operational controls projects. Projects may not be limited to the projects identified herein if future energy efficiency and conservation measures become feasible.

5. As part of EAP implementation and through the ELP, the City will continue to improve the reduction of energy use through water conservation, with full implementation achieving at least a 10% reduction in energy use related to water.

6. The ECMs that are implemented will be monitored. Estimating or measuring energy use before and after the implementation of the ECM will accomplish this. Energy use will be measured on a time resolution of fifteen minutes (using data from McKinstry's Enterprise Energy Management (EEM) software. See the City of Simi Valley's Benchmarking Policy for further details).

7. Results for the energy and economic performance of the ECMs will be recorded in a standardized spreadsheet (Table 17). Further ECMs may be identified through the City's Partnership with Southern California Edison (SCE) and the process of retro-commissioning, which is outlined in the City's Retro-Commissioning Policy.

8. The City will establish a working relationship with the Southern California Gas Company (SCG) to provide a concerted effort towards reducing natural gas use.

9. The City will investigate the feasibility of incorporating renewable energy systems on City property.

10. City staff will prepare an annual report to be presented to the City Council, documenting the findings that result from the actions described above.

Relation of Energy Action Plan to Other City Policies

The City of Simi Valley has a long-standing commitment to reducing energy usage, costs and GHG emissions. The EAP is another tool to help in achieving these City goals. Other policies that are tied to this EAP and should be referred to for further information are described below. The logical progression is to 1) benchmark facilities-to gain an understanding of performance, 2) where appropriate, implement RCx to tighten the control of facilities and 3) to implement energy conservation measures-to put more efficient equipment in place-as outlined in the Energy Action Plan. Updates to these policies will include language that references the EAP to strengthen the efficient use of energy resources in city facilities.

1. **Benchmarking Policy**. ENERGY STAR Portfolio Manager accounts have been established for the eight facilities listed previously and contain monthly utility data from 2006 to the present. These accounts are automatically updated with utility data and can be used to measure progress towards EAP goals by comparing energy savings to the 2006 baseline year. General facility data, such as operating hours, number of occupants, etc. are also housed here.

2. **Retro-Commissioning (Rcx) Policy**. RCx is a systematic process for improving an existing facility's performance by identifying and implementing relatively low-cost operational and maintenance improvements. RCx is one of the tools that can be implemented to help achieve EAP goals.

3. **Greenhouse Gas Inventory Policy And Reduction Strategies**. These documents provide background on GHG emissions tied to energy use in City facilities and makes recommendations for how they can be reduced. The EAP will assist in achieving GHG reduction goals.

Beyond these policies, additional resources that may be helpful to the EAP process will be outlined in more detail in subsequent sections.

ENERGY ACTION PLAN BACKGROUND AND PURPOSE

Definition of Energy Action Plan

An Energy Action Plan (EAP) provides an understanding of energy usage and the means to reduce it. This EAP is focused on the City of Simi Valley's energy use, where energy is defined as the electricity and natural gas consumed by municipal operations.

Benefits of Energy Action Plan

This EAP provides the most comprehensive analysis of municipal energy use to date, in a single source. This information allows an understanding of the effectiveness of ECMs taken to date, evaluates new opportunities, and prioritizes those opportunities based on cost effectiveness. By establishing an EAP and implementing ECMs, the City is reducing its operating costs, GHG emissions and other energy-based environmental impacts, while conserving natural resources.

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ENERGY ACTION PLAN PROCESS

Scope of Analysis

The broad scope of the EAP is:

1. To measure, analyze and understand municipal energy usage, GHG emissions and ECMs implemented from 2006-2011.
2. To identify and measure potential future ECM opportunities and outline a prioritized path for implementing them.

Energy use is defined as the electricity and natural gas consumed by municipal operations. Usage is further subdivided into "building" and "non-building" categories. The City has 344 electrical service accounts and 13 natural gas service accounts. Energy will be analyzed on annual, monthly and 15-minute interval bases.

First, energy use and GHG emissions are analyzed in the following ways:

1. Total and building energy use and GHG emissions.
2. Total and building electricity use and GHG emissions.
3. Total and building natural gas use and GHG emissions.

Second, energy use and ECMs are analyzed at the building level. The "buildings" consist of the 8 facilities operated by the City. In some cases, the utility service accounts at the site serve uses other than those strictly required by buildings, as outlined below. All sites have one electricity and one natural gas service account unless otherwise noted. The eight facilities are:

1. City Hall.
2. Cultural Arts Center.
3. Development Services (2 electricity and 2 natural gas service accounts).
4. Police Department.
5. Senior Center.
6. Sanitation/Waterworks (The electrical service account is associated with the Sanitation Plant's process loads and also serves the following buildings: Sanitation/Waterworks, Public Services Facility and Transit Facility. The actual Waterworks process loads are on separate electrical service accounts. The natural gas service account is associated solely with the Sanitation Plant's process loads).
7. Public Services Facility (No electricity service account. Served by Sanitation/Waterworks account).
8. Transit Facility (The natural gas service account is associated with the fueling of buses and the electrical service account is associated with fueling equipment. The Transit Facility office loads are served by the Sanitation/Waterworks account).

Third, energy use and ECMs are analyzed at the non-building level, which consists of:

1. Waterworks (potable water delivery).
2. Street lighting.
3. Traffic signal lighting.
4. Landscape irrigation.
5. Other.

Data Collection Process

Data were collected from the following sources:

Electricity and natural gas use:

- Monthly for 344 electrical service accounts, from 2006 to 2011 and 15-minute interval for 23 service accounts for 2011 (Source: Southern California Edison (SCE) and supplemented with monthly City records where necessary).
- Monthly for 13 natural gas service accounts, from 2006-2011 (Source: Southern California Gas (SCG)).

Greenhouse gas emissions factors (data collection and calculation methodologies):

- California Climate Registry.
- "Greenhouse Gas Modeling of California's Electricity Sector to 2020" Updated results of the GHG Calculator Version 3b [3].
- "Local Government Operations Protocol" For the quantification and reporting of greenhouse gas emissions inventories Version 1 [4].

Electricity and natural gas ECMs:

- Energy audit and demand response reports (Source: SCE and City efforts).
- Energy audits performed by The Cadmus Group.
- Retrofit projects (SCE. City records including Energy Efficiency Conservation Block Grant (EECBG) forms, LEED documentation and spreadsheets).

Operational and equipment data (Source: City):

- Facility information, including space type(s), year built, year of renovation or expansion, major energy consuming systems, gross floor area, number of occupants, number of computers, number of servers, operating hours and percent heated and cooled.
- Mechanical equipment lists.
- Motor lists for Waterworks and Sanitation.
- Water flows: Waterworks (supply) and Sanitation (treated).
- Sanitation biogas flow rate and composition.

- Street, safety and traffic signal lighting descriptions and counts.

Data Quality Control

Data quality was rigorously controlled in the process of acquisition and analysis. Most data are directly sourced from the utilities. Some gaps were found in monthly electricity data associated with street lighting service accounts. These gaps were filled using City records and extrapolating escalation rates where necessary (applies from 1/2006-12/2007 for street lighting service accounts 3-001-7986-07, 3-001-7986-54 and 3-001-7986-48). In a few cases, monthly data were found to span two months instead of one. In these cases, the monthly data are averaged over the two months. In general, multiple sources were cross-referenced, as necessary, to clarify data and ensure data reliability.

Calculation Methodology and Assumptions

Much of the usage and power demand data presented in this EAP is in raw form as provided by the utilities.

The units of energy used in this report are:

1. Kilowatt-hour (kWh). A measure of electrical energy use.
2. Kilowatt (kW). A measure of electrical power demand.
3. Therms. A measure of natural gas energy use.
4. Kilo British Thermal Units (kBTU). A measure of total energy use that combines electricity and natural gas, where there are 3.413 kBTU/kWh and 100 kBTU/Therms
5. Million British Thermal Units (MMBTU). A measure of total energy use that combines electricity and natural gas, where there are 0.003413 MMBTU/kWh and 0.1 MMBTU/Therms
6. Pounds of carbon dioxide equivalent (lbs CO_{2e}). A measure of GHG emissions that accounts for carbon dioxide, and converts other emissions such as methane and nitrous oxide into an equivalent amount of carbon dioxide.
7. Metric tons of carbon dioxide equivalent (MT CO_{2e}) where there are 2204.62 lbs/MT.

SCE and The Cadmus Group primarily executed ECM annual energy use reduction and rebate calculations. Annual electricity costs savings were computed using 2011 rates for each site, as shown in Table 4.

Table 4. Average electricity rates for 2011.

Site Name - Account Number	Electrical Rate ($/kWh)
City Hall - 3000962804	0.132
Cultural Arts Center - 3010031431	0.180
Development Services - 3001158986 & 3012840644	0.150
Police Department - 3014319386	0.120
Senior Center - 3001159047	0.140
Transit Facility - 3014992925	0.185
Sanitation/Waterworks-PSC - 3012296523	0.095
Average	**0.143**

These average rates vary mainly based on SCE rate structure, the time of electricity use and the magnitude of usage. Typically, the service accounts with the lowest average rates have the highest off-peak and overall usage. Annual cost savings for natural gas were computed using 2011 rates for each site, as shown in Table 5. These rates vary depending on SCG rate structure. The accounts with the highest overall usage have the lowest average rates.

Table 5. Average natural gas rates for 2011.

Site Name - Account Number	Natural Gas Rate ($/Therms)
City Hall - 181-213-8600	0.774
Cultural Arts Center - 028-313-9901	1.090
Development Services - 130-813-8461 & 128-713-8400	0.928
Police - 046-831-1440	0.733
Public Services Facility - 201-114-2100	0.910
Sanitation Facility - 007-914-2200	0.672
Senior Center - 111-913-8700	0.802
Transit Facility - 163-393-1979	0.516
Average	**0.803**

GHG emissions were calculated assuming the emissions factors as shown in Table 6. Reported values for electricity only exist for 2006-2007. Assumed and modeled values were used for 2008-2020. The natural gas emissions factor is assumed to be constant since natural gas carbon content is a function of composition and chemical structure, which is relatively fixed.

Additional assumptions and calculation methods are provided in subsequent sections.

Table 6. Electricity and natural gas GHG emissions factors.

Year	Electricity CO_2e Emission Factor (lbs/MWh)	Natural Gas CO_2e Emission Factor (lbs/Therms)	Electricity Emissions Factor Source	Natural Gas Emissions Factor Source
2006	641.26	11.72	CA Climate Registry	CA LGO Protocol
2007	630.89	11.72	CA Climate Registry	CA LGO Protocol
2008	630.89	11.72	Assume same as 2007	CA LGO Protocol
2009	630.89	11.72	Assume same as 2007	CA LGO Protocol
2010	630.89	11.72	Assume same as 2007	CA LGO Protocol
2011	626.11	11.72	E3 GHG Modeling (2010)	CA LGO Protocol
2012	606.27	11.72	E3 GHG Modeling (2010)	CA LGO Protocol
2013	590.84	11.72	E3 GHG Modeling (2010)	CA LGO Protocol
2014	577.61	11.72	E3 GHG Modeling (2010)	CA LGO Protocol
2015	562.18	11.72	E3 GHG Modeling (2010)	CA LGO Protocol
2016	548.95	11.72	E3 GHG Modeling (2010)	CA LGO Protocol
2017	533.52	11.72	E3 GHG Modeling (2010)	CA LGO Protocol
2018	518.09	11.72	E3 GHG Modeling (2010)	CA LGO Protocol
2019	502.65	11.72	E3 GHG Modeling (2010)	CA LGO Protocol
2020	493.84	11.72	E3 GHG Modeling (2010)	CA LGO Protocol

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TOTAL MUNICIPAL ENERGY USE

Total Energy Use

The City of Simi Valley provides many services to the community that require the use of energy. This section focuses on total energy, in the form of electricity and natural gas, consumed at the municipal level for these services. The City has a total of 344 service accounts for electricity and 13 service accounts for natural gas. Energy use is broken down into "building" and "non-building" related services. Building energy use is mainly associated with the Police Department, City Hall, Cultural Arts Center, Development Services, Senior Center, and the Public Services Complex (PSC). The PSC includes buildings associated with the Transit Facility, Vehicle Maintenance, Public Services, Waterworks and Sanitation. Non-building energy use is mainly associated with potable water delivered through the municipal water utility (commonly referred to as the Waterworks), the treatment of waste in the City's waste water treatment plant (commonly referred to as the Sanitation Plant), street lights, traffic signal lights and landscape irrigation. It should be noted that the PSC has an electrical meter that serves the several buildings described above as well as all Sanitation Plant equipment. This meter has the highest usage of all City accounts and is classified in the "building" category.

Monthly electricity and natural gas usage data spanning 2006-2011 for all City of Simi Valley service accounts was analyzed. 117,026 million British Thermal Units (MMBTU) were consumed in 2011, with 66% of use related to electricity consumption and 34% of use related to gas consumption (Table 7).

Table 7. Total City of Simi Valley energy use by fuel type for 2011.

Fuel Type	2011 Energy Use (MMBTU/Year)	2011 Energy Use (kWh/Year-Electric & Therms/Year-Gas)	Percent of Total (%)
Total Electricity Use	77,155	22,611,915	66%
Total Natural Gas Use	39,871	398,709	34%
Total	**117,026**		

For the total energy consumed in 2011, 66% fell into the building category and 34% fell into the non-building category (Table 8). However, as noted previously, energy use associated with some of the operations in the building category, such as the Sanitation Plant and the Transit Facility, are not actual buildings.

Table 8. Total City of Simi Valley energy use by use type for 2011.

Use Type	2011 Energy Use (MMBTU/Year)	Percent of Total (%)
Total Building Energy	77,645	66%
Total Non-Building Energy	39,381	34%
Total	**117,026**	

The City's total and municipal building energy use in 2006 and 2011, and the reduction necessary to meet the 2020 target, was measured (Figure 1). While total energy use was reduced by 2.5% from 2006 to 2011, building energy use increased by 1.0% from 2006 to 2011. To meet the 20% reduction target for municipal buildings in 2020, an additional 21% reduction must be made (a reduction rate of 2.3% per year).

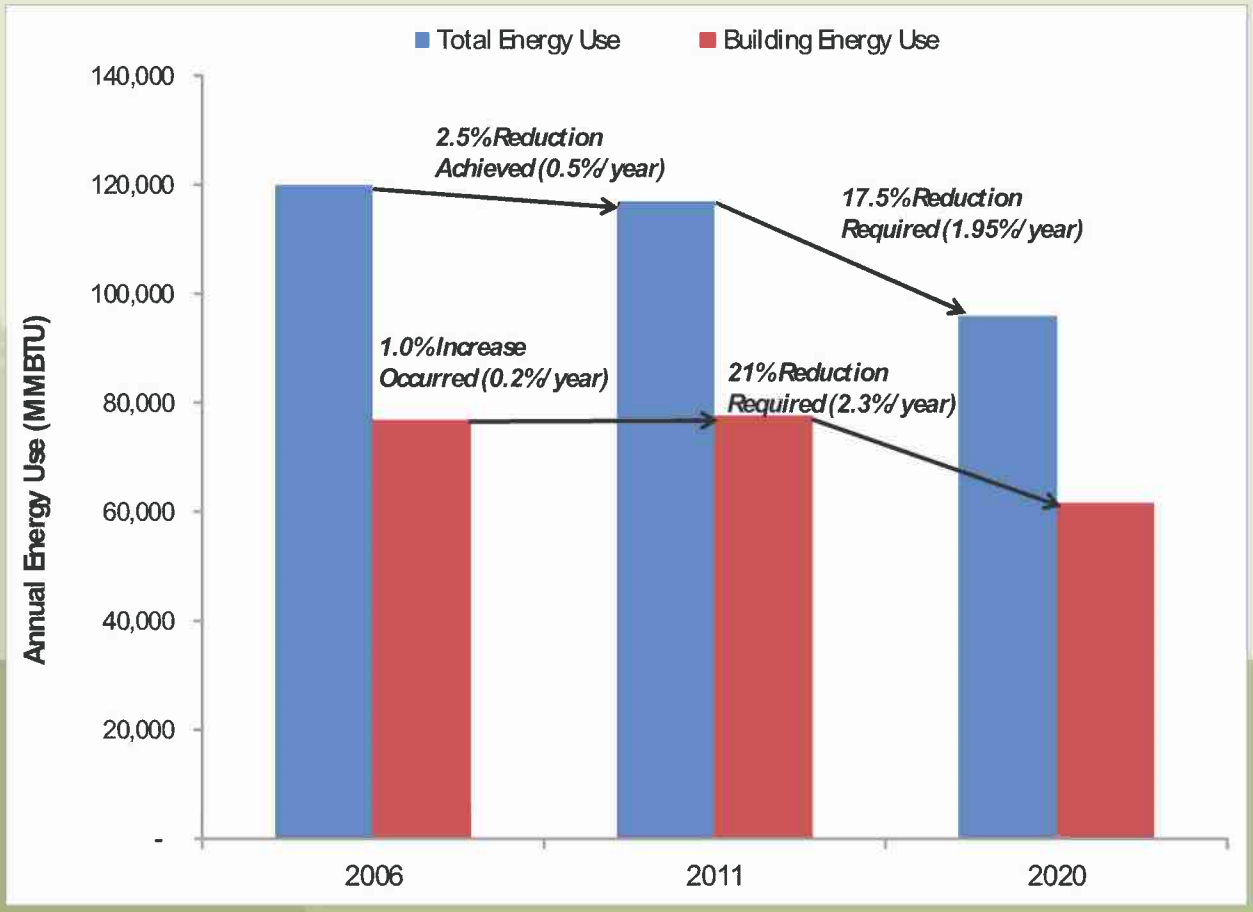

Figure 1. Total and building related annual energy use for 2006, 2011 and 2020 target.

Total Electricity Use

Of the total electricity consumed in 2011, 51% fell into the building category and 49% fell into the non-building category (Table 9). However, as noted previously, electricity use associated with some of the operations in the building category, such as the Sanitation Plant and the Transit Facility, are not actual buildings.

Table 9. Total City of Simi Valley electricity use-by-use type for 2011.

Use Type	2011 Electricity Use (kWh/Year)	Percent of Total (%)
Total Building Electricity	11,075,116	49%
Total Non-Building Electricity	11,536,799	51%
Total	**22,611,915**	

The City's total and municipal building electricity use measured in 2006 and 2011, and the reduction necessary to meet the 2020 target, is shown in Figure 2. Total electricity use was reduced by 7.1% from 2006 to 2011. Building electricity use was reduced by 5.64% from 2006 to 2011 (a reduction rate of 1.13% per year). To meet the 20% reduction target in 2020, an additional 14.36% reduction must be made (a reduction rate of 1.6% per year).

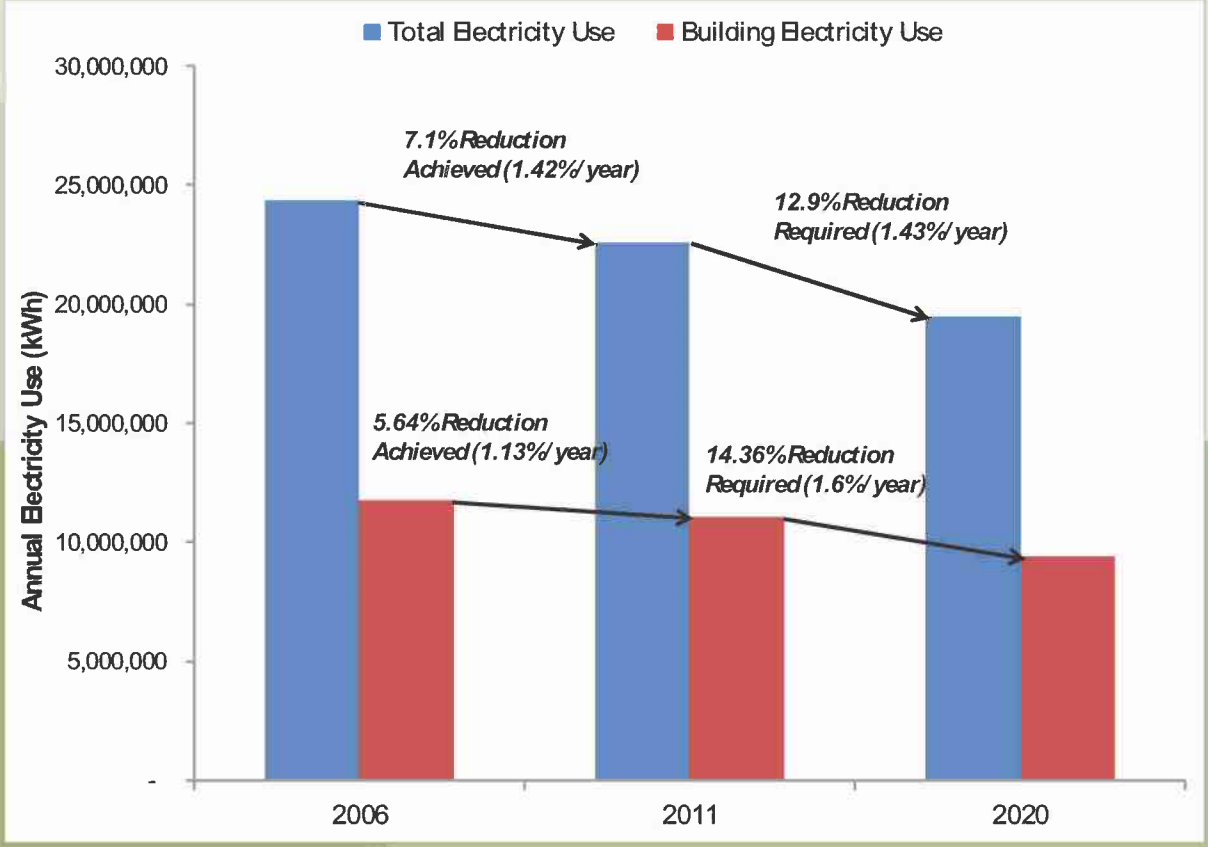

Figure 2. Total and building related annual electricity use for 2006, 2011 and for 2020 target.

Electricity reductions have been successful, and, if reduction rates occur at roughly the same pace as in past years, the City is on track to meet its 20% reduction target.

The City has a total of 344 electrical service accounts. Electricity by use-type in 2011 was ranked from highest to lowest, shown in Figure 3, (where blue denotes 'building' and black denotes 'non-building'). The use-types with the highest electrical usage are:

- Waterworks at 33.8% (43 service accounts).
- Sanitation/PSC facility at 32.6% (1 service account).
- Street and traffic signal lighting at 15.9% (14 service accounts for street lighting and 125 service accounts for traffic signal lighting).
- The remaining 17.7% of use is spread across 7 other building accounts and 154 non-building accounts (136 of which are associated with landscape irrigation).

Since 66% of total electricity use in 2011 was found to be associated with water usage, efforts to conserve water will be instrumental in reducing energy use.

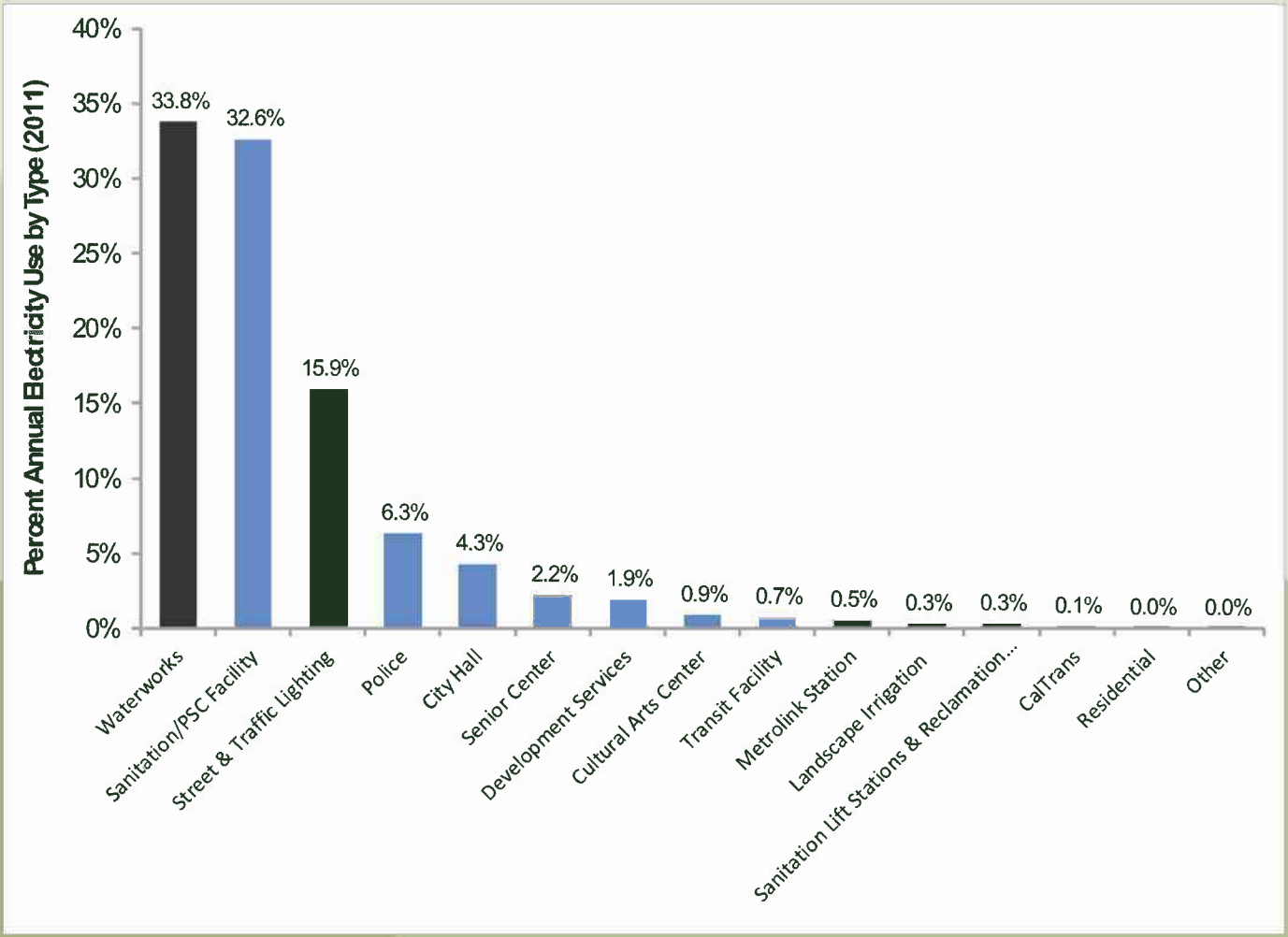

Figure 3. City of Simi Valley percent annual electricity use by use-type (2011).

The 20 highest individual use service accounts in 2011 are shown in Figure 4, (where blue denotes 'building,' black denotes water pumping within the Waterworks, yellow denotes street lighting and green denotes the other 324 service accounts). The service accounts with the highest usage are:

- Sanitation/PSC facility (1 service account).
- SCE owned and operated street lights (1 service account).
- Buildings (5 service accounts).
- Water pumping stations (12 service accounts).
- City owned street lights (1 service account).

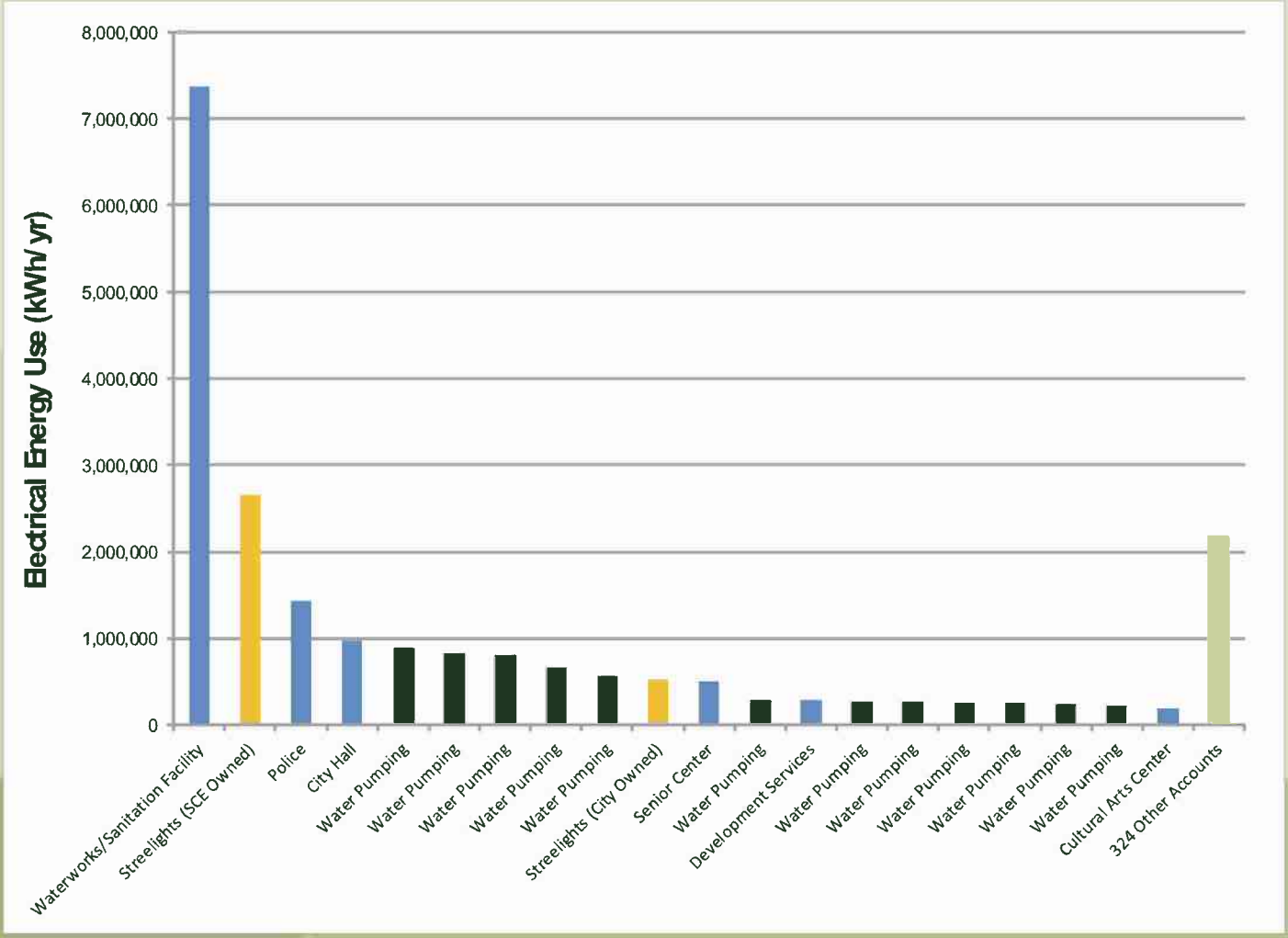

Figure 4. Top 20 electricity service accounts with the highest use by source (2011).

Total Natural Gas Use

For the total natural gas consumed in 2011, 99.96% fell into the building category and 0.04% fell into the non-building category (Table 10). However, as noted previously, natural gas use associated with some of the operations in the building category, such as the Sanitation Plant and the Transit Facility, are not actual buildings.

Table 10. Total City of Simi Valley natural gas use by use type for 2011.

Use Type	2011 Natural Gas Use (Therms/Year)	Percent of Total (%)
Total Building Natural Gas	398,548	99.96%
Total Non-Building Natural Gas	161	0.04%
Total	**398,709**	

The City's total and municipal building natural gas use measured in 2006 and 2011, and the reduction necessary to meet the 2020 target, was investigated (Figure 5). For building natural gas use, an 8.14% increase was observed from 2006 to 2011. To meet the 20% reduction target in 2020, an additional 23.14% reduction must be made. These increases mainly occurred at the Sanitation Plant, City Hall and Transit Facility (Table 16). The reasons behind these increases are explored in further detail in the section on Municipal Building Energy Use.

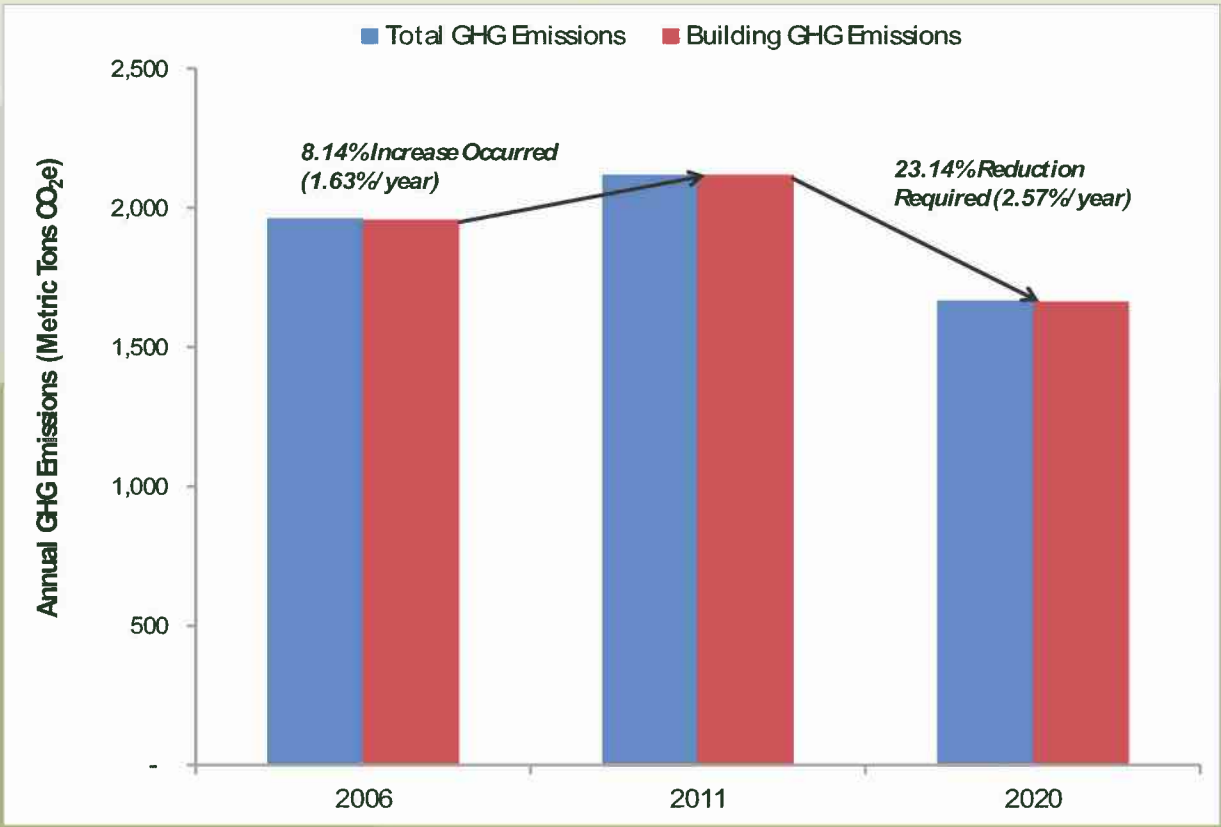

Figure 5. Total and building related annual natural gas use for 2006, 2011 and 2020 target.

Breaking down natural gas use in 2011 (Figure 6), it was found that the Transit Facility is the single largest user of gas, at 68.8% of usage. This gas is used for the City's natural gas fueled public transportation fleet. The Sanitation Plant is the second highest user of gas, at 14.9% of usage. This gas is used primarily in process heating applications within the plant. The remaining 16.3% of gas is predominantly used in building space heating applications.

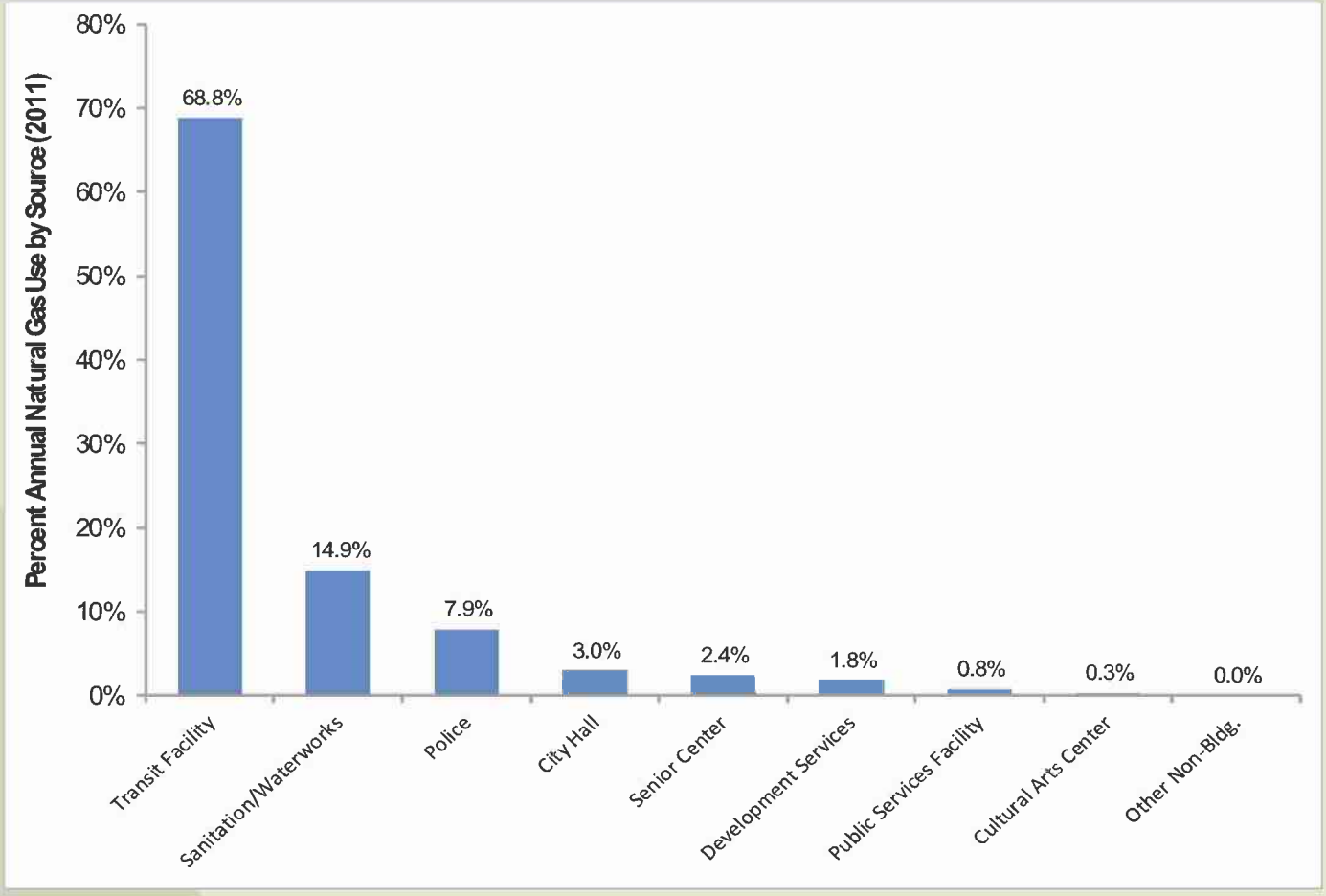

Figure 6. City of Simi Valley percent annual natural gas use by source (2011).

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TOTAL MUNICIPAL GREENHOUSE GAS EMISSIONS

Total Energy Related Greenhouse Gases

Greenhouse (GHG) emissions, in the amount of 8,541 metric tons of carbon dioxide equivalent (MT CO_2e), were produced in 2011 due to energy use, with 75% of emissions related to electricity consumption and 25% of emissions related to gas consumption (Table 11).

Table 11. Total City of Simi Valley greenhouse gas emissions by fuel type for 2011.

Fuel Type	2011 GHG Emissions (MT CO_{2e}/Year)	Percent of Total (%)
Total Electricity GHG Emissions	6,422	75%
Total Natural Gas GHG Emissions	2,119	25%
Total	**8,541**	

The City's total and municipal building GHG emissions as measured in 2006 and 2011, and the reduction necessary to meet the 2020 target, is shown in Figure 7. For total GHG emissions, a 6% reduction was achieved from 2006 to 2011. To meet the 15% reduction target in 2020, an additional 9% reduction must be made. For building GHG emissions, a 2.4% reduction was achieved from 2006 to 2011.

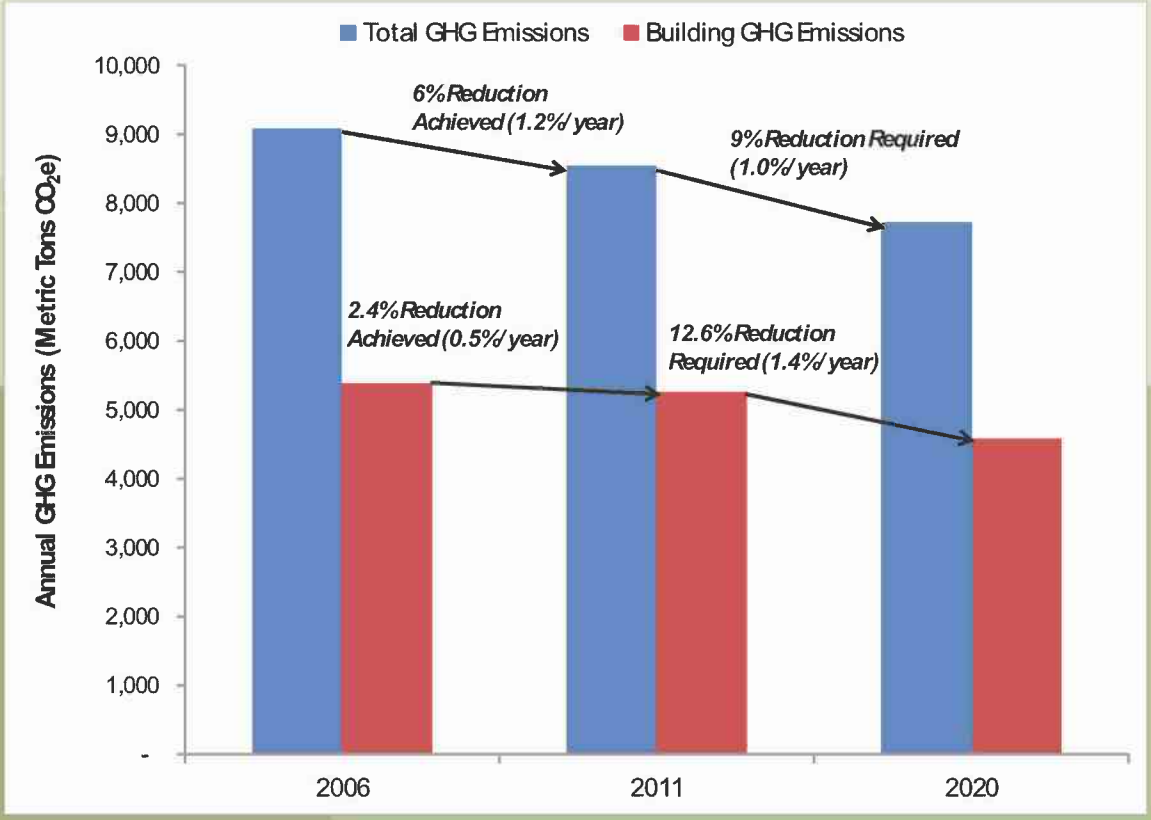

Figure 7. Total and building related annual GHG emissions for 2006, 2011 and 2020 target (assuming no change in 2020 emissions factor compared to 2011).

Since GHG emissions reductions are a result of both energy reductions and changes in emission factors, GHGs have been reduced by a greater percentage than energy use. This is due to reductions in electrical emission factors, as more low carbon and renewable power generation is brought on line. This analysis assumes that emission factors for electricity are the same in 2020 as they were in 2011. However, due to policy and regulations to reduce GHG emissions at the California State level, it is projected that emission factors will be substantially less in 2020 as compared to 2011[3]. If the GHG emission factor predicted for electricity in 2020 is used, a 21% GHG reduction will be achieved for total energy as compared to 2006, even if no further energy use reductions are made after 2011. A 14.7% reduction will be achieved for municipal buildings, under the same assumptions.

Total Electricity Related Greenhouse Gases

The City's total and municipal building electrical GHG emissions measured in 2006 and 2011, and the reduction necessary to meet the 2020 target is described in Figure 8. For total electrical GHG emissions, a 9.78% reduction was achieved from 2006 to 2011. To meet the 15% reduction target in 2020, an additional 5.22% reduction must be made. For building electrical GHG emissions, an 8.36% reduction was achieved from 2006 to 2011.

This analysis assumes that emission factors for electricity are the same in 2020 as they were in 2011. However, due to policy and regulations to reduce GHG emissions at the California State level, it is projected that emission factors will be substantially less in 2020 as compared to 2011[3]. If the GHG emission factor predicted for electricity in 2020 is used, a 28.8% GHG reduction will be achieved for total electricity as compared to 2006, even if no further electricity use reductions are made after 2011. A 27.7% reduction will be achieved for municipal buildings, under the same assumptions.

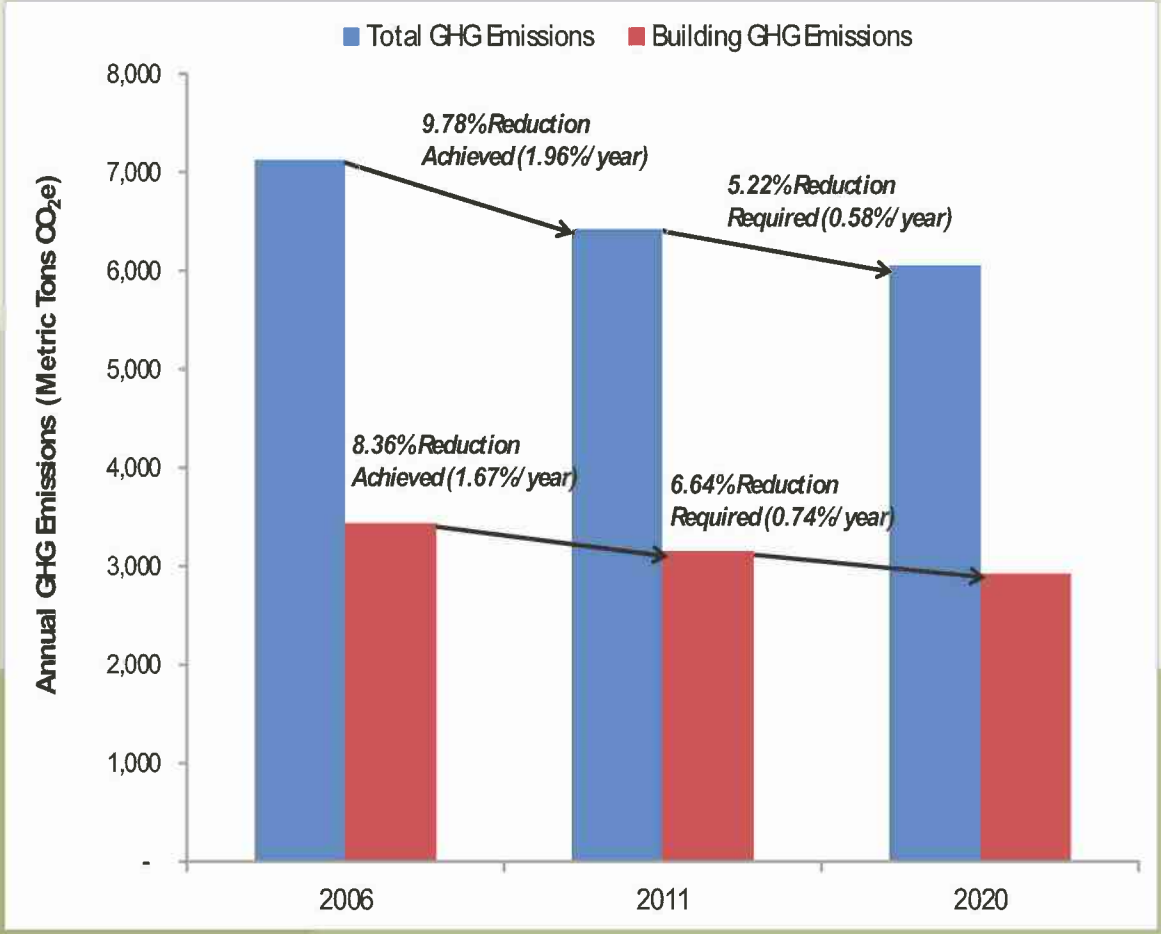

Figure 8. Total and building related annual electrical GHG emissions for 2006, 2011 and 2020 target (assuming no change in 2020 emissions factor compared to 2011).

Total Natural Gas Related Greenhouse Gases

The City's total and municipal building natural gas based GHG emissions measured in 2006 and 2011, and the reduction necessary to meet the 2020 target was investigated (Figure 9). For building natural gas GHG emissions, an 8.14% increase was observed from 2006 to 2011. To meet the 15% reduction target in 2020, an additional 23.14% reduction must be made. Since natural gas based GHG emissions are tied primarily to fuel composition and this composition is relatively static, it is assumed that emission factors are unchanged over time.

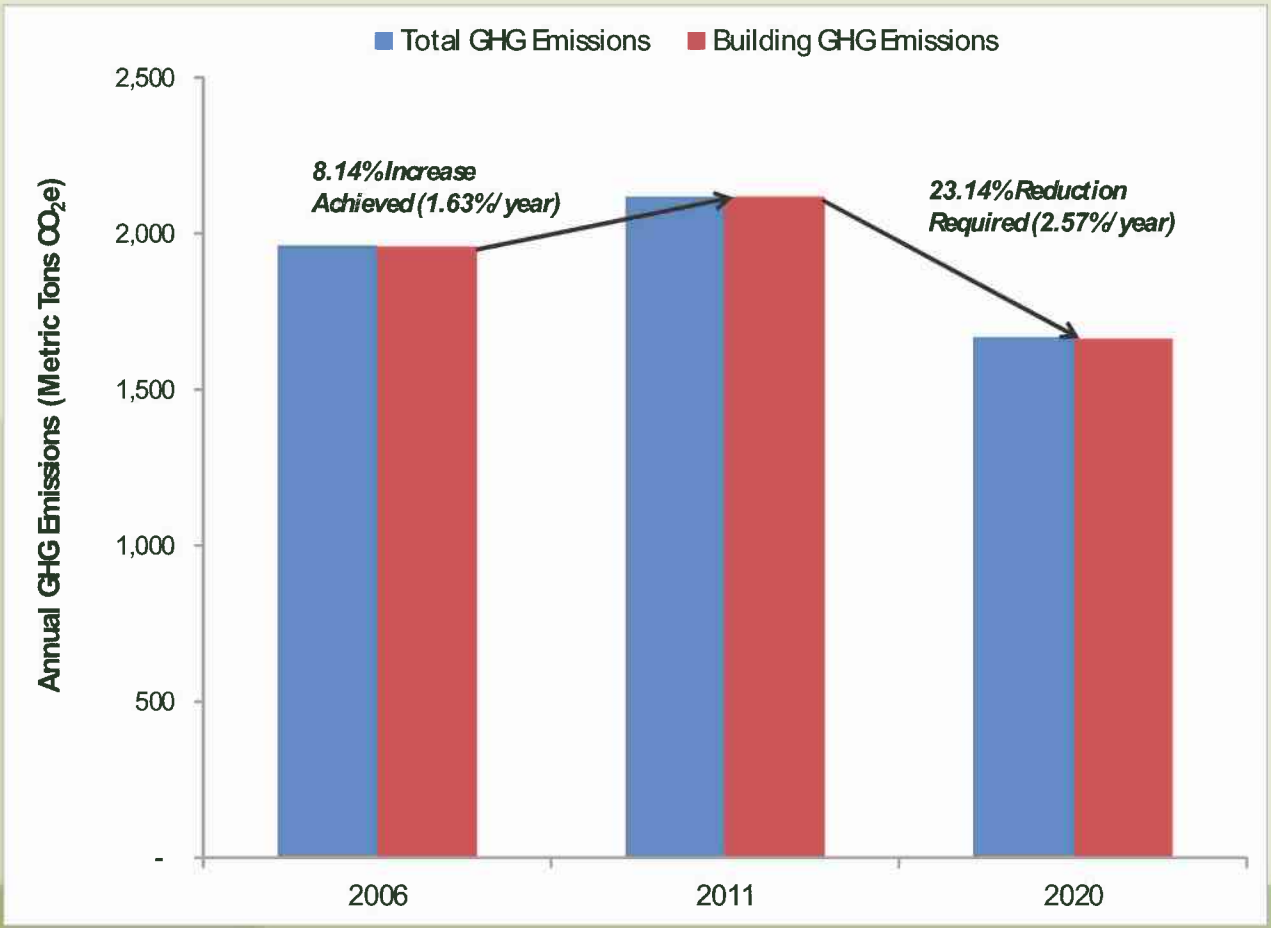

Figure 9. Total and building related annual natural gas GHG emissions for 2006, 2011 and 2020 target.

MUNICIPAL BUILDING ENERGY USE

Municipal Building Overview

This section provides an overview of the 8 main facilities operated by the City. Each facility has a building associated with it (Table 12). However, the electrical service account at the Sanitation/Waterworks facility serves waste water treatment plant process loads as well as the following buildings: Sanitation/Waterworks, Public Services Facility and Transit Facility. The Transit Facility electricity and natural gas service accounts are associated with fueling equipment and public transit fueling, respectively. For simplicity, these facilities are categorized as "buildings" in this section. This City's goal is to reduce the aggregate energy use across these facilities 20% by 2020, as compared to 2006. Building energy use is distinct from non-building energy uses, which mainly consist of water delivered as part of the municipal water utility (commonly referred to as the Waterworks), street lighting, traffic signal lighting and landscape irrigation. Non-building energy uses are analyzed in the subsequent section.

Table 12 provides background on these facilities. Accounts for these facilities have been established in ENERGY STAR's Portfolio Manager. These accounts house monthly data from 2006 to the present and are automatically updated via electronic feed from the utilities. Further information on individual facilities can be found in the sections dedicated to them.

Table 12. City facility information.

	City Hall	Cultural Arts Center	Development Services	Police Department	Public Services Facility	Senior Center	Transit Facility	Sanitation/ Waterworks
Building GSF	43,771	12,105	18,125	50,000	18,150	29,559	12,720	18,174
Year of Construction	1982	1910	1977	1998	1977	1984	1988	1962
Year of Renovation or Expansion	1987 & 2012	1995	NA	NA	1996	1991 & 2006	2012	1972, 1987 & 2004
Portfolio Manager Account	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control System	Yes/DDC	Yes/DDC	No	Yes/DDC	No	Yes/DDC	Yes/DDC	No
Eligible for SCE RCx Program	Yes	No	No	Yes	No	Maybe	No	No
2006 Annual Electricity Usage (kWh)	1,062,012	234,720	439,400	1,504,738	Electricity on Sanitation Meter	445,120	159,544	7,891,940
2006 Annual Natural Gas Usage (Therms)	6,356	1,697	4,184	27,330	4,131	9,599	277,147	38,100
2006 Total Energy Usage (kBTU)	4,260,247	970,799	1,918,072	7,868,671	413,100	2,479,095	28,259,224	30,745,191
2006 Energy Use Intensity (kBTU/SF)	97	80	106	157	23	84	2,222	1,692
2011 Annual Electricity Usage (kWh)	971,067	197,647	433,840	1,430,850	Electricity on Sanitation Meter	500,880	166,046	7,374,786
2011 Annual Natural Gas Usage (Therms)	10,062	1,367	6,322	27,637	3,214	8,682	280,392	60,872
2011 Total Energy Usage (kBTU)	4,320,452	811,269	2,112,896	7,647,191	321,400	2,577,703	28,605,915	31,257,345
2011 Energy Use Intensity (kBTU/SF)	97	67	117	153	18	87	2,249	1,720
Change in Electricity Use. 2011 vs. 2006 (%)	-8.56%	-15.79%	-1.27%	-4.91%	NA	12.53%	4.08%	-6.55%
Change in Gas Use. 2011 vs. 2006 (%)	58.31%	-19.45%	51.10%	1.12%	-22.20%	-9.55%	1.17%	59.77%
Change in Energy Use. 2011 vs. 2006 (%)	1.41%	-16.43%	10.16%	-2.81%	-22.20%	3.98%	1.23%	1.67%

Figure 10 shows energy use, broken down by electricity and natural gas use, for each of the facilities and the percent change in energy use in 2011 as compared to 2006. Electricity use reductions have been achieved in all facilities except the Senior Center and the Transit Facility. Gas use has increased at in all facilities except the Senior Center and Cultural Arts Center.

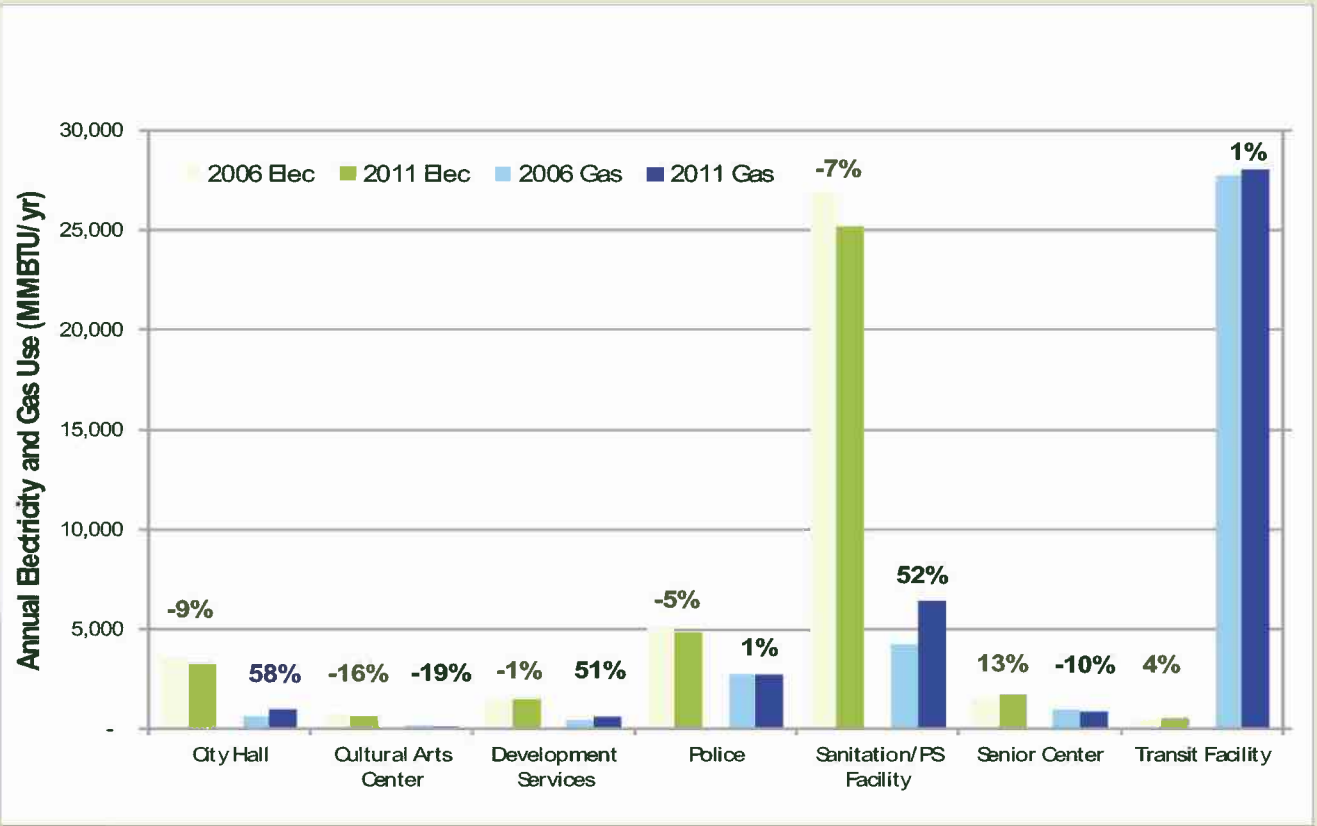

Figure 10. Annual electricity and gas use for main City facilities in 2006 and 2011 and percent change from 2006 baseline.

Table 13 breaks out annual electricity use for individual municipal building service accounts. A 5.6% reduction in electricity use was achieved in 2011 as compared to 2006. The greatest absolute reduction in electricity use among the facilities occurred at the Sanitation Plant followed by City Hall and the Police Department (Table 14). These reductions resulted mainly from the implementation of energy conservation measures, which are detailed in subsequent sections.

Table 15 breaks out annual natural gas use for individual municipal building service accounts. An 8.1% increase in gas use occurred in 2011 as compared to 2006. The greatest absolute increase in natural gas use among the facilities occurred at the Sanitation Plant followed by City Hall and the Transit Facility (Table 16). The gas use increases resulted mainly for the following reasons:

- Sanitation Plant: Replacement of an inaccurate service account meter.
- City Hall: HVAC retrofit where it is thought that gas use control is not optimized.
- Transit Facility: Increase in compressed natural gas use to fuel buses.

Table 13. 2006-2011 Municipal facility annual electricity use by service account

Site Name	Electrical Use (kWh: 2006)	Electrical Use (kWh: 2007)	Electrical Use (kWh: 2008)	Electrical Use (kWh: 2009)	Electrical Use (kWh: 2010)	Electrical Use (kWh: 2011)	% Change in Use (2006 - 2007)	% Change in Use (2007 - 2008)	% Change in Use (2008 - 2009)	% Change in Use (2009 - 2010)	% Change in Use (2010 - 2011)
Waterworks-Sanitation-PSC	7,891,940	8,090,662	8,045,057	7,272,988	7,064,612	7,374,786	2.52	-0.56	-9.60	-2.87	4.39
Police Department	1,504,738	1,514,997	1,516,285	1,494,695	1,444,701	1,430,850	0.68	0.09	-1.42	-3.34	-0.96
City Hall	1,062,012	1,045,166	1,018,080	1,002,137	981,396	971,067	-1.59	-2.59	-1.57	-2.07	-1.05
Senior Center	445,120	479,360	509,760	508,480	473,120	500,880	7.69	6.34	-0.25	-6.95	5.87
Development Services-1	168,400	170,000	170,360	163,000	154,760	152,360	0.95	0.21	-4.32	-5.06	-1.55
Development Services-2	271,000	267,400	282,240	300,800	304,240	281,480	-1.33	5.55	6.58	1.14	-7.48
Cultural Arts Center	234,720	228,240	232,980	235,980	212,880	197,647	-2.76	2.08	1.29	-9.79	-7.16
Transit Facility	159,544	159,490	146,241	162,281	161,615	166,046	-0.03	-8.31	10.97	-0.41	2.74
Totals:	**11,737,474**	**11,955,315**	**11,921,003**	**11,140,361**	**10,797,324**	**11,075,116**	**1.86**	**-0.29**	**-6.55**	**-3.08**	**2.57**

Table 14. Municipal facility total and percent change in electricity usage in 2011 vs. 2006

Site Name - Account Number	Change in Electricity Usage in 2011 vs. 2006 (kWh)	Percent of Total (%)
City Hall - 3000962804	-90,945	14%
Cultural Arts Center - 3010031431	-37,073	6%
Development Services-1 - 3001158986	-16,040	2%
Development Services-2 - 3012840644	10,480	-2%
Police Department - 3014319386	-73,888	11%
Senior Center - 3001159047	55,760	-8%
Transit Facility - 3014992925	6,502	-1%
Waterworks-Sanitation-PSC - 3012296523	-517,154	78%
Total	**-662,358**	**100%**

Table 15. Municipal facility annual natural gas use by service account (2006-2011)

Site Name - Account Number	Natural Gas Use (Therms: 2006)	Natural Gas Use (Therms: 2007)	Natural Gas Use (Therms: 2008)	Natural Gas Use (Therms: 2009)	Natural Gas Use (Therms: 2010)	Natural Gas Use (Therms: 2011)	% Change in Use (2006 - 2007)	% Change in Use (2007 - 2008)	% Change in Use (2008 - 2009)	% Change in Use (2009 - 2010)	% Change in Use (2010 - 2011)
Transit Facility	277,147	277,275	277,439	278,384	273,409	280,392	0.05	0.06	0.34	-1.79	2.55
Sanitation Facility	38,100	49,256	74,640	77,038	68,686	60,872	29.28	51.53	3.21	-10.84	-11.38
Police	27,330	25,903	27,098	33,000	33,681	27,637	-5.22	4.61	21.78	2.06	-17.94
City Hall	6,356	7,322	6,795	7,596	8,144	10,062	15.20	-7.20	11.79	7.21	23.55
Senior Center	9,599	8,134	7,895	7,525	8,443	8,682	-15.26	-2.94	-4.69	12.20	2.83
Development Services	2,639	3,162	4,228	5,751	6,800	4,591	19.82	33.71	36.02	18.24	-32.49
Public Services Facility	4,131	3,068	2,657	3,507	3,369	3,214	-25.73	-13.40	31.99	-3.93	-4.60
Development Services	1,545	1,592	1,660	1,342	1,732	1,731	3.04	4.27	-19.16	29.06	-0.06
Cultural Arts Center	1,697	994	1,713	1,494	1,127	1,367	-41.43	72.33	-12.78	-24.56	21.30
Totals:	**368,544**	**376,706**	**404,125**	**415,637**	**405,391**	**398,548**	**2.21**	**7.28**	**2.85**	**-2.47**	**-1.69**

Table 16. Municipal facility total and percent change in natural gas usage in 2011 vs. 2006

Site Name - Account Number	Change in Gas Usage in 2011 vs. 2006 (Therms)	Percent of Total (%)
City Hall - 181-213-8600	3,706	12%
Cultural Arts Center - 028-313-9901	-330	-1%
Development Services - 128-713-8400	186	1%
Development Services - 130-813-8461	1,952	7%
Police - 046-831-1440	307	1%
Public Services Facility - 201-114-2100	-917	-3%
Sanitation Facility - 007-914-2200	22,772	76%
Senior Center - 111-913-8700	-917	-3%
Transit Facility - 163-393-1979	3,245	11%
Total	**30,004**	**100%**

Existing City resources that can be leveraged for energy projects in municipal facilities include:

- Energy Star's Portfolio Manager accounts (described in detail in the City's Benchmarking Policy).
- The City of Simi Valley Benchmarking Policy, which provides further information on facilities and energy use and GHG comparisons to the 2006 baseline.
- Facility equipment lists.
- The Enterprise Energy Management (EEM) accounts (described in detail in the City's Benchmarking Policy).
- The City of Simi Valley Retro-Commissioning Policy, which provides further information on methods for reducing energy.
- 15-minute interval power demand data, which exists for the Sanitation/Waterworks, City Hall, Police Department and Transit Facility.

Energy Conservation Measures

The implementation of energy conservation measures (ECMs) will be the primary strategy used to meet the City's energy reduction goals. Historic and potential ECMs for specific facilities are outlined in subsequent sections. The City will prioritize the implementation of ECMs based on a combination of fast payback period and the size of the energy use reduction. All implemented and proposed ECMs will be documented using a standardized template (Table 17). This will allow the City to better understand the impact and value of specific ECMs. City staff will review these measures, prior to implementation, to ensure that they are practical and consistent with actions related to the City's Benchmarking Policy and Retro-Commissioning Policy. Table 16 provides three generic examples of ECMs that fall into the broad categories of controls optimization, component replacement and a retrofit. All the fields that are input manually are shown in white and those that are calculated automatically are shown in yellow.

The annual energy savings (kWh/year) of the ECM will be determined by either an engineering calculation or by direct measurement and verification. The annual GHG emission reduction (lbs CO_2e/year) will be calculated using the emissions factors shown in Table 6.

Annual cost savings ($/year) is the product of annual energy savings and average utility rate. Payback period (years) is defined as the installed costs after rebates or incentives divided by the annual energy cost savings. Nominal return on investment (%) is defined as the lifetime energy cost savings of the ECM minus the installed costs after rebates divided by the installed costs after rebates. This calculation assumes a constant dollar value. Project lifetimes will be estimated based on industry best practices or City experience.

Table 17. Standardized template for tracking future energy conservation measures.

Facility Name	SC Edison Service Account #	SC Gas Service Account #	Measure Name/ Description	Details	Measure Status (Month & Year Implemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Investment (%)
City Hall	3-000-9628-04	NA	Controls: Optimized scheduling of HVAC operation	EMS used to schedule HVAC to operate on City "flex" schedule	9/2013	5,000	3,173	$600	$500	$0	$500	0.8	5	500%
City Hall	3-000-9628-04	NA	Component replacement: Economizer dampers replaced	5 rusted out dampers replaced	9/2013	15,000	9,519	$1,800	$12,500	$1,500	$11,000	6.1	7	15%
City Hall	3-000-9628-04	NA	Retrofit: HVAC unit replaced	1 new 5 ton rooftop package unit replaced with 15 SEER unit	9/2013	10,000	6,261	$1,200	$10,000	$1,000	$9,000	7.5	15	100%
					Totals & Averages	**30,000**	**18,953**	**$3,600**	$3,600	$23,000	$2,500	$20,500		**205%**
					Current Annual Electricity Usage (2011)	**971,067**								
					ECM Electricity as a Percent of Current Annual Electric Usage	**3.1%**								

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City Hall

The City Hall is a 43,771 square foot office building built in 1982 (Figure 11). An expansion of the Public Works offices occurred in 1987 and 2012.

Figure 11. City Hall building.

The energy consuming systems consist primarily of HVAC, lighting, plug loads and servers. HVAC is served by package rooftop units, lighting is mainly linear fluorescent and plug loads are mainly related to office equipment (computers, printers and personal equipment). The HVAC system has direct digital controls (DDC), which allows a high level of controllability. This site is a good candidate for retro-commissioning (RCx). RCx is the process of tightening the control of building systems and is explained further in the City's Retro-Commissioning Policy.

Monthly electricity use trends are shown in Figure 12. Usage is highest in summer months, driven by air conditioning loads. An annual trend of decreased usage is observed. There is significant reduction in summer months, when electricity costs are highest. These trends are more clearly visible in Figure 13, which shows year over year monthly use in 2006 and 2011.

Monthly natural gas use trends are shown in Figure 14. Usage is highest in winter months, driven by heating loads. There is a significant increase in 2011 as compared to prior years. This may be due to an HVAC retrofit where heating controls require further optimization. These trends are more clearly visible in Figure 15, which shows year over year monthly use in 2006 and 2011.

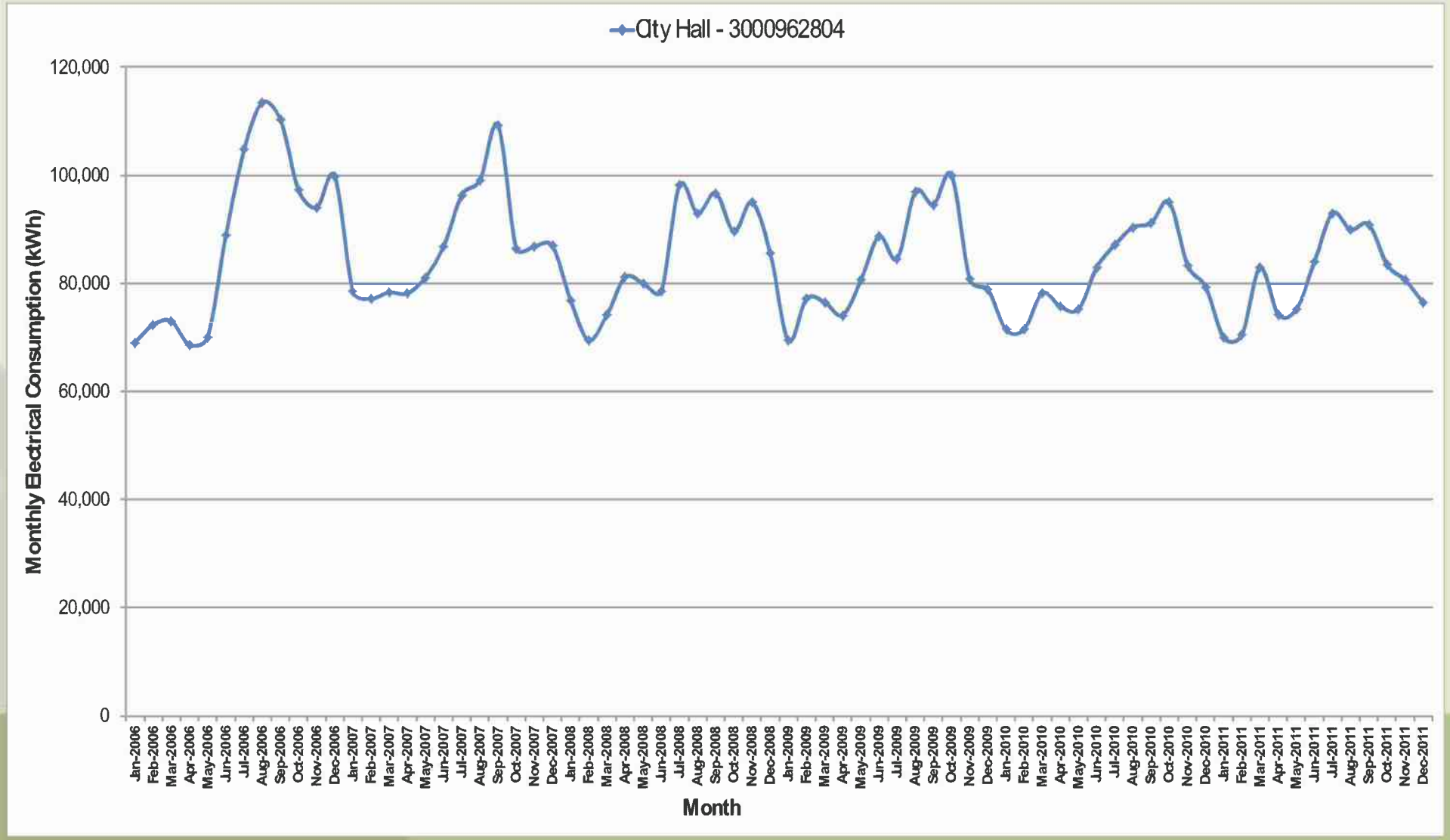

Figure 12. City Hall monthly electricity use (2006-2011).

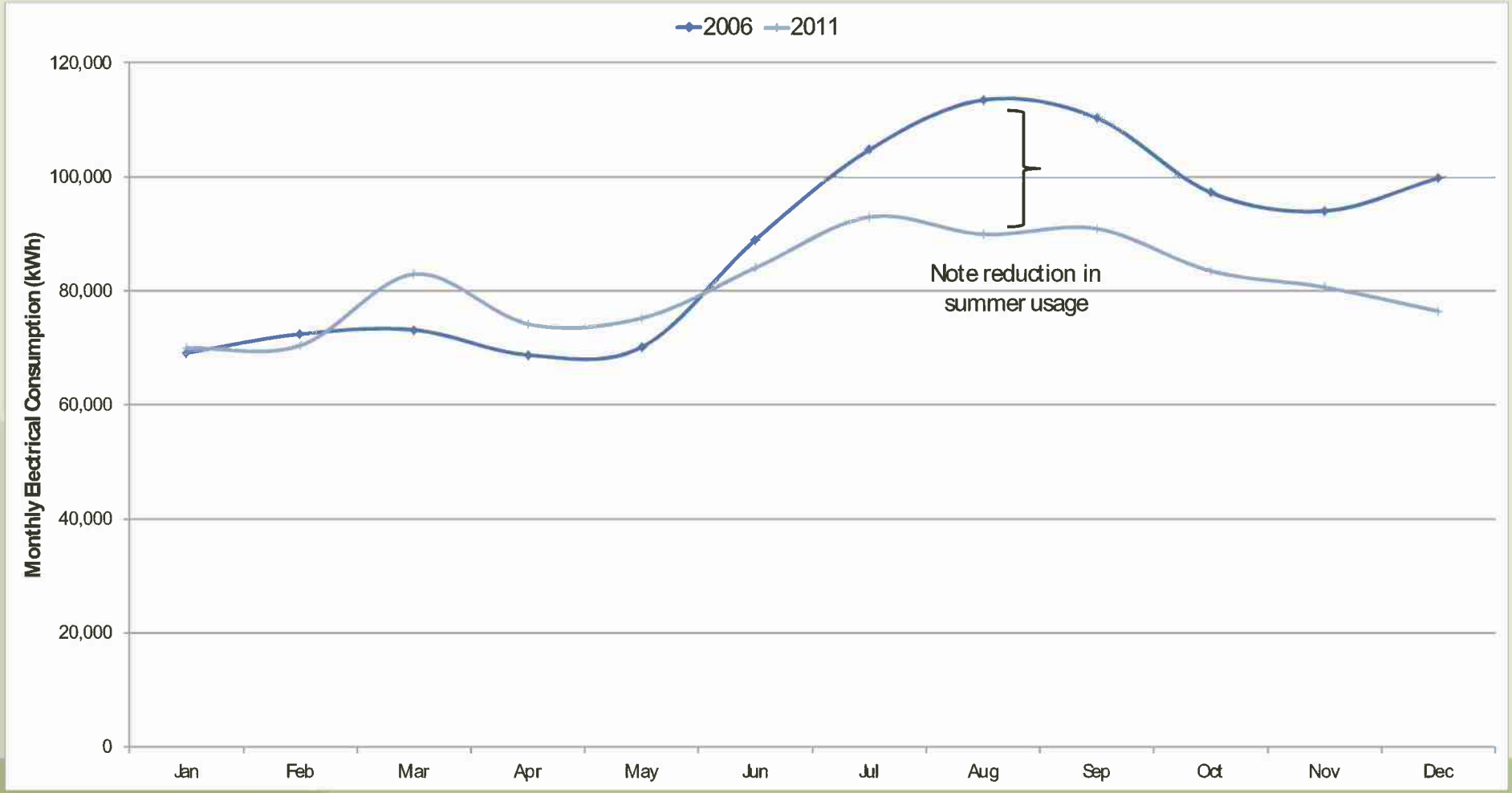

Figure 13. City Hall monthly electricity usage, year over year (2006 & 2011).

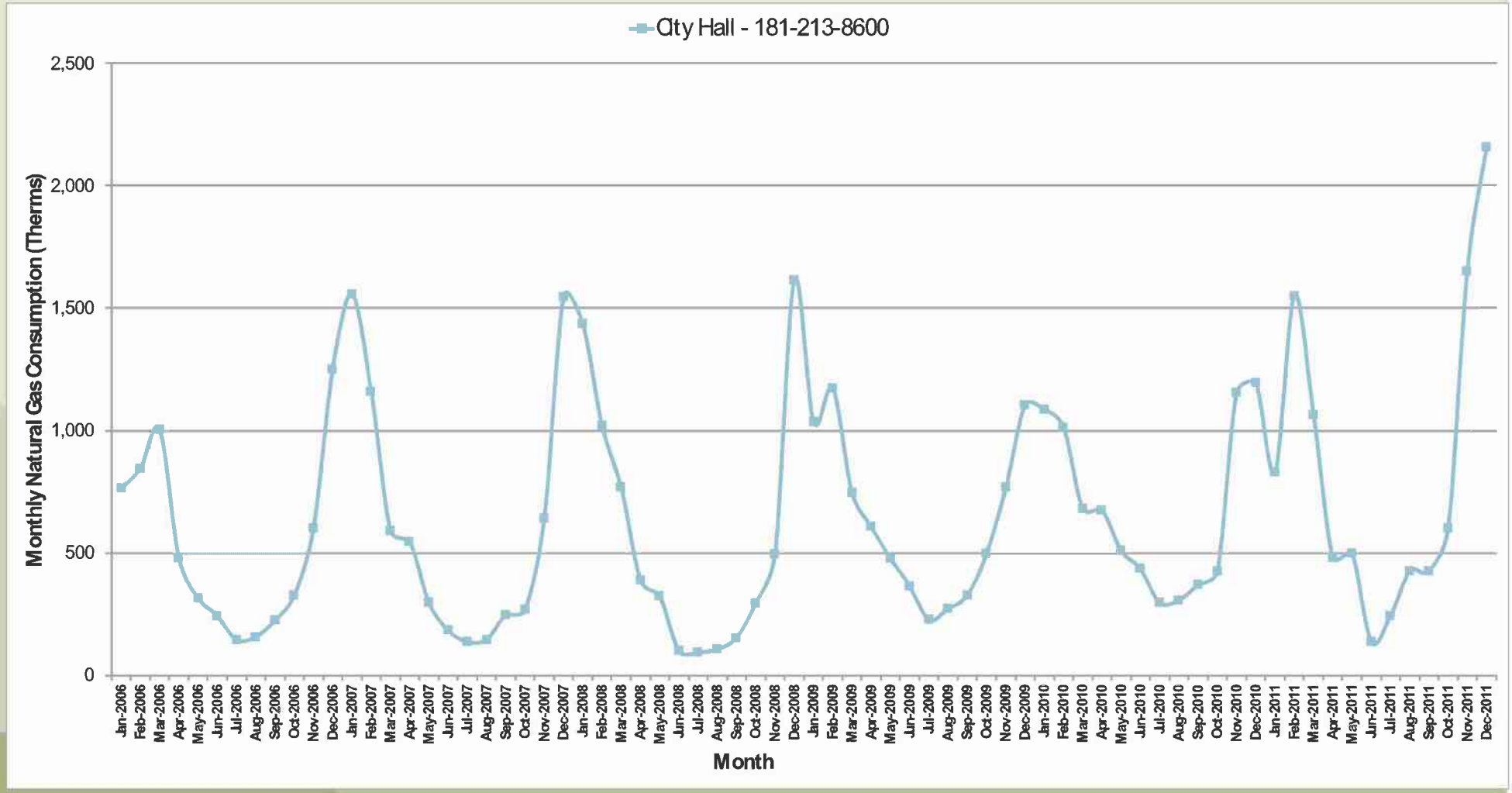

Figure 14. City Hall monthly natural gas use (2006-2011).

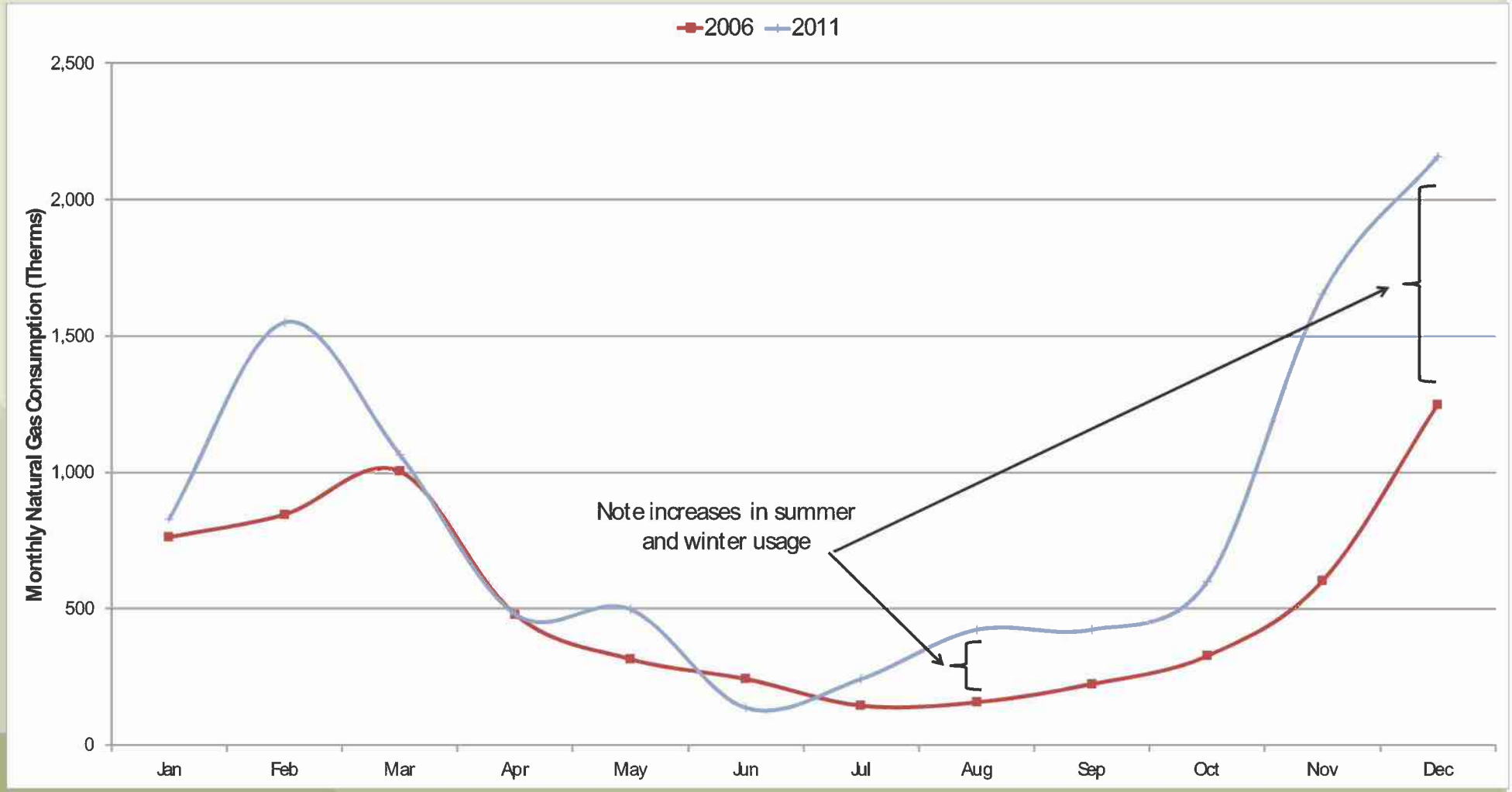

Figure 15. City Hall monthly natural gas usage, year over year (2006 & 2011).

Figure 16 shows the average 15-minute interval power demand for the months of January, August and December 2011. A high nighttime baseload power consumption ranging from 60-90 kW is seen. This is largely due to data center and associated cooling loads, but the fluctuation suggests other loads are also involved. The opportunity to reduce this load will be further investigated. Figure 17 shows a nighttime load of approximately 25 kW occurring between 2 – 4 AM. The opportunity to reduce this load will be further investigated.

Figure 18 shows the average power demand profile by day type. On weekdays, equipment operates on average from 6 AM – 10 PM. Opportunity to tighten up this operating schedule with optimum start and stop controls will be further investigated.

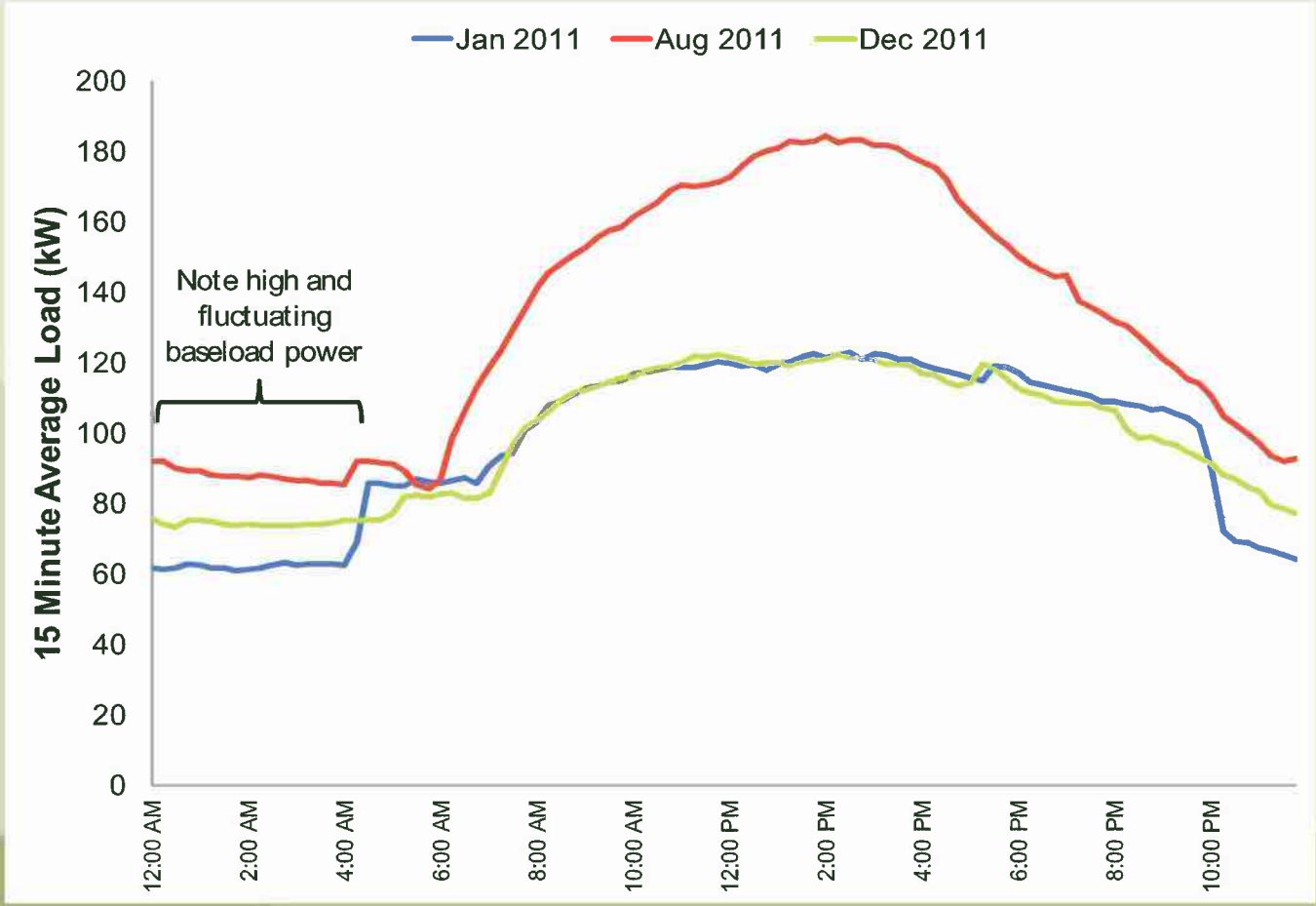

Figure 16. City Hall average 15-minute power demand per month (1, 8, 12/2011- time not adjusted for daylight savings).

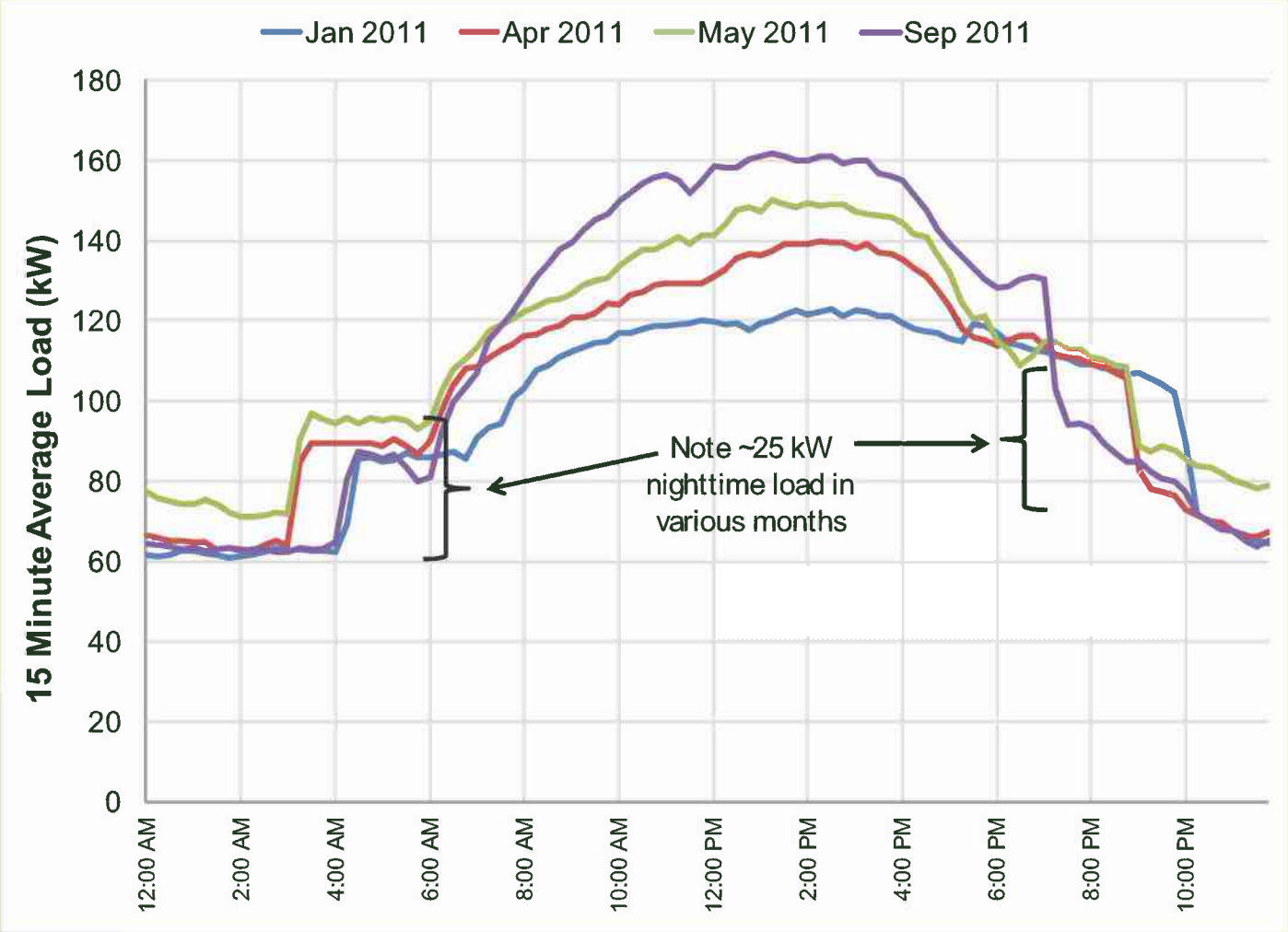

Figure 17. City Hall average 15-minute power demand per month (1, 4, 5, 9/2011- time not adjusted for daylight savings).

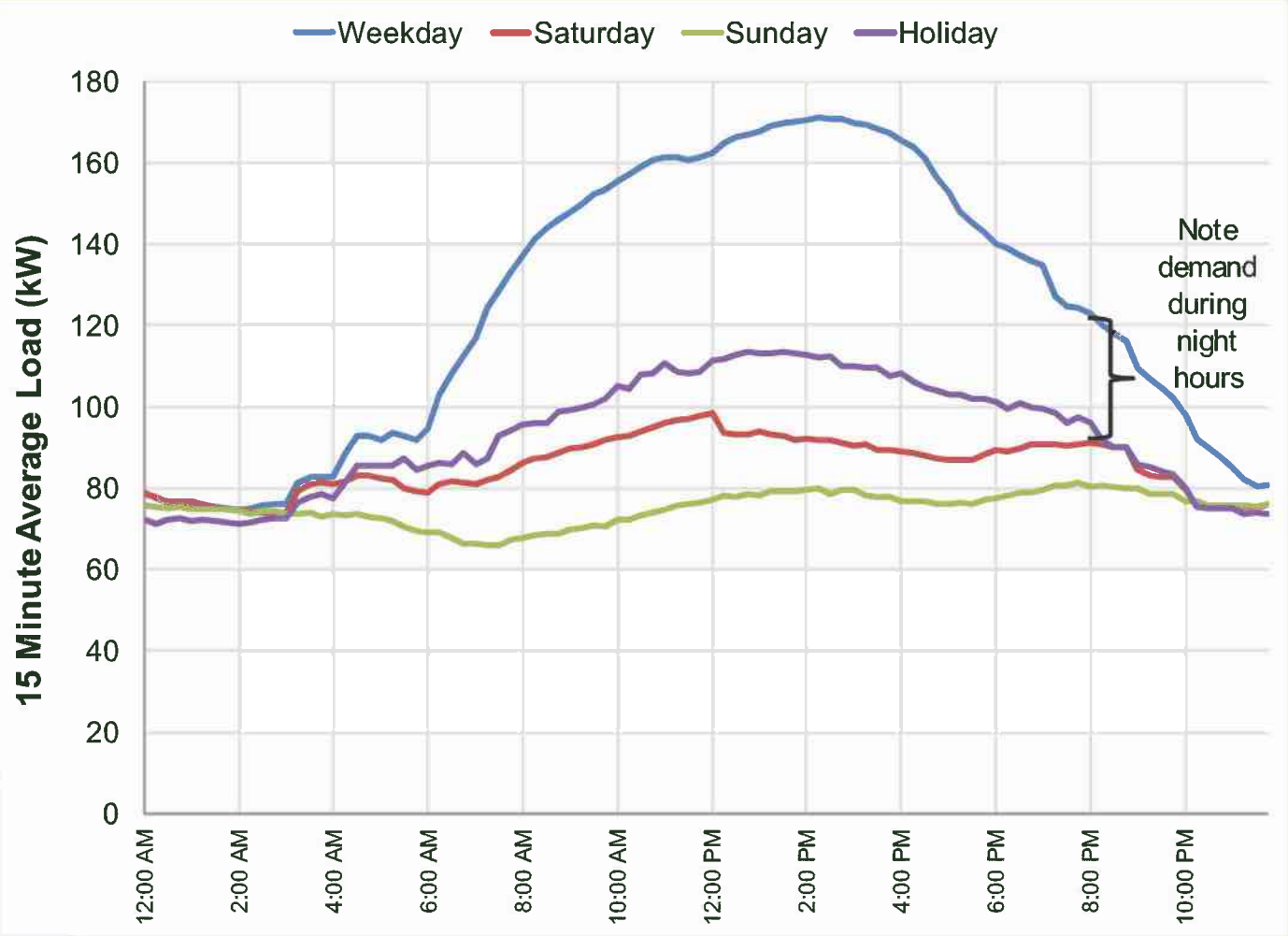

Figure 18. City Hall average 15-minute power demand by day type (2011- time not adjusted for daylight savings).

A number of ECMs, focused on electricity use reduction, have been implemented at the City Hall (Table 18). Potential future ECMs are shown in Table 19. Historic and future ECMs are summarized in Table 20, along with the ability of solar PV to contribute to energy use reduction. The GHG emissions associated with the historic and future ECMs are summarized in Table 21.

Unquantified ECMs and best practices that will be implemented or further investigated include:

- Retro-commissioning.
- Periodic HVAC maintenance, including filter replacements, fan belt adjustments or replacements, condenser coils cleaning and refrigeration checks.
- Use of photocells or astronomical time clocks in exterior lighting applications that currently use set hourly schedules.

- Use of higher efficiency office equipment during replacements.

Overall, an 8.6% electricity use reduction has been achieved at the City Hall in 2011 as compared to 2006. However, a 58.3% increase in gas use occurred over the same period. This has led to a 1.4% increase in total energy use. ECMs that have the potential to reduce energy use by 12.9%, along with PV systems that have the potential to source 59.7% of energy use with renewables have been identified. This leads to a total potential energy use reduction of 72.6%, as compared to 2006. The associated GHG reduction potential is 74.8%.

Table 18. City Hall implemented energy conservation measures.

Measure Name/ Description	Details	Measure Status (Year Implemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Investment (%)
Server virtualization	30 servers virtualized	2009	48,618	30,440	$6,423	$5,000	$0	$5,000	0.8	10	1185%
Lighting occupancy sensors	9 occupancy sensors installed	2010	5,130	3,256	$678	$900	$315	$585	0.9	10	1059%
Lighting upgrade (Re-lamping)	Replaced 139 ballasts and changed 417 T-12 lamps to T-8 lamps (Public Works Wing of City Hall)	2010	12,513	7,835	$1,762	$10,503	$10,000	$503	0.3	7	2353%
Plug load occupancy sensors	125 occupancy sensors installed	2011	14,619	9,277	$1,931	$12,500	$1,875	$10,625	5.5	10	82%
HVAC replacement	11 new rooftop package units (exceeds T24 Code) to replace old system (18-24 yrs old)	2011	133,396	83,521	$18,789	$1,119,600	$945,411	$174,189	9.3	15	62%
		Totals & Averages	**214,276**	**134,329**	**$29,584**	**$1,148,503**	**$957,601**	**$190,902**	3.3		948%

Table 19. City Hall potential energy conservation measures.

Measure Name/ Description	Details	Measure Status (Year Implemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Investment (%)
Automatic shutdown software on computers	Shuts down 167 computers when not in use	Future	50,100	31,368	$6,619	$4,175	$1,500	$2,675	0.4	7	1632%
Vending machine controllers	Controllers on 3 refrigerated beverage machines	Future	1,200	751	$159	$600	$225	$375	2.4	5	111%
10% reduction in baseload power	Reduce unnecessary loads at night by 10% (7.5 kW reduction from current baseload of 75 kW)	Future	65,700	41,136	$8,680	$2,000	$0	$2,000	0.2	5	2070%
Increase thermostat lower setpoint limit	Limit thermostat setpoint to 72°F in cooling mode	Future	1,680	1,052	$222	$100	$0	$100	0.5	5	1010%
Replace incandescent canister lights with LED fixtures	Replace 6x 75W incandescent downlights with 18W LED fixtures	Future	1,636	1,024	$216	$700	$210	$490	2.3	10	341%
Replace 8' T-12 fixtures in storage area	Replace 10x 2 bulb 8 foot T-12 fluorescent fixtures with 2x28W 4' T-8 fixtures	Future	1,558	975	$206	$950	$250	$700	3.4	10	194%
Install lighting occupancy sensors	Install occupant sensing on additional private offices, conference rooms, and storage areas	Future	2,050	1,284	$271	$2,000	$700	$1,300	4.8	10	108%
De-lamp fixtures in open office area	Open office area has lighting levels of 70 f.c. at the work surface - 1/3 of bulbs could be removed or shut off at bi-level switch	Future	21,910	13,718	$2,895	$1,000	$0	$1,000	0.3	10	2795%

Measure Name/ Description	Details	Measure Status (Year Implemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Investment (%)
Tighten schedule of operation	Schedule HVAC on at 6 AM vs 5 AM and off at 6 PM vs 10 PM. 20 kW reduction on weekdays.	Future	15,600	9,767	$2,061	$100	$0	$100	0.0	5	10205%
		Totals & Averages	**161,434**	**101,076**	**$21,329**	**$11,625**	**$2,885**	**$8,740**	**1.6**		**2052%**
		Current Annual Electricity Usage (2011)	**971,067**								
		ECM as a Percent of Current Annual Electric Usage	**16.6%**								

Table 20. Summary of City Hall historic and future energy reductions.

City Hall Change in Energy Use	Value	Percent Change (%)	Reduction Baseline
Measured 2006 Annual Electricity Usage (kWh/yr)	1,062,012		
Measured 2011 Annual Electricity Usage (kWh/yr)	971,067	-8.6%	Total 2006 Electricity
Measured 2006 Annual Natural Gas Usage (Therms/yr)	6,356		
Measured 2011 Annual Natural Gas Usage (Therms/yr)	10,062	58.3%	Total 2006 Gas
Measured 2006 Total Energy Usage (kBTU/yr)	4,260,247		
Measured 2011 Total Energy Usage (kBTU/yr)	4,320,452	1.4%	Total 2006 Energy
Estimated Energy Reduction-Installed ECMs (kBTU/yr)	731,325	-17.2%	Total 2006 Energy
Estimated Energy Reduction-Future ECMs (kBTU/yr)	550,975	-12.9%	Total 2006 Energy
Estimated Energy Reduction-Rooftop Solar PV (kBTU/yr)	1,130,680	-26.5%	Total 2006 Energy
Estimated Energy Reduction-Carport Solar PV (kBTU/yr)	1,413,350	-33.2%	Total 2006 Energy
Total Future Reduction Potential		**-72.6%**	**Total 2006 Energy**

Table 21. Summary of City Hall historic and future GHG emission reductions.

City Hall Change in GHG Emissions	Value	Percent Change (%)	Reduction Baseline
Measured 2006 Annual Electricity GHG Emissions (lbs CO2e/yr)	684,680		
Measured 2011 Annual Electricity GHG Emissions (lbs CO2e/yr)	607,998	-11.2%	Total 2006 Electricity GHG
Measured 2006 Annual Natural Gas GHG Emissions (lbs CO2e/yr)	74,485		
Measured 2011 Annual Natural Gas GHG Emissions (lbs CO2e/yr)	117,915	58.3%	Total 2006 Gas GHG
Measured 2006 Total Energy GHG Emissions (lbs CO2e/yr)	759,165		
Measured 2011 Total Energy GHG Emissions (lbs CO2e/yr)	725,913	-4.4%	Total 2006 GHG
Estimated GHG Emissions Reduction-Installed ECMs (lbs CO2e/yr)	134,329	-17.7%	Total 2006 GHG
Estimated GHG Emissions Reduction-Future ECMs (lbs CO2e/yr)	101,076	-13.3%	Total 2006 GHG
Estimated GHG Emissions Reduction-Rooftop Solar PV (lbs CO2e/yr)	207,423	-27.3%	Total 2006 GHG
Estimated GHG Emissions Reduction-Carport Solar PV (lbs CO2e/yr)	259,278	-34.2%	Total 2006 GHG
Total Future Reduction Potential		**-74.8%**	**Total 2006 GHG**

Cultural Arts Center

The Cultural Arts Center is a 12,105 square foot building built in 1910 (Figure 19). A major renovation occurred in 1995. This building is designated as a Historic Landmark within Ventura County. The facility includes a 220 seat main theater, with a main floor and balcony. There are two art galleries showcasing both regional and local artists throughout the year, as well as a working fireplace and two fully equipped dressing rooms. The multipurpose community room, with a seating capacity of 70-90 on the lower level, is host to various business meetings, receptions and parties and contains a fully functioning catering kitchen.

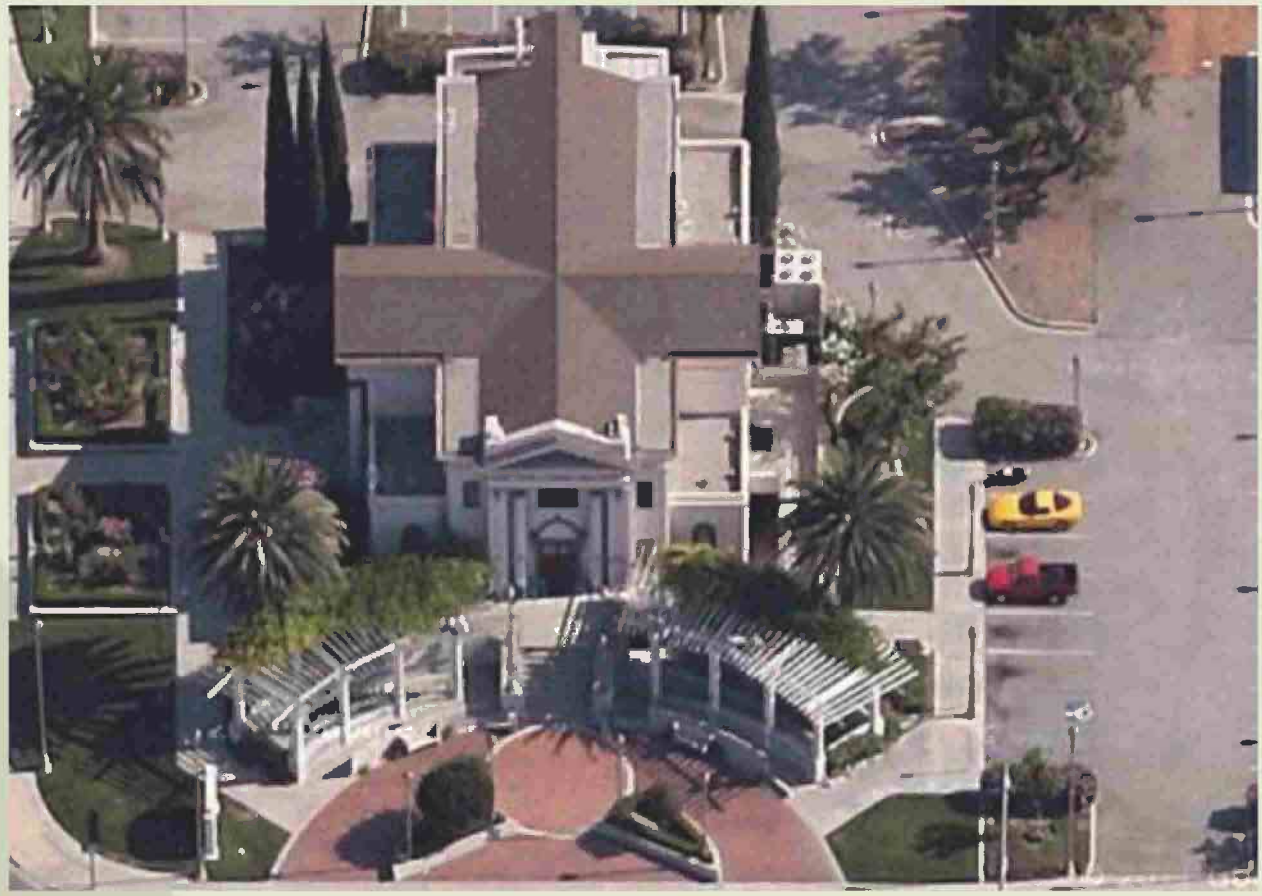

Figure 19. Cultural Arts Center building.

The energy consuming systems mainly consist of split system HVAC units that serve each floor and lighting. There is also projector equipment, a sound system and specialty lighting. Operation of these systems is typically during evening and weekends, when electricity costs are relatively low, leading to longer ECM payback periods.

Monthly electricity use trends are shown in Figure 20. Usage is highest in summer months, driven by air conditioning loads. Annual trends have been relatively stable from 2007-2011.

Monthly natural gas use trends are shown in Figure 21. Usage is highest in winter months, driven by heating loads. Annual usage trends vary, driven by weather fluctuations and the varied occupancy schedule at this facility relative to others.

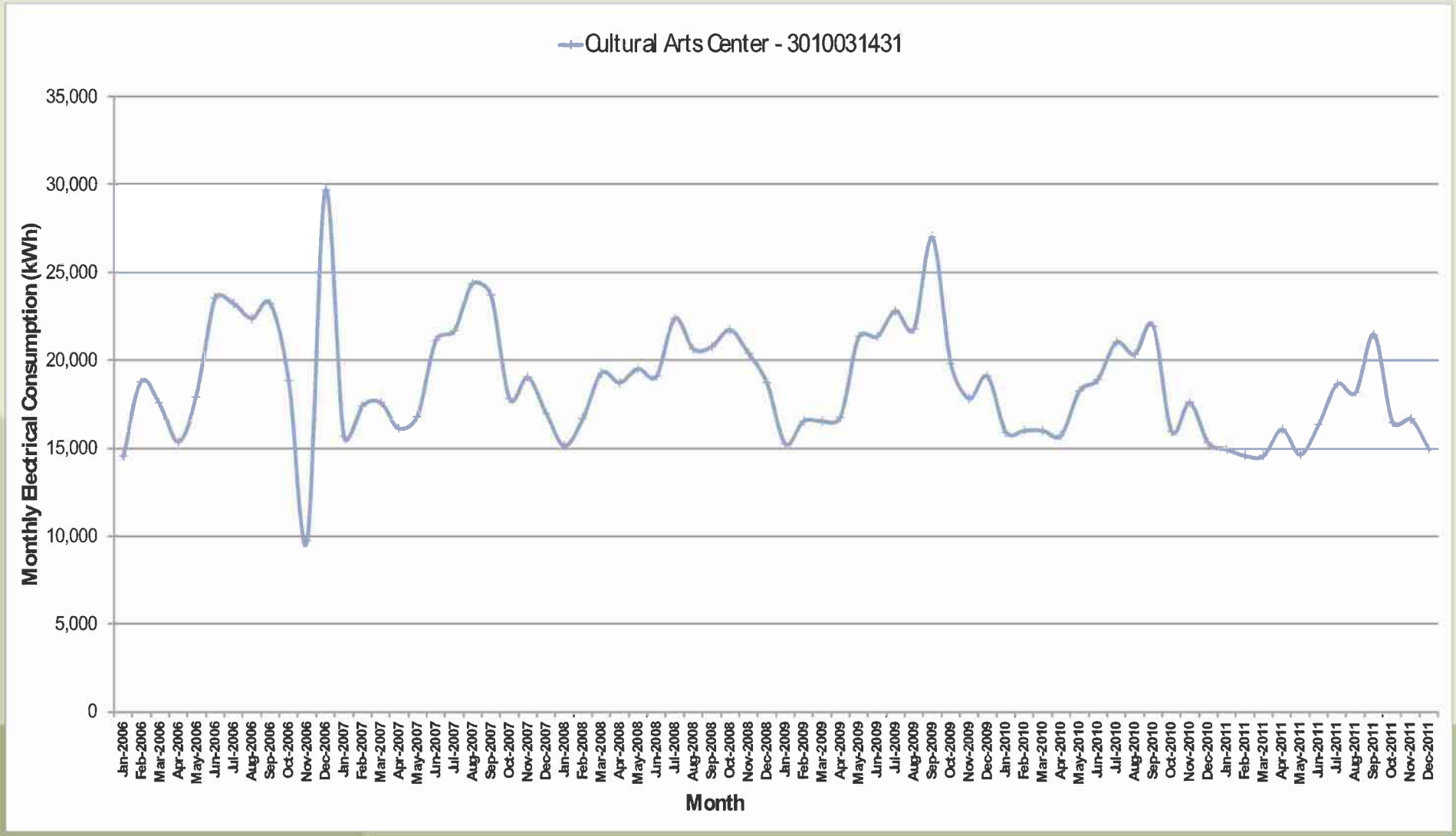

Figure 20. Cultural Arts Center monthly electricity use (2006-2011).

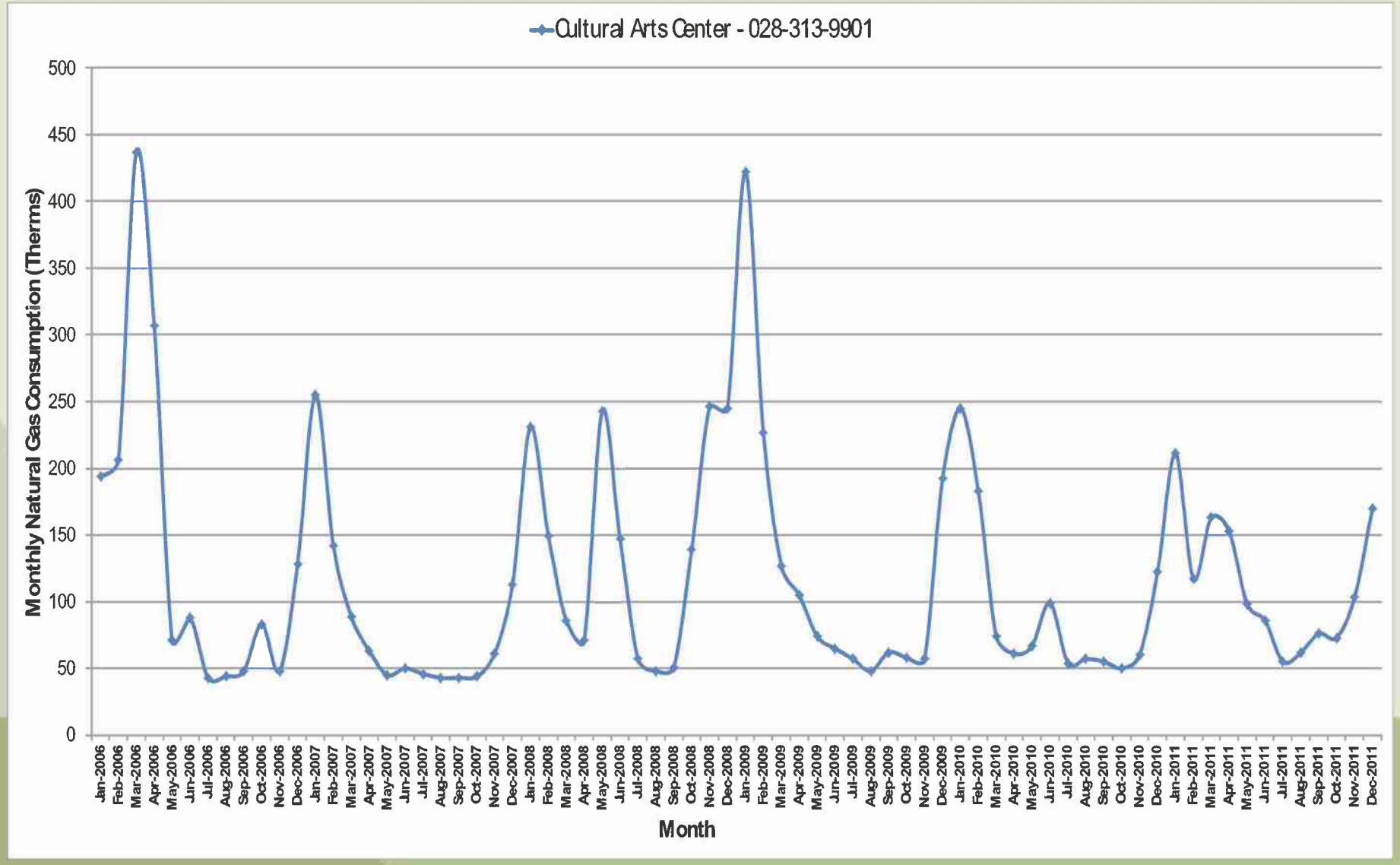

Figure 21. Cultural Arts Center monthly natural gas use (2006-2011).

No major ECMs have been implemented in the 2006-2011 timeframe. Potential future ECMs are shown in Table 22. Historic and future ECMs are summarized in Table 23.

Solar PV was not found to be feasible at this site. The GHG emissions associated with the historic and future ECMs are summarized in Table 24. Unquantified ECMs and best practices that will be implemented or further investigated include:

- Periodic HVAC maintenance, including filter replacements, fan belt adjustments or replacements, condenser coils cleaning and refrigeration checks.
- Use of photocells or astronomical time clocks in exterior lighting applications that currently use set hourly schedules.
- Use of higher efficiency office equipment during replacements.

Overall, a 15.8% electricity use reduction has been achieved at the Cultural Arts Center in 2011 as compared to 2006. A 19.4% natural gas use reduction occurred over the same period. These results may be related to reduced operating hours. This has led to a 16.4% reduction in total energy use. ECMs that have the potential to reduce energy use by 2.0%, as compared to 2006, have been identified. The associated GHG reduction potential is 2.1%.

Table 22. Cultural Arts Center potential energy conservation measures.

Measure Name/ Description	Details	Measure Status (Year Imp-lemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Invest-ment (%)
Lighting	Replace 72 incandescent lamps with CFLs	Future	4,147	2,597	$747	$720	$315	$405	0.5	7	1191%
Lighting	Replace 12 incandescent exit sign lamps with LEDs	Future	1,682	1,053	$303	$660	$324	$336	1.1	10	802%
		Totals & Averages	**5,829**	**3,650**	**$1,050**	**$1,380**	**$639**	**$741**	**0.8**		**996%**

Table 23. Summary of Cultural Arts Center historic and future energy reductions.

Cultural Arts Center Change in Energy Use	Value	Percent Change (%)	Reduction Baseline
Measured 2006 Annual Electricity Usage (kWh/yr)	234,720		
Measured 2011 Annual Electricity Usage (kWh/yr)	197,647	-15.8%	Total 2006 Electricity
Measured 2006 Annual Natural Gas Usage (Therms/yr)	1,697		
Measured 2011 Annual Natural Gas Usage (Therms/yr)	1,367	-19.4%	Total 2006 Gas
Measured 2006 Total Energy Usage (kBTU/yr)	970,799		
Measured 2011 Total Energy Usage (kBTU/yr)	811,269	-16.4%	Total 2006 Energy
Estimated Energy Reduction-Installed ECMs (kBTU/yr)	-	0.0%	Total 2006 Energy
Estimated Energy Reduction-Future ECMs (kBTU/yr)	19,895	-2.0%	Total 2006 Energy
Estimated Energy Reduction-Rooftop Solar PV (kBTU/yr)	-	0.0%	Total 2006 Energy
Estimated Energy Reduction-Carport Solar PV (kBTU/yr)	-	0.0%	Total 2006 Energy
Total Future Reduction Potential		**-2.0%**	**Total 2006 Energy**

Table 24. Summary of Cultural Arts Center historic and future GHG emission reductions.

Cultural Arts Center Change in GHG Emissions	Value	Percent Change (%)	Reduction Baseline
Measured 2006 Annual Electricity GHG Emissions (lbs CO2e/yr)	151,324		
Measured 2011 Annual Electricity GHG Emissions (lbs CO2e/yr)	123,749	-18.2%	Total 2006 Electricity GHG
Measured 2006 Annual Natural Gas GHG Emissions (lbs CO2e/yr)	19,887		
Measured 2011 Annual Natural Gas GHG Emissions (lbs CO2e/yr)	16,020	-19.4%	Total 2006 Gas GHG
Measured 2006 Total Energy GHG Emissions (lbs CO2e/yr)	171,211		
Measured 2011 Total Energy GHG Emissions (lbs CO2e/yr)	139,769	-18.4%	Total 2006 GHG
Estimated GHG Emissions Reduction-Installed ECMs (lbs CO_2e/yr)	-	0.0%	Total 2006 GHG
Estimated GHG Emissions Reduction-Future ECMs (lbs CO2e/yr)	3,650	-2.1%	Total 2006 GHG
Estimated GHG Emissions Reduction-Rooftop Solar PV (lbs CO2e/yr)	-	0.0%	Total 2006 GHG
Estimated GHG Emissions Reduction-Carport Solar PV (lbs CO2e/yr)	-	0.0%	Total 2006 GHG
Total Future Reduction Potential		**-2.1%**	**Total 2006 GHG**

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Development Services Building

The Development Services Building is an 18,125 square foot building built in 1977 (Figure 22).

Figure 22. Development Services Building.

The energy consuming systems consist primarily of HVAC, lighting and plug loads. Package rooftop units serve HVAC, lighting is mainly linear fluorescent and plug loads are mainly related to office equipment (computers, printers and personal equipment).

Monthly electricity use trends for the two accounts at the Development Services building are shown in Figure 23. Usage is highest in summer months, driven by air conditioning loads. Annual trends have been relatively stable from 2006-2011for both accounts. There is a noticeable increase in electricity use in 2009 on service account 3-012-84-0644.

Monthly natural gas use trends for the two accounts at the Development Services building are shown in Figure 24. Usage is highest in winter months, driven by heating loads. There is a very large increase in gas use in 2008 and thereafter on service account 130-813-8461, which will be further investigated. These trends are more clearly visible in Figure 25, which shows year over year monthly use in 2006 and 2011.

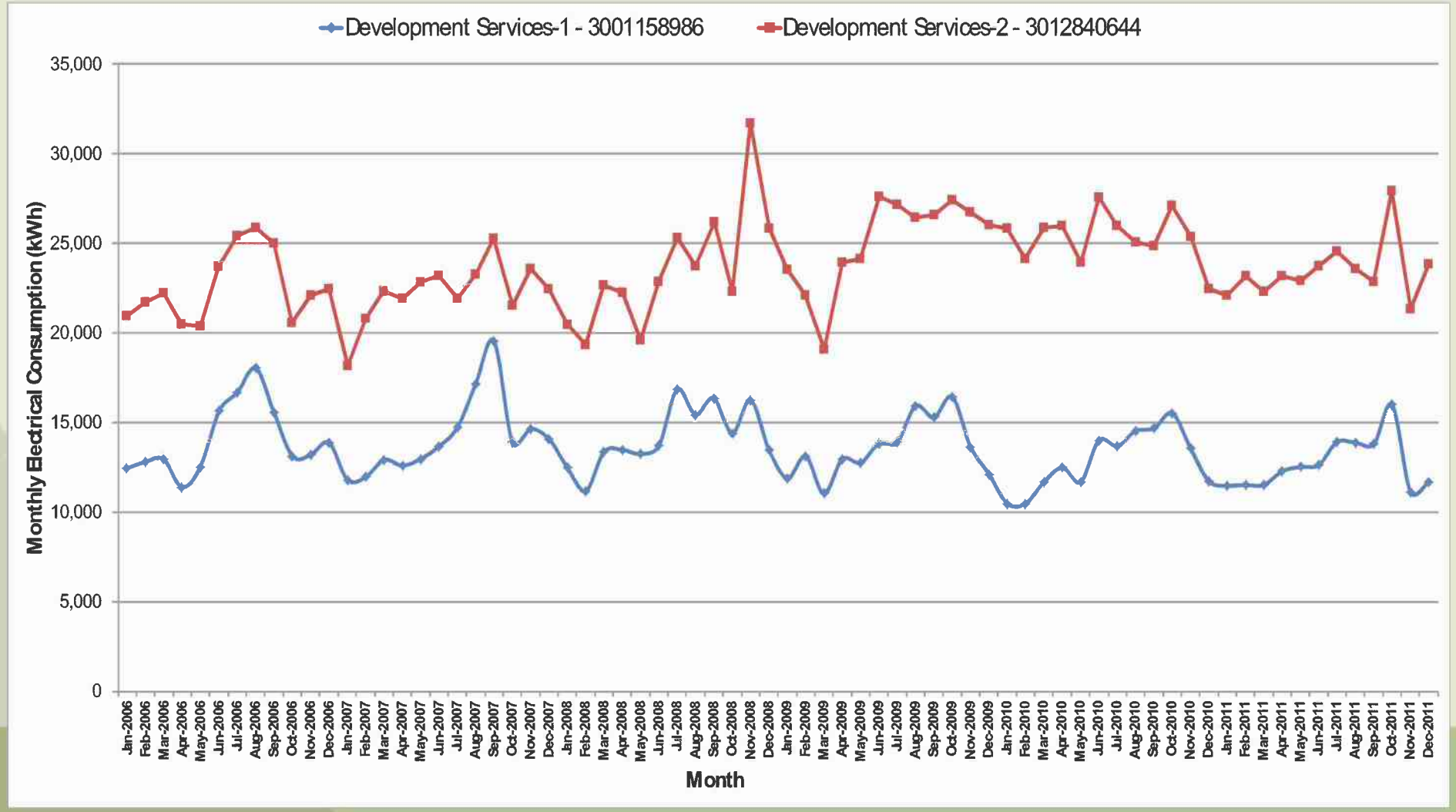

Figure 23. Development Services Building monthly electricity use (2006-2011).

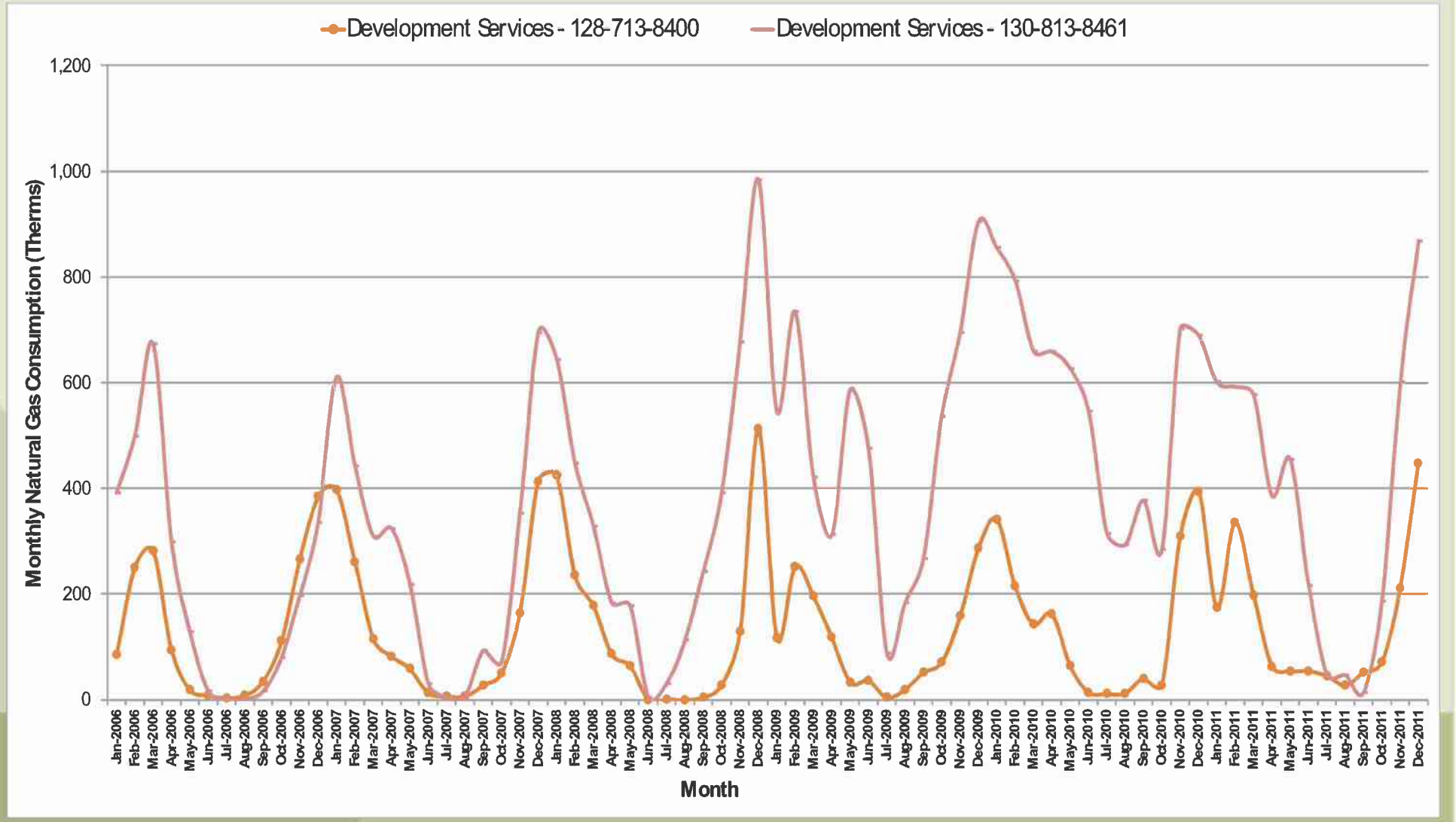

Figure 24. Development Services Building monthly natural gas use (2006-2011).

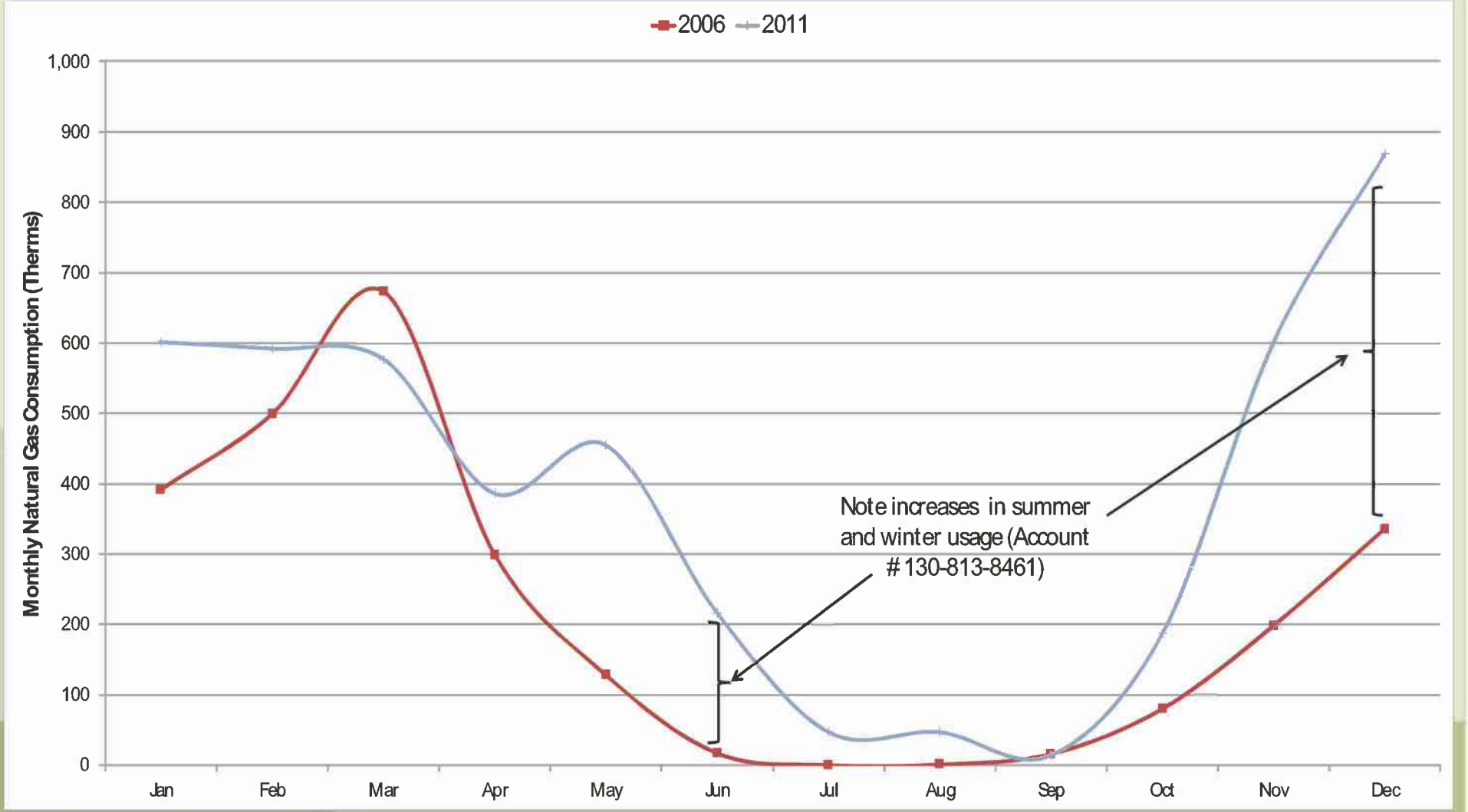

Figure 25. Development Services Building monthly natural gas usage, year over year (2006 & 2011).

A number of ECMs, focused on electricity use reduction, have been implemented at the Development Services (Table 25). Potential future ECMs are shown in Table 26 and Table 27. Historic and future ECMs are summarized in Table 28, along with the ability of solar PV to contribute to energy use reduction. The GHG emissions associated with the historic and future ECMs are summarized in Table 29. Unquantified ECMs and best practices that will be implemented or further investigated include:

- Periodic HVAC maintenance, including filter replacements, fan belt adjustments or replacements, condenser coils cleaning and refrigeration checks.
- Use of photocells or astronomical time clocks in exterior lighting applications that currently use set hourly schedules.
- Use of higher efficiency office equipment during replacements.

Overall, a 1.3% electricity use reduction has been achieved at the Development Services in 2011 as compared to 2006. However, a 51.1% increase in gas use occurred over the same period. This has led to a 10.2% increase in total energy use. ECMs that have the potential to reduce energy use by 13.1%, along with PV systems that have the potential to source 61.0% of energy use with renewables have been identified. This leads to a total potential energy use reduction of 74.1%, as compared to 2006. The associated GHG reduction potential is 74.2%.

Table 25. Development Services Building implemented energy conservation measures.

Measure Name/ Description	Details	Measure Status (Year Implemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Investment (%)
Lighting occupancy sensors	11 occupancy sensors installed	2010	577	366	$86	$825	$385	$440	5.1	10	96%
Plug load occupancy sensors	80 occupancy sensors installed	2011	9,360	5,860	$1,401	$8,000	$1,200	$6,800	4.9	10	106%
		Totals & Averages	**9,937**	**6,227**	**$1,488**	**$8,825**	**$1,585**	**$7,240**	**5.0**		**101%**

Table 26. Development Services Building potential energy conservation measures (electrical).

Measure Name/ Description	Details	Measure Status (Year Implemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Investment (%)
HVAC controls	Reduce run hours of HVAC equipment by 1300h per year	Future	10,725	6,715	$1,606	$150	$0	$150	0.1	10	10604%
		Totals & Averages	**10,725**	**6,715**	**$1,606**	**$150**	**$0**	**$150**	**0.1**		**10604%**
		Current Annual Electricity Usage (2011)	**433,840**								
		ECM as a Percent of Current Annual Electric Usage	**2.5%**								

Table 27. Development Services Building potential energy conservation measures (natural gas).

Measure Name/ Description	Details	Measure Status (Year Imp-lemented)	Annual Energy Savings (Therms/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Invest-ment (%)
Heating reduction	Reduce unexplained jump in annual gas use	Future	2,138	25,055	$1,983	$1,000		$1,000	0.5	5	892%
		Totals & Averages	**2,138**	**25,055**	**$1,983**	**$1,000**	**$0**	**$1,000**	**0.5**		**892%**

Table 28. Summary of Development Services Building historic and future energy reductions.

Development Services Change in Energy Use	Value	Percent Change (%)	Reduction Baseline
Measured 2006 Annual Electricity Usage (kWh/yr)	439,400		
Measured 2011 Annual Electricity Usage (kWh/yr)	433,840	-1.3%	Total 2006 Electricity
Measured 2006 Annual Natural Gas Usage (Therms/yr)	4,184		
Measured 2011 Annual Natural Gas Usage (Therms/yr)	6,322	51.1%	Total 2006 Gas
Measured 2006 Total Energy Usage (kBTU/yr)	1,918,072		
Measured 2011 Total Energy Usage (kBTU/yr)	2,112,896	10.2%	Total 2006 Energy
Estimated Energy Reduction-Installed ECMs (kBTU/yr)	33,916	-1.8%	Total 2006 Energy
Estimated Energy Reduction-Future ECMs (kBTU/yr)	250,404	-13.1%	Total 2006 Energy
Estimated Energy Reduction-Rooftop Solar PV (kBTU/yr)	585,250	-30.5%	Total 2006 Energy
Estimated Energy Reduction-Carport Solar PV (kBTU/yr)	585,250	-30.5%	Total 2006 Energy
Total Future Reduction Potential		**-74.1%**	**Total 2006 Energy**

Table 29. Summary of Development Services Building historic and future GHG emission reductions.

Development Services Change in GHG Emissions	Value	Percent Change (%)	Reduction Baseline
Measured 2006 Annual Electricity GHG Emissions (lbs CO2e/yr)	283,282		
Measured 2011 Annual Electricity GHG Emissions (lbs CO2e/yr)	271,633	-4.1%	Total 2006 Electricity GHG
Measured 2006 Annual Natural Gas GHG Emissions (lbs CO2e/yr)	49,032		
Measured 2011 Annual Natural Gas GHG Emissions (lbs CO2e/yr)	74,087	51.1%	Total 2006 Gas GHG
Measured 2006 Total Energy GHG Emissions (lbs CO2e/yr)	332,313		
Measured 2011 Total Energy GHG Emissions (lbs CO2e/yr)	345,720	4.0%	Total 2006 GHG
Estimated GHG Emissions Reduction-Installed ECMs (lbs CO2e/yr)	6,227	-1.9%	Total 2006 GHG
Estimated GHG Emissions Reduction-Future ECMs (lbs CO2e/yr)	31,770	-9.6%	Total 2006 GHG
Estimated GHG Emissions Reduction-Rooftop Solar PV (lbs CO2e/yr)	107,364	-32.3%	Total 2006 GHG
Estimated GHG Emissions Reduction-Carport Solar PV (lbs CO2e/yr)	107,364	-32.3%	Total 2006 GHG
Total Future Reduction Potential		**-74.2%**	**Total 2006 GHG**

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Police Department

The Police Department is a 50,000 square foot building built in 1998 (Figure 26).

Figure 26. Police Department building.

The energy consuming systems consist primarily of HVAC, lighting, plug loads and servers. HVAC is served by package rooftop units, lighting is mainly linear fluorescent and plug loads are mainly related to office equipment (computers, printers and personal equipment). Lighting also serves underground parking and a mechanic's bay.

Monthly electricity use trends are shown in Figure 27. Usage is highest in summer months, driven by air conditioning loads. Annual trends have been relatively stable from 2006-2011.

Monthly natural gas use trends are shown in Figure 28. Usage is highest in winter months, driven by heating loads. Electricity has decreased and gas use has slightly increased from 2006-2011.

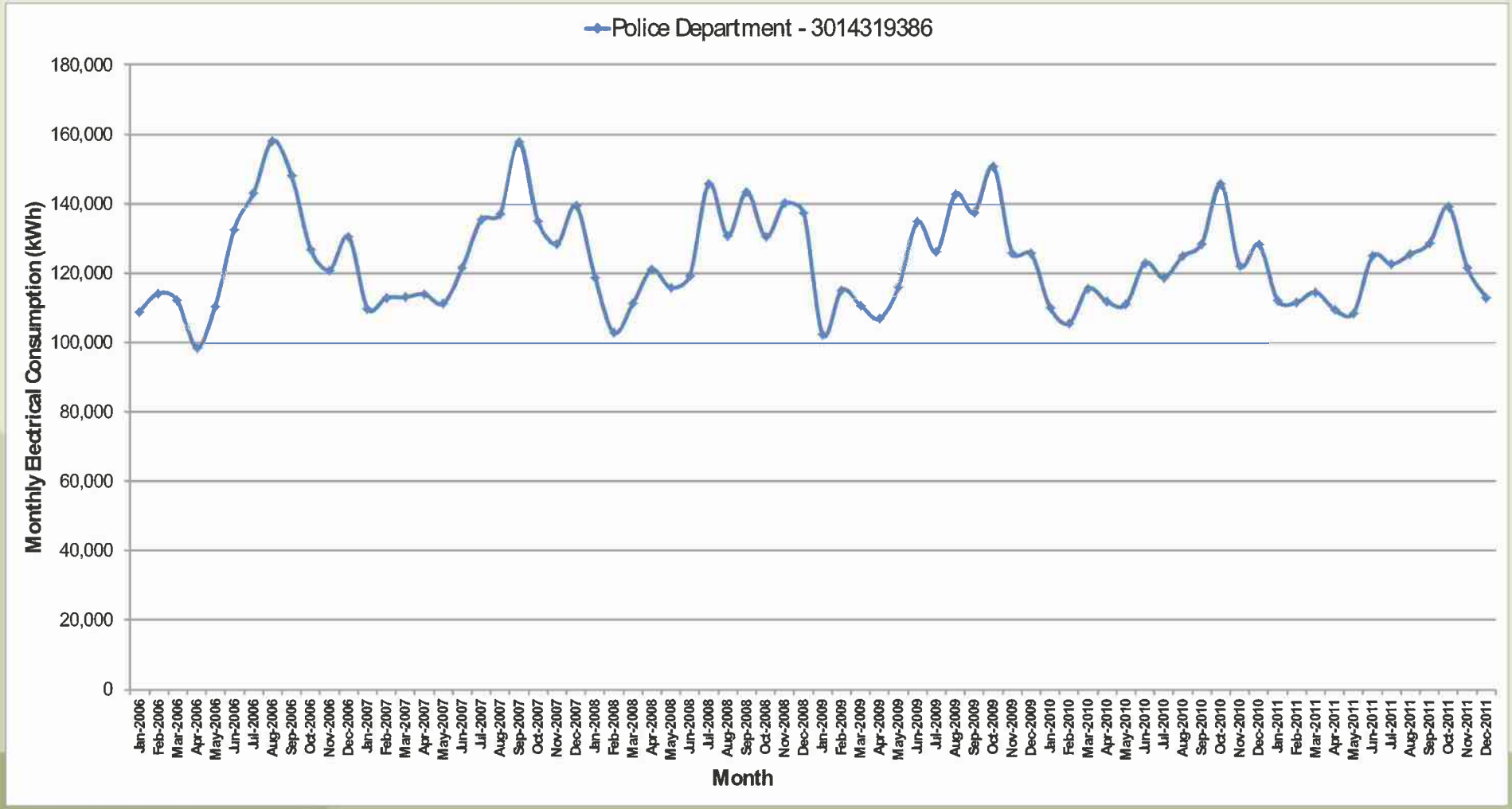

Figure 27. Police Department monthly electricity use (2006-2011).

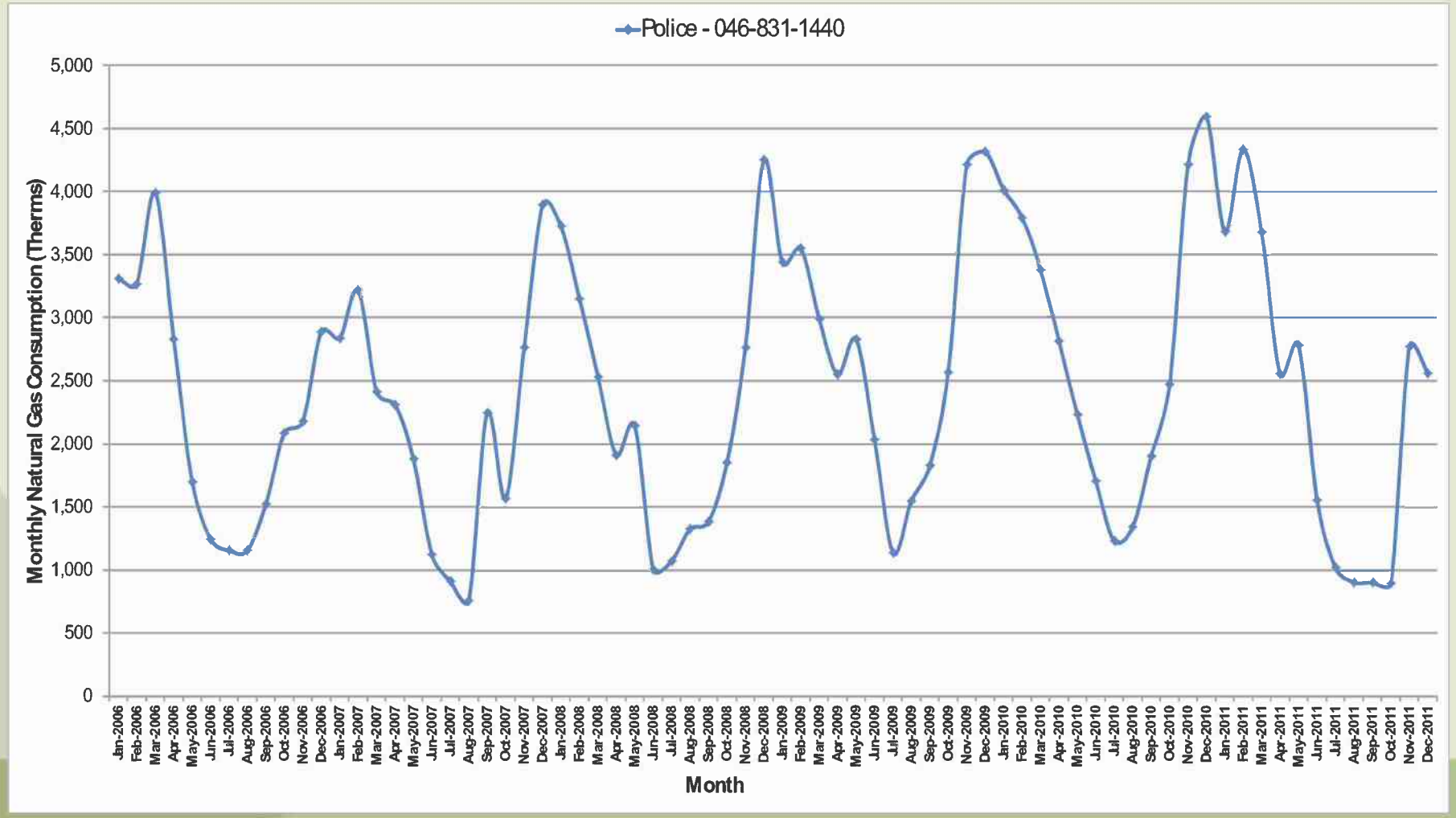

Figure 28. Police Department monthly natural gas use (2006-2011).

Figure 29 shows the average 15-minute interval power demand for all months in 2011. A high nighttime baseload power consumption ranging from 135-165 kW is seen. The baseload fluctuation is largely due to cooling loads. The opportunity to reduce this high baseload will be further investigated. A nighttime lighting load of approximately 20 kW is seen and is effectively controlled for seasonal daylight availability.

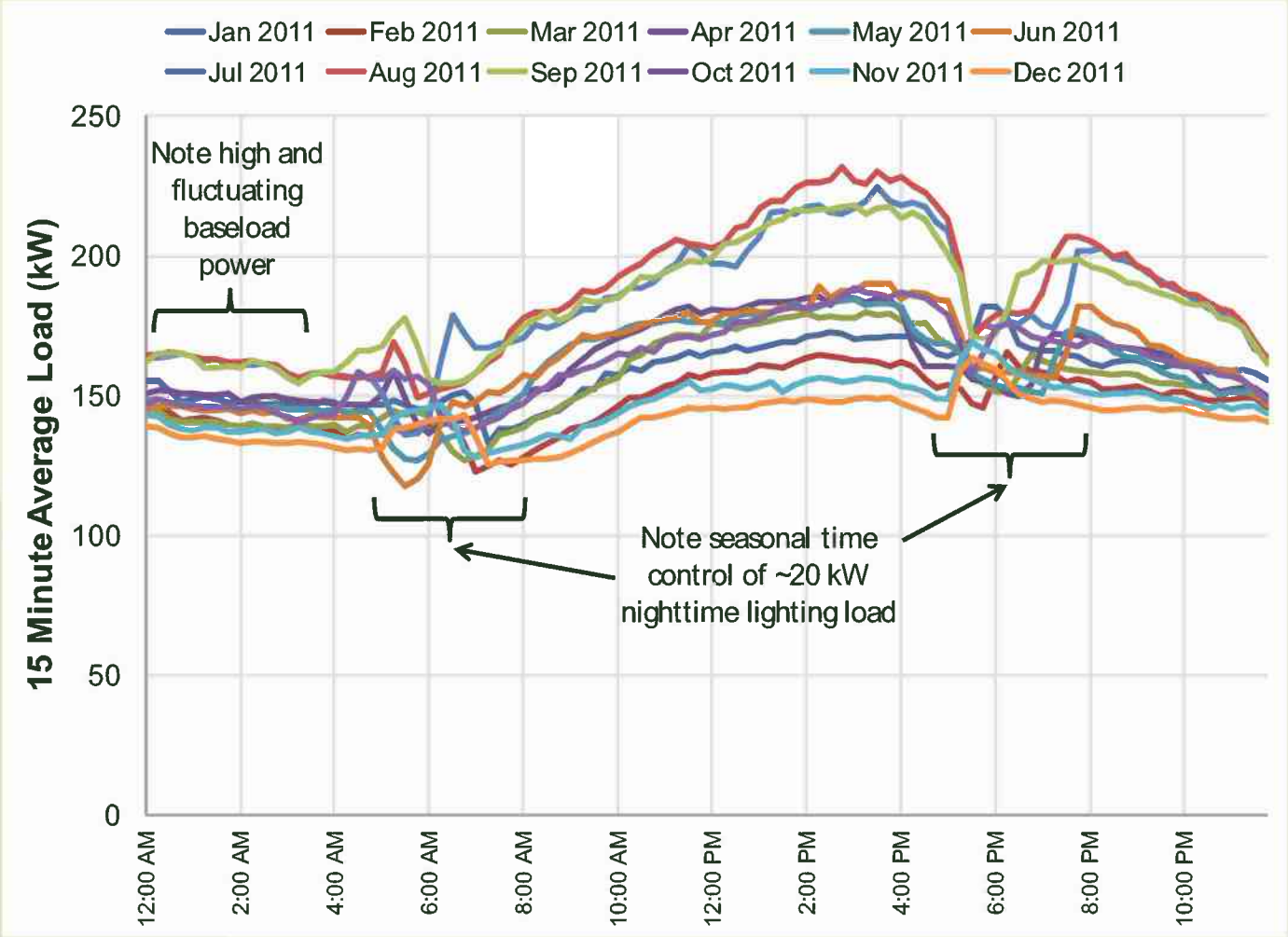

Figure 29. Police Department average 15-minute power demand per month (2011-time not adjusted for daylight savings).

A number of ECMs, focused on electricity use reduction, have been implemented at the Police Department (Table 30). Potential future ECMs are shown in Table 31. Historic and future ECMs are summarized in Table 32, along with the ability of solar PV to contribute to energy use reduction. The GHG emissions associated with the historic and future ECMs are summarized in Table 33. Unquantified ECMs and best practices that will be implemented or further investigated include:
Retro-commissioning.

- Periodic HVAC maintenance, including filter replacements, fan belt adjustments or replacements, condenser coils cleaning and refrigeration checks.

- Use of photocells or astronomical time clocks in exterior lighting applications that currently use set hourly schedules.
- Use of higher efficiency office equipment during replacements.

Overall, a 4.9% electricity use reduction has been achieved at the Police Department in 2011 as compared to 2006. However, a 1.1% increase in gas use occurred over the same period. This has led to a 2.8% reduction in total energy use. ECMs that have the potential to reduce energy use by 9.4%, along with PV systems that have the potential to source 32.8% of energy use with renewables have been identified. This leads to a total potential energy use reduction of 42.2%, as compared to 2006. The associated GHG reduction potential is 47.2%.

Table 30. Police Department implemented energy conservation measures.

Measure Name/ Description	Details	Measure Status (Year Implemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Investment (%)
Lighting occupancy sensors	11 occupancy sensors installed	2010	901	572	$108	$300	$100	$200	1.9	15	708%
Plug load occupancy sensors	60 occupancy sensors installed	2011	7,020	4,395	$839	$6,000	$900	$5,100	6.1	10	65%
		Totals & Averages	**7,921**	**4,967**	**$947**	**$6,300**	**$1,000**	**$5,300**	**4.0**		**386%**

Table 31. Police Department potential energy conservation measures.

Measure Name/ Description	Details	Measure Status (Year Implemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Invest-ment (%)
Lighting retrofit	100 lamp retrofit of 90W metal halide with 70W pulse start metal halide.	Future	8,280	5,184	$990	$3,500	$1,500	$2,000	2.0	5	148%
Lighting retrofit	46 lamp retrofit of HID fixtures with induction fixtures in parking areas	Future	24,757	15,501	$2,960	$23,000	$3,450	$19,550	6.6	10	51%
Lighting retrofit	75 lamp retrofit of fluorescent exit signs with LED exit signs	Future	11,826	7,404	$1,414	$2,063	$1,125	$938	0.7	10	1408%
PC auto-shutdown	Shuts down 120 computers when not in use	Future	36,000	22,540	$4,305	$3,000	$1,200	$1,800	0.4	10	2291%
10% reduction in baseload power	Reduce unnecessary loads at night by 10% (15 kW reduction from current baseload of 150 kW)	Future	131,400	82,271	$15,712	$2,500		$2,500	0.2	10	6185%
Lighting retrofit	Replace incandescent bulbs in 4 fixtures with LED or Fluorescent bulbs	Future	1,798	1,126	$215	$140		$140	0.7	10	1435%
Vending machine control	Controllers on 2 refrigerated beverage machines	Future	2,400	1,503	$287	$400	$200	$200	0.7	5	617%
		Totals & Averages	**216,461**	**135,529**	**$25,882**	**$34,603**	**$7,475**	**$27,128**	**1.6**		**1734%**
		Current Annual Electricity Usage (2011)	**1,430,850**								
		ECM as a Percent of Current Annual Electric Usage	**15.1%**								

Table 32. Summary of Police Department historic and future energy reductions.

Police Department Change in Energy Use	Value	Percent Change (%)	Reduction Baseline
Measured 2006 Annual Electricity Usage (kWh/yr)	1,504,738		
Measured 2011 Annual Electricity Usage (kWh/yr)	1,430,850	-4.9%	Total 2006 Electricity
Measured 2006 Annual Natural Gas Usage (Therms/yr)	27,330		
Measured 2011 Annual Natural Gas Usage (Therms/yr)	27,637	1.1%	Total 2006 Gas
Measured 2006 Total Energy Usage (kBTU/yr)	7,868,671		
Measured 2011 Total Energy Usage (kBTU/yr)	7,647,191	-2.8%	Total 2006 Energy
Estimated Energy Reduction-Installed ECMs (kBTU/yr)	27,035	-0.3%	Total 2006 Energy
Estimated Energy Reduction-Future ECMs (kBTU/yr)	738,780	-9.4%	Total 2006 Energy
Estimated Energy Reduction-Rooftop Solar PV (kBTU/yr)	968,689	-12.3%	Total 2006 Energy
Estimated Energy Reduction-Carport Solar PV (kBTU/yr)	1,614,482	-20.5%	Total 2006 Energy
Total Future Reduction Potential		**-42.2%**	**Total 2006 Energy**

Table 33. Summary of Police Department historic and future GHG emission reductions.

Police Department Change in GHG Emissions	Value	Percent Change (%)	Reduction Baseline
Measured 2006 Annual Electricity GHG Emissions (lbs CO2e/yr)	970,106		
Measured 2011 Annual Electricity GHG Emissions (lbs CO2e/yr)	895,874	-7.7%	Total 2006 Electricity GHG
Measured 2006 Annual Natural Gas GHG Emissions (lbs CO2e/yr)	320,277		
Measured 2011 Annual Natural Gas GHG Emissions (lbs CO2e/yr)	323,875	1.1%	Total 2006 Gas GHG
Measured 2006 Total Energy GHG Emissions (lbs CO2e/yr)	1,290,383		
Measured 2011 Total Energy GHG Emissions (lbs CO2e/yr)	1,219,749	-5.5%	Total 2006 GHG
Estimated GHG Emissions Reduction-Installed ECMs (lbs CO2e/yr)	4,967	-0.4%	Total 2006 GHG
Estimated GHG Emissions Reduction-Future ECMs (lbs CO2e/yr)	135,529	-10.5%	Total 2006 GHG
Estimated GHG Emissions Reduction-Rooftop Solar PV (lbs CO2e/yr)	177,705	-13.8%	Total 2006 GHG
Estimated GHG Emissions Reduction-Carport Solar PV (lbs CO2e/yr)	296,176	-23.0%	Total 2006 GHG
Total Future Reduction Potential		**-47.2%**	**Total 2006 GHG**

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Public Services Center

The Public Services Center is an 18,150 square foot building built in 1977 (Figure 30). An expansion occurred in 1996.

Figure 30. Public Services Center Building.

The energy consuming systems consist primarily of HVAC, lighting and plug loads. HVAC is served by package rooftop units, lighting is mainly linear fluorescent and plug loads are mainly related to office equipment (computers, printers and personal equipment). There is also a shop at the site, with various power tools.

There is no dedicated electrical service account at the Public Services Center. The electricity that serves this facility is on the service account associated with the Sanitation/Waterworks facility.

Monthly natural gas use trends are shown in Figure 31. Usage is highest in winter months, driven by heating loads. Annual trends have been relatively stable from 2008-2011.

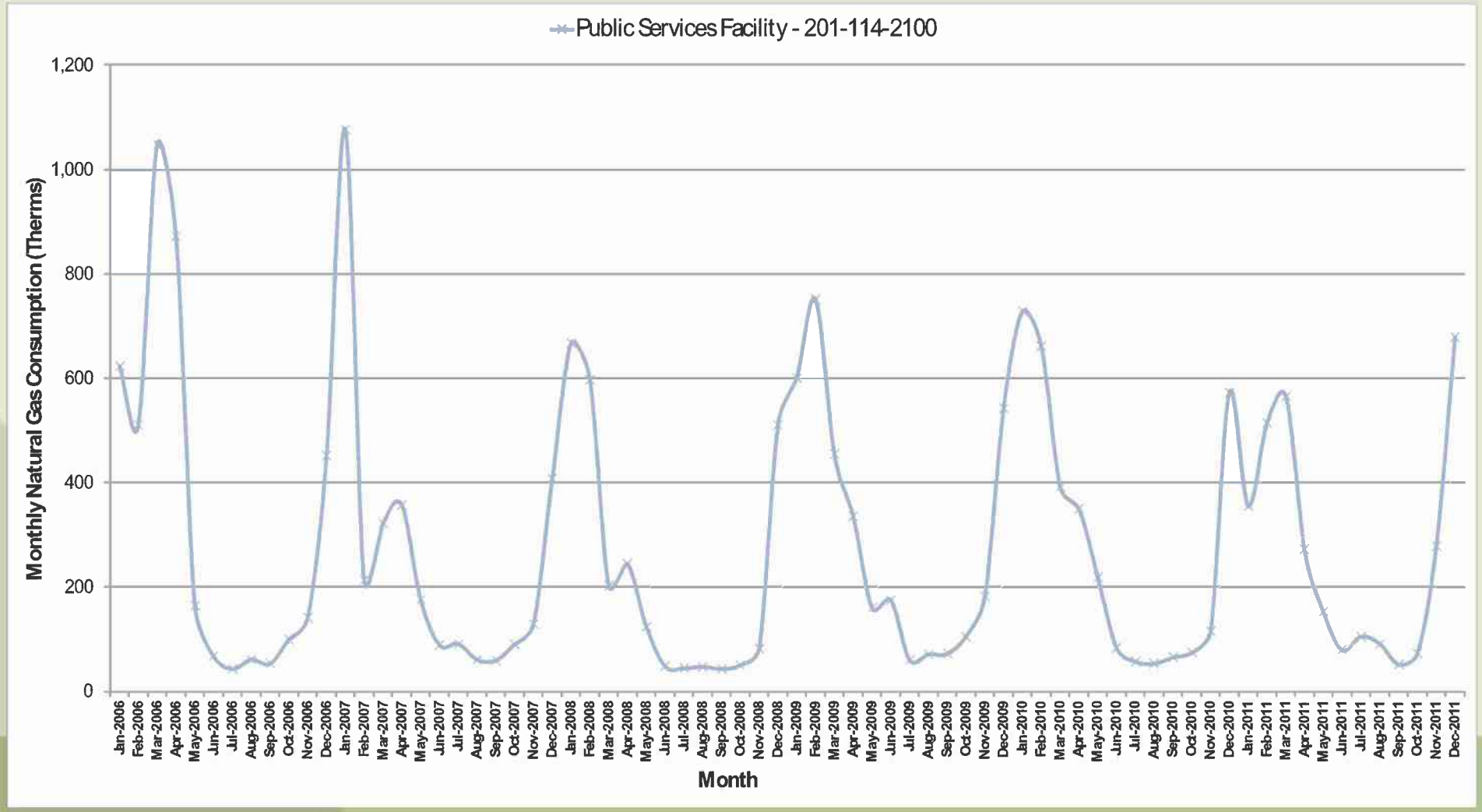

Figure 31. Public Services Center monthly natural gas use (2006-2011).

A number of ECMs, focused on electricity use reduction, have been implemented at the Public Services Center (Table 34). Potential future ECMs are shown in Table 35. Historic and future ECMs are summarized in Table 36, along with the ability of solar PV to contribute to energy use reduction. The GHG emissions associated with the historic and future ECMs are summarized in Table 37. Unquantified ECMs and best practices that will be implemented or further investigated include:

- Periodic HVAC maintenance, including filter replacements, fan belt adjustments or replacements, condenser coils cleaning and refrigeration checks.
- Use of photocells or astronomical time clocks in exterior lighting applications that currently use set hourly schedules.
- Use of higher efficiency office equipment during replacements.

Overall, a 22.2% natural gas use reduction has been achieved at the Public Services Facility in 2011 as compared to 2006. This has led to a 22.2% reduction in total energy use, since there is no dedicated electrical service account. ECMs that have the potential to reduce energy use by 42.3%, along with PV systems that have the potential to source 212.8% of energy use with renewables have been identified. This leads to a total potential energy use reduction of 255.1%, as compared to 2006. The associated GHG reduction potential is 399.3%. In reality, the PV system would be connected to the Sanitation/Waterworks service account.

Table 34. Public Services Center implemented energy conservation measures.

Measure Name/ Description	Details	Measure Status (Year Implemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Investment (%)
Lighting retrofit	Replaced 300 T-12 lamps to T-8 lamps and magnetic ballasts to electronic ballasts	2011	10,313	6,457	$981	$5,000	$1,275	$3,725	3.8	7	84%
		Totals & Averages	**10,313**	**6,457**	**$981**	**$5,000**	**$1,275**	**$3,725**	**3.8**		**84%**

Table 35. Public Services Center potential energy conservation measures.

Measure Name/ Description	Details	Measure Status (Year Implemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Investment (%)
Lighting retrofit	14 lamp retrofit of 7 incandescent exit signs with LED exit signs	Future	1,717	1,075	$163	$385	$189	$196	1.2	10	733%
HVAC retrofit	Replace 6 old HVAC with high efficiency package unit	Future	23,905	14,967	$2,273	$57,000		$57,000	25.1	10	-60%
HVAC controls	Replace thermostats or timers	Future	5,000	3,131	$475	$600		$600	1.3	5	296%
Lighting retrofit	Replace outdoor soffit lighting with fluorescent or LED lights. Assume 125W Par 38 to 23W fluorescent	Future	5,018	3,142	$477	$120	$0	$120	0.3	10	3877%
Lighting retrofit	Evaluate de-lamping fixtures	Future	13,120	8,215	$1,248	$2,000	$0	$2,000	1.6	15	836%
Vending machine control	Controllers on 2 refrigerated beverage machines	Future	2,400	1,503	$228	$600	$200	$400	1.8	5	185%
		Totals & Averages	**51,160**	**32,032**	**$4,865**	**$60,705**	**$389**	**$60,316**	**5.2**		**978%**
		Current Annual Electricity Usage (2011)	**NA**								
		ECM as a Percent of Current Annual Electric Usage	**NA**								

Table 36. Summary of Public Service Center historic and future energy reductions.

Public Services Facility Change in Energy Use	Value	Percent Change (%)	Reduction Baseline
Measured 2006 Annual Electricity Usage (kWh/yr)	NA		
Measured 2011 Annual Electricity Usage (kWh/yr)	NA	NA	Total 2006 Electricity
Measured 2006 Annual Natural Gas Usage (Therms/yr)	4,131		
Measured 2011 Annual Natural Gas Usage (Therms/yr)	3,214	-22.2%	Total 2006 Gas
Measured 2006 Total Energy Usage (kBTU/yr)	413,100		
Measured 2011 Total Energy Usage (kBTU/yr)	321,400	-22.2%	Total 2006 Energy
Estimated Energy Reduction-Installed ECMs (kBTU/yr)	35,198	-8.5%	Total 2006 Energy
Estimated Energy Reduction-Future ECMs (kBTU/yr)	174,610	-42.3%	Total 2006 Energy
Estimated Energy Reduction-Rooftop Solar PV (kBTU/yr)	175,817	-42.6%	Total 2006 Energy
Estimated Energy Reduction-Carport Solar PV (kBTU/yr)	703,268	-170.2%	Total 2006 Energy
Total Future Reduction Potential		**-255.1%**	**Total 2006 Energy**

Table 37. Summary of Public Services Center historic and future GHG emission reductions.

Public Services Facility Change in GHG Emissions	Value	Percent Change (%)	Reduction Baseline
Measured 2006 Annual Electricity GHG Emissions (lbs CO2e/yr)	NA		
Measured 2011 Annual Electricity GHG Emissions (lbs CO2e/yr)	NA	NA	Total 2006 Electricity GHG
Measured 2006 Annual Natural Gas GHG Emissions (lbs CO2e/yr)	48,411		
Measured 2011 Annual Natural Gas GHG Emissions (lbs CO2e/yr)	37,665	-22.2%	Total 2006 Gas GHG
Measured 2006 Total Energy GHG Emissions (lbs CO2e/yr)	48,411		
Measured 2011 Total Energy GHG Emissions (lbs CO2e/yr)	37,665	-22.2%	Total 2006 GHG
Estimated GHG Emissions Reduction-Installed ECMs (lbs CO2e/yr)	6,457	-13.3%	Total 2006 GHG
Estimated GHG Emissions Reduction-Future ECMs (lbs CO2e/yr)	32,032	-66.2%	Total 2006 GHG
Estimated GHG Emissions Reduction-Rooftop Solar PV (lbs CO2e/yr)	32,254	-66.6%	Total 2006 GHG
Estimated GHG Emissions Reduction-Carport Solar PV (lbs CO2e/yr)	129,014	-266.5%	Total 2006 GHG
Total Future Reduction Potential		**-399.3%**	**Total 2006 GHG**

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Sanitation/Waterworks

The Sanitation/Waterworks building is an 18,174 square foot building built in 1962 (Figure 32). Expansions occurred in 1972, 1987 and 2004.

Figure 32. Sanitation/Waterworks building.

The energy consuming systems within the building consist primarily of HVAC, lighting and plug loads. HVAC is served by package rooftop units, lighting is mainly linear fluorescent and plug loads are mainly related to office equipment (computers, printers and personal equipment). There is also water quality control equipment.

The electric service account for this building also powers process loads at the City's Sanitation Plant shown in Figure 33, as well as the Public Services Center and Transit Facility buildings.

Figure 33. Sanitation wastewater treatment plant site.

The Sanitation Plant is located on 33 acres of land and treats approximately 10 million gallons of wastewater each day. The sanitary sewer system consists of nearly 500 miles of pipeline; three lift stations and approximately 7,000 sewer manholes. The wastewater comes from a variety of sources, including discharges from local businesses and industries, with the majority of discharge coming from residential sources. Community based water conservation efforts will reduce flows to the Sanitation Plant, conserving energy and reducing sewer service fees.

The entire treatment system is continuously monitored via a state of the art SCADA computer system. This is an activated sludge plant using the latest methods for biological nutrient removal.

Primary effluent is mixed with return activated sludge in the aeration tanks. The remaining solids are removed using air supplied by compressors and microbial action. The plant also uses bacteria to remove ammonia and some phosphorus to prevent eutrophication.

The solids removed from the primary clarifiers and a portion of the solids from the activated sludge process are further reduced in anaerobic digesters. This process reduces the volatile solids and further stabilizes the sludge. These large cylindrical tanks are heated and mixed to create methane and carbon dioxide gas. The

methane gas is flared in a waste gas burner. The digesters are the only process load within the plant that require gas-fired heating.

The Sanitation/Waterworks service account has the highest electrical usage of the City's 344 accounts, at 33% of the total. Therefore, this service account is a major focus for ECMs.

Annual electricity use trends, along with average daily influent flow rates to the Sanitation Plant, are shown in Figure 34. It is difficult to find a correlation between electricity use and influent flow rates, one, because there is only an 11% difference between the highest and lowest average daily influent flow rates and this range does not result in major changes in plant operational processes, two, because many ECMs have been implemented from 2006-2011, and three because of the buildings that are also served by this account. However, it was found that the electrical intensity of treating 1,000 gallons of water has gone from 2.46 kWh/1,000 gallons in 2006, to 2.24 kWh/1,000 gallons in 2011, a 9% reduction. This is thought to be predominantly a result of the ECMs implemented at the Sanitation Plant.

The variety of building and process loads on this service account makes it difficult to distinguish between the load type contributions. Sub-metering at this site using the EEM system will be further investigated. This may allow a better understanding of individual loads and opportunities for ECMs.

Monthly electricity use trends are shown in Figure 35. Usage is dominated by Sanitation Plant process loads, not air conditioning loads. A general trend of decreasing usage is observed, which is the result of aggressive energy efficiency efforts within the Sanitation Plant and the three buildings on this service account. These trends are more clearly visible in Figure 36, which shows year over year monthly use in 2006 and 2011. Reductions occur in almost all months of the year.

Monthly natural gas use trends are shown in Figure 37. The heating of the anaerobic digesters at the Sanitation Plant is the only use of gas on this service account. Gas use is highest in winter months, driven by digester heating loads. There is a significant increase in 2007/2008 winter usage, which is persistent. This is due to the replacement of an inaccurate meter. These trends are more clearly visible in Figure 38, which shows year over year monthly use in 2006 and 2011. Increases occur in all months of the year.

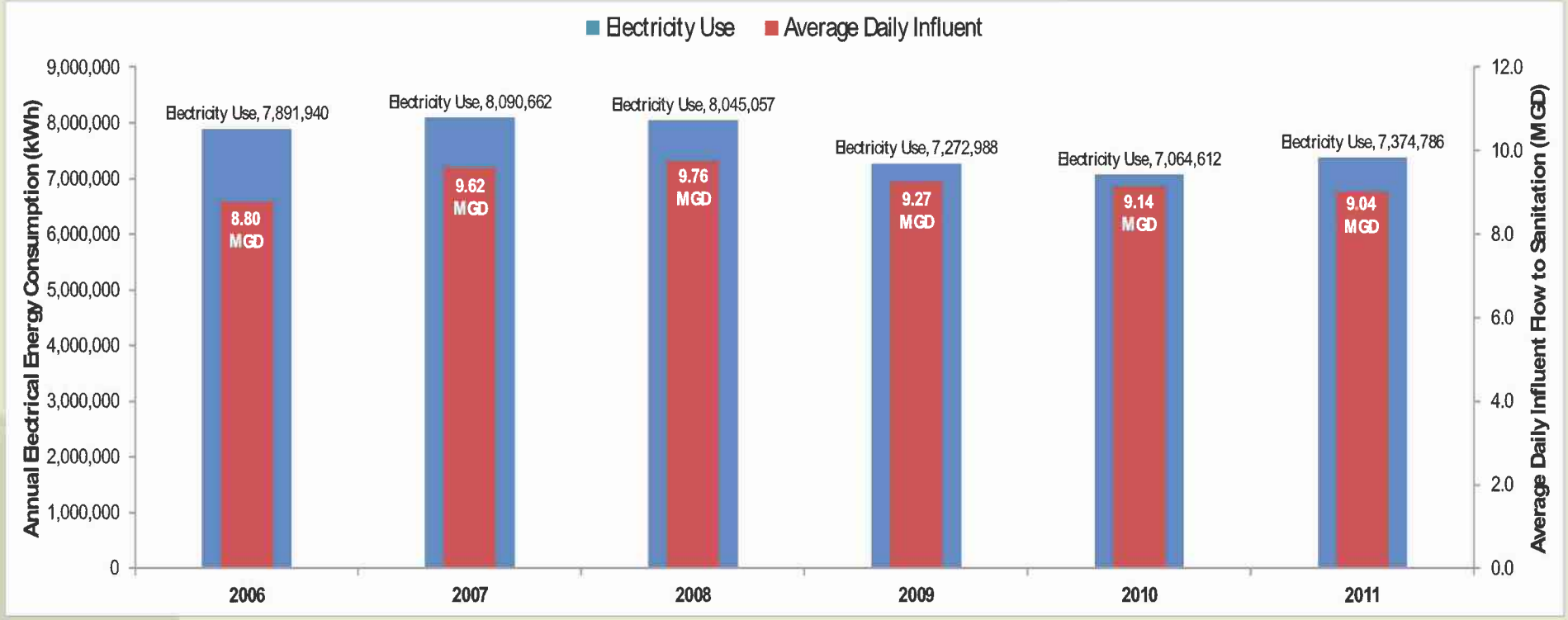

Figure 34. Sanitation/Waterworks/PSC total annual electricity use and water volume treated (2006-2011).

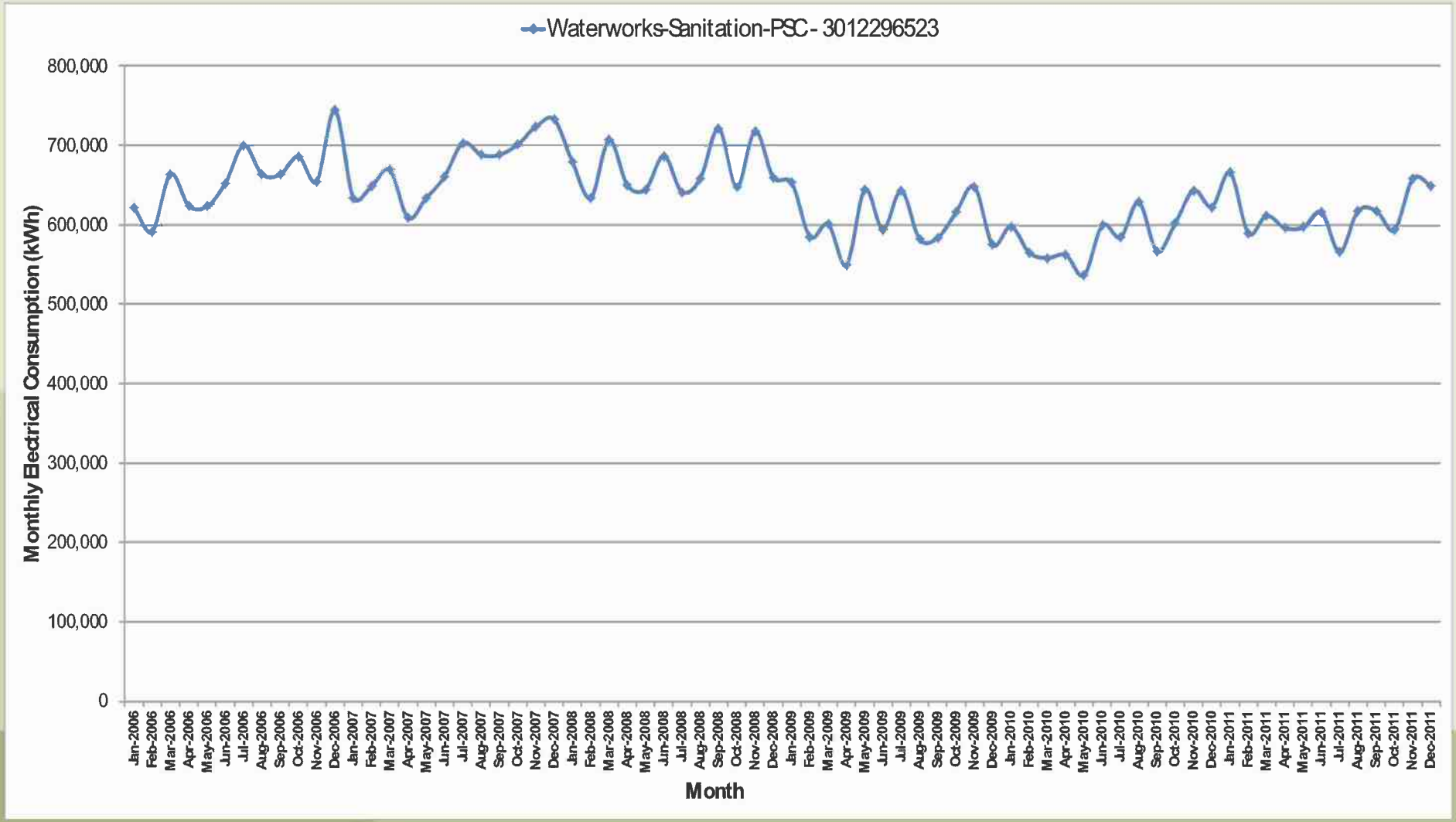

Figure 35. Sanitation/Waterworks/PSC monthly electricity use (2006-2011).

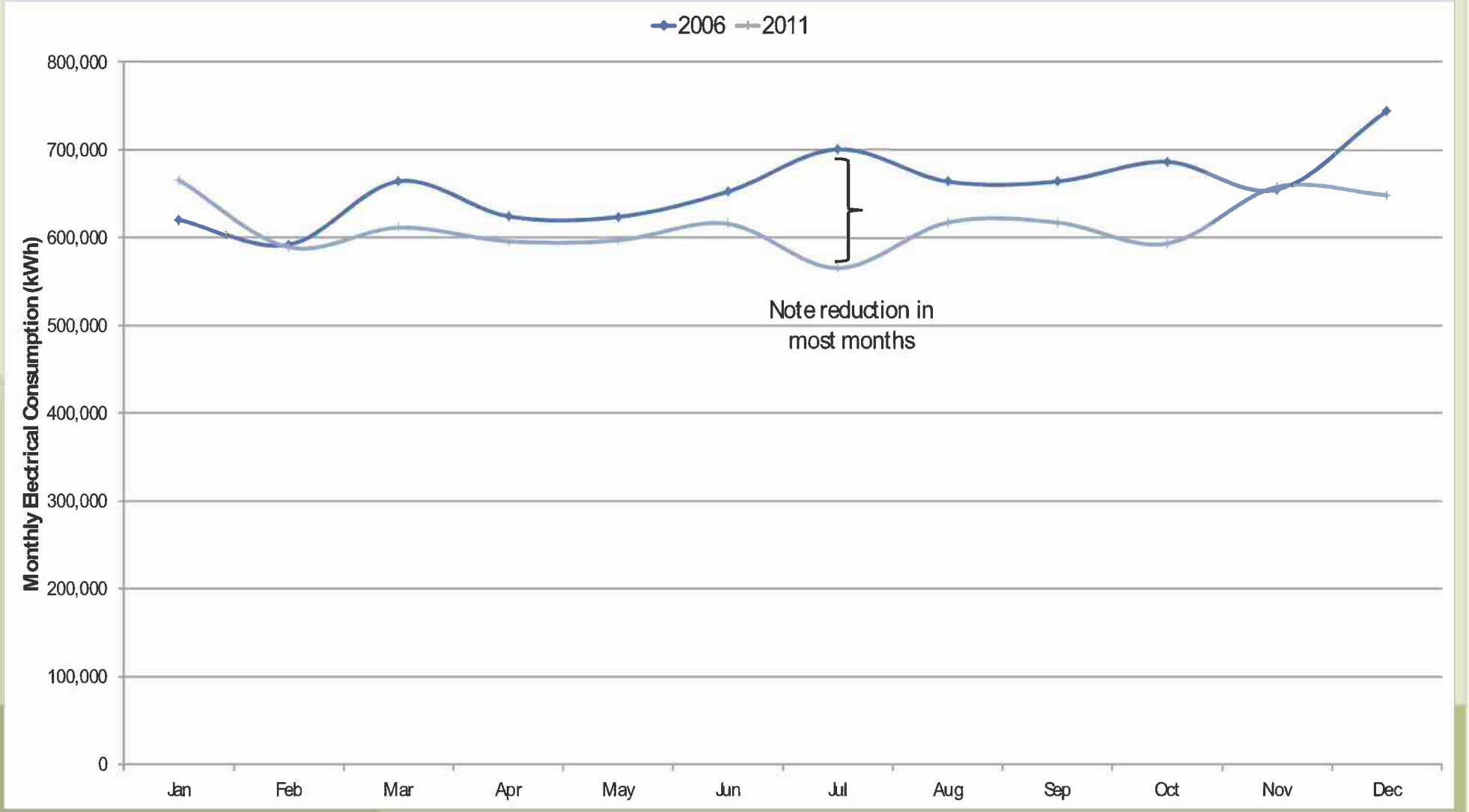

Figure 36. Sanitation/Waterworks/PSC monthly electricity usage, year over year (2006 & 2011).

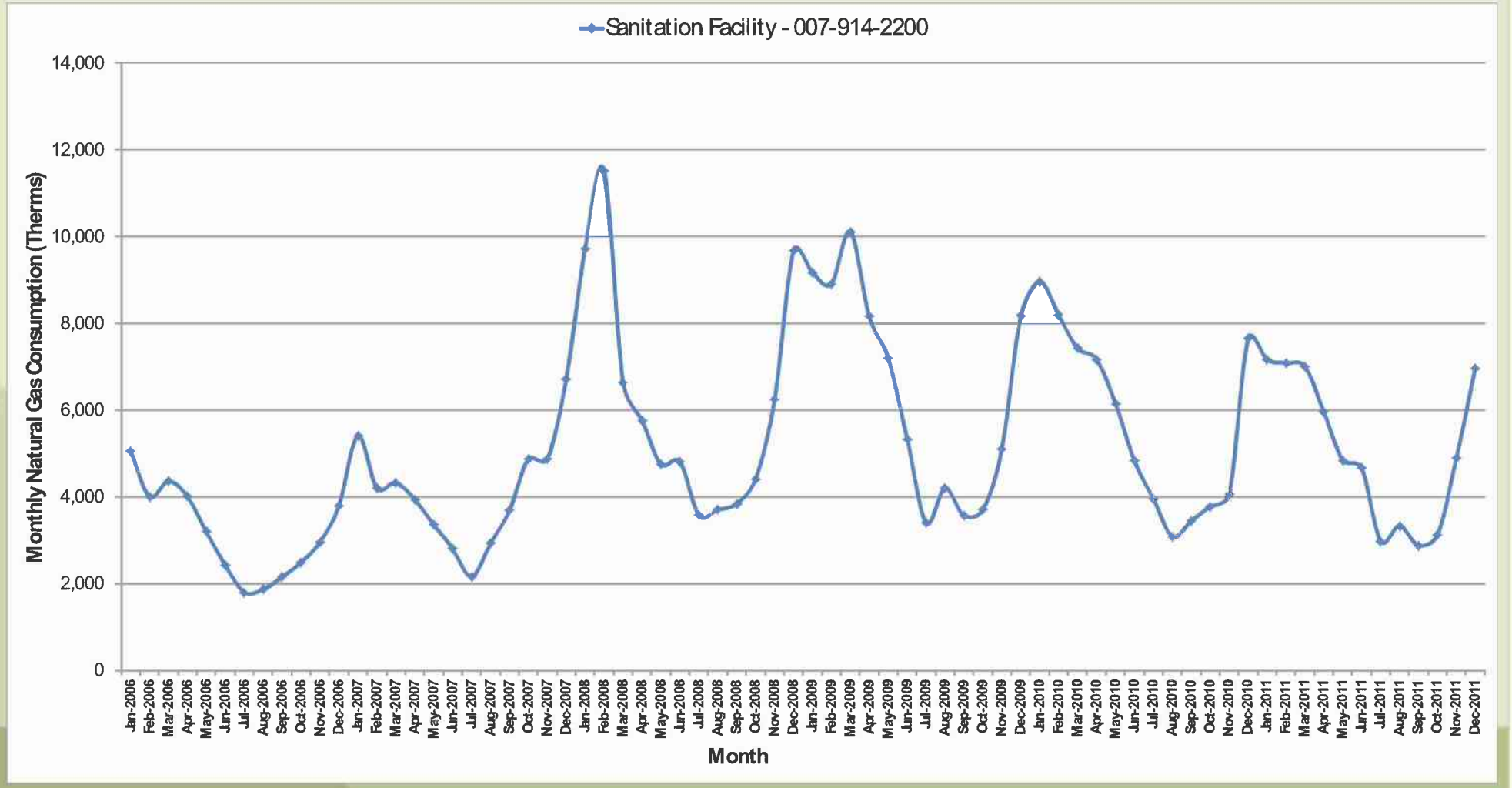

Figure 37. Sanitation/Waterworks monthly natural gas use (2006-2011).

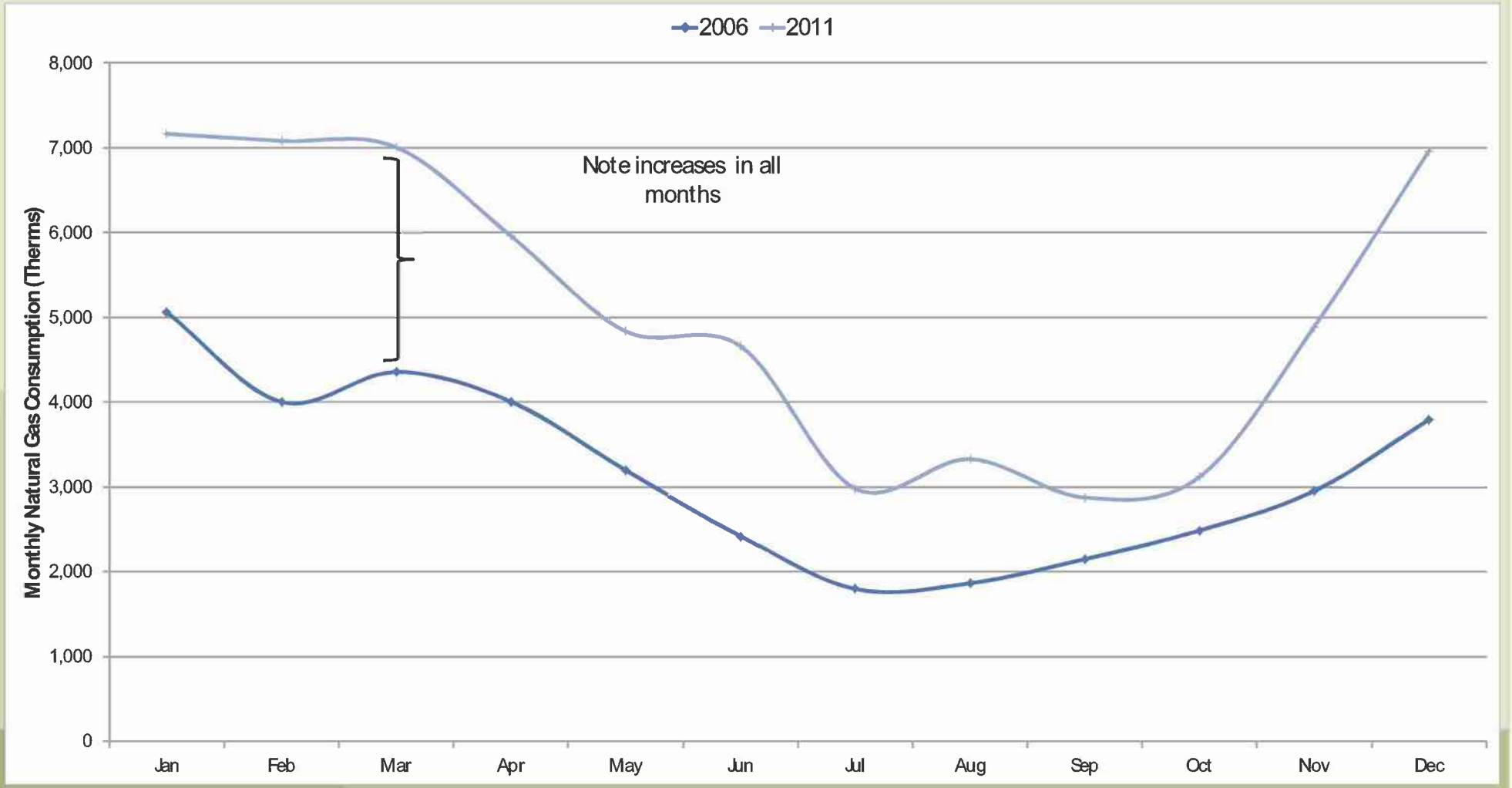

Figure 38. Sanitation/Waterworks monthly natural gas usage, year over year (2006 & 2011).

Figure 39 shows the average 15-minute interval power demand for all months in 2011. This service account powers the Sanitation Plant's process loads as well as the following buildings: Sanitation/Waterworks, Public Services Facility and Transit Facility. The load shape indicates a combination of Sanitation process loads that are relatively constant, and cooling loads, driven by the buildings. Exterior lighting also contributes to the nighttime load. A power reduction of approximately 50 kW occurred on 6/2/2011 and is persistent. Sub-metering at this site using the EEM system will be further investigated. This may allow a better understanding of individual loads and opportunities for ECMs.

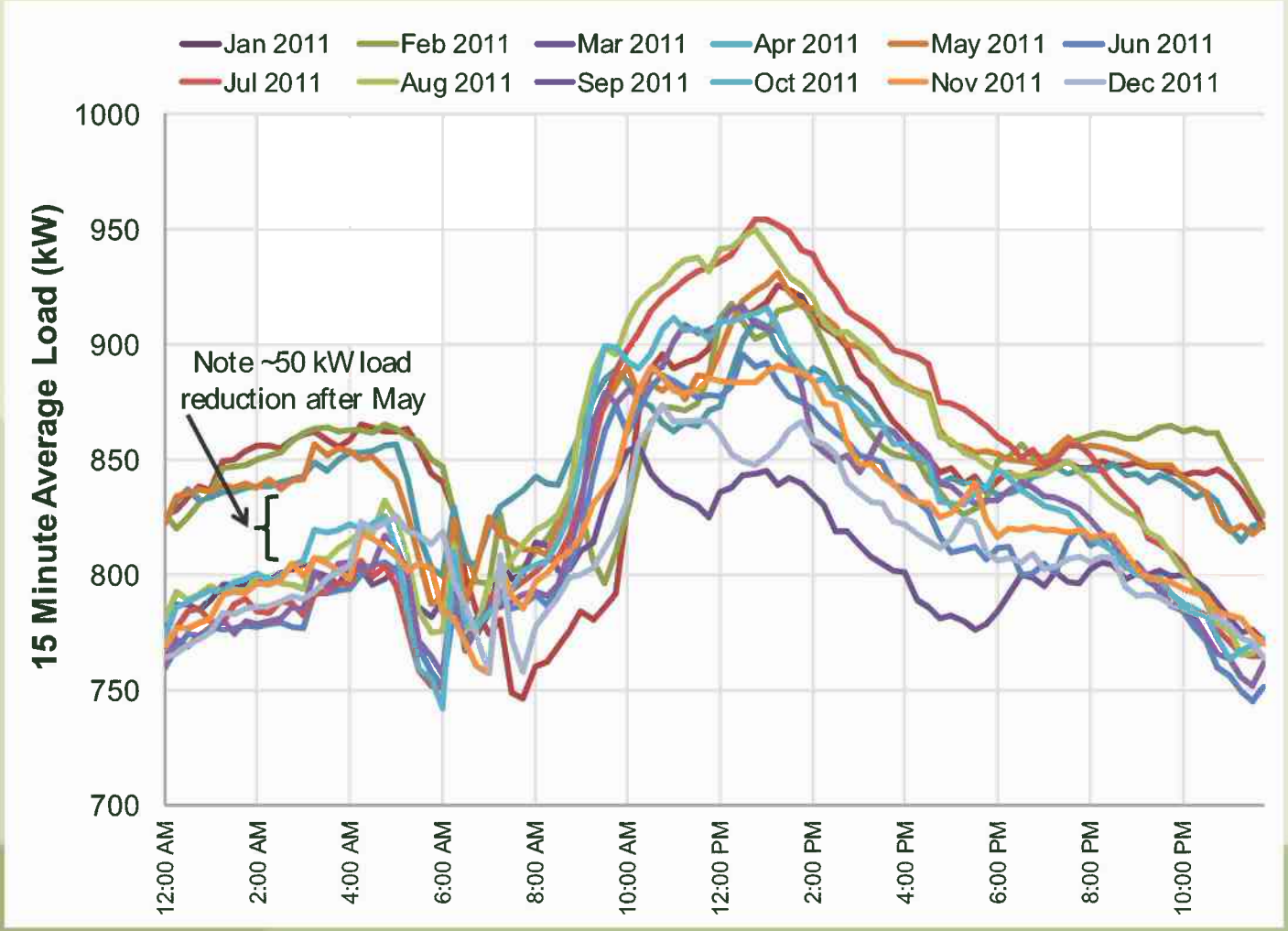

Figure 39. Sanitation/Waterworks average 15-minute power demand per month (2011- time not adjusted for daylight savings).

A number of ECMs, focused on electricity use reduction, have been implemented at the Sanitation/Waterworks (Table 38 – Table 41). Potential future ECMs are shown in Table 42. Historic and future ECMs are summarized in Table 43, along with the ability of solar PV and cogeneration to contribute to energy use reduction. The GHG emissions associated with the historic and future ECMs are summarized in Table 44. Unquantified ECMs and best practices that will be implemented or further investigated include:

- Potential to enhance the efficiency of biological nutrient removal:
    - The BIOS system, which achieves energy efficiency through control of the physical and chemical aspects of the nitrogen removal process for certain design configurations of the treatment process (e.g., the Modified Ludzak Ettinger process, Bardenpho process). More information on this technology can be found at **http://www.biochemtech.com.**
    - There are a number of proprietary processes for biological nutrient removal that claim to be energy efficient. Two of the more promising are the ANAMMOX process (for nitrogen removal) and the PHOSPAQ process (for phosphorus removal). Information on these processes can be found at http://enpaques.nl.
- Potential to enhance the efficiency of the aeration system control:
    - "Most Open Valve" control system provided by Dresser/ESCOR works on the blowers and aeration system control valves.
    - SRT/DO aeration control. Information on this technology can be found at http://www.srtcontrol.com.
- Motor/pump efficiency upgrades (There are 48 motors that range from 15-250 HP within the Sanitation Plant. The efficiency is known for all but 11 of the 48 motors. Currently, the efficiency range for 15-50 HP motors is 90-94%; for 51-100 HP motors, 91-94%; for 101-250 HP motors, 95%).
- Periodic HVAC maintenance, including filter replacements, fan belt adjustments or replacements, condenser coils cleaning and refrigeration checks.
- Use of photocells or astronomical time clocks in exterior lighting applications that currently use set hourly schedules.
- Use of higher efficiency office equipment during replacements.

Overall, a 6.6% electricity use reduction has been achieved on the Sanitation/Waterworks service account in 2011 as compared to 2006. However, a 59.8% increase in gas use occurred over the same period. This has led to a 1.7% increase in total energy use. ECMs that have the potential to reduce energy use by 2.9%, along with PV systems that have the potential to source 1.7% and a cogeneration plant that have the potential to source 61.8% of energy use with renewables have been identified. This leads to a total viable potential energy use reduction of 66.4%, as compared to 2006. The associated GHG reduction potential is 60.3%.

Table 38. Sanitation/Waterworks implemented energy conservation measures (one of four).

Measure Name/ Description	Details	Measure Status (Year Imp-lemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Invest-ment (%)
Variable frequency drives	Installed progressive cavity pumps/motors, along with VFDs, for the DAFT thickened sludge to prevent starting and stopping of the older belt driven constant speed pump-motors. Project also reduced maintenance costs by $15,000 (one-time savings included in 'rebate' category)	2007-2008	NA	NA	$2,200	NA	$15,000	NA	NA	NA	NA
Tankless boilers retrofit	Boiler retrofit with more efficient equipment. New SCADA/PLC control of anaerobic digesters so that all tanks are heated evenly, reducing gas use in boilers and electricity use in booster pumps.	2008	NA	NA	NA	NA	NA	NA	NA	NA	NA
Valve and actuator replacement program	Repaired and replaced leaking valves, reducing pumping requirements. For example, filter drain gate valves leaked into the backwash storage tank causing the extra liquid to be pumped daily. Replaced four 30-year filter applied actuators and re-sealed the filter applied and drain gate valves to stop very large leaks. Replaced a 30-year old filtered water valve and backwash valves to stop leaks from being re-pumped	2008-2009	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 39. Sanitation/Waterworks implemented energy conservation measures (two of four).

Measure Name/ Description	Details	Measure Status (Year Imp-lemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Invest-ment (%)
Turbex blowers retrofit	Upgrade to high efficiency aeration blowers.	2009	NA	NA	NA	NA	$60,000	NA	NA	NA	NA
Potable water reduction	Staff hooked up 3-water to the 24/7 sodium bisulfite spray/mixing system, lowering potable water usage by 85% (lowering Waterworks pumping requirements)	2009	NA	NA	NA	NA	NA	NA	NA	NA	NA
Annual analysis of pump efficiency	Annual pump/motor efficiency testing of pumps >20 HP (provided free by SCE). Helps to also assess and fix other equipment (clogged impellers, impeller clearances, rebuilding the units, etc)	2009-2010	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Water pumping reduction	Tertiary water motor/pump loads have been reduced by use of flow restrictors, repair of leaks, reduced sprayer requirements and separation of outfall analyzer chemicals (eliminating 99% of the liquid pumped back through the process).	2010	NA	NA	NA	NA	NA	NA	NA	NA	NA
DAFT and Grit motor upgrades	Replaced two 25 HP motors at the Dissolved Air Flotation Thickeners (DAFT) pressurization pumps and four 20 HP Grit pump motors with premium efficiency motors.	2010	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 40. Sanitation/Waterworks implemented energy conservation measures (three of four).

Measure Name/ Description	Details	Measure Status (Year Imp-lemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Invest-ment (%)
Lighting retrofit and motion detectors	Retrofit T12 office lighting to T8 fluorescent and LED bulbs at most of the Plant lighting areas and installed motion detectors at many locations throughout the Plant.	2010	NA	NA	NA	NA	NA	NA	NA	NA	NA
Replace 110 volt feeders	110 volt outfall analyzers and pumping equipment feeds retrofit to 220 volt. 110 volt ferric chloride pumps feed retrofit to 480 volt.	2010	NA	NA	NA	NA	NA	NA	NA	NA	NA
Waste backwash pump control	Waste backwash (WB) pumps programmed operate only during low flow. This eliminates WB flows from being pumped back through the plant at the same time that partial flow is being diverted to the flow equalization basin (FEB). Now WB is only pumped once through the process rather than a second time via the FEB.	2010	NA	NA	NA	NA	NA	NA	NA	NA	NA
Air leaks repaired	Air leaks repaired at 12 inch rubber victaulic fitting and East Basin's square measuring box on main air header.	2010	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 41. Sanitation/Waterworks implemented energy conservation measures (four of four).

Measure Name/ Description	Details	Measure Status (Year Imp-lemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Invest-ment (%)
Turf replacement	Replaced over 14,000 SF of turf grass with drought tolerant landscape (lowering Waterworks pumping requirements)	2010-2012	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Water motors upgrade	Three 25 HP 3-Water pump motors have been replaced by premium efficiency motors	2011	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wood Ranch lift station	Replaced two very old Wemco vertical turbine pumps and 78% efficiency motors with very efficient Wemco Hydrostal pumps and premium efficiency motors.	2011	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plug load occupancy sensors	75 occupancy sensors installed in S/W, Public Services and Transit Facility buildings	2011	8,775	5,494	$834	$7,500	$1,125	$6,375	7.6	10	31%
Converting all gas driven carts to electric	Replaced 3 Cushman gasoline driven carts with one-ton electric units for the Maintenance and Instrumentation sections of the Plant. Will reduce costs and improve air quality.	Ongoing	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Totals & Averages	**8,775**	**5,494**	**$3,034**	**$7,500**	**$76,125**	**$6,375**	**7.6**		**31%**

Table 42. Sanitation/Waterworks potential energy conservation measures.

Measure Name/ Description	Details	Measure Status (Year Imp-lemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Invest-ment (%)
Lighting retrofit	Retrofit 152 T12 fixtures and magnetic ballast with T8 lighting and electronic ballasts	Future	5,066	3,071	$482	$13,832	$2,100	$11,732	24.4	10	-59%
Lighting retrofit	27 lamp retrofit of 75W mercury vapor lamps with 2 -26 W CFLs	Future	203	123	$19	$170		$170	8.8	10	14%
Lighting retrofit	35 lamp retrofit of 50W HID to 26 W CFLs (Exterior)	Future	6,665	4,041	$634	$364		$364	0.6	10	1641%
Motor retrofit	WAS Pumps #1. Replace 26 year old 15 HP motor with premium efficiency	Future	9,101	5,518	$865	$1,050		$1,050	1.2	20	1548%
Motor retrofit	Screened Sludge Circulation #1. Replace 22 year old 25 HP motor with premium efficiency motor	Future	4,424	2,682	$421	$1,750		$1,750	4.2	20	381%
Motor retrofit	Screened Sludge Circulation #2. Replace 22 year old 25 HP motor with premium efficiency motor	Future	4,424	2,682	$421	$1,750		$1,750	4.2	20	381%
Motor retrofit	Applied Pump #2. Replace 32 year old 50 HP motor with premium efficiency motor	Future	30,336	18,392	$2,885	$3,500		$3,500	1.2	20	1548%
Motor retrofit	Applied Pump #3. Replace 32 year old 50 HP motor with premium efficiency	Future	30,336	18,392	$2,885	$3,500		$3,500	1.2	20	1548%
Anoxic mixer timing control	Installation of timers for all 21 anoxic mixers.	Future	167,846	101,760	$15,961	$6,500	$3,250	$3,250	0.2	10	4811%
		Totals & Averages	**258,401**	**156,661**	**$24,573**	**$32,416**	**$5,350**	**$27,066**	**5.1**		**1313%**
		Current Annual Electricity Usage (2011)	**7,374,786**								
		ECM as a Percent of Current Annual Electric Usage	**3.5%**								

Table 43. Summary of Sanitation/Waterworks historic and future energy reductions.

Sanitation/Waterworks Change in Energy Use	Value	Percent Change (%)	Reduction Baseline
Measured 2006 Annual Electricity Usage (kWh/yr)	7,891,940		
Measured 2011 Annual Electricity Usage (kWh/yr)	7,374,786	-6.6%	Total 2006 Electricity
Measured 2006 Annual Natural Gas Usage (Therms/yr)	38,100		
Measured 2011 Annual Natural Gas Usage (Therms/yr)	60,872	59.8%	Total 2006 Gas
Measured 2006 Total Energy Usage (kBTU/yr)	30,745,191		
Measured 2011 Total Energy Usage (kBTU/yr)	31,257,345	1.7%	Total 2006 Energy
Estimated Energy Reduction-Installed ECMs (kBTU/yr)	29,949	-0.1%	Total 2006 Energy
Estimated Energy Reduction-Future ECMs (kBTU/yr)	881,921	-2.9%	Total 2006 Energy
Estimated Energy Reduction-Rooftop Solar PV (kBTU/yr)	176,050	-0.6%	Total 2006 Energy
Estimated Energy Reduction-Carport Solar PV (kBTU/yr)	352,099	-1.1%	Total 2006 Energy
Estimated Electricity Reduction-Cogeneration (kWh/yr)	3,783,246	-47.9%	Total 2006 Electricity
Estimated Natural Gas Reduction-Cogeneration (Therms/yr)	182,493	-479.0%	Total 2006 Gas
Estimated Total Energy Reduction-Cogeneration (kBTU/yr)	31,161,486	-101.4%	Total 2006 Energy
Estimated Viable Total Energy Reduction-Cogeneration (kBTU/yr)	18,999,418	-61.8%	Total 2006 Energy
Total Future Reduction Potential		**-105.9%**	**Total 2006 Energy**
Viable Future Reduction Potential		**-66.4%**	**Total 2006 Energy**

Table 44. Summary of Sanitation/Waterworks historic and future GHG emission reductions.

Sanitation/Waterworks Change in GHG Emissions	Value	Percent Change (%)	Reduction Baseline
Measured 2006 Annual Electricity GHG Emissions (lbs CO2e/yr)	5,087,942		
Measured 2011 Annual Electricity GHG Emissions (lbs CO2e/yr)	4,617,448	-9.2%	Total 2006 Electricity GHG
Measured 2006 Annual Natural Gas GHG Emissions (lbs CO2e/yr)	446,490		
Measured 2011 Annual Natural Gas GHG Emissions (lbs CO2e/yr)	713,352	59.8%	Total 2006 Gas GHG
Measured 2006 Total Energy GHG Emissions (lbs CO2e/yr)	5,534,431		
Measured 2011 Total Energy GHG Emissions (lbs CO2e/yr)	5,330,800	-3.7%	Total 2006 GHG
Estimated GHG Emissions Reduction-Installed ECMs (lbs CO2e/yr)	5,494	-0.1%	Total 2006 GHG
Estimated GHG Emissions Reduction-Future ECMs (lbs CO2e/yr)	156,661	-2.8%	Total 2006 GHG
Estimated GHG Emissions Reduction-Rooftop Solar PV (lbs CO2e/yr)	32,296	-0.6%	Total 2006 GHG
Estimated GHG Emissions Reduction-Carport Solar PV (lbs CO2e/yr)	64,592	-1.2%	Total 2006 GHG
Estimated Electricity GHG Reduction-Cogeneration (lbs CO2e/yr)	2,368,739	-46.6%	Total 2006 Electricity GHG
Estimated Natural Gas GHG Reduction-Cogeneration (lbs CO2e/yr)	2,138,612	-479.0%	Total 2006 Gas GHG
Estimated Total Energy GHG Reduction-Cogeneration (lbs CO2e/yr)	4,507,351	-81.4%	Total 2006 GHG
Estimated Viable Total Energy GHG Reduction-Cogeneration (lbs CO2e/yr)	3,082,091	-55.7%	Total 2006 GHG
Total Future Reduction Potential		**-86.0%**	**Total 2006 GHG**
Viable Future Reduction Potential		**-60.3%**	**Total 2006 GHG**

Senior Center

The Senior Center is a 29,559 square foot building built in 1984 (Figure 40). Expansions occurred in 1991 and 2006.

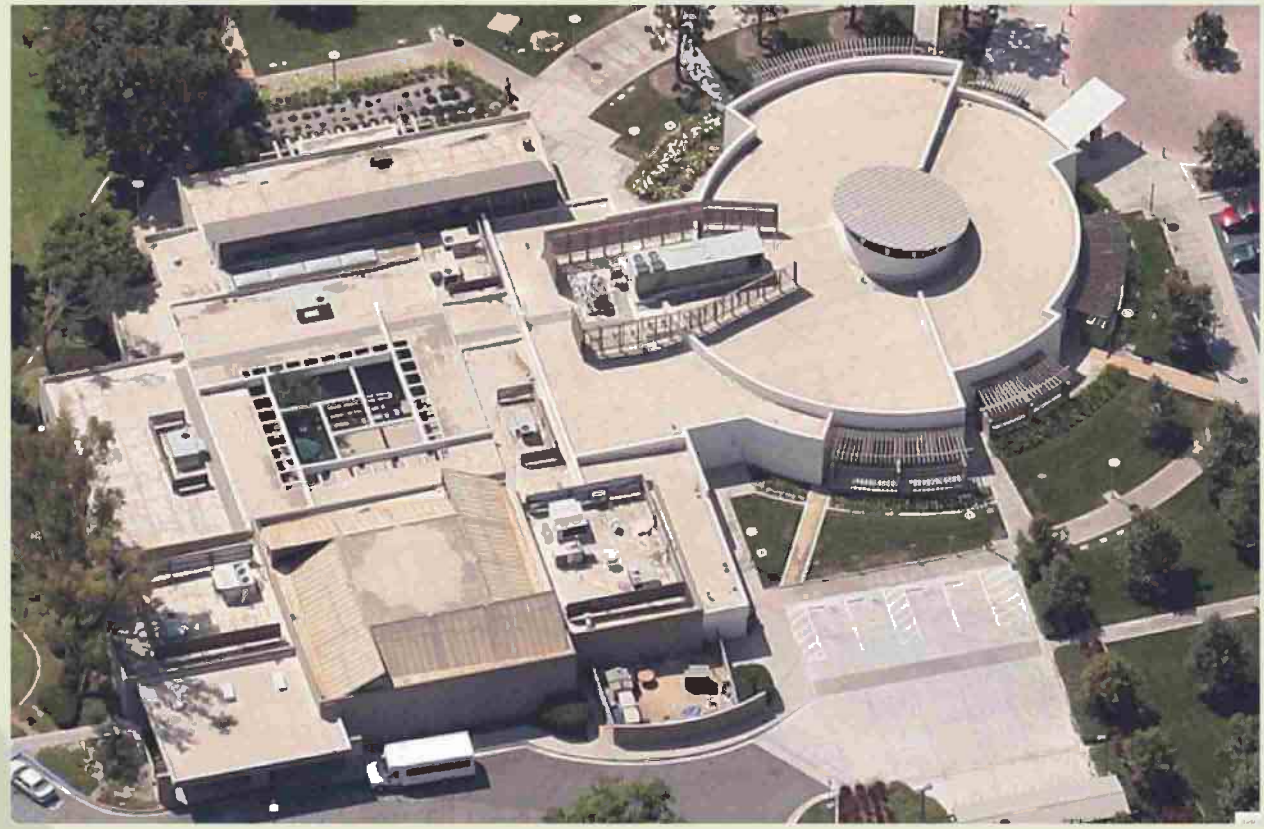

Figure 40. Simi Valley Senior Center building.

The energy consuming systems within the building consist primarily of HVAC, lighting, and plug loads. HVAC is served by package rooftop units, lighting is mainly linear fluorescent, and plug loads are mainly related to office equipment (computers, printers and personal equipment). The Senior Center also contains a computer lab, pottery kilns, a full commercial kitchen, and walk-in freezers.

Monthly electricity use trends are shown in Figure 41. Usage is highest in summer months, driven by air conditioning loads. An increase in usage occurred in 2006, in correlation with the expansion of the facility. Annual usage trends have been relatively stable from 2007-2011.

Monthly natural gas use trends are shown in Figure 42. Usage is highest in winter months, driven by heating loads. A spike in usage occurred in 2006, in correlation with the expansion of the facility. Annual usage trends have been relatively stable from 2007-2011.

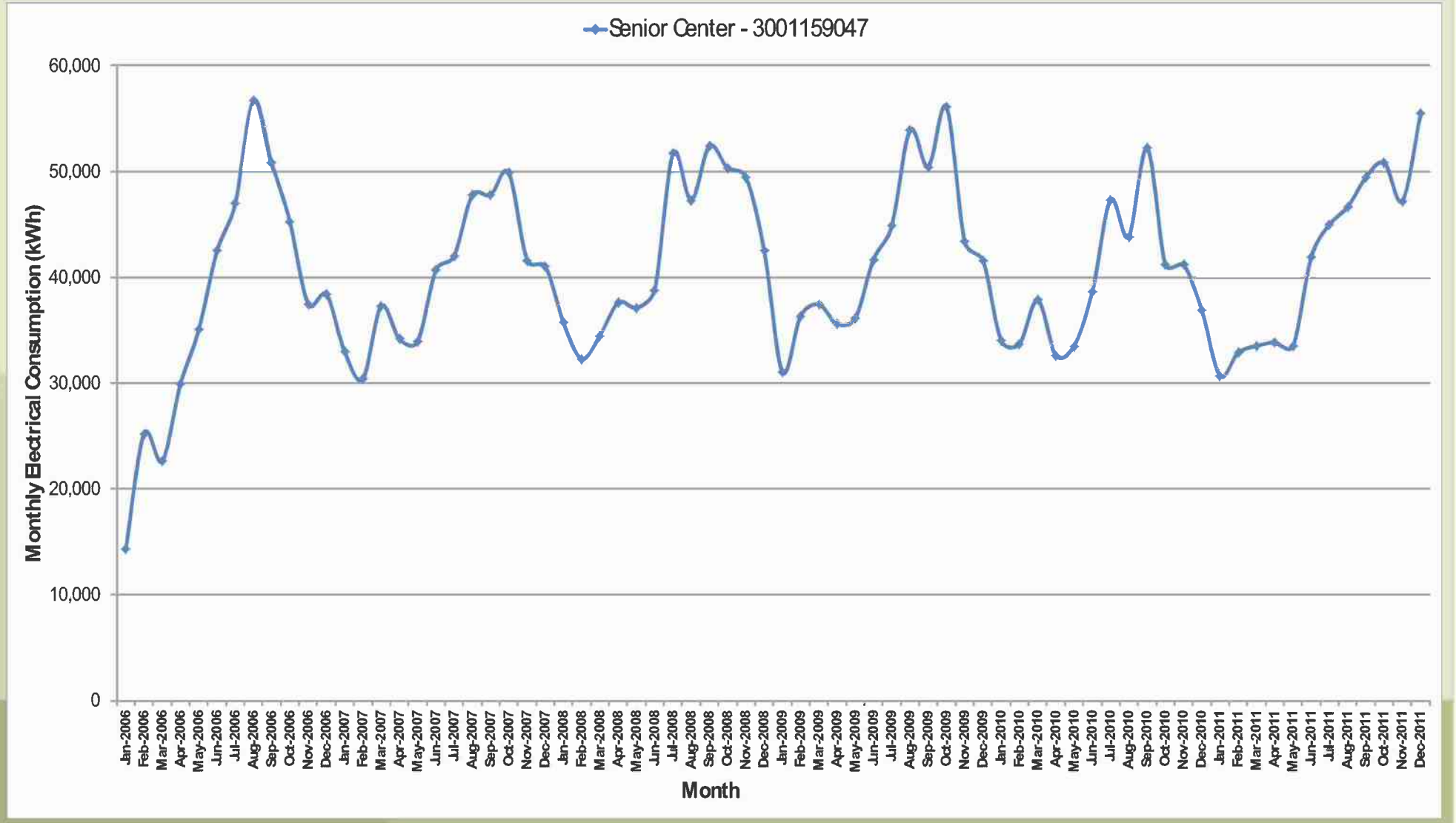

Figure 41. Senior Center monthly electricity use (2006-2011).

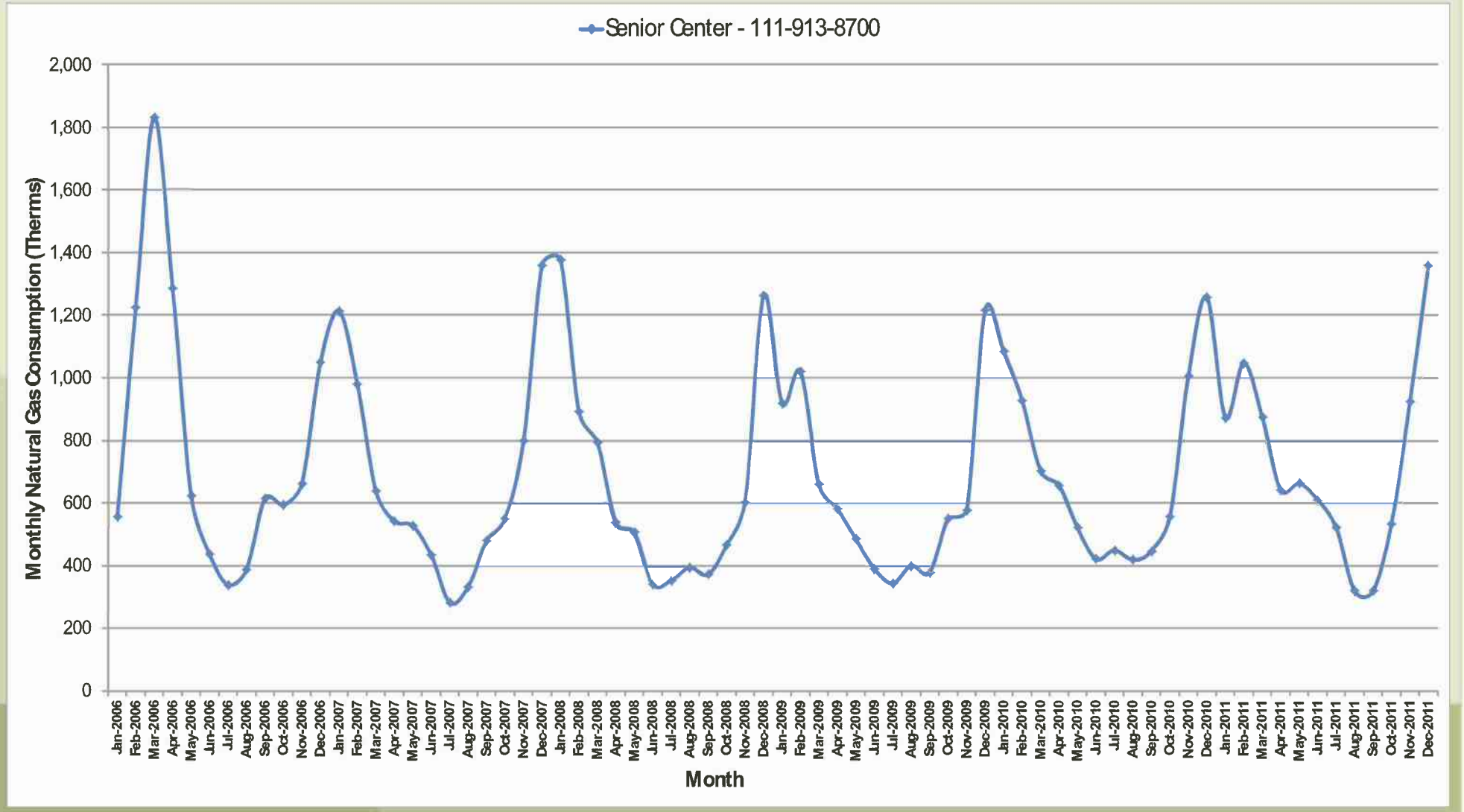

Figure 42. Senior Center monthly natural gas use (2006-2011).

A number of ECMs, focused on electricity use reduction, have been implemented at the Senior Center (Table 45). Potential future ECMs are shown in Table 46. Historic and future ECMs are summarized in Table 47, along with the ability of solar PV to contribute to energy use reduction. The GHG emissions associated with the historic and future ECMs are summarized in Table 48. Unquantified ECMs and best practices that will be implemented or further investigated include:

- Retro-commissioning.
- Periodic HVAC maintenance, including filter replacements, fan belt adjustments or replacements, condenser coils cleaning and refrigeration checks.
- Use of photocells or astronomical time clocks in exterior lighting applications that currently use set hourly schedules.
- Use of higher efficiency office equipment during replacements.

Overall, a 12.5% increase in electricity use occurred at the Senior Center in 2011 as compared to 2006. This increase is correlated with the expansion of the facility in 2006. However, a 9.6% reduction in gas use occurred over the same period. This has led to a 4.0% increase in total energy use. ECMs that have the potential to reduce energy use by 6.2%, along with PV systems that have the potential to source 61.6% of energy use with renewables have been identified. This leads to a total potential energy use reduction of 67.8%, as compared to 2006. The associated GHG reduction potential is 77.0%

Table 45. Senior Center implemented energy conservation measures.

Measure Name/ Description	Details	Measure Status (Year Implemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Investment (%)
Lighting occupancy sensors	11 occupancy sensors installed	2010	901	572	$126	$858		$858	6.8		-100%
Thermostat replacement in original building	10 x mercury thermostats controlling legacy HVAC replaced by programmable dual-setpoint thermostats	2011	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Totals & Averages	**901**	**572**	**$126**	**$858**	**$0**	**$858**	**6.8**		**-100%**

Table 46. Senior Center potential energy conservation measures.

Measure Name/ Description	Details	Measure Status (Year Implemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Investment (%)
Lighting retrofit	41 lamp retrofit of HID fixtures with induction fixtures in parking areas	Future	27,328	16,568	$3,835	$20,500	$3,075	$17,425	4.5	10	120%
Lighting retrofit	Replace 85x 50W MR-16 pin base architectural lights with LED bulbs	Future	10,455	6,339	$1,467	$2,125	$0	$2,125	1.4	10	590%
Lighting retrofit	Replace 12x halogen flood bulbs with LED or compact fluorescent flood bulbs	Future	4,920	2,983	$1,096	$1,200	$420	$780	0.7	10	1306%
Lighting retrofit	Replace 12x Incandescent accent bulbs with LED or compact fluorescent	Future	2,460	1,491	$548	$1,200	$420	$780	1.4	10	603%
Controls retrofit	Add HVAC points on the building's energy management system and control HVAC to minimize reheat energy	Future	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Totals & Averages	**45,163**	**27,381**	**$6,946**	**$25,025**	**$3,915**	**$21,110**	**2.0**		**655%**
		Current Annual Electricity Usage (2011)	**500,880**								
		ECM as a Percent of Current Annual Electric Usage	**9.0%**								

Table 47. Summary of Senior Center historic and future energy reductions.

Senior Center Change in Energy Use	Value	Percent Change (%)	Reduction Baseline
Measured 2006 Annual Electricity Usage (kWh/yr)	445,120		
Measured 2011 Annual Electricity Usage (kWh/yr)	500,880	12.5%	Total 2006 Electricity
Measured 2006 Annual Natural Gas Usage (Therms/yr)	9,599		
Measured 2011 Annual Natural Gas Usage (Therms/yr)	8,682	-9.6%	Total 2006 Gas
Measured 2006 Total Energy Usage (kBTU/yr)	2,479,095		
Measured 2011 Total Energy Usage (kBTU/yr)	2,577,703	4.0%	Total 2006 Energy
Estimated Energy Reduction-Installed ECMs (kBTU/yr)	3,076	-0.1%	Total 2006 Energy
Estimated Energy Reduction-Future ECMs (kBTU/yr)	154,141	-6.2%	Total 2006 Energy
Estimated Energy Reduction-Rooftop Solar PV (kBTU/yr)	-	0.0%	Total 2006 Energy
Estimated Energy Reduction-Carport Solar PV (kBTU/yr)	1,527,119	-61.6%	Total 2006 Energy
Total Future Reduction Potential		**-67.8%**	**Total 2006 Energy**

Table 48. Summary of Senior Center historic and future GHG emission reductions.

Senior Center Change in GHG Emissions	Value	Percent Change (%)	Reduction Baseline
Measured 2006 Annual Electricity GHG Emissions (lbs CO2e/yr)	286,969		
Measured 2011 Annual Electricity GHG Emissions (lbs CO2e/yr)	313,607	9.3%	Total 2006 Electricity GHG
Measured 2006 Annual Natural Gas GHG Emissions (lbs CO2e/yr)	112,490		
Measured 2011 Annual Natural Gas GHG Emissions (lbs CO2e/yr)	101,743	-9.6%	Total 2006 Gas GHG
Measured 2006 Total Energy GHG Emissions (lbs CO2e/yr)	399,459		
Measured 2011 Total Energy GHG Emissions (lbs CO2e/yr)	415,351	4.0%	Total 2006 GHG
Estimated GHG Emissions Reduction-Installed ECMs (lbs CO2e/yr)	572	-0.1%	Total 2006 GHG
Estimated GHG Emissions Reduction-Future ECMs (lbs CO2e/yr)	27,381	-6.9%	Total 2006 GHG
Estimated GHG Emissions Reduction-Rooftop Solar PV (lbs CO2e/yr)	-	0.0%	Total 2006 GHG
Estimated GHG Emissions Reduction-Carport Solar PV (lbs CO2e/yr)	280,149	-70.1%	Total 2006 GHG
Total Future Reduction Potential		**-77.0%**	**Total 2006 GHG**

Transit Facility

The Transit Facility is a 12,720 square foot building built in 1988 (Figure 43). The original facility was 11,620 square feet. In 2012 the facility was expanded by 1,100 square feet and redesigned. The new design achieved a LEED Gold rating. This expansion resulted in more efficient HVAC and lighting systems that serve the entire facility.

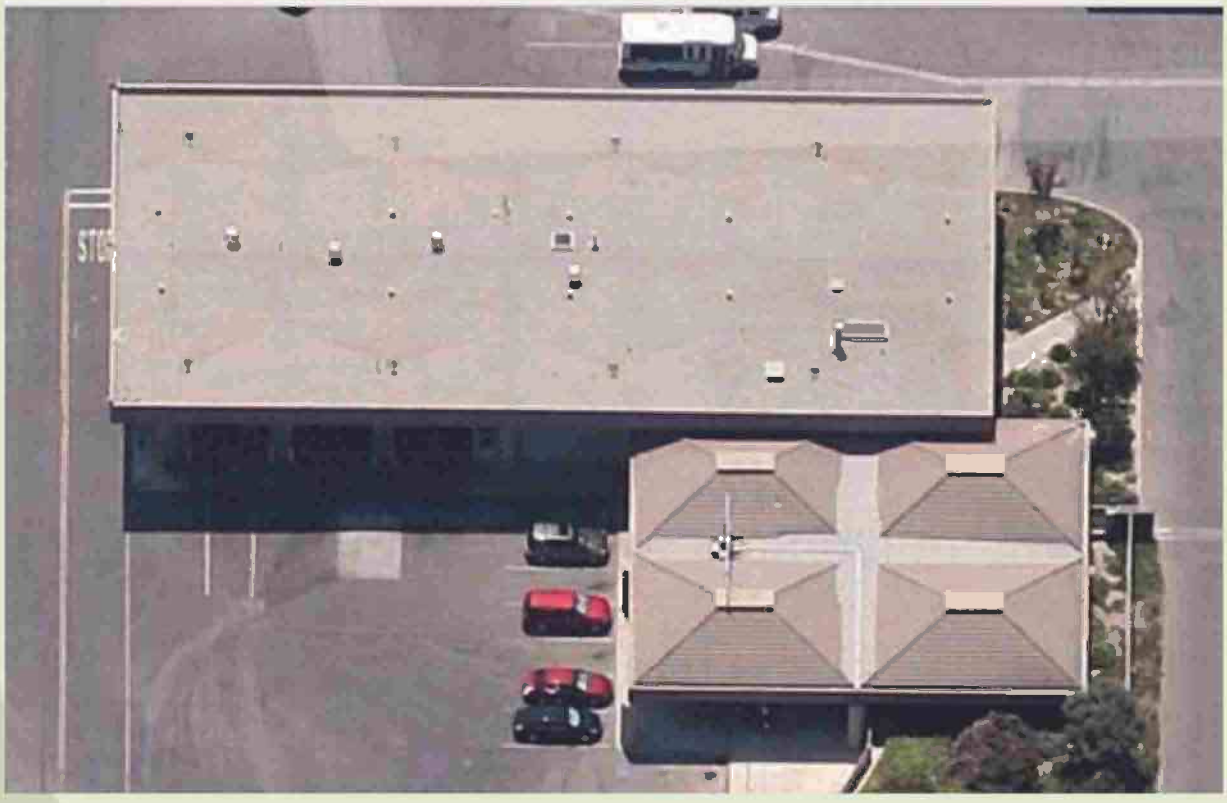

Figure 43. Transit Facility building.

The energy consuming systems consist primarily of a compressed natural gas (CNG) fueling center, bus wash station and mechanic bay lighting. The building loads are served by the Sanitation/Waterworks service account and consist of HVAC, lighting and plug loads. HVAC is served by package rooftop units, interior lighting is mainly linear fluorescent and plug loads are mainly related to office equipment (computers, printers and personal equipment).

Monthly electricity use trends are shown in Figure 44. Electricity use on this service account is associated with Transit Facility operations and maintenance and not the adjoining building. Compressors used to fuel the buses are the main load on this account.

Monthly natural gas use trends are shown in Figure 45. This service account has the highest gas usage within the City. The majority of gas use is associated with fueling of the City's CNG bus fleet. The City's transition from diesel to CNG fueled buses began in 1998 and was completed in the 2005-2006 timeframe. This effort has significantly improved air quality in the City and the surrounding air basin. In 2010, the City entered into an agreement with the City of Moorpark at the fueling facility, explaining the slight increase in gas use between 2011 and 2010.

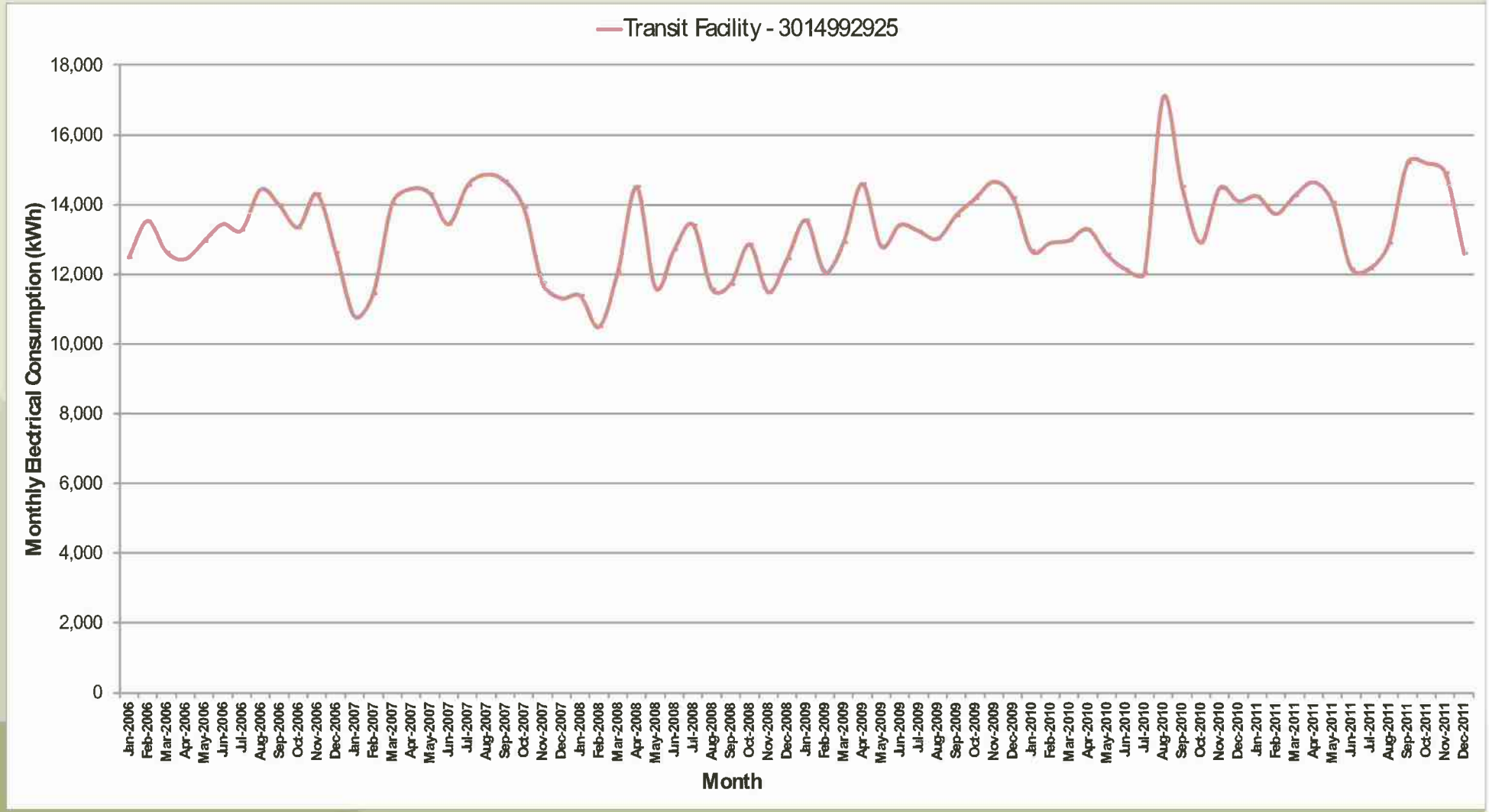

Figure 44. Transit Facility monthly electricity use (2006-2011).

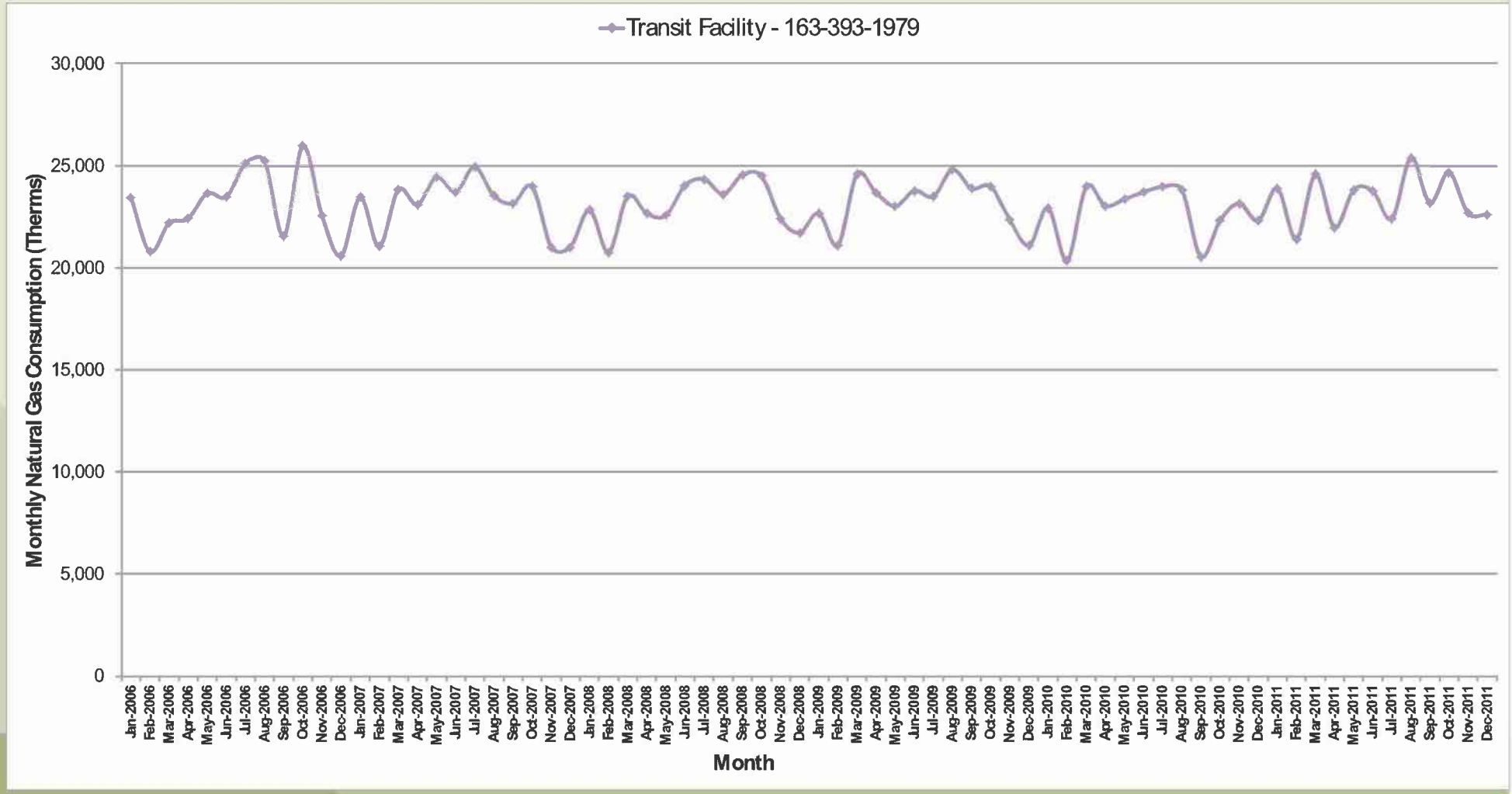

Figure 45. Transit Facility monthly natural gas use (2006-2011).

Figure 46 shows the average 15-minute interval power demand for all months in 2011. From 3AM-10AM, stand-by loads have been minimized, indicating an efficient operation. From 10AM-7PM, compressors associated with bus fueling can be seen cycling. From 7PM-3AM, the compressors operate in a "slow fill" mode and are on constantly during this period.

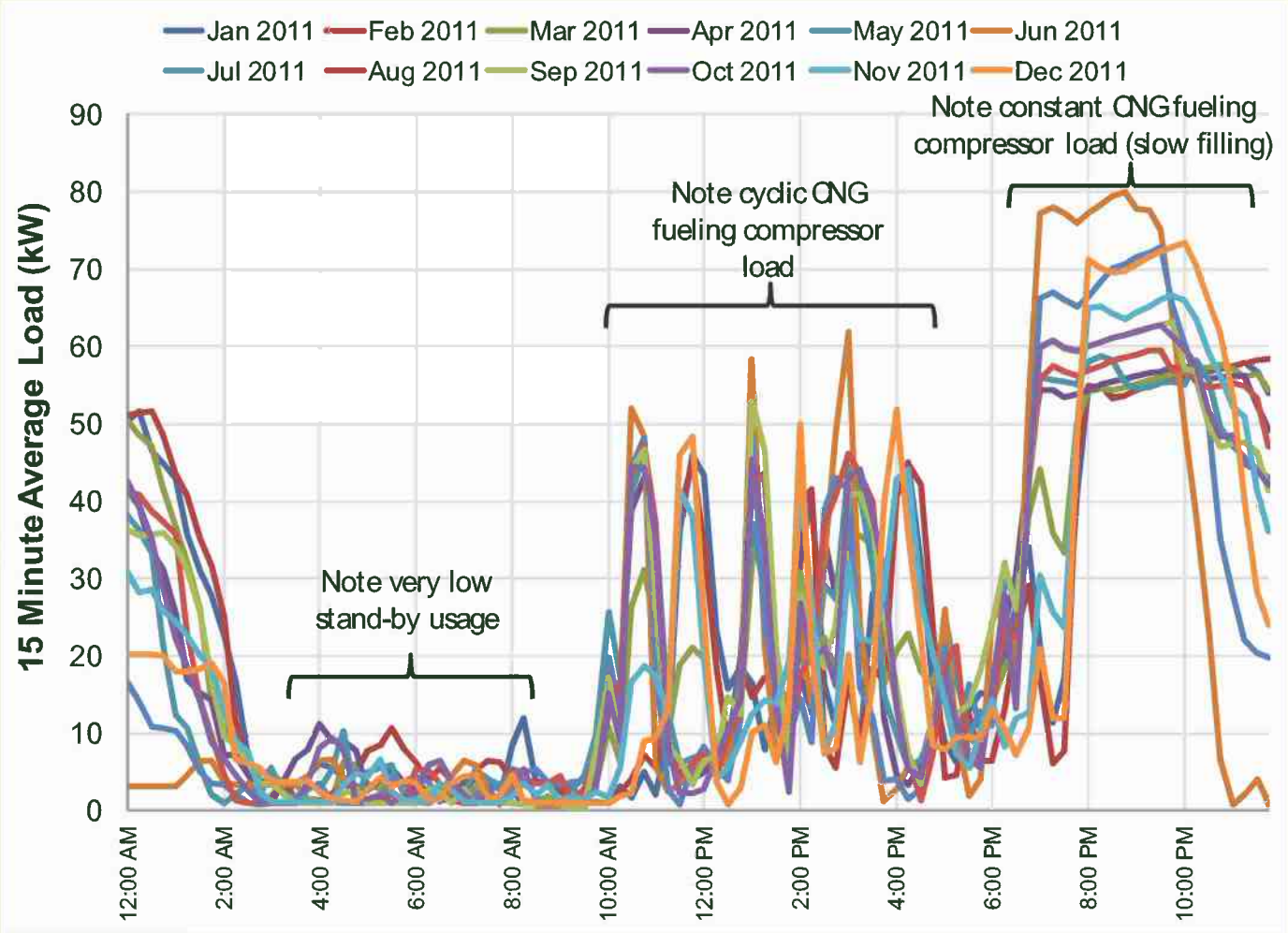

Figure 46. Transit Facility average 15-minute power demand per month (2011- time not adjusted for daylight savings).

A number of ECMs, focused on electricity use reduction, have been implemented at the Transit Facility (Table 49). Potential future ECMs are shown in Table 50. Historic and future ECMs are summarized in Table 51, along with the ability of solar PV to contribute to energy use reduction. The GHG emissions associated with the historic and future ECMs are summarized in Table 52. Unquantified ECMs and best practices that will be implemented or further investigated include:

- Periodic HVAC maintenance, including filter replacements, fan belt adjustments or replacements, condenser coils cleaning and refrigeration checks.

- Use of photocells or astronomical time clocks in exterior lighting applications that currently use set hourly schedules.
- Use of higher efficiency office equipment during replacements.

Overall, a 4.1% increase in electricity use and a 1.2% increase in natural gas use occurred at the Transit Facility in 2011 as compared to 2006. This has led to a 1.2% increase in total energy use. ECMs that have the potential to reduce energy use by 0.5%, along with PV systems that have the potential to source 2.6% of energy use with renewables have been identified. This leads to a total potential energy use reduction of 3.1%, as compared to 2006. The associated GHG reduction potential is 4.8%.

Table 49. Transit Facility implemented energy conservation measures.

Measure Name/ Description	Details	Measure Status (Year Implemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Investment (%)
Lighting occupancy sensors	Lighting occupancy a part of the renovation of the building.	2010	4,800	3,046	$889	$3,500	$0	$3,500	3.9	15	281%
HVAC retrofit	HVAC for entire facility replaced with high efficiency equipment. Conditioned area roughly doubled.	2011	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Totals & Averages	**4,800**	**3,046**	**$889**	**$3,500**	**$0**	**$3,500**	**3.9**		**281%**

Table 50. Transit Facility potential energy conservation measures.

Measure Name/ Description	Details	Measure Status (Year Implemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Invest-ment (%)
Lighting retrofit	14 lamp retrofit of 7 incandescent exit signs with LED exit signs	Future	1,717	1,041	$318	$385	$189	$196	0.6	15	2333%
Lighting retrofit	28 lamp retrofit of 250 W HPS to 4-lamp T5 HO fixtures	Future	3,998	2,503	$740	$7,000		$7,000	9.5	15	59%
Lighting retrofit	Retrofit 8' T-12 fixtures with T-8 28W fixtures	Future	7,921	4,802	$1,467	$2,875	$0	$2,875	2.0	15	665%
Lighting Schedule	Schedule site lighting OFF after gates are locked	Future	21,000	12,732	$3,888	$100	$0	$100	0.0	15	58227%
Air Compressor	Decrease air compressor setpoint	Future	1,000	606	$185	$10	$0	$10	0.1	10	18416%
Lighting retrofit	Replace exterior 8' T-12 exterior lighting with T-8 bulbs and ballasts	Future	6,451	3,911	$1,195	$6,000	$0	$6,000	5.0	15	199%
		Totals & Averages	**42,088**	**25,596**	**$7,793**	**$16,370**	**$189**	**$19,053**	**2.9**		**13317%**
		Current Annual Electricity Usage (2011)	**166,046**								
		ECM as a Percent of Current Annual Electric Usage	**25.3%**								

Table 51. Summary of Transit Facility historic and future energy reductions.

Transit Facility Change in Energy Use	Value	Percent Change (%)	Reduction Baseline
Measured 2006 Annual Electricity Usage (kWh/yr)	159,544		
Measured 2011 Annual Electricity Usage (kWh/yr)	166,046	4.1%	Total 2006 Electricity
Measured 2006 Annual Natural Gas Usage (Therms/yr)	277,147		
Measured 2011 Annual Natural Gas Usage (Therms/yr)	280,392	1.2%	Total 2006 Gas
Measured 2006 Total Energy Usage (kBTU/yr)	28,259,224		
Measured 2011 Total Energy Usage (kBTU/yr)	28,605,915	1.2%	Total 2006 Energy
Estimated Energy Reduction-Installed ECMs (kBTU/yr)	16,382	-0.1%	Total 2006 Energy
Estimated Energy Reduction-Future ECMs (kBTU/yr)	143,646	-0.5%	Total 2006 Energy
Estimated Energy Reduction-Rooftop Solar PV (kBTU/yr)	492,869	-1.7%	Total 2006 Energy
Estimated Energy Reduction-Carport Solar PV (kBTU/yr)	246,435	-0.9%	Total 2006 Energy
Total Future Reduction Potential		**-3.1%**	**Total 2006 Energy**

Table 52. Summary of Transit Facility historic and future GHG emission reductions.

Transit Facility Change in GHG Emissions	Value	Percent Change (%)	Reduction Baseline
Measured 2006 Annual Electricity GHG Emissions (lbs CO2e/yr)	102,858		
Measured 2011 Annual Electricity GHG Emissions (lbs CO2e/yr)	103,964	1.1%	Total 2006 Electricity GHG
Measured 2006 Annual Natural Gas GHG Emissions (lbs CO2e/yr)	3,247,856		
Measured 2011 Annual Natural Gas GHG Emissions (lbs CO2e/yr)	3,285,884	1.2%	Total 2006 Gas GHG
Measured 2006 Total Energy GHG Emissions (lbs CO2e/yr)	3,350,714		
Measured 2011 Total Energy GHG Emissions (lbs CO2e/yr)	3,389,847	1.2%	Total 2006 GHG
Estimated GHG Emissions Reduction-Installed ECMs (lbs CO2e/yr)	3,046	-0.1%	Total 2006 GHG
Estimated GHG Emissions Reduction-Future ECMs (lbs CO2e/yr)	25,596	-0.8%	Total 2006 GHG
Estimated GHG Emissions Reduction-Rooftop Solar PV (lbs CO2e/yr)	90,417	-2.7%	Total 2006 GHG
Estimated GHG Emissions Reduction-Carport Solar PV (lbs CO2e/yr)	45,208	-1.3%	Total 2006 GHG
Total Future Reduction Potential		**-4.8%**	**Total 2006 GHG**

BLANK

MUNICIPAL NON-BUILDING ENERGY USE

Waterworks District No. 8

Waterworks District No. 8 (District) is a municipal water utility that serves 60% of Simi Valley's water service accounts. The District delivers over 23,000 acre-feet of water annually to approximately 24,000 service connections. In addition to 40 storage facilities, such as water tanks, the District has 2,700 fire hydrants, 18 pump stations, and 357 miles of water pipes in its system. The main source of water for the District is the Calleguas Municipal Water District. The District also owns two wells in the Tapo Canyon area that supply water to the Tapo Canyon Water Treatment Plant.

In 2010, the City adopted the 25-year, "Urban Water Management Plan [6]," to manage water resources that are predominantly imported from Northern California. The plan has a goal of reducing water consumption 20% by 2020, which will require a collective effort between all water users in the Waterworks District.

There are 43 electrical service accounts associated with District operations. These accounts include pump stations, wells, turn-out facilities and storage tanks. Collectively, movement of water is the single highest use of electricity in the City, at 33.8% of the 2011 total (Figure 3). Water conservation should therefore be a key strategy in reducing energy use. The City has committed to reducing "water use in City-owned facilities 10% by 2015 and 20% by 2020." [1]. However, water conservation at the community level, especially as it relates to landscape irrigation, will have a substantial impact on City energy use and greenhouse gas emissions.

Pump stations consume the majority of the District's electricity use. These pumps convey water from the State Water Project to sources of water demand and to storage tanks. The operation of storage tanks uses a small portion of the total electricity used for District operations, and includes electricity for lighting, automatic gates, irrigation of surrounding landscape, and occasionally for radio links and cell towers. The total annual electricity use associated with these 43 service accounts and annual water deliveries can be found in Figure 47, which shows a 16.2% decrease in aggregate electricity use from 2006 to 2011. Although there is a strong relationship between electricity use and the water volume delivered, due to the supply water's variation in hydraulic head, a direct correlation cannot be made. Annual electricity use for each of the 43 service accounts from 2006-2011 can be found in Table 53.

The City has taken aggressive steps to reduce electricity use within the District by installing efficient pumps and motors where feasible, as outlined in Table 55-56. These ECMs have resulted in an estimated 690,423 kWh/year reduction from 2006-2011; a 7.6% reduction compared to total 2006 electricity use. Table 54 depicts annual power demand for each of the 43 service accounts from 2006-2011. Annual demand data values tend to be quite consistent for most accounts. There is some fluctuation in aggregate annual power demand. However, the increase in demand seen in 2011 relative to other years is likely an artifact of demand data only being available in 2011 on some accounts.

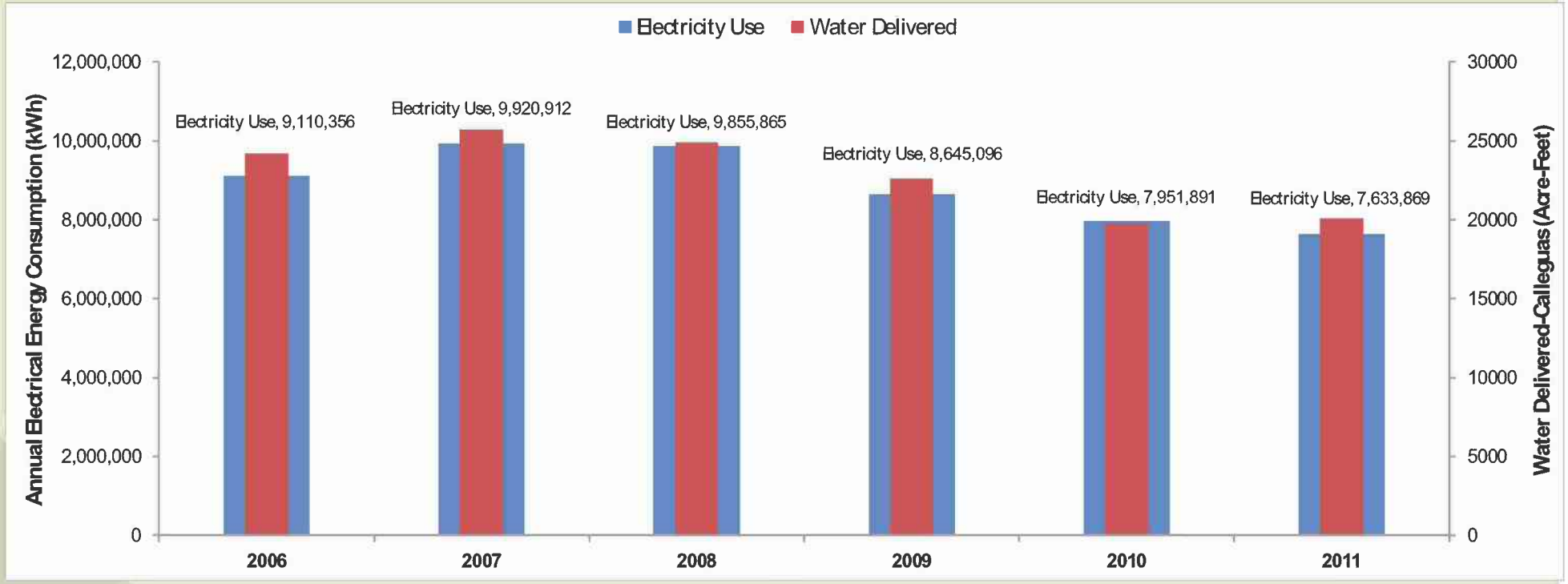

Figure 47. Waterworks total annual electricity use and water volume delivered (2006-2011).

Table 53. Waterworks annual electricity use by service account (2006-2011).

Site Name - Account Number	Address	Rate Schedule	Electrical Use (kWh:2006)	Electrical Use (kWh:2007)	Electrical Use (kWh:2008)	Electrical Use (kWh:2009)	Electrical Use (kWh:2010)	Electrical Use (kWh:2011)	% Change in Use (2006 - 2007)	% Change in Use (2007 - 2008)	% Change in Use (2008 - 2009)	% Change in Use (2009 - 2010)	% Change in Use (2010 - 2011)
Station #3 (Rocketdyne) - 3-000-2042-86	BOX CANYON/ SUMMIT 1	TOU-PA-SOP-2	1,352,601	1,335,056	1,426,742	1,205,903	1,195,443	1,067,247	-1.30	6.87	-15.48	-0.87	-10.72
Station #1 (Rocketdyne) - 3-000-5300-03	SS SMITH RD EO LA	TOU-PA-SOP-2	826,582	818,195	871,523	739,557	742,919	665,249	-1.01	6.52	-15.14	0.45	-10.45
Wood Ranch #2 Tank - 3-000-7640-58	399 HORNEBLEND	GS-1	929	889	927	933	925	932	-4.31	4.27	0.65	-0.86	0.76
Bridal Path #1 P.S. - 3-000-8020-35	MELOW LN 1400 E/ O1ST	TOU-PA-B	312,355	338,873	302,527	267,013	247,856	114,146	8.49	-10.73	-11.74	-7.17	-53.95
Oak Knoll P.S. - 3-000-8521-10	5898 OAK KNOLLS RD	PA-2	96,480	86,976	98,892	90,120	82,233	66,915	-9.85	13.70	-8.87	-8.75	-18.63
Madera P.S. - 3-001-1586-90	2810 N MADERA RD	TOU-PA-SOP-2	121,729	160,542	154,171	126,369	132,430	128,731	31.88	-3.97	-18.03	4.80	-2.79
Sinaloa Well - 3-001-1587-44	1951 SINALOA ROAD	PA-1	147,708	153,306	150,084	145,458	168,930	295,092	3.79	-2.10	-3.08	16.14	74.68
Well #31 - 3-001-1587-93	END HOG CYN WELL 31	PA-2	147,420	176,340	251,400	223,620	8,340	6,300	19.62	42.57	-11.05	-96.27	-24.46
Well #32 - 3-001-1587-94	W/ O TAPOCYN WELL 32	PA-2	122,085	107,117	79,057	85,013	101,117	121,711	-12.26	-26.20	7.53	18.94	20.37
Stearns P.S. - 3-001-1588-90	S/ O LA AV EXT STEAR	TOU-PA-SOP-2	941,510	804,055	1,191,374	1,021,025	1,049,129	1,013,491	-14.60	48.17	-14.30	2.75	-3.40
Stearns Shop - 3-001-1588-91	S END STEARNS	GS-1	194	271	404	481	521	311	39.43	49.17	19.08	8.32	-40.25
Station #2 (Rocketdyne) - 3-001-1588-93	7198 SANTA SUSANA PASS RD	TOU-PA-SOP-2	1,286,533	1,204,101	1,288,145	1,202,322	1,089,865	969,419	-6.41	6.98	-6.66	-9.35	-11.05
Wood Ranch #1 P.S. - 3-001-1589-23	155 WOOD RANCH PKWY	TOU-PA-SOP-2	22,748	8,141	19,742	23,639	13,055	9,821	-64.21	142.50	19.74	-44.77	-24.77
Wood Ranch #2 P.S. - 3-001-1589-24	601 1/2 CIRCLE KNOLL	TOU-PA-SOP-2	5,258	2,011	8,966	12,454	4,751	3,453	-61.75	345.85	38.90	-61.85	-27.32
Wood Ranch 5 M Tank - 3-001-1589-83	1152 1/2 ADIRONDACK CT	GS-1	823	838	837	943	847	838	1.82	-0.12	12.66	-10.18	-1.06
First Street Turnout - 3-001-1590-82	650 1ST ST	GS-1	346	392	393	373	406	238	13.29	0.26	-5.09	8.85	-41.38
Yosemite P.S. - 3-001-1591-28	5799 COCHRAN ST	TOU-PA-SOP-2	1,018,063	1,431,400	861,752	775,344	681,705	742,650	40.60	-39.80	-10.03	-12.08	8.94
Ward Avenue Well - 3-001-1591-32	2202 WARD ST PA1	PA-1	113,230	113,020	113,250	110,570	107,200	108,850	-0.19	0.20	-2.37	-3.05	1.54
Mellow Lane Tank - 3-001-1591-52	E/ MELLOW / WATER TANK	GS-1	1,412	564	544	698	853	1,397	-60.06	-3.55	28.31	22.21	63.77
Bridal Path #2 P.S. - 3-001-1591-74	1561 MELLOW LN	TOU-PA-SOP-2	141,033	151,345	145,924	124,653	109,126	110,086	7.31	-3.58	-14.58	-12.46	0.88
Casual Court Tank - 3-001-1591-75	2090 CASUAL CT	GS-1	809	870	763	632	667	585	7.54	-12.30	-17.17	5.54	-12.29
First Street Well - 3-001-1592-00	2020 1ST ST	PA-1	307,030	311,730	311,840	268,520	267,190	262,450	1.53	0.04	-13.89	-0.50	-1.77
Water Storage Bldg. - 3-001-1594-23	720 PACIFIC AVE	GS-1	382	49	47	111	572	325	-87.17	-4.08	135.11	417.19	-43.13
Chain Drive Well - 3-002-7273-32	2356 1/2 CHAIN DR	PA-1	164,934	187,506	192,222	70,722	64,008	59,166	13.69	2.52	-63.21	-9.49	-7.56
Mine Rd. P.S. - 3-003-1348-38	TAPO CYN/ BENNETT	TOU-PA-SOP-2	34,407	36,156	35,178	35,965	28,979	30,355	5.08	-2.70	2.24	-19.42	4.75
Wahmt Barn - 3-011-3232-28	3799 WALNUT AVE	GS-1	4,191	6,124	6,856	6,494	5,306	3,973	46.12	11.95	-5.28	-18.29	-25.12
Flanagan P.S. - 3-011-5842-87	2810 YOSEMITE AVE	TOU-PA-SOP-2	412,822	449,766	439,395	334,092	306,645	362,282	8.95	-2.31	-23.97	-8.22	18.14
Cochran Street P.S. - 3-011-6648-09	S/ E COR COCH/ TAPO / PMPS	TOU-PA-SOP-2	253,004	339,576	361,312	305,846	280,234	227,992	34.22	6.40	-15.35	-8.37	-18.64
Tapo Street P.S. - 3-013-1498-55	3150 TAPO ST	TOU-PA-SOP-2	356,508	334,934	313,794	282,351	237,820	255,090	-6.05	-6.31	-10.02	-15.77	7.26
Wood Ranch Zone 3 Tank - 3-013-8562-40	728 1/2 RUSTIC HILLS DR	GS-1	986	986	981	954	953	826	0.00	-0.51	-2.75	-0.10	-13.33
Library P.S. - 3-015-0835-38	375 1/2 MADERA ROAD	TOU-PA-SOP-2	131,820	208,620	210,360	199,560	127,535	96,536	58.26	0.83	-5.13	-36.09	-24.31
Pacific Ave. Well - 3-017-3142-80	720 1/2 PACIFIC AVE	PA-1	104,526	106,110	106,614	105,876	104,886	104,958	1.52	0.47	-0.69	-0.94	0.07
Crosby Pump Station - 3-017-3521-40	2387 RUDOLPH DR	PA-1	87,120	90,060	90,420	82,020	69,540	69,660	3.37	0.40	-9.29	-15.22	0.17
Mt. Sinai Tank - 3-020-1104-39	6150 1/2 MOUNT SINAI DR	GS-1	7,216	5,816	3,271	3,201	2,987	1,819	-19.41	-43.75	-2.14	-6.69	-39.10
Crosby Tank - 3-020-4911-30	758 1/2 CAMDEN CRT	GS-1	742	816	846	837	835	843	9.97	3.68	-1.06	-0.24	0.96
Mt. McCoy Tank - 3-021-0944-80	1201 1/2 PRESIDENTIAL DR	GS-1	42,080	43,640	47,400	51,680	51,680	51,960	3.71	8.62	9.03	0.00	0.54
Greystone Tank - 3-022-2494-52	1868 1/2 SUMMERTIME AVE	GS-1	1,243	1,199	1,089	1,038	1,019	2,154	-3.54	-9.17	-4.68	-1.83	111.38
Chumash P.S. - 3-027-7368-27	2960 CHUMASH AVE	TOU-PA-SOP-2	100,160	168,880	143,960	99,240	87,772	94,691	68.61	-14.76	-31.06	-11.56	7.88
Big Sky #1 P.S. - 3-027-7368-71	2830 1/2 ERRINGER RD	TOU-PA-SOP-2	261,416	384,583	348,443	320,971	275,276	278,761	47.12	-9.40	-7.88	-14.24	1.27
Big Sky #2 P.S. - 3-027-7409-89	1730 1/2 PEREGRINE CT	TOU-PA-SOP-2	150,246	313,334	240,653	248,094	229,225	237,062	108.55	-23.20	3.09	-7.61	3.42
Stow Tank - 3-029-5211-18	5610 1/2 IROQUOIS CT	GS-1	29,672	36,726	33,769	29,846	28,633	38,073	23.77	-8.05	-11.62	-4.06	32.97
Tapo Canyon WTP - 3-033-0492-29	5300 BENNETT RD	PA-2	0	0	0	40,560	42,480	27,120	--	--	--	4.73	-36.16
Long Canyon P.O. - 3-036-9504-97	33 1/2 LONG CANYON RD	GS-1	6	0	0	0	0	312	-100.00	--	--	--	--
		Totals:	**9,110,356**	**9,920,912**	**9,855,865**	**8,645,096**	**7,951,891**	**7,633,869**	**8.90**	**-0.66**	**-12.28**	**-8.02**	**-4.00**

Table 54. Waterworks annual maximum power demand by service account (2006-2011).

Site Name - Account Number	Address	Rate Schedule	Electrical Max Demand ($:2006)	Electrical Max Demand ($:2007)	Electrical Max Demand ($:2008)	Electrical Max Demand ($:2009)	Electrical Max Demand ($:2010)	Electrical Max Demand ($:0)	% Change in Demand (2006 - 2007)	% Change in Demand (2007 - 2008)	% Change in Demand (2008 - 2009)	% Change in Demand (2009 - 2010)	% Change in Demand (2010 - 2011)
Station #3 (Rocketdyne) - 3-000-2042-86	BOX CANYON/ SUMMIT 1	TOU-PA-SOP-2	292	293	291	293	290	291	0.34	-0.82	0.83	-1.16	0.34
Station #1 (Rocketdyne) - 3-000-5300-03	SS SMITH RD EO LA	TOU-PA-SOP-2	252	250	252	245	250	249	-0.56	0.76	-2.86	1.96	-0.40
Wood Ranch #2 Tank - 3-000-7640-58	399 HORNEBLEND	GS-1	--	--	--	--	--	53	--	--	--	--	--
Bridal Path #1 P.S. - 3-000-8020-35	MELOW LN 1400 E/ O1ST	TOU-PA-B	153	149	155	139	122	118	-2.48	3.55	-9.96	-12.43	-3.53
Oak Knoll P.S. - 3-000-8521-10	5898 OAK KNOLLS RD	PA-2	33	30	30	30	30	31	-9.37	0.67	0.00	0.66	0.66
Madera P.S. - 3-001-1586-90	2810 N MADERA RD	TOU-PA-SOP-2	205	205	206	205	206	206	0.20	0.24	-0.24	0.49	-0.24
Sinaloa Well - 3-001-1587-44	1951 SINALOA ROAD	PA-1	--	--	--	--	--	--	--	--	--	--	--
Well #31 - 3-001-1587-93	END HOG CYN WELL 31	PA-2	105	100	104	104	84	95	-5.14	4.82	0.00	-19.54	12.86
Well #32 - 3-001-1587-94	W/ O TAPOCYN WELL 32	PA-2	43	44	88	42	40	39	3.74	99.10	-52.26	-5.21	-3.00
Stearns P.S. - 3-001-1588-90	S/ O LA AV EXT STEAR	TOU-PA-SOP-2	172	172	173	171	170	171	-0.41	0.93	-1.27	-0.41	0.41
Stearns Shop - 3-001-1588-91	S END STEARNS	GS-1	85	--	--	--	--	154	--	--	--	--	--
Station #2 (Rocketdyne) - 3-001-1588-93	7198 SANTA SUSANA PASS RD	TOU-PA-SOP-2	313	281	281	284	284	285	-10.14	0.18	0.85	0.18	0.14
Wood Ranch #1 P.S. - 3-001-1589-23	155 WOOD RANCH PKWY	TOU-PA-SOP-2	150	146	151	151	150	150	-2.66	3.28	0.13	-0.66	0.00
Wood Ranch #2 P.S. - 3-001-1589-24	601 1/ 2 CIRCLE KNOLL	TOU-PA-SOP-2	41	42	42	42	41	41	2.45	-0.72	0.00	-1.20	-0.49
Wood Ranch 5 M Tank - 3-001-1589-83	1152 1/ 2 ADIRONDACK CT	GS-1	--	--	--	--	--	--	--	--	--	--	--
First Street Turnout - 3-001-1590-82	650 1ST ST	GS-1	--	--	--	--	--	--	--	--	--	--	--
Yosemite P.S. - 3-001-1591-28	5799 COCHRAN ST	TOU-PA-SOP-2	209	209	208	207	207	204	0.00	-0.48	-0.19	0.00	-1.64
Ward Avenue Well - 3-001-1591-32	2202 WARD ST PA1	PA-1	--	--	--	--	--	--	--	--	--	--	--
Mellow Lane Tank - 3-001-1591-52	E/ MELLOW / WATER TANK	GS-1	--	--	--	--	--	36	--	--	--	--	--
Bridal Path #2 P.S. - 3-001-1591-74	1561 MELLOW LN	TOU-PA-SOP-2	126	122	121	122	118	123	-3.10	-0.41	0.41	-3.53	4.51
Casual Court Tank - 3-001-1591-75	2090 CASUAL CT	GS-1	58	--	--	--	--	--	--	--	--	--	--
First Street Well - 3-001-1592-00	2020 1ST ST	PA-1	--	--	--	--	--	--	--	--	--	--	--
Water Storage Bldg. - 3-001-1594-23	720 PACIFIC AVE	GS-1	--	--	--	--	--	--	--	--	--	--	--
Chain Drive Well - 3-002-7273-32	2356 1/ 2 CHAIN DR	PA-1	--	--	--	--	--	11	--	--	--	--	--
Mine Rd. P.S. - 3-003-1348-38	TAPO CYN/ BENNETT	TOU-PA-SOP-2	24	26	23	23	23	22	4.51	-10.20	0.44	0.87	-3.88
Wahmt Barn - 3-011-3232-28	3799 WALNUT AVE	GS-1	--	--	--	--	--	70	--	--	--	--	--
Flanagan P.S. - 3-011-5842-87	2810 YOSEMITE AVE	TOU-PA-SOP-2	141	140	141	140	141	136	-0.50	0.14	-0.28	0.50	-3.41
Cochran Street P.S. - 3-011-6648-09	S/ E COR COCH/ TAPO / PMPS	TOU-PA-SOP-2	287	288	287	285	283	288	0.31	-0.31	-0.52	-0.84	1.70
Tapo Street P.S. - 3-013-1498-55	3150 TAPO ST	TOU-PA-SOP-2	112	114	116	119	120	137	1.60	1.23	2.68	0.76	14.23
Wood Ranch Zone 3 Tank - 3-013-8562-40	728 1/ 2 RUSTIC HILLS DR	GS-1	--	--	--	--	--	--	--	--	--	--	--
Library P.S. - 3-015-0835-38	375 1/ 2 MADERA ROAD	TOU-PA-SOP-2	43	--	--	--	65	65	--	--	--	--	0.00
Pacific Ave. Well - 3-017-3142-80	720 1/ 2 PACIFIC AVE	PA-1	--	--	--	--	--	--	--	--	--	--	--
Crosby Pump Station - 3-017-3521-40	2387 RUDOLPH DR	PA-1	--	--	--	--	--	--	--	--	--	--	--
Mt. Sinai Tank - 3-020-1104-39	6150 1/ 2 MOUNT SINAI DR	GS-1	--	--	--	--	--	--	--	--	--	--	--
Crosby Tank - 3-020-4911-30	758 1/ 2 CAMDEN CRT	GS-1	--	--	--	--	--	--	--	--	--	--	--
Mt. McCoy Tank - 3-021-0944-80	1201 1/ 2 PRESIDENTIAL DR	GS-1	--	--	--	--	--	--	--	--	--	--	--
Greystone Tank - 3-022-2494-52	1868 1/ 2 SUMMERTIME AVE	GS-1	--	--	--	--	--	--	--	--	--	--	--
Chumash P.S. - 3-027-7368-27	2960 CHUMASH AVE	TOU-PA-SOP-2	119	120	120	121	118	118	0.67	0.00	0.67	-2.07	-0.59
Big Sky #1 P.S. - 3-027-7368-71	2830 1/ 2 ERRINGER RD	TOU-PA-SOP-2	291	244	244	216	244	244	-16.19	0.00	-11.40	12.87	0.00
Big Sky #2 P.S. - 3-027-7409-89	1730 1/ 2 PEREGRINE CT	TOU-PA-SOP-2	290	289	289	286	285	287	-0.17	0.00	-1.31	-0.18	0.67
Stow Tank - 3-029-5211-18	5610 1/ 2 IROQUOIS CT	GS-1	--	--	--	--	--	--	--	--	--	--	--
Tapo Canyon WTP - 3-033-0492-29	5300 BENNETT RD	PA-2	--	--	--	49	47	51	--	--	--	-3.28	8.47
Long Canyon P.O. - 3-036-9504-97	33 1/ 2 LONG CANYON RD	GS-1	--	--	--	--	--	--	--	--	--	--	--
		Totals:	3,544	3,264	3,321	3,274	3,318	3,672	-7.91	1.76	-1.42	1.34	10.67

Water deliveries tend to peak in summer months, as seen in Figure 48. This is likely due to increased demand for irrigation during these months. The summer period also corresponds to the peak power demand period for SCE.

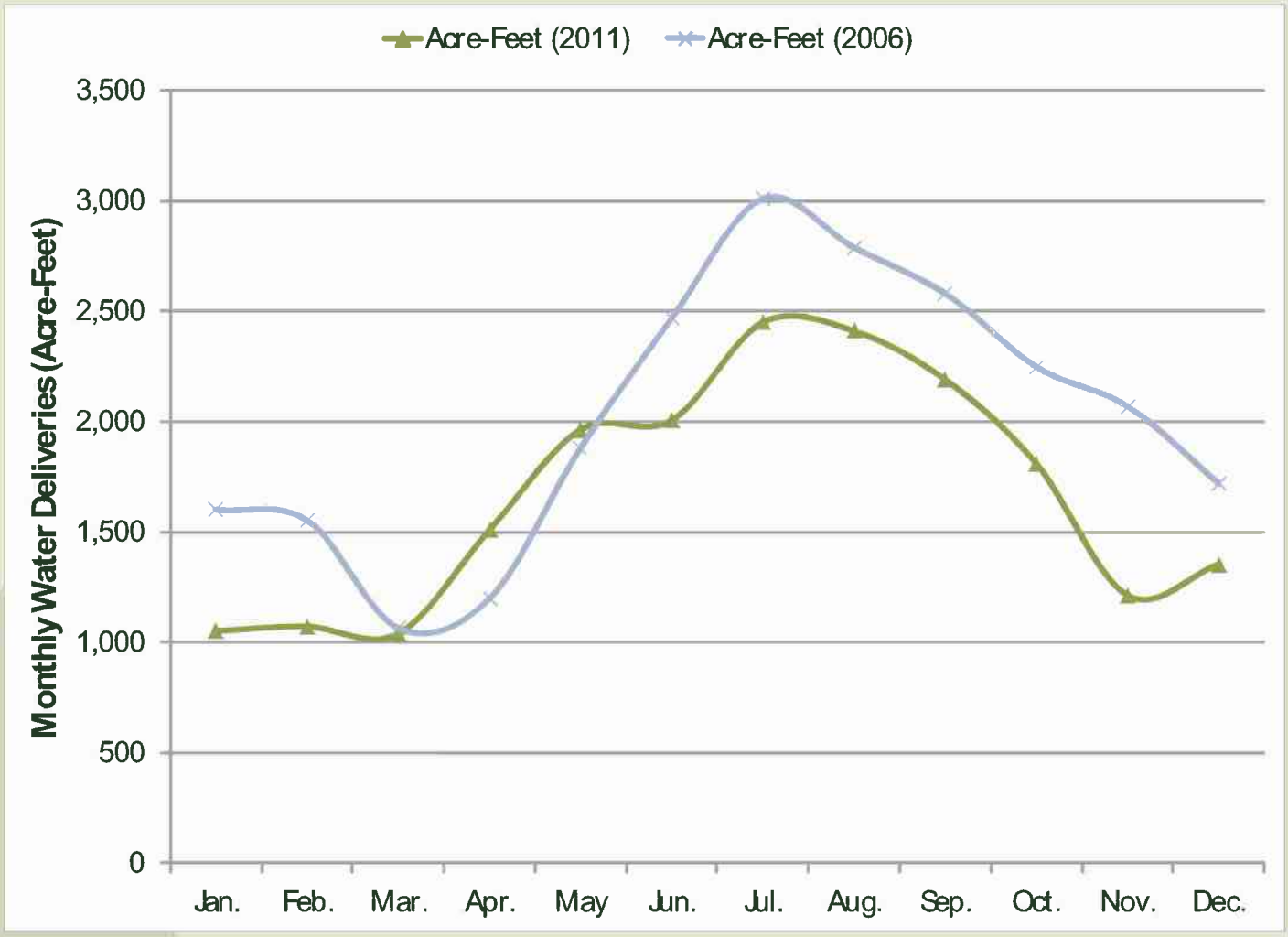

Figure 48. Monthly water deliveries (2006 & 2011).

The City is working with SCE by participating in demand response programs that reduce use during peak power periods. There are 15-minute interval data available at 18 of the 43 District service accounts. Figure 49 shows average 15-minute power demand per month for the Rocketdyne Pump Station #3. The data show that pumps are shut down from 1-5 PM during the peak demand months of June-August (Figure 49 and Figure 50, not adjusted for daylight savings time). Aggressive pumping occurs during off-peak periods. The majority of the pump stations are engaged in demand response programs and utilize "super off peak-time of use" rate schedules that are structured for demand response and provide cost savings to the City (Table 54). The City will explore, where possible, the ability to shift more pumping to the super off peak period of midnight to 6 AM to further assist in these efforts [7].

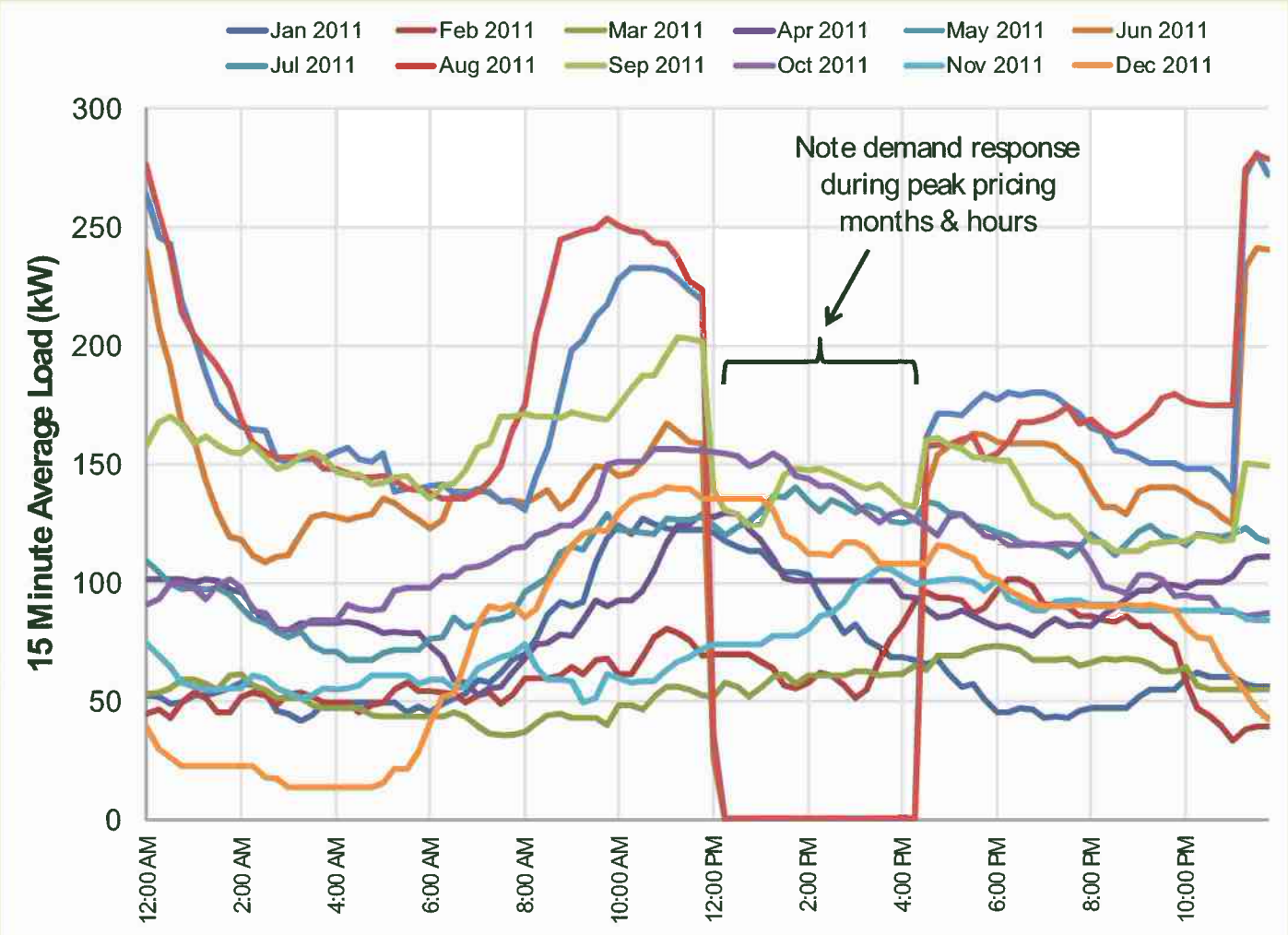

Figure 49. Rocketdyne pump station #3: average 15-minute power demand per month (2011- time not adjusted for daylight savings).

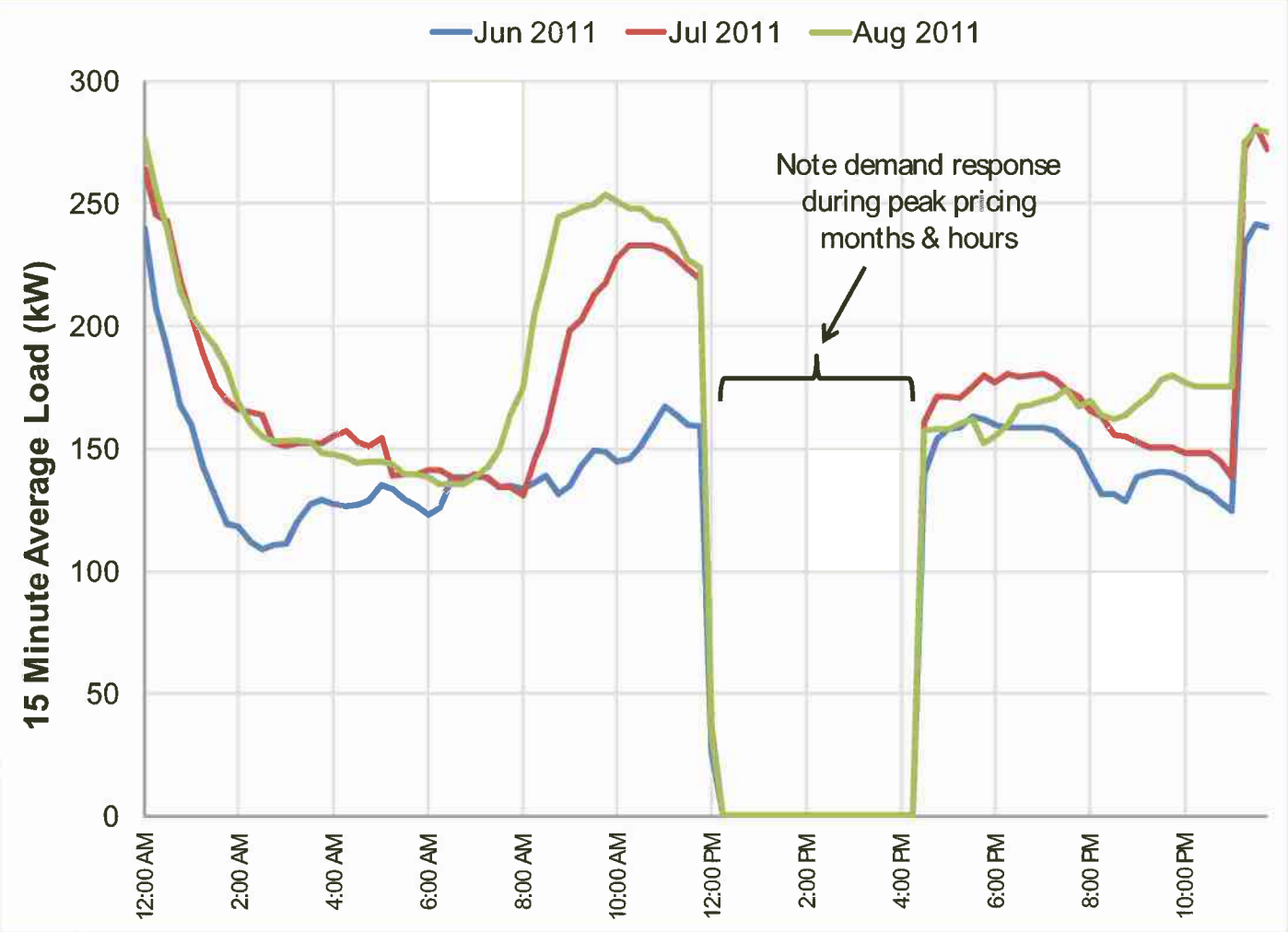

Figure 50. Rocketdyne pump station #3: average 15-minute power demand per month (Summer 2011-time not adjusted for daylight savings).

The Waterworks has worked closely with SCE to implement multiple ECMs between 2006 and 2011. The details of these ECMs can be found in Table 55-56. The majority of these ECMs have focused on increasing the efficiency of pumping operations by retrofitting both pumps and motors.

Planned and potential ECMs that will be the focus of future efforts at the Waterworks can be found in Table 57. These include expansion of efficiency upgrades to pumping operations and use of existing hydraulic head to reduce pumping requirements.

Table 55. Waterworks implemented energy conservation measures (one of two).

Facility or Service Type (Waterworks)	SCE Service Account	Measure Name/ Description	Details	Measure Status (Year Imp-lemented)	Annual Energy Savings (kWh/ yr)	Annual GHG Emission Reduction (Lbs CO_2/ year)	Annual Energy Cost Savings ($/ yr)	Installed Cost-Before Rebates($)	Rebates($)	Installed Cost-After Rebates($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Invest-ment (%)
Rocketdyne Station 2 : M1 and P1	3-001-1588-93	Repairs to 200 HP motor and pump	New Plant Motor/ Pump Install	2006	62,750	40,455	$ 6,005	$ 28,721	$ -	$ 28,721	4.8	20	318%
Rocketdyne Station 2: M2	3-001-1588-93	New premium efficiency motor	(12.3% improvement)	2006	50,005	32,238	$ 4,785	$ 12,027	$ -	$ 12,027	2.5	20	696%
Tapo St.: P1	3-013-1498-55	Repair pump and replace piping	From 62.9% to 75.0% (19.2% improvement)	2006	24,536	15,818	$ 2,572	$ 23,233	$ -	$ 23,233	9.0	20	121%
Flanagan: M2	3-011-5842-87	Repairs to the 50 HP premium efficiency motor	From 65.0% to 68.0% (4.6% improvement)	2008	6,295	3,995	$ 649	$ 2,299	$ -	$ 2,299	3.5	20	465%
Bridal Path #1: P3	3-000-8020-35	New pump/ piping replacement	From 63.5% to 66.1% (4.1% improvement)	2008	1,542	979	$ 274	$ 23,810	$ -	$ 23,810	86.9	20	-77%
Well 32	3-001-1587-94	New premium efficiency motor / Well Repair	Well Upgrades	2008	NA	NA	NA	$ 33,319	NA	NA	NA	NA	NA
Oak Knolls: M1	3-000-8521-10	New premium efficiency motor	From 53.1% to 57.8% (8.9% improvement)	2009	5,446	3,456	$ 834	$ 2,620	$ -	$ 2,620	3.1	20	536%
Flanagan: P1	3-011-5842-87	New pump/ piping replacement	From 66.5% to 77.4% (16.4% improvement)	2010	22,354	14,186	$ 2,306	$ 27,980	$ 627	$ 27,353	11.9	20	69%
Stearns: P1	3-001-1588-90	Pump and piping repair	From 68.9% to 77.4% (12.3% improvement)	2010	51,210	32,498	$ 4,181	$ 34,563	$ 4,295	$ 30,268	7.2	20	176%
Tapo Canyon Plant	3-033-0492-29	New premium efficiency motor with VSD Control	New Plant Motor/ Pump Install	2010	NA	NA	NA	NA	$ 2,102	NA	NA	NA	NA

Table 56. Waterworks implemented energy conservation measures (two of two).

Facility or Service Type (Waterworks)	SCE Service Account	Measure Name/ Description	Details	Measure Status (Year Implemented)	Annual Energy Savings (kWh/ yr)	Annual GHG Emission Reduction (Lbs CO_2/ year)	Annual Energy Cost Savings ($/ yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Investment (%)
Mine Rd.: M1	3-003-1348-38	New premium efficiency motor	From 62.5% to not yet tested	2010	NA	NA	NA	$ 2,872	$ -	$ 2,872	NA	20	NA
Well 31 B	3-001-1587-93	New premium efficiency motor	Replaced old Motor	2011	NA	NA	NA	$ 99,500	$ 1,428				
Big Sky #1: P1	3-027-7368-71	Pump repair and replacement	(-2.8% improvement). Problem with location of test port	2011	NA	NA	NA	$ 17,340	$ -	$ 17,340	NA	20	NA
Flanagan: M1	3-011-5842-87	New premium efficiency motor	From 68.9% to 77.4% (12.3% improvement)	2011	16,825	10,534	$ 1,735	$ 4,842	$ -	$ 4,842	2.8	20	617%
Cochran: M2	3-011-6648-09	New premium efficiency motor	From 59.4% to 64.1% (7.9% improvement)	2011	5,953	3,727	$ 918	$ 12,573	$ -	$ 12,573	13.7	20	46%
Library: P2 and M2	3-015-0835-38	Pump replacement and repairs to 30 HP motor	From 64.4% to 65.8% (2.2% improvement)	2011	693	434	$ 82	$ 22,015	$ -	$ 22,015	269.3	20	-93%
Long Canyon Pressure Reducing Station:	3-036-9504-97	Using hydraulic head to limit pumping requirements	Refer to SA# 3-000-8020-35 for savings starting 6/2011. Total kWh used 211,253 (6/10-3/11) vs. 55,279 (6/11-3/12) -(73.8% improvement)	2011	188,564	118,062	$ 24,878	$ 316,889	$ -	$ 316,889	12.7	20	57%
				Totals & Averages	**436,173**	**276,382**	**$ 49,218**	**$ 664,603**	**$ 8,452**	**$ 526,862**	**35.6**		**244%**

Table 57. Waterworks potential energy conservation measures.

Facility or Service Type (Waterworks)	SCE Service Account	Measure Name/ Description	Details	Measure Status (Year Imp-lemented)	Annual Energy Savings (kWh/ yr)	Annual GHG Emission Reduction (Lbs CO_2/ year)	Annual Energy Cost Savings ($/ yr)	Installed Cost-Before Rebates($)	Rebates($)	Installed Cost-After Rebates($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Invest-ment (%)
Woodranch #1	3-001-1589-23	Cla-Val pressure reducer installation	Using hydraulic head to limit pumping requirements	2012	3,652	2,214	$ 3,905	$ 6,000	$ 627	$ 5,373	1.4	20	1354%
Woodranch #2	3-001-1589-24	Cla-Val pressure reducer installation	Using hydraulic head to limit pumping requirements	2012	5,631	3,414	$ 6,191	$ 6,000	$ 918	$ 5,082	0.8	20	2337%
Rocketdyne Station. 3	3-000-2042-86	New premium efficiency motor 150 HP	Motor on Order / Projected Install 10/ 12	2012	59,564	36,112	$ 5,788	$ 14,500		$ 14,500	2.5	20	698%
Rocketdyne Station. 3	3-000-2042-86	New premium efficiency motor 200 HP	Motor on Order / Projected Install 10/ 12	2012	79,418	48,149	$ 7,717	$ 18,000		$ 18,000	2.3	20	757%
Rocketdyne Station. 1	3-000-5300-03	New premium efficiency 150 HP motor & new Pump	Work will be Started this Winter	2013	66,259	40,171	$ 7,021	$ 48,000		$ 48,000	6.8	20	193%
				Totals & Averages	**214,523**	**130,059**	**$ 30,623**	**$ 92,500**	**$ 1,546**	**$ 90,954**	**2.8**		**1068%**

Street Lighting

There are 14 service accounts associated with street lighting. The rate schedules consist of 1 LS-1 account, which is un-metered, 12 LS-2 accounts, which are un-metered, and 1 LS-3 account, which is metered. The LS-1account has the largest usage of all accounts. The streetlights on this account are owned and maintained by SCE. All other streetlights are owned and maintained by the City.

There are approximately 7,400 streetlights on the LS-1 service account. These lamps range from 40-400 Watt and most are high-pressure sodium (HPS). Both LED and induction lamps use less energy than HPS and will be considered for retrofits where feasible.

Collectively, street lighting accounted for 14.3% of total 2011 City electricity use. Electricity use associated with street lighting has increased steadily from 2006 to 2011 (Table 58). The increase is driven by the two street lighting accounts with the highest use. Given that all but one of these accounts are un-metered, it is difficult to correlate actual use with billed use.

Table 58. Street lighting annual electricity use by service account (2006-2011).

Site Name - Account Number	Address	Rate Schedule	Electrical Use (kWh:2006)	Electrical Use (kWh:2007)	Electrical Use (kWh:2008)	Electrical Use (kWh:2009)	Electrical Use (kWh:2010)	Electrical Use (kWh:2011)	% Change in Use (2006 - 2007)	% Change in Use (2007 - 2008)	% Change in Use (2008 - 2009)	% Change in Use (2009 - 2010)	% Change in Use (2010 - 2011)
LS-3 - 3001798607	2216 BROWNSTONE CREEK AVE, SIMI VALLEY	LS-3	2,518	2,518	2,518	2,431	2,444	2,577	0.00	0.00	-3.46	0.53	5.44
LS-2 Various - 3001798648	VARIOUS LS2, SIMI VALLEY	LS-2 Various	484,025	484,025	484,025	494,152	521,554	509,832	0.00	0.00	2.09	5.55	-2.25
LS-1-ALLNITE - 3001798654	SIMI VALLEY LIGHTING DISTRICT, SIMI VALLEY	LS-1-ALLNITE	2,317,935	2,342,065	2,511,281	2,516,276	2,595,442	2,658,954	1.04	7.23	0.20	3.15	2.45
LS-2-a - 3008954510	ROYAL-VAQUERO, SIMI VALLEY	LS-2	4,068	4,068	4,068	4,068	4,068	4,068	0.00	0.00	0.00	0.00	0.00
LS-2-b - 3008954511	ALAMO-TEXAS, SIMI VALLEY	LS-2	4,068	4,068	4,068	4,068	4,068	4,068	0.00	0.00	0.00	0.00	0.00
LS-2-c - 3012168546	3598 ALAMO ST, SIMI VALLEY	LS-2	4,068	4,068	4,068	4,068	4,068	4,068	0.00	0.00	0.00	0.00	0.00
LS-2-d - 3013537885	3700 ROYAL AVE, SIMI VALLEY	LS-2	2,592	2,592	2,592	2,592	2,592	2,592	0.00	0.00	0.00	0.00	0.00
LS-2-e - 3014190925	1199 ERRINGER, SIMI VALLEY	LS-2	4,068	4,068	4,068	4,068	4,068	4,747	0.00	0.00	0.00	0.00	16.69
LS-2-f - 3015875323	630 ROYAL AVE, SIMI VALLEY	LS-2	3,888	3,888	3,888	3,888	3,888	3,888	0.00	0.00	0.00	0.00	0.00
LS-2-g - 3025824313	FIRST ST-ENCHANTED, SIMI VALLEY	LS-2	9,516	9,516	9,516	9,516	9,516	9,516	0.00	0.00	0.00	0.00	0.00
LS-2-h - 3025824337	ES ERRINGER 50 S-O HWY 118, SIMI VALLEY	LS-2	15,084	15,084	15,084	15,084	15,084	15,084	0.00	0.00	0.00	0.00	0.00
LS-2-i - 3025824455	N-S 118 AT STEARNS, SIMI VALLEY	LS-2	3,888	3,888	3,888	3,888	3,888	3,888	0.00	0.00	0.00	0.00	0.00
LS-2-j - 3025824490	S-S OF 118 AT TAPO CANYON, SIMI VALLEY	LS-2	11,316	11,316	11,316	11,316	11,316	8,802	0.00	0.00	0.00	0.00	-22.22
LS-2-k - 3025824544	S-S 118 FRWY - SYCAMORE, SIMI VALLEY	LS-2	9,972	9,972	9,972	9,972	9,972	9,972	0.00	0.00	0.00	0.00	0.00
		Totals:	**2,877,006**	**2,901,136**	**3,070,352**	**3,085,387**	**3,191,968**	**3,242,056**	**0.84**	**5.83**	**0.49**	**3.45**	**1.57**

Traffic Signal Lighting

There are 125 service accounts associated with traffic signal lighting. Traffic signal lighting consists of traffic signals (commonly referred to as "stop lights"), pedestrian crossing signals, and safety lights (which are the streetlights located at the same intersection as the traffic signals). The City owns and operates all traffic signal lighting. The number of the City's traffic lights has remained relatively constant from 2006-2011, with 117 traffic signals in 2006 and 121 in 2011.

In 2002-2003, the red and green incandescent traffic signal lamps were retrofit to LED. In 2005-2007 incandescent pedestrian crossing signals lamps were retrofit to LED. By 2011 there were approximately 450 safety lights operating at 121 traffic intersections. The majority of the safety lights are HPS, including 85 lamps at 150 Watt, 40 lamps at 200 Watt and 325 lamps at 250 Watt. Approximately 40% of the safety lights have the "mission bell" design. At two of the 121 intersections, the HPS safety light lamps were retrofit with induction style lamps.

Future measures include converting yellow traffic signal lamps from incandescent to LED (about 75% are still incandescent) as needed, and converting safety lights from HPS to induction.

Collectively, traffic signal lighting accounted for 1.6% of total 2011 City electricity use. Electricity use associated with traffic signal lighting has been reduced by 2% from 2006 to 2011. These data and annual trends for specific accounts are given in Table 59 – Table 61.

Table 59. Traffic signal lighting annual electricity use by service account (2006-2011. One of three).

Site Name - Account Number	Address	Rate Schedule	Electrical Use (kWh:2006)	Electrical Use (kWh:2007)	Electrical Use (kWh:2008)	Electrical Use (kWh:2009)	Electrical Use (kWh:2010)	Electrical Use (kWh:2011)	% Change in Use (2006 - 2007)	% Change in Use (2007 - 2008)	% Change in Use (2008 - 2009)	% Change in Use (2009 - 2010)	% Change in Use (2010 - 2011)
Traffic Control - 3-000-9598-40	HEYWOOD/ SYCAMORE	TC-1	2,815	2,791	2,389	1,387	1,350	1,357	-0.85	-14.40	-41.94	-2.67	0.52
Traffic Control - 3-001-0916-43	1802 1/2 ERRINGER RD	TC-1	2,458	2,465	2,522	2,505	2,709	2,226	0.28	2.31	-0.67	8.12	-17.81
Traffic Control - 3-001-0972-06	1601 1/2 MADERA	TC-1	2,461	2,472	2,410	2,429	2,436	2,604	0.45	-2.51	0.79	0.29	6.90
Traffic Control - 3-001-1586-55	ROYAL AVE/ MADERA	TC-1	4,069	4,054	4,348	4,633	4,471	4,280	-0.37	7.25	6.55	-3.50	-4.27
Traffic Control - 3-001-1586-87	2650 1/2 MADERA ROAD	TC-1	2,140	2,141	2,155	2,143	2,178	2,258	0.05	0.65	-0.56	1.63	3.67
Traffic Control - 3-001-1586-89	S/W CR COCHRN/ MADERA	TC-1	15,396	15,321	14,612	12,706	13,023	10,566	-0.49	-4.63	-13.04	2.49	-18.87
Traffic Control - 3-001-1587-30	LA AVE AT MADERA ROAD	TC-1	2,977	2,925	2,948	2,939	3,175	3,207	-1.75	0.79	-0.31	8.03	1.01
Traffic Control - 3-001-1587-32	TIERRA REJADA/ FRIENDLY	TC-1	2,558	2,418	2,479	2,572	2,589	2,755	-5.47	2.52	3.75	0.66	6.41
Traffic Control - 3-001-1587-35	221 TIERRA REJADA	TC-1	5	2	0	0	0	0	-55.56	-100.00	--	--	--
Traffic Control - 3-001-1587-42	CHURCH S/ O LAKE	TC-1	4,440	3,540	3,672	5,048	4,290	4,188	-20.27	3.73	37.47	-15.02	-2.38
Traffic Control - 3-001-1587-43	ROYAL/ SINALOA	TC-1	2,549	2,584	2,551	2,587	2,544	2,546	1.37	-1.28	1.41	-1.66	0.08
Traffic Control - 3-001-1587-45	COCHRAN/ SYCAMORE	TC-1	3,025	2,890	3,112	2,875	2,832	2,870	-4.46	7.68	-7.62	-1.50	1.34
Traffic Control - 3-001-1587-74	COCHRAN W/ O GALENA	TC-1	2,926	2,742	2,700	2,529	2,695	2,599	-6.29	-1.53	-6.33	6.56	-3.56
Traffic Control - 3-001-1587-75	2568 1/2 SYCAMORE DR	TC-1	7,771	7,848	7,971	7,203	5,583	2,888	0.99	1.57	-9.63	-22.49	-48.27
Traffic Control - 3-001-1587-76	NW/ CO COCHRAN/ GALENA	TC-1	2,818	2,685	2,693	2,736	2,671	2,674	-4.72	0.30	1.60	-2.38	0.11
Traffic Control - 3-001-1588-09	ERRINGER/ LARCH ST	TC-1	2,520	2,416	2,454	2,478	2,504	2,524	-4.13	1.57	0.98	1.05	0.80
Traffic Control - 3-001-1588-11	COCHRAN/ ERRINGER	TC-1	3,701	3,662	3,671	3,649	3,576	3,584	-1.05	0.25	-0.60	-2.00	0.22
Traffic Control - 3-001-1588-49	2405 1/2 SYCAMORE DR	TC-1	7,982	7,398	7,582	7,116	7,040	7,070	-7.32	2.49	-6.15	-1.07	0.43
Traffic Control - 3-001-1588-50	KUEHNER/ KATHERINE TC1	TC-1	3,126	2,805	2,829	3,650	2,920	2,885	-10.27	0.86	29.04	-20.00	-1.20
Traffic Control - 3-001-1588-52	KUEHNER DR/ SMITH ROAD	TC-1	3,667	2,418	2,362	2,983	2,351	2,312	-34.06	-2.32	26.29	-21.19	-1.68
Traffic Control - 3-001-1588-89	1928 1/2 TAPO ST	TC-1	4,786	3,538	3,518	4,785	3,776	3,567	-26.07	-0.57	36.01	-21.09	-5.53
Traffic Control - 3-001-1589-50	WOOD RCH/ CNTY CLB TFL	TC-1	3,220	3,178	3,193	3,140	3,063	3,059	-1.30	0.47	-1.66	-2.45	-0.13
Traffic Control - 3-001-1589-51	MADERA/ WOOD RCH TFL	TC-1	7,535	5,459	5,201	4,974	4,902	4,840	-27.55	-4.73	-4.36	-1.45	-1.26
Traffic Control - 3-001-1589-53	1 SYCAMORE LA AVE SIG	TC-1	3,480	3,321	3,346	3,203	3,097	3,128	-4.56	0.75	-4.27	-3.31	1.00
Traffic Control - 3-001-1589-54	801 1/4 MADERA RD	TC-1	4,479	7,154	9,407	7,413	7,529	7,481	59.72	31.49	-21.20	1.56	-0.64
Traffic Control - 3-001-1589-84	ALAMO/ TAPO CYN TFL	TC-1	3,345	3,412	3,472	3,406	3,220	8,492	2.00	1.76	-1.90	-5.46	163.73
Traffic Control - 3-001-1590-48	LOS ANG AV/ RORY LANE	TC-1	2,162	1,882	2,247	2,824	2,403	2,151	-12.95	19.37	25.71	-14.93	-10.47
Traffic Control - 3-001-1590-50	LOS ANG/ 5TH ST TC1	TC-1	2,470	2,471	2,468	2,501	2,507	2,464	0.04	-0.12	1.34	0.24	-1.72
Traffic Control - 3-001-1590-52	LOS ANGELES/ SINALOA	TC-1	2,759	2,630	2,615	2,686	2,626	2,682	-4.68	-0.57	2.72	-2.23	2.13
Traffic Control - 3-001-1590-78	1910 1/2 E LOS ANGELES AVE	TC-1	3,126	2,937	2,963	2,894	3,278	3,266	-6.05	0.89	-2.33	13.25	-0.35
Traffic Control - 3-001-1590-79	ERRINGER/ HEYWOOD	TC-1	2,103	2,074	2,131	2,095	2,315	2,134	-1.38	2.75	-1.69	10.50	-7.82
Traffic Control - 3-001-1591-27	COCHRAN & STOW	TC-1	3,265	3,142	2,916	2,531	2,797	3,131	-3.78	-7.19	-13.19	10.51	11.92
Traffic Control - 3-001-1591-31	1097 1/2 EASY	TC-1	2,672	2,582	2,598	2,874	2,468	2,473	-3.37	0.62	10.62	-14.13	0.20
Traffic Control - 3-001-1591-48	2283 1ST ST	TC-1	2,642	2,578	2,565	2,576	2,545	2,510	-2.42	-0.50	0.43	-1.20	-1.38
Traffic Control - 3-001-1591-51	ALAMO/ TAPO TFL	TC-1	3,199	4,002	3,355	3,392	3,303	3,636	25.09	-16.16	1.10	-2.62	10.07
Traffic Control - 3-001-1591-76	N/ E COCHRAN/ STEARNS	TC-1	3,355	3,857	2,943	3,011	3,304	3,201	14.95	-23.69	2.31	9.73	-3.13
Traffic Control - 3-001-1591-98	LA AVE/ PATRICIA	TC-1	2,704	2,515	2,541	2,537	2,593	2,632	-6.99	1.03	-0.16	2.21	1.50
Traffic Control - 3-001-1591-99	1900 HUBBARD ST SIG	TC-1	4,341	4,303	4,358	4,302	4,412	3,250	-0.88	1.28	-1.28	2.56	-26.34
Traffic Control - 3-001-1592-32	TAPO ST/ EILEEN TFL	TC-1	2,277	2,253	2,030	2,106	2,069	878	-1.05	-9.90	3.74	-1.76	-57.59
Traffic Control - 3-001-1592-33	TAPO AT COCHRAN SIG	TC-1	3,451	3,943	3,504	3,578	3,478	3,458	14.26	-11.13	2.11	-2.79	-0.58
Traffic Control - 3-001-1592-55	ERRINGER/ ROYAL	TC-1	3,412	3,245	3,309	3,213	3,138	3,078	-4.89	1.97	-2.90	-2.33	-1.91

Table 60. Traffic signal lighting annual electricity use by service account (2006-2011. Two of three).

Site Name - Account Number	Address	Rate Schedule	Electrical Use (kWh:2006)	Electrical Use (kWh:2007)	Electrical Use (kWh:2008)	Electrical Use (kWh:2009)	Electrical Use (kWh:2010)	Electrical Use (kWh:2011)	% Change in Use (2006 - 2007)	% Change in Use (2007 - 2008)	% Change in Use (2008 - 2009)	% Change in Use (2009 - 2010)	% Change in Use (2010 - 2011)
Traffic Control - 3-001-1592-59	COCHRAN AT TAPO CYN	TC-1	3,144	3,334	3,036	2,966	3,022	3,075	6.04	-8.94	-2.31	1.89	1.75
Traffic Control - 3-001-1592-69	ROYAL/ SYCAMORE	TC-1	3,119	3,090	3,097	3,120	3,005	3,033	-0.93	0.23	0.74	-3.69	0.93
Traffic Control - 3-001-1592-73	1 LA AVE/ STEARNS	TC-1	2,982	3,220	2,572	2,313	2,585	2,853	7.96	-20.11	-10.07	11.74	10.39
Traffic Control - 3-001-1593-67	S/ E COR 1ST/ ARCANE	TC-1	1,875	1,744	1,848	1,880	1,875	1,855	-6.99	5.96	1.73	-0.27	-1.07
Traffic Control - 3-001-1593-96	LOS ANGELES/ SEQUOIA	TC-1	3,124	2,866	2,780	2,731	2,723	2,844	-8.26	-3.00	-1.76	-0.29	4.44
Traffic Control - 3-001-1594-27	ROYAL/ 4TH	TC-1	2,732	2,194	2,210	2,190	2,195	2,033	-19.69	0.73	-0.90	0.23	-7.38
Traffic Control - 3-001-1594-29	N/ S COCHRAN/ SEQUOIA	TC-1	2,783	2,899	2,964	2,984	2,980	3,018	4.17	2.24	0.67	-0.13	1.28
Traffic Control - 3-001-1594-30	NW/ CO COCHRAN/ TRACY TCI	TC-1	2,070	1,945	1,957	1,977	1,973	2,035	-6.04	0.62	1.02	-0.20	3.14
Traffic Control - 3-001-1594-31	LOS ANGELES/ STOW SIG	TC-1	2,787	2,272	2,313	3,388	2,749	2,721	-18.48	1.80	46.48	-18.88	-1.00
Traffic Control - 3-001-1594-32	LA AVE/ YOSEMITE	TC-1	6,967	5,370	6,025	7,040	5,710	5,680	-22.92	12.19	16.86	-18.90	-0.52
Traffic Control - 3-001-1594-59	SYCMORE/ ALAMO	TC-1	2,885	3,013	2,893	2,709	2,675	2,632	4.44	-3.98	-6.36	-1.26	-1.61
Traffic Control - 3-001-1594-83	LOS ANGELES/ 1ST	TC-1	4,166	4,276	4,244	4,273	4,081	4,063	2.64	-0.75	0.68	-4.49	-0.44
Traffic Control - 3-001-1594-84	COCHRAN/ YOSEMITE TC1	TC-1	3,970	3,731	3,360	2,825	3,114	3,613	-6.03	-9.95	-15.91	10.23	16.02
Traffic Control - 3-001-1594-85	ROYAL AV / CROCKER	TC-1	2,399	2,384	2,357	2,342	2,336	2,350	-0.63	-1.13	-0.64	-0.26	0.60
Traffic Control - 3-001-1595-07	ALAMO/ GALENA N/ W COR	TC-1	2,747	2,637	2,828	2,828	2,656	2,610	-4.00	7.24	0.00	-6.08	-1.73
Traffic Control - 3-001-1595-08	ALAMO/ SEQUOIA N/ W COR	TC-1	2,844	2,822	2,846	2,943	3,003	2,890	-0.77	0.85	3.41	2.04	-3.76
Traffic Control - 3-001-2494-12	2305 1/2 ALAMO ST	TC-1	1,843	1,489	1,519	1,596	1,665	1,455	-19.21	2.01	5.07	4.32	-12.61
Traffic Control - 3-001-7986-74	3605 1/2 COCHRAN ST	TC-1	1,905	1,962	1,916	1,864	1,811	1,844	2.99	-2.34	-2.71	-2.84	1.82
Traffic Control - 3-001-7986-75	1598 1/2 COCHRAN	TC-1	2,351	2,078	2,108	2,182	2,085	2,046	-11.61	1.44	3.51	-4.45	-1.87
Traffic Control - 3-001-7986-76	1040 1/2 MADERA ROAD	TC-1	3,008	3,040	3,102	3,135	3,406	3,468	1.06	2.04	1.06	8.64	1.82
Traffic Control - 3-001-7986-77	220 1/2 MADERA ROAD	TC-1	3,117	3,061	3,134	3,001	2,970	2,978	-1.80	2.38	-4.24	-1.03	0.27
Traffic Control - 3-001-8882-25	1579 1/2 LOS ANGELES	TC-1	1,646	1,603	1,632	1,647	1,598	1,693	-2.61	1.81	0.92	-2.98	5.94
Traffic Control - 3-002-3919-25	50 1/2 VIEW LINE DRIV	TC-1	2,443	2,389	2,373	2,423	2,178	2,146	-2.21	-0.67	2.11	-10.11	-1.47
Traffic Control - 3-002-7065-47	3998 1/2 LOS ANGELES	TC-1	5,985	4,721	3,395	7,403	6,912	6,240	-21.12	-28.10	118.09	-6.64	-9.72
Traffic Control - 3-002-7273-31	2791 1/2 MADERA ROAD	TC-1	2,262	2,161	2,269	2,288	2,223	2,263	-4.47	5.00	0.84	-2.84	1.80
Traffic Control - 3-003-3785-58	3908 1/2 E LOS ANGELES AVE	TC-1	1,884	1,857	1,898	2,372	1,956	2,159	-1.43	2.21	24.95	-17.54	10.41
Traffic Control - 3-003-8436-88	1102 1/2 COCHRAN	TC-1	7,800	7,727	7,814	7,879	7,716	7,503	-0.94	1.13	0.83	-2.07	-2.76
Traffic Control - 3-005-6263-70	2283 1/2 ROYAL AVE	TC-1	2,150	2,167	2,165	2,213	2,214	2,167	0.79	-0.09	2.22	0.05	-2.12
Traffic Control - 3-008-6653-19	2604 1/2 YOSEMITE AVE	TC-1	3,440	7,079	9,305	4,023	4,122	3,588	105.81	31.45	-56.77	2.46	-12.95
Traffic Control - 3-009-3483-54	1397 1/2 E LOS ANGELES AVE	TC-1	2,540	2,646	2,675	2,666	2,798	2,578	4.17	1.10	-0.34	4.95	-7.86
Traffic Control - 3-009-4499-97	223 1/2 ROYAL AVE	TC-1	796	800	786	751	731	720	0.50	-1.75	-4.45	-2.66	-1.50
Traffic Control - 3-009-4996-24	2814 1/2 TEXAS AVE	TC-1	2,004	2,325	2,470	2,549	2,420	2,539	15.99	6.26	3.20	-5.06	4.92
Traffic Control - 3-010-4648-15	1576 1/2 ERRINGER RD	TC-1	1,032	1,012	1,023	1,025	1,027	1,011	-1.94	1.09	0.20	0.20	-1.56
Traffic Control - 3-011-2951-48	73 1/2 W COCHRAN ST	TC-1	2,833	2,849	2,765	2,724	2,676	2,737	0.56	-2.95	-1.48	-1.76	2.28
Traffic Control - 3-011-2951-52	3050 1/2 ROYAL AVE	TC-1	1,012	1,022	1,039	1,048	985	999	0.99	1.66	0.87	-6.01	1.42
Traffic Control - 3-011-3196-96	6210 1/2 LOS ANGELES	TC-1	3,187	2,885	3,272	3,541	3,153	3,155	-9.46	13.40	8.24	-10.97	0.06
Traffic Control - 3-011-7446-79	5000 1/2 E LOS ANGELES AVE	TC-1	8,210	8,000	6,706	6,960	7,712	6,809	-2.56	-16.18	3.79	10.80	-11.70
Traffic Control - 3-011-7862-93	3850 1/2 ALAMO ST	TC-1	2,424	2,209	2,282	2,410	2,376	2,327	-8.87	3.30	5.61	-1.41	-2.06
Traffic Control - 3-012-5537-78	3598 1/2 ALAMO ST T/ C	TC-1	2,990	2,874	2,904	3,064	3,063	3,033	-3.88	1.04	5.51	-0.03	-0.98
Traffic Control - 3-012-8418-76	2884 1/2 ROYAL AVE	TC-1	2,619	2,592	2,653	2,758	3,068	2,753	-1.03	2.35	3.96	11.22	-10.25
Traffic Control - 3-013-5020-31	3700 1/2 ROYAL	TC-1	4,557	3,364	3,420	4,024	4,104	3,721	-26.17	1.65	17.68	1.99	-9.33

Table 61. Traffic signal lighting annual electricity use by service account (2006-2011. Three of three).

Site Name - Account Number	Address	Rate Schedule	Electrical Use (kWh:2006)	Electrical Use (kWh:2007)	Electrical Use (kWh:2008)	Electrical Use (kWh:2009)	Electrical Use (kWh:2010)	Electrical Use (kWh:2011)	% Change in Use (2006 - 2007)	% Change in Use (2007 - 2008)	% Change in Use (2008 - 2009)	% Change in Use (2009 - 2010)	% Change in Use (2010 - 2011)
Traffic Control - 3-014-6539-91	1199 1/2 ERRINGER	TC-1	2,716	2,699	2,816	2,813	2,716	2,727	-0.63	4.33	-0.11	-3.45	0.41
Holiday Lighting - 3-015-0875-77	2149 1/2 TAPO ST	GS-1	7,074	11,696	14,830	21,918	15,555	5,979	65.33	26.80	47.80	-29.03	-61.56
Traffic Control - 3-015-1001-25	303 1/2 W COCHRAN ST	TC-1	1,914	1,916	1,931	1,991	1,967	1,975	0.10	0.78	3.11	-1.21	0.41
Traffic Control - 3-015-1001-26	505 1/2 COCHRAN ST	TC-1	1,740	1,759	1,764	1,822	1,922	1,739	1.09	0.28	3.29	5.49	-9.52
Traffic Control - 3-015-2832-39	630 1/2 ROYAL AVE	TC-1	1,427	1,393	1,428	1,379	1,458	1,467	-2.38	2.51	-3.43	5.73	0.62
Traffic Control - 3-017-3053-99	1998 1/2 GALT	TC-1	1,943	1,938	1,919	1,955	1,997	1,960	-0.26	-0.98	1.88	2.15	-1.85
Traffic Control - 3-017-6096-39	1402 1/2 THOMPSON	TC-1	1,894	1,903	1,945	1,963	1,969	1,959	0.48	2.21	0.93	0.31	-0.51
Traffic Control - 3-017-7324-69	2391 1/2 WINIFRED	TC-1	1,756	1,964	1,733	1,772	1,861	1,645	11.82	-11.74	2.25	5.02	-11.61
Traffic Control - 3-017-7464-49	1402 1/2 BUCKSKIN	TC-1	1,963	1,976	2,006	1,988	1,994	1,982	0.66	1.52	-0.90	0.30	-0.60
Traffic Control - 3-018-4451-60	1002 1/2 WHITCOMB AVE	TC-1	1,750	1,842	1,907	1,912	1,981	1,909	5.26	3.53	0.26	3.61	-3.63
Traffic Control - 3-019-6591-54	C/ O EASY/ MADERA	TC-1	2,811	2,785	2,828	2,825	2,801	2,823	-0.92	1.54	-0.11	-0.85	0.79
Traffic Control - 3-019-6592-39	3199 1/2 TAPO	TC-1	4,695	5,404	3,260	2,985	2,973	3,183	15.11	-39.67	-8.44	-0.40	7.06
Traffic Control - 3-019-6594-12	1455 1/2 SYCAMORE DR	TC-1	1,244	1,283	1,280	1,227	1,210	1,199	3.14	-0.23	-4.14	-1.39	-0.91
Traffic Control - 3-019-6594-61	3002 1/2 TAPO CANYON	TC-1	2,949	2,960	2,992	3,040	3,006	2,993	0.37	1.08	1.60	-1.12	-0.43
Traffic Control - 3-019-6656-31	400 1/2 MADERA RD	TC-1	2,612	2,583	2,680	2,609	4,169	2,658	-1.11	3.76	-2.65	59.79	-36.24
Traffic Control - 3-020-1249-27	2905 1/2 MADERA	TC-1	2,274	2,256	2,286	2,335	2,243	2,257	-0.79	1.33	2.14	-3.94	0.62
Traffic Control - 3-020-1397-58	980 1/2 MADERA RD	TC-1	3,042	2,802	2,693	2,606	2,556	2,591	-7.89	-3.89	-3.23	-1.92	1.37
Traffic Control - 3-020-1398-73	1204 1/2 MADERA	TC-1	2,613	2,636	2,659	2,693	2,713	2,772	0.88	0.87	1.28	0.74	2.17
Traffic Control - 3-020-3493-29	799 1/2 1ST	TC-1	2,034	1,999	2,052	2,126	2,032	1,976	-1.72	2.65	3.61	-4.42	-2.76
Traffic Control - 3-020-7050-93	96 1/2 WOOD RANCH	TC-1	1,919	1,934	1,979	2,064	1,968	1,976	0.78	2.33	4.30	-4.65	0.41
Traffic Control - 3-020-7907-00	995 1/2 FIRST ST	TC-1	1,873	1,877	1,912	1,934	1,929	1,896	0.21	1.86	1.15	-0.26	-1.71
Traffic Control - 3-021-0043-48	1550 1/2 KUEHNER DR	TC-1	3,951	3,318	2,465	2,924	3,342	2,887	-16.03	-25.71	18.62	14.30	-13.60
Traffic Control - 3-022-3112-36	360 1/2 TIERRA REJADA ROAD	TC-1	2,508	2,373	2,404	2,459	2,438	2,642	-5.38	1.31	2.29	-0.85	8.37
Traffic Control - 3-023-5188-87	E/ S ERRGR 60 N/ FWY	TC-1	8,826	9,456	9,467	8,802	8,596	8,542	7.14	0.12	-7.02	-2.34	-0.63
Traffic Control - 3-023-5189-54	N/ S 118 AT SYCAMORE	TC-1	2,047	2,184	2,271	2,252	2,276	2,254	6.69	3.98	-0.84	1.07	-0.97
Traffic Control - 3-023-5191-10	N/ S 118 FRWY/ TAPO	TC-1	3,125	5,875	4,542	2,635	3,280	3,218	88.00	-22.69	-41.99	24.46	-1.88
Traffic Control - 3-023-5192-01	S/ S 118 AT TAPO CYN	TC-1	2,084	2,846	1,977	2,064	2,390	2,311	36.60	-30.53	4.40	15.77	-3.31
Traffic Control - 3-023-5195-93	S/ S 118 FRW/ STEARNS	TC-1	1,018	543	504	601	688	599	-46.66	-7.18	19.25	14.39	-12.95
Traffic Control - 3-023-5196-35	E/ S ERRGR 50 S/ OFWY	TC-1	2,160	1,300	2,184	2,131	2,297	2,368	-39.84	68.06	-2.43	7.79	3.09
Traffic Control - 3-023-5196-82	N/ S 118 FRW/ STEARNS	TC-1	2,999	3,782	3,332	2,546	2,283	2,191	26.11	-11.89	-23.59	-10.35	-4.03
Traffic Control - 3-024-3833-49	ROYAL/ 1ST	TC-1	3,936	3,037	3,045	3,191	3,188	3,166	-22.84	0.26	4.79	-0.09	-0.69
Traffic Control - 3-024-8991-19	964 1/2 MADERA RD	TC-1	2,522	2,518	2,547	2,561	2,562	2,540	-0.16	1.15	0.55	0.04	-0.86
Traffic Control - 3-027-3070-00	591 1/2 LONG CANYON	TC-1	2,547	2,774	2,861	2,890	2,816	2,823	8.91	3.14	1.01	-2.56	0.25
Traffic Control - 3-027-3070-54	5215 1/2 ALAMO ST	TC-1	2,653	4,021	2,969	2,619	2,582	2,922	51.57	-26.17	-11.77	-1.41	13.15
Traffic Control - 3-029-4605-09	300 1/2 LONG CANYON ROAD	TC-1	572	1,147	1,149	1,183	1,253	1,233	100.52	0.17	2.96	5.92	-1.60
Traffic Control - 3-029-4850-71	449 1/2 1ST ST	TC-1	481	2,383	2,395	2,472	2,471	2,469	395.94	0.50	3.22	-0.04	-0.08
Traffic Control - 3-029-6570-22	125 1/2 LONG CANYON	TC-1	1,488	1,165	991	895	872	868	-21.68	-14.94	-9.69	-2.57	-0.46
Traffic Control - 3-030-0619-48	4397 1/2 WALNUT ST	TC-1	34	463	1,180	1,211	1,184	1,181	1260.29	155.14	2.63	-2.23	-0.25
Traffic Control - 3-030-6387-24	3910 1/2 ALAMO ST	TC-1	54	125	2,448	2,549	2,518	2,523	132.71	1866.27	4.13	-1.22	0.20
Traffic Control - 3-031-9698-61	4001 1/2 TOWNSHIP AVE	TC-1	7	0	367	1,096	1,086	1,083	-100.00	--	198.64	-0.91	-0.28
Traffic Control - 3-032-2857-66	2222 1/2 COCHRAN ST	GS-1	0	0	541	2,044	2,073	2,088	--	--	277.82	1.42	0.72
Traffic Control - 3-035-8759-69	2097 1/2 MADERA RD	TC-1	0	0	0	0	658	2,037	--	--	--	--	209.57
Traffic Control - 3-035-8759-90	55 1/2 TIERRA REJADA RD	TC-1	85	0	0	0	0	4,258	-100.00	--	--	--	--
			370,152	**374,670**	**376,629**	**383,345**	**373,276**	**362,005**	**1.22**	**0.52**	**1.78**	**-2.63**	**-3.02**

Landscape Irrigation

There are 136 electrical service accounts associated with landscape irrigation. Irrigation controllers that deliver water to landscaped areas maintained by the City are the predominant source of electricity use. Since water delivery accounts for the highest fraction of total electricity usage in the City (Figure 3), water conservation measures will reduce both the electricity associated with source water delivery and irrigation control. Methods that have been applied throughout the City include replacing turf and other water intensive species with drought tolerant species, efficient irrigation techniques and use of weather-based irrigation controls. These practices will be expanded in the future.

Collectively, landscape irrigation accounted for 0.3% of total 2011 City electricity use. There may be opportunity to deploy ECMs, such as more efficient pumps and controllers, but the overall impact on City electricity use will be minor. Electricity use associated with landscape irrigation has fluctuated dramatically between 2006 and 2011. These data and annual trends for specific accounts are given in Table 62 – Table 64.

Table 62. Landscape irrigation annual electricity use by service account (2006-2011. One of three).

Site Name-Account Number	Address	Rate Schedule	Electrical Use (kWh:2006)	Electrical Use (kWh:2007)	Electrical Use (kWh:2008)	Electrical Use (kWh:2009)	Electrical Use (kWh:2010)	Electrical Use (kWh:2011)	% Change in Use (2006 - 2007)	% Change in Use (2007 - 2008)	% Change in Use (2008 - 2009)	% Change in Use (2009 - 2010)	% Change in Use (2010 - 2011)
Irrigation Controllers/ Zone 55 - 3-000-5445-46	5510 ALAMO ST	GS-1	36,105	0	0	0	0	2	-100.00	--	--	--	--
Irrigation Controllers/ Zone 14B - 3-000-5445-47	5345 SENECA PL	GS-1	1	0	0	0	0	5	-100.00	--	--	--	--
Irrigation Controllers/ Zone 39 - 3-000-6340-73	LOS ANG AV/ ERRINGER SPR	GS-1	102	122	122	138	143	149	19.61	0.00	12.70	3.64	4.21
Irrigation Controllers/ Zone 13 - 3-000-6396-64	MARK/ SINALOA SPR	GS-1	6	13	18	13	12	27	127.27	40.00	-28.57	-8.00	134.78
Irrigation Controllers/ Zone 39 - 3-000-6645-13	3660 COCHRAN ST	GS-1	0	0	0	3	11	14	--	--	--	250.00	28.57
Irrigation Controllers/ Zone 39 - 3-000-6645-18	3664 ALAMO ST	GS-1	10	11	8	4	2	9	15.79	-27.27	-50.00	-50.00	350.00
Irrigation Controllers/ Zone 39 - 3-000-7131-79	2149 BELHAVEN AVE	GS-1	118	110	103	75	80	39	-7.20	-6.39	-26.83	6.67	-51.25
Irrigation Controllers/ Zone 39 - 3-000-7144-71	2074 ERRINGER ROAD	GS-1	7	5	4	4	4	10	-30.77	-11.11	0.00	0.00	150.00
Irrigation Controllers/ Zone 39 - 3-000-7433-40	1600 SEQUOIA AVE	GS-1	77	7	7	8	4	11	-91.50	0.00	15.38	-46.67	175.00
Irrigation Controllers/ Zone 39 - 3-000-7490-76	LA AV 300' W/ O TAPO	GS-1	122	102	105	155	137	126	-16.05	2.45	48.33	-11.61	-8.03
Irrigation Controllers/ Zone 39 - 3-000-7504-05	4396 TOWNSHIP AVE	GS-1	14	13	109	111	120	98	-7.41	772.00	1.83	7.66	-17.99
Irrigation Controllers/ Zone 35 - 3-000-8876-88	2603 RESERVOIR DR	GS-1	1,883	2	0	0	0	0	-99.89	-100.00	--	--	--
Irrigation Controllers/ Zone 32 - 3-000-8876-89	2711 BITTERNUT CIR	GS-1	2	2	6	2	3	72	0.00	175.00	-63.64	25.00	2760.00
Irrigation Controllers/ Zone 32 - 3-000-8876-90	2621 BITTERNUT CIR	GS-1	72	72	72	72	72	72	0.00	0.00	0.00	0.00	0.00
Irrigation Controllers/ Zone 39 - 3-000-9598-41	LOS ANG AV/ SYCMORE	GS-1	63	0	0	0	2	0	-100.00	--	--	--	-100.00
Irrigation Controllers/ Zone 39 - 3-000-9627-60	2290 KUEHNER	GS-1	0	0	0	0	0	34,564	--	--	--	--	--
Irrigation Controllers/ Zone 14B - 3-001-1075-84	R/ O 5475 SENECA	GS-1	109	0	0	0	0	6	-100.00	--	--	--	--
Irrigation Controllers/ Zone 39 - 3-001-1478-70	100YDE/ O SEQ ON LA SPR	GS-1	169	150	152	222	160	134	-10.98	1.33	46.05	-28.15	-15.99
Irrigation Controllers/ Zone 39 - 3-001-1586-53	1507 MADERA	GS-1	18	9	8	8	7	192	-50.00	-11.11	-6.25	-6.67	2635.71
Irrigation Controllers/ Zone 34 - 3-001-1586-85	1390 CASMALIA CT	GS-1	140	141	141	141	140	119	0.71	0.00	0.00	-0.71	-15.00
Irrigation Controllers/ Zone 21 - 3-001-1586-86	C/ O TOWNSHIP/ SHERI	GS-1	30	2	2	2	2	89	-93.33	0.00	0.00	0.00	4325.00
Irrigation Controllers/ Zone 42 - 3-001-1587-33	2100 TIERRA REJADA	GS-1	86	52	40	31	35	56	-39.53	-23.08	-22.50	12.90	60.00
Irrigation Controllers/ Zone 42 - 3-001-1587-36	2135 1/ 2 MANDAN PL	GS-1	8	10	10	31	41	47	26.67	5.26	205.00	34.43	14.63
Irrigation Controllers/ Zone 20 - 3-001-1587-97	4538 LUBBOCK DR	GS-1	75	34	55	53	27	46	-54.67	61.76	-3.64	-49.06	68.52
Irrigation Controllers/ Zone 39 - 3-001-1588-10	2336 ERRINGER RD	GS-1	112	0	6	85	55	58	-100.00	--	1316.67	-35.29	5.45
Irrigation Controllers/ Zone 39 - 3-001-1588-12	2085 SHERMAN ST	GS-1	78	7	0	22	26	30	-91.67	-100.00	--	20.93	15.38
Irrigation Controllers/ Zone 19 - 3-001-1588-13	LA S/ SW/ O ALSCOT SPR	GS-1	91	18	18	23	27	65	-80.11	0.00	25.00	17.78	143.40
Irrigation Controllers/ Zone 07 - 3-001-1588-27	LOS ANGLS E/ O BARNESSPR	GS-1	85	47	49	61	54	59	-44.71	3.19	24.74	-10.74	9.26
Irrigation Controllers/ Zone 39 - 3-001-1588-28	1403 MORENO DR	GS-1	83	60	83	83	66	63	-27.27	38.33	0.00	-20.48	-4.55
Irrigation Controllers/ Zone 07 - 3-001-1588-29	1544 DARRAH AVE	GS-1	3	0	0	2	0	7	-100.00	--	--	-100.00	--
Irrigation Controllers/ Zone 39 - 3-001-1588-47	SEQOIA E/ S N/ MRENO SPR	GS-1	115	83	95	110	103	81	-27.51	14.46	15.79	-6.36	-21.84
Irrigation Controllers/ Zone 09 - 3-001-1588-94	YARNELL 200 S/ O YUMA SPR	GS-1	41	8	9	9	7	11	-80.49	6.25	0.00	-23.53	69.23
Irrigation Controllers/ Zone 18 - 3-001-1589-25	3628 HIGHBURY CT	GS-1	63	79	55	51	40	41	25.40	-30.38	-7.27	-21.57	2.50
Irrigation Controllers/ Zone 21 - 3-001-1589-88	TAPO CYN/ N/ O TWNSHIP	GS-1	5,840	0	0	0	0	7,160	-100.00	--	--	--	--
Irrigation Controllers/ Zone 19 - 3-001-1590-49	SANDLWD W/ O KUEHNER SPR	GS-1	85	1	0	0	0	111	-99.41	-100.00	--	--	--
Irrigation Controllers/ Zone 39 - 3-001-1590-51	LOS ANG/ MADERA 1	GS-1	93	87	86	87	85	82	-6.45	-1.15	1.16	-2.30	-3.53
Irrigation Controllers/ Zone 39 - 3-001-1590-76	104 ARISTOTLE ST	GS-1	125	5	4	39	52	53	-95.98	-30.00	1000.00	35.06	1.92
Irrigation Controllers/ Zone 17 - 3-001-1590-80	YSRELLA / MRN GLRY SPR	GS-1	70	61	61	57	63	152	-12.86	0.00	-6.56	10.53	141.27
Irrigation Controllers/ Zone 17 - 3-001-1590-81	LA S/ S E/ O LAVNDER SPR	GS-1	189	120	129	127	124	105	-36.51	7.50	-1.55	-2.76	-14.98
Irrigation Controllers/ Zone 39 - 3-001-1591-29	5752 COCHRAN ST	GS-1	93	93	88	71	88	89	0.00	-4.86	-19.32	23.24	1.14
Irrigation Controllers/ Zone 22 - 3-001-1591-30	5800 NUTWOOD CIR	GS-1	109	116	95	74	78	86	5.96	-17.75	-22.11	4.73	10.32
Irrigation Controllers/ Zone 39 - 3-001-1591-50	2743 1/ 2 STEARNS ST	GS-1	118	2	0	0	0	153	-98.30	-100.00	--	--	--
Irrigation Controllers/ Zone 45 - 3-001-1591-77	5334 COCHRAN ST	GS-1	147	158	127	132	152	156	7.14	-19.37	3.94	14.77	2.97
Irrigation Controllers/ Zone 14A - 3-001-1592-09	5235 ALAMO ST	GS-1	75	76	57	50	41	16	1.33	-25.66	-11.50	-18.00	-62.20
Irrigation Controllers/ Zone 14A - 3-001-1592-10	5348 INDIAN HILLS DR	GS-1	1,533	1,709	2,109	544	418	828	11.48	23.41	-74.20	-23.16	97.97

Table 63. Landscape irrigation annual electricity use by service account (2006-2011. Two of three).

Site Name-Account Number	Address	Rate Schedule	Electrical Use (kWh:2006)	Electrical Use (kWh:2007)	Electrical Use (kWh:2008)	Electrical Use (kWh:2009)	Electrical Use (kWh:2010)	Electrical Use (kWh:2011)	% Change in Use (2006 - 2007)	% Change in Use (2007 - 2008)	% Change in Use (2008 - 2009)	% Change in Use (2009 - 2010)	% Change in Use (2010 - 2011)
Irrigation Controllers/ Zone 14A - 3-001-1592-11	5663 SHOSHONE ST	GS-1	10	0	0	0	0	0	-100.00	--	--	--	--
Irrigation Controllers/ Zone 14A - 3-001-1592-12	5462 INDIAN HILLS DR	GS-1	1,325	3,855	3,102	1,891	1,001	1,524	191.05	-19.55	-39.03	-47.07	52.25
Irrigation Controllers/ Zone 14A - 3-001-1592-29	5506 INDIAN HILLS DR	GS-1	366	1,139	1,298	582	354	524	211.49	13.97	-55.14	-39.18	47.88
Irrigation Controllers/ Zone 14A - 3-001-1592-30	5649 INDIAN HILLS DR	GS-1	621	2,797	2,156	2,237	1,453	185	350.68	-22.90	3.76	-35.07	-87.30
Irrigation Controllers/ Zone 37 - 3-001-1592-34	COCHRN/ ORNGWOD SPR	GS-1	41	46	47	41	37	29	12.20	2.17	-12.77	-9.76	-21.62
Irrigation Controllers/ Zone 37 - 3-001-1592-35	2448 PINEWOOD PL	GS-1	6	7	4	5	2	10	8.33	-38.46	25.00	-60.00	400.00
Irrigation Controllers/ Zone 13 - 3-001-1592-54	ROYAL AV/ NAPLES SPR	GS-1	90	70	68	60	49	96	-22.22	-2.86	-11.76	-19.17	97.94
Irrigation Controllers/ Zone 14A - 3-001-1592-56	2824 CHIPPEWA AVE	GS-1	6,619	6,148	6,074	4,855	2,927	2,536	-7.12	-1.20	-20.07	-39.72	-13.36
Irrigation Controllers/ Zone 64 - 3-001-1592-57	N FLANAGAN SLOPE SPR	GS-1	45	0	0	0	0	2	-100.00	--	--	--	--
Irrigation Controllers/ Zone 64 - 3-001-1592-58	3155 FLANAGAN DR	GS-1	0	2	3	7	2	165	--	25.00	160.00	-69.23	8125.00
Irrigation Controllers/ Zone 39 - 3-001-1592-68	SINALOA N/ O DODD SPR	GS-1	138	2	1	2	0	132	-98.55	-75.00	200.00	-100.00	--
Irrigation Controllers/ Zone 05 - 3-001-1592-70	W/ S SEQUOIA S/ COCH SPR	GS-1	125	0	0	0	0	3	-100.00	--	--	--	--
Irrigation Controllers/ Zone 45 - 3-001-1592-71	5217 ELOS ANGELES AVE	GS-1	66	51	42	35	47	68	-23.48	-16.83	-16.67	32.86	46.24
Irrigation Controllers/ Zone 65 - 3-001-1592-72	5236 HUNTLEY ST	GS-1	12	3	8	3	5	129	-78.26	200.00	-66.67	80.00	2755.56
Irrigation Controllers/ Zone 45 - 3-001-1592-74	2250 OAK HAVEN AVE	GS-1	65	10	11	7	4	5	-85.27	15.79	-40.91	-46.15	42.86
Irrigation Controllers/ Zone 39 - 3-001-1592-90	3794 COCHRAN ST	GS-1	0	0	0	3	10	12	--	--	--	233.33	15.00
Irrigation Controllers/ Zone 03 - 3-001-1592-91	2201 CARLSBAD CT	GS-1	12	13	9	12	9	11	4.17	-28.00	33.33	-29.17	29.41
Irrigation Controllers/ Zone 28 - 3-001-1592-92	S/ E C/ O SEQUA/ ALAMO	GS-1	68	75	63	68	65	62	10.29	-16.00	7.94	-4.41	-4.62
Irrigation Controllers/ Zone 28 - 3-001-1592-93	S/ E C/ O SEQUA/ COPFLD	GS-1	9	7	9	8	4	8	-22.22	21.43	-5.88	-50.00	100.00
Irrigation Controllers/ Zone 28 - 3-001-1592-94	N/ E C/ O SEQUA/ COPFLD	GS-1	84	85	84	82	70	69	1.19	-1.18	-2.38	-14.63	-1.43
Irrigation Controllers/ Zone 04 - 3-001-1592-95	N/ O 2996 KILAINE SPR	GS-1	1,222	1,981	1,884	1,816	1,950	1,852	62.11	-4.90	-3.61	7.38	-5.03
Irrigation Controllers/ Zone 32 - 3-001-1593-05	2768 BITTERNUT CIR	GS-1	95	81	83	80	90	79	-15.26	3.11	-4.22	13.21	-12.22
Irrigation Controllers/ Zone 15 - 3-001-1593-06	SEQUOIA W/ SN/ O ALAMO	GS-1	140	142	142	141	108	149	1.43	0.00	-0.70	-23.76	38.14
Irrigation Controllers/ Zone 04 - 3-001-1593-07	3491 1/ 2 ALAMO ST	GS-1	75	78	77	76	52	118	4.00	-1.28	-1.30	-32.24	129.13
Irrigation Controllers/ Zone 31 - 3-001-1593-08	3390 1/ 2 LAUREN ST	GS-1	135	127	146	90	66	3	-5.93	14.96	-38.36	-27.22	-95.42
Irrigation Controllers/ Zone 31 - 3-001-1593-30	2619 GEORGETTE PL	GS-1	0	0	0	0	0	2	--	--	--	--	--
Irrigation Controllers/ Zone 31 - 3-001-1593-31	2667 1/ 2 GEORGETTE PL	GS-1	0	0	0	0	0	3	--	--	--	--	--
Irrigation Controllers/ Zone 28 - 3-001-1593-33	3590 ALAMO ST	GS-1	65	72	67	61	51	157	10.77	-7.64	-8.27	-17.21	210.89
Irrigation Controllers/ Zone 04 - 3-001-1593-34	2932 1/ 2 SEQUOIA	GS-1	12	9	6	6	3	8	-26.09	-29.41	-8.33	-45.45	166.67
Irrigation Controllers/ Zone 31 - 3-001-1593-35	2715 CHERYL CT	GS-1	206	203	205	181	195	67	-1.46	0.99	-11.71	7.73	-65.64
Irrigation Controllers/ Zone 31 - 3-001-1593-36	2687 SASHA CT	GS-1	10	6	4	4	8	38	-45.00	-36.36	14.29	87.50	406.67
Irrigation Controllers/ Zone 29 - 3-001-1593-50	5556 HONEYMAN ST	GS-1	80	95	61	61	55	27	18.75	-35.79	0.00	-10.66	-51.38
Irrigation Controllers/ Zone 29 - 3-001-1593-51	5454 HONEYMAN ST	GS-1	2,340	3,305	2,120	1,590	2,007	2,472	41.22	-35.85	-25.00	26.23	23.14
Irrigation Controllers/ Zone 29 - 3-001-1593-52	5410 SANDIMAN ST	GS-1	69	14	7	9	7	4	-80.29	-51.85	30.77	-23.53	-38.46
Irrigation Controllers/ Zone 35 - 3-001-1593-53	RESERVOIR & ALAMO SPR	GS-1	218	203	206	200	201	69	-6.88	1.48	-2.91	0.50	-65.67
Irrigation Controllers/ Zone 32 - 3-001-1593-54	3050 SOUKA	GS-1	100	85	112	88	80	53	-15.00	31.76	-21.43	-9.66	-33.96
Irrigation Controllers/ Zone 35 - 3-001-1593-55	2607 SHRUBWOOD CIR	GS-1	57	7	10	6	5	7	-87.61	35.71	-36.84	-16.67	40.00
Irrigation Controllers/ Zone 32 - 3-001-1593-63	2624 NUTMEG CIR	GS-1	0	0	0	0	0	47	--	--	--	--	--
Irrigation Controllers/ Zone 31 - 3-001-1593-64	2625 SAMANTHA CT	GS-1	965	912	844	958	960	935	-5.49	-7.46	13.51	0.21	-2.60
Irrigation Controllers/ Zone 32 - 3-001-1593-65	2768 GUM CIR	GS-1	48	0	0	0	0	105	-100.00	--	--	--	--
Irrigation Controllers/ Zone 39 - 3-001-1593-95	1412 WILLOWBROOK LN	GS-1	78	4	4	2	4	160	-94.84	0.00	-50.00	100.00	3900.00
Irrigation Controllers/ Zone 39 - 3-001-1593-97	2795 ATHERWOOD AVE	GS-1	91	92	86	80	82	83	1.10	-6.52	-6.98	2.50	1.22
Irrigation Controllers/ Zone 39 - 3-001-1593-98	2379 KENTFIELD ST	GS-1	93	33	0	0	0	18	-64.52	-100.00	--	--	--
Irrigation Controllers/ Zone 39 - 3-001-1594-61	2249 ALAMO ST	GS-1	53	58	63	64	65	74	9.43	8.62	1.59	1.56	13.85
Irrigation Controllers/ Zone 12 - 3-001-1594-63	2805 N WOODROW AVE	GS-1	175	181	180	174	154	135	3.43	-0.55	-3.33	-11.49	-12.34

Table 64. Landscape irrigation annual electricity use by service account (2006-2011. Three of three).

Site Name-Account Number	Address	Rate Schedule	Electrical Use (kWh:2006)	Electrical Use (kWh:2007)	Electrical Use (kWh:2008)	Electrical Use (kWh:2009)	Electrical Use (kWh:2010)	Electrical Use (kWh:2011)	% Change in Use (2006 - 2007)	% Change in Use (2007 - 2008)	% Change in Use (2008 - 2009)	% Change in Use (2009 - 2010)	% Change in Use (2010 - 2011)
Irrigation Controllers/ Zone 39 - 3-001-1594-65	2392 BOALT AVE	GS-1	8	4	0	0	1	2	-50.00	-100.00	--	--	200.00
Irrigation Controllers/ Zone 02 - 3-001-1594-66	3898 GAINES CT	GS-1	0	0	0	0	0	4	--	--	--	--	--
Irrigation Controllers/ Zone 02 - 3-001-1594-67	3896 DILLER CT	GS-1	60	38	30	19	16	15	-37.50	-20.00	-36.67	-18.42	-3.23
Irrigation Controllers/ Zone 24 - 3-001-1594-86	NW/ CO ROYAL / CROCKR	GS-1	130	7	6	7	4	23	-94.62	-21.43	18.18	-46.15	557.14
Irrigation Controllers/ Zone 62 - 3-001-1594-87	TOWNSHIP W/ O YARDLEY	GS-1	95	96	100	101	79	73	1.05	4.17	1.00	-21.78	-7.59
Irrigation Controllers/ Zone 04 - 3-001-1595-05	3400 TOWNSHIP AVE	GS-1	144	101	58	53	45	30	-29.86	-42.57	-8.62	-15.09	-33.33
Irrigation Controllers/ Zone 15 - 3-001-1595-06	AV SIMI/ SEQUOIA N/ W SPR	GS-1	56	57	53	58	59	63	1.79	-7.02	9.43	1.72	6.78
Irrigation Controllers/ Zone 16 - 3-001-1595-09	3175 ALAMO ST	GS-1	8	9	8	6	4	3	6.25	-5.88	-25.00	-33.33	-25.00
Irrigation Controllers/ Zone 04 - 3-001-1595-10	3077 KILAINE DR	GS-1	67	67	69	74	60	62	0.00	2.99	6.52	-18.37	3.33
Irrigation Controllers/ Zone 26 - 3-001-1595-11	S/ PRESIDO W/ O VLRIE/ SPR	GS-1	3	0	0	0	0	4	-100.00	--	--	--	--
Irrigation Controllers/ Zone 15 - 3-001-1595-12	TOPAZ AV S/ O GEM CR SPR	GS-1	82	83	78	83	75	71	1.22	-6.02	6.41	-9.64	-5.33
Irrigation Controllers/ Zone 15 - 3-001-1595-13	IVORY AV S/ O AVEN SI SPR	GS-1	6	198	0	0	0	0	3500.00	-100.00	--	--	--
Irrigation Controllers/ Zone 25 - 3-001-1595-14	3429 LEORA ST	GS-1	0	0	0	0	0	1	--	--	--	--	--
Irrigation Controllers/ Zone 51 - 3-001-1595-15	3180 LEMON DRIV	GS-1	15	23	13	11	6	7	53.33	-45.65	-16.00	-42.86	16.67
Irrigation Controllers/ Zone 39 - 3-001-1595-16	1591 PRATHER ST	GS-1	45	8	8	6	6	133	-83.33	6.67	-25.00	0.00	2116.67
Irrigation Controllers/ Zone 39 - 3-001-7986-73	2468 1/ 2 TAPO CANYON RD	GS-1	79	97	65	63	65	66	22.78	-32.99	-3.08	3.17	0.77
Irrigation Controllers/ Zone 39 - 3-003-2638-04	3996 1/ 2 E LOS ANGELES AVE	GS-1	956	0	3	3	1	5,076	-100.00	--	20.00	-83.33	1015100.00
Irrigation Controllers/ Zone 39 - 3-003-3560-26	2307 1/ 2 TAPO CANYON	GS-1	85	11	12	15	9	87	-87.65	14.29	20.83	-41.38	923.53
Irrigation Controllers/ Zone 61 - 3-003-6723-21	C/ O ALAMO/ GLF MDOW SPR	GS-1	64	15	18	21	44	73	-76.56	16.67	17.14	114.63	65.91
Irrigation Controllers/ Zone 41A - 3-004-3788-38	SW COR FTZGRD/ SQUOA SPR	GS-1	332	0	0	4	6	11	-100.00	--	--	50.00	75.00
Irrigation Controllers/ Zone 41A - 3-004-3788-39	NW COR FITZGLD/ SEQU	GS-1	1	0	0	0	0	0	-100.00	--	--	--	--
Irrigation Controllers/ Zone 39 - 3-004-4384-35	2596 1/ 2 1ST	GS-1	0	0	0	0	0	0	--	--	--	--	--
Irrigation Controllers/ Zone 39 - 3-004-4438-03	2284 1/ 2 1ST ST	GS-1	0	0	24	11	9	6	--	--	-56.25	-19.05	-29.41
Irrigation Controllers/ Zone 39 - 3-004-4500-02	2170 1/ 2 1ST ST	GS-1	0	0	0	0	0	3	--	--	--	--	--
Irrigation Controllers/ Zone 39 - 3-004-6123-16	2801 1/ 2 N MADERA RD	GS-1	43	34	43	26	31	57	-20.93	25.00	-38.82	19.23	83.87
Irrigation Controllers/ Zone 39 - 3-005-6475-36	2600 1/ 2 STEARNS ST	GS-1	92	0	0	0	0	0	-100.00	--	--	--	--
Irrigation Controllers/ Zone 39 - 3-008-1762-24	2605 1/ 2 YOSEMITE AVE	GS-1	0	0	2	2	0	119	--	--	0.00	-100.00	--
Irrigation Controllers/ Zone 100 - 3-015-7669-40	3148 1/ 2 EMERALD AVE	GS-1	58	0	0	0	0	162	-100.00	--	--	--	--
Irrigation Controllers/ Zone 96 - 3-015-9912-36	300 1/ 2 STARGAZE	GS-1	162	0	0	0	0	0	-100.00	--	--	--	--
Irrigation Controllers/ Zone 96 - 3-015-9912-85	2090 1/ 2 MANDAN PLCE	GS-1	0	0	0	0	0	0	--	--	--	--	--
Irrigation Controllers/ Zone 39 - 3-015-9912-92	492 1/ 2 TIERRA REJADA RD	GS-1	0	0	0	0	0	0	--	--	--	--	--
Irrigation Controllers/ Zone 83 - 3-016-4135-01	2604 1/ 2 BRIARPATCH DR	GS-1	0	0	0	0	0	5	--	--	--	--	--
Irrigation Controllers/ Zone 83 - 3-016-4135-27	2886 1/ 2 ROYAL AVE	GS-1	104	88	82	79	83	74	-15.38	-6.82	-3.66	5.06	-10.84
Irrigation Controllers/ Zone 41B - 3-018-3481-78	749 1/ 2 SEQUOIA	GS-1	116	0	0	0	0	26	-100.00	--	--	--	--
Irrigation Controllers/ Zone 41B - 3-018-3482-23	617 1/ 2 SEQUOIA	GS-1	2,063	525	614	419	388	320	-74.55	16.95	-31.76	-7.40	-17.53
Irrigation Controllers/ Zone 39 - 3-019-1718-75	3701 1/ 2 LOS ANGELES	GS-1	136	122	132	148	119	123	-9.96	7.79	12.17	-19.32	2.94
Irrigation Controllers/ Zone 39 - 3-019-5249-81	4001 1/ 2 LOS ANGELES	GS-1	230	66	35	49	58	64	-71.30	-46.97	40.00	18.37	10.34
Irrigation Controllers/ Zone 96 - 3-020-2081-01	1882 1/ 2 SUMMERTIME	GS-1	31	109	138	168	181	178	251.61	26.61	21.74	7.74	-1.66
Irrigation Controllers/ Zone 39 - 3-022-9190-24	700 1/ 2 TIERRA REJADA	GS-1	1,020	0	0	0	0	120	-100.00	--	--	--	--
Irrigation Controllers/ Zone 34 - 3-025-6043-82	2581 CHANDLER AVE # B	GS-1	36	12	7	2	14	23	-66.67	-45.83	-69.23	575.00	70.37
Irrigation Controllers/ Zone 39 - 3-026-4970-16	2201 OLSEN RD	GS-2	1,956	1,880	7,240	11,440	6,040	5,360	-3.86	285.11	58.01	-47.20	-11.26
Irrigation Controllers/ Zone 74 - 3-027-9328-84	2515 1/ 2 YOSEMITE AVE	GS-1	7,724	0	0	0	0	2	-100.00	--	--	--	--
Irrigation Controllers/ Zone 39 - 3-031-0398-68	2069 1/ 2 KUEHNER DR I	GS-1	114	0	34	112	122	139	-100.00	--	227.94	9.42	13.93
Irrigation Controllers/ Zone 39 - 3-031-3927-06	1234 1/ 2 ERRINGER RD	GS-1	6	0	32	94	118	151	-100.00	--	198.41	25.53	27.97
Irrigation Controller/ Chumash P.S. - 3-032-1277-60	2960 1/ 2 CHUMASH AVE	PA-1	49	0	7,476	15,364	2,880	0	-100.00	--	105.52	-81.26	-100.00
Irrigation Controllers/ Zone 39 - 3-034-6168-39	801 1/ 4 MADERA RD	GS-1	300	0	0	0	2	0	-100.00	--	--	--	-100.00
			80,849	**29,221**	**39,685**	**46,711**	**25,171**	**70,244**	**-63.86**	**35.81**	**17.70**	**-46.11**	**179.07**

Other

The "other" category consists of a mix of electrical service account types. There are 18 electrical service accounts associated with this category. These accounts include the Metrolink Station, 3 lift stations associated with the conveyance of waste water, a water reclamation pump station, 5 CalTrans accounts, 6 residential accounts, a miscellaneous charge account and an unknown account.

The highest use occurs on the Metrolink Station account, which is driven by parking lot lighting, and the lift stations and water reclamation accounts, which are water-pumping operations.

Collectively, the other category accounted for 1.0% of total 2011 City electricity use. Electricity use associated with the other category has been variable from 2006 to 2011. These data and annual trends for specific accounts are given in Table 65.

Table 65. "Other" annual electricity use by service account (2006-2011).

Site Name - Account Number	Address	Rate Schedule	Electrical Use (kWh:2006)	Electrical Use (kWh:2007)	Electrical Use (kWh:2008)	Electrical Use (kWh:2009)	Electrical Use (kWh:2010)	Electrical Use (kWh:2011)	% Change in Use (2006 - 2007)	% Change in Use (2007 - 2008)	% Change in Use (2008 - 2009)	% Change in Use (2009 - 2010)	% Change in Use (2010 - 2011)
Wood Ranch Lift Station - 3-001-1589-52	LAKEPARK/WOODRCH AGR	PA-1	19,820	19,450	18,990	17,560	14,520	12,680	-1.87	-2.37	-7.53	-17.31	-12.67
Metrolink Station - 3-003-3331-02	5000 E LOS ANGELES AVE	GS2T-B	108,203	117,334	119,274	126,259	139,135	122,714	8.44	1.65	5.86	10.20	-11.80
NON-BLDG OTHER - 3-005-4095-44	670 W LOS ANGELES AVE # A	GS-1	134	42	116	148	124	267	-68.66	176.19	27.16	-15.93	115.32
Sanitation/ PS Facility - 3-016-0811-62	600 W LOS ANGELES AVE	MISC-CHARGES	0	0	0	0	0	0	--	--	--	--	--
Arroyo Lift Station - 3-017-8444-75	67 1/2 MORELAND RD	GS-1	3,374	2,925	3,201	3,275	3,072	2,779	-13.31	9.44	2.31	-6.20	-9.54
Water Reclamation Pump Station - 3-022-8970-18	600 1/2 W LOS ANGELES AVE	PA-2	28,970	83,080	34,720	39,040	36,880	45,980	186.78	-58.21	12.44	-5.53	24.67
Big Sky Lift Station - 3-029-4130-97	2451 1/2 LOST CANYONS RD	GS-1	0	4,148	6,434	6,269	6,539	6,593	--	55.11	-2.56	4.31	0.83
Residential - 3-032-6578-96	1225 FITZGERALD RD APT C	DOMESTIC	89	0	59	165	122	4,276	-100.00	--	182.05	-26.36	3419.34
Caltrans - 3-033-3614-45	2360 1/4 KUEHNER DR	GS-1	1,880	0	0	6,285	8,042	7,539	-100.00	--	--	27.95	-6.25
Caltrans - 3-033-3614-63	2581 1/4 STEARNS ST	GS-1	331	0	0	3,189	7,347	6,651	-100.00	--	--	130.39	-9.48
Caltrans - 3-033-3614-74	2581 1/4 KADOTA ST	GS-1	327	0	0	1,773	3,073	3,340	-100.00	--	--	73.32	8.69
Caltrans - 3-033-3614-83	2534 1/4 TAPO ST	GS-1	171	0	0	3,498	7,333	6,395	-100.00	--	--	109.65	-12.79
Caltrans - 3-033-3614-92	2534 1/4 TAPO CANYON RD	GS-1	318	0	0	2,501	5,116	7,149	-100.00	--	--	104.58	39.74
Residential - 3-036-0065-98	1143 TIVOLI LN UNIT 105	DOMESTIC	118	0	0	0	76	195	-100.00	--	--	--	158.28
Residential - 3-036-4658-96	1125 FITZGERALD RD APT E	DOMESTIC	9	0	0	0	2	1,320	-100.00	--	--	--	87900.00
Residential - 3-036-6502-37	284 MIDNIGHT MOON LN	DOMESTIC	45	0	0	0	0	177	-100.00	--	--	--	--
Residential - 3-037-0890-42	1007 WALTHAM RD APT E	DOMESTIC	16	0	0	0	0	572	-100.00	--	--	--	--
Residential - 3-037-8120-16	1079 WALTHAM RD APT E	DOMESTIC	40	0	0	0	0	0	-100.00	--	--	--	--
		Totals:	**163,842**	**226,979**	**182,793**	**209,960**	**231,378**	**228,625**	**38.54**	**-19.47**	**14.86**	**10.20**	**-1.19**

SUMMARY AND CONCLUSIONS

Summary of Goals

The City will implement the Energy Action Plan (EAP) so that it can fulfill the goals of a 20% energy use reduction, on an aggregate basis for its facilities, by 2020 as compared to 2006. The EAP actions apply to eight City facilities: City Hall, Cultural Arts Center, Development Services, Police Department, Senior Center, Sanitation/Waterworks, Public Services Facility and Transit Facility.

The EAP will be used to identify and implement a sufficient number of cost-effective projects so that the City may achieve a 20 percent reduction in energy use and advance to the "Platinum" or highest tier, in the ELP program.

The EAP will be used to reduce energy use in provided city services as well, including reducing energy used to move and treat water.

City staff from the Public Works, Administrative Services, and Environmental Services Departments, and decision makers, will select specific energy efficiency projects that could be implemented in the near future, and in the long-term, for City facilities. The city will make energy efficiency and conservation a standard practice by including funds for these projects in the City's facility maintenance budget.

Summary of Key Findings and Future Actions

The EAP investigated electricity use, gas use and greenhouse gas (GHG) emissions for all City of Simi Valley service accounts from 2006 to 2011. The analysis focused on total energy use, "building" energy use (for 8 individual City facilities) and "non-building" energy use (broken into the categories of water delivery, street lighting, traffic signal lighting, landscape irrigation and "other"). Energy use trends were analyzed on annual, monthly and 15-minute bases. Both historic and prospective future energy conservation measures (ECMs) were compiled. These measures list energy, cost and GHG performance where possible. On-site renewable energy systems were also investigated as a means of reducing costs and GHG emissions. The key findings of the Energy Action Plan along with historic achievements and future opportunities are summarized here:

Total Energy

In 2011, total energy use was composed of 66% electricity and 34% natural gas. In 2011, total GHG emissions consisted of 75% from electricity and 25% from natural gas sources (Table 66). Therefore, electricity based ECMs will have a greater impact on GHG reductions than natural gas based ECMs for an equivalent amount of energy reduction.

Table 66. Total percent energy and GHG emissions by energy source.

	Electricity	Gas
Total 2011 Energy Use (%)	66%	34%
Total 2011 Greenhouse Gas Emissions (%)	75%	25%

In 2011, 66% of total energy use was associated with buildings. Breaking this down by fuel source, 49% of total electricity use and 100% of total natural gas use was in buildings (Table 67). It should be noted that "buildings" are defined as the 8 main facilities operated by the City and include the non-building operations of the Sanitation Plant and the Transit Facility.

Table 67. Total percent energy use by type ("building" and "non-building").

	Building Energy	Non-Building Energy
Total 2011 Energy Use (%)	66%	34%
Total 2011 Electricity Use (%)	49%	51%
Total 2011 Natural Gas Use (%)	100%	0%

Total energy use has been reduced by 2.5% from 2006 to 2011. This total consists of a 7.1% reduction in electricity use and 7.9% increase in gas use (Table 68).

Table 68. Total energy use in 2006 and 2011 and percent change from 2006 baseline.

	2006	2011	Percent Change from 2006
Total Energy Use (MMBTU/yr)	120,010	117,026	-2.5%
Total Electricity Use (kWh/yr)	24,339,679	22,611,915	-7.1%
Total Natural Gas Use (Therms/yr)	369,599	398,709	7.9%

Total GHG emissions have been reduced by 6.0% from 2006 to 2011. This total consists of a 9.8% reduction in electricity based GHG emissions and a 7.9% increase in gas based GHG emissions (Table 69).

Table 69. Total GHG emissions in 2006 and 2011 and percent change from 2006 baseline.

	2006	2011	Percent Change from 2006
Total Energy Based GHG Emissions (Metric Ton CO_2e)	9,082	8,541	-6.0%
Total Electricity Based GHG Emissions (Metric Ton CO_2e)	7,118	6,422	-9.8%
Total Natural Gas Based GHG Emissions (Metric Ton CO_2e)	1,965	2,119	7.9%

Potable water supply is the single largest source of electricity use (33.8%), followed by waste water treatment (32.6%), street and traffic signal lighting (15.9%), with the balance largely found in buildings (Figure 51). Water conservation will play a key role in energy conservation.

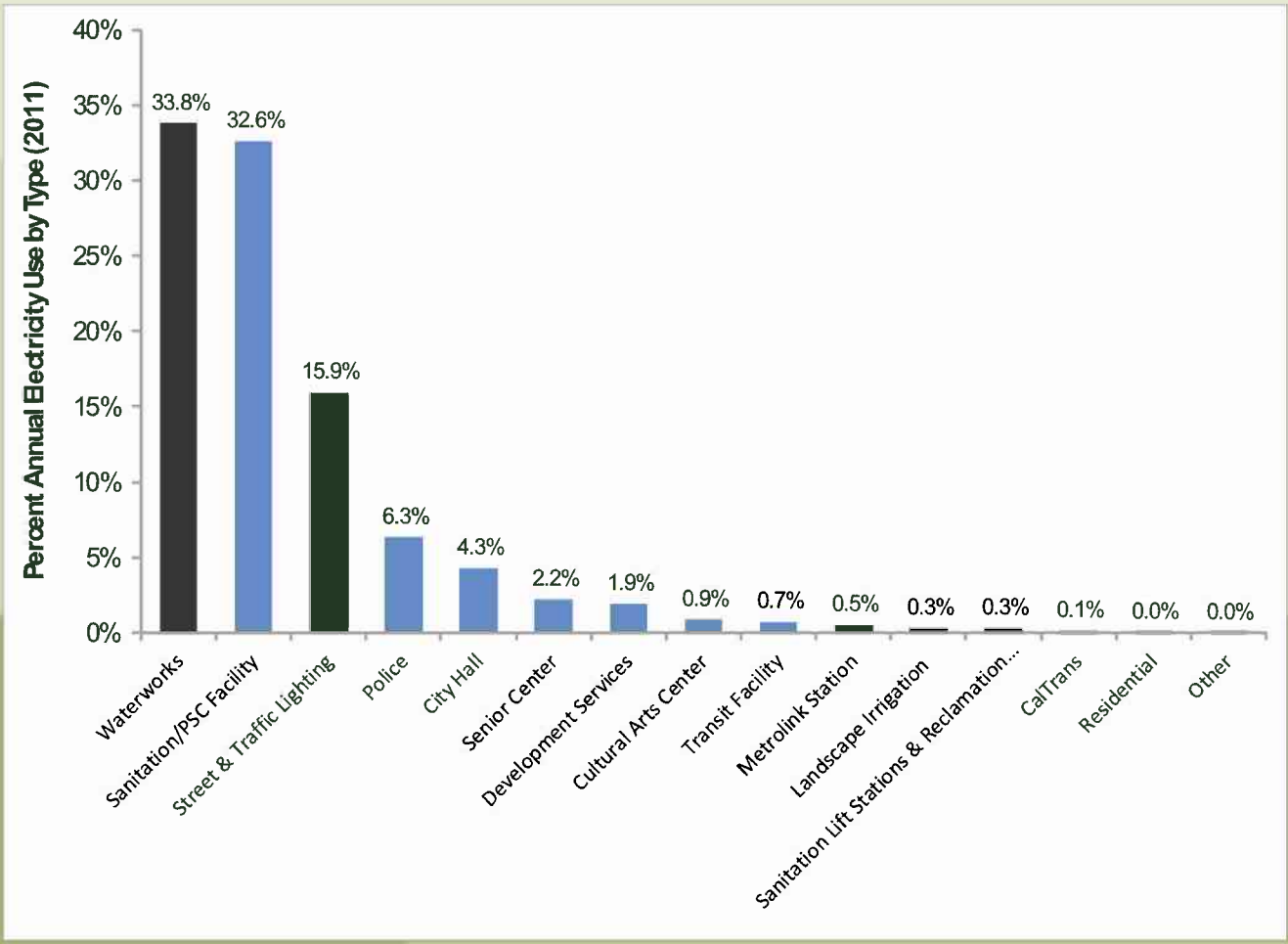

Figure 51. Total percent annual electricity use by source (2011).

Public transportation is the single largest source of natural gas use (68.8%), followed by waste water treatment (14.9%), with the balance found in buildings (Figure 52).

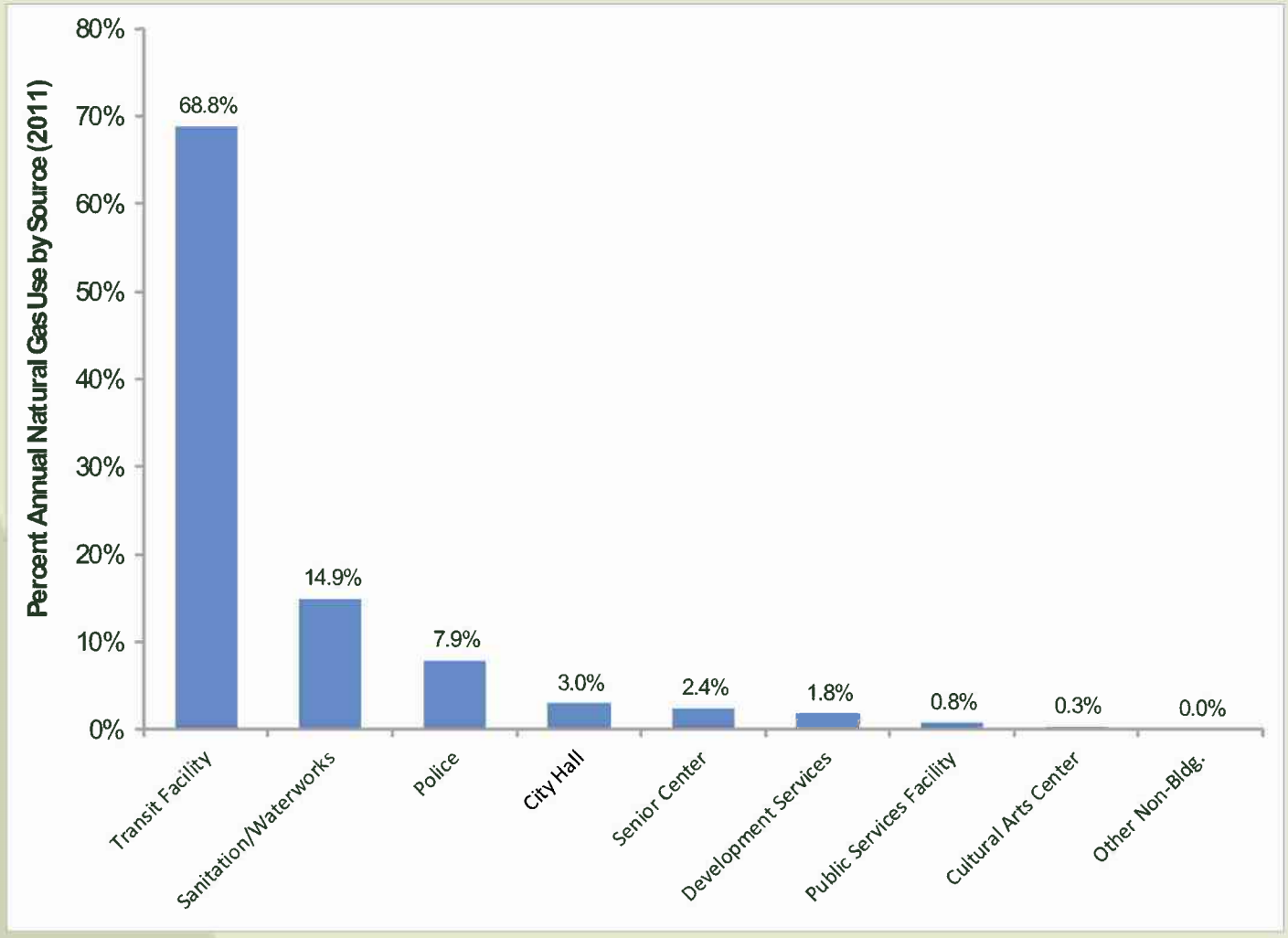

Figure 52. Total percent annual natural gas use by source (2011).

In most cases, major gains in electricity use reduction have been achieved from 2006 to 2011. Through its Local Government Partnership with SCE, the City has had a strong focus on electrical efficiency projects. This partnership has been highly successful. However, in many cases, gas use has increased from 2006 to 2011. The City will seek a closer relationship with Southern California Gas (SCG) to make gains in gas use efficiency. However, since 68.8% of total 2011 natural gas consumption was used to fuel the City's public transportation this may be challenging. A major reduction in utility gas use at the Sanitation Plant may be possible by installing a cogeneration plant to utilize the renewable biogas produced there. This site accounted for 14.9% of total natural gas consumption in 2011. This measure will substantially reduce GHG emissions, as the biogas is currently flared.

Building Energy

Building energy use has increased by 1.0% from 2006 to 2011. This total consists of a 5.6% reduction in electricity use and 8.1% increase in gas use (Table 70).

Table 70. Building energy use in 2006 and 2011 and percent change from 2006 baseline.

	2006	*2011*	*Percent Change from 2006*
Building Energy Use (MMBTU/yr)	76,904	77,645	1.0%
Building Electricity Use (kWh/yr)	11,737,474	11,075,116	-5.6%
Building Natural Gas Use (Therms/yr)	368,544	398,548	8.1%

Building GHG emissions have been reduced by 2.4% from 2006 to 2011. This total consists of an 8.4% reduction in electricity based GHG emissions and an 8.1% increase in gas based GHG emissions (Table 71).

Table 71. Building GHG emission in 2006 and 2011 and percent change from 2006 baseline.

	2006	2011	Percent Change from 2006
Building Energy Based GHG Emissions (Metric Ton CO_2e)	5,391	5,264	-2.4%
Building Electricity Based GHG Emissions (Metric Ton CO_2e)	3,432	3,145	-8.4%
Building Natural Gas Based GHG Emissions (Metric Ton CO_2e)	1,959	2,119	8.1%

Electricity use in 2011 was less than in 2006 in 5 of 7 facilities and natural gas use in 2011 was less than in 2006 in 2 of 7 facilities (Figure 53. In this case, the Sanitation/Waterworks and the Public Services Facility are treated as a single facility as they are all on the same electrical service account).

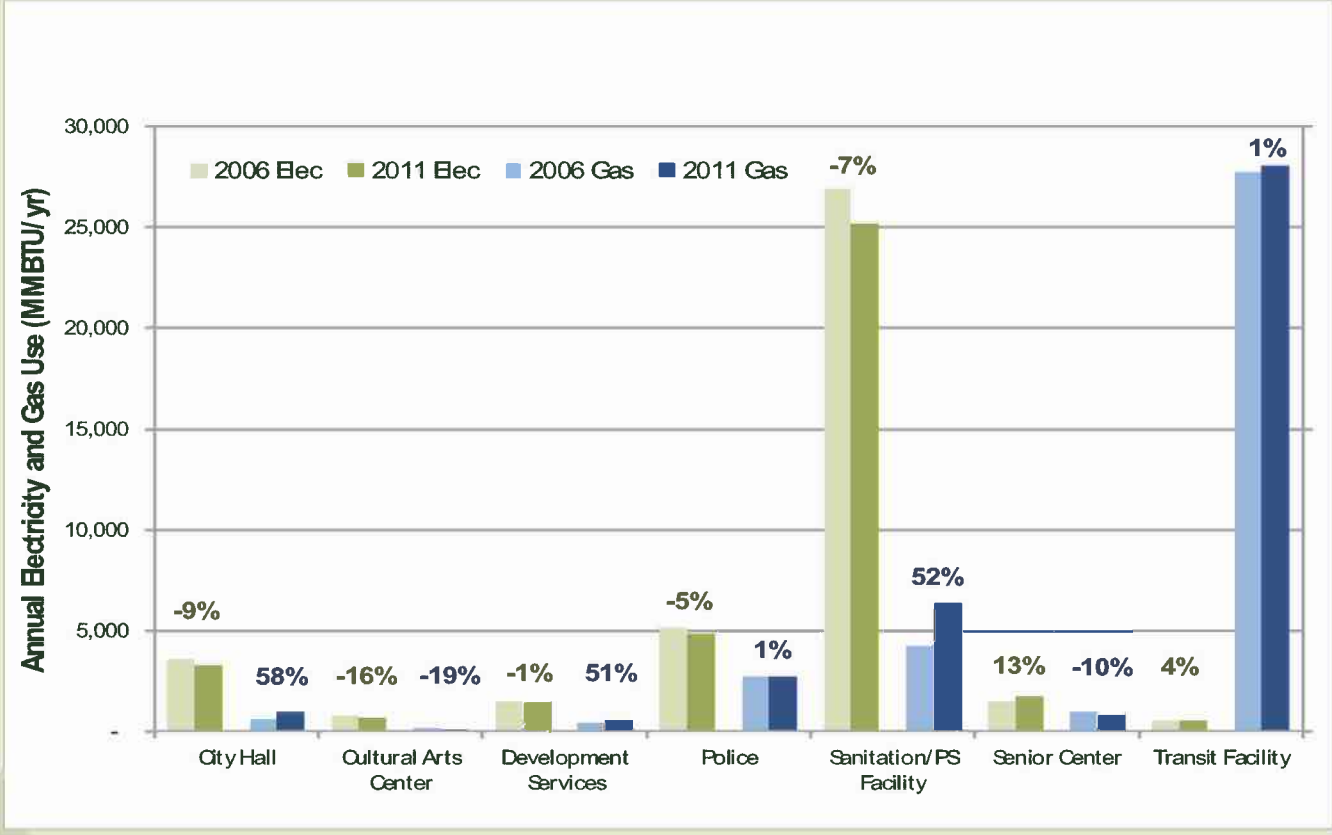

Figure 53. Annual electricity and gas use for main City facilities in 2006 and 2011 and percent change from 2006 baseline.

Electricity: From 2006 to 2011, a total 5.6% reduction in electricity use was achieved across all City facilities. ECMs that provide an additional 6.7% reduction potential have been identified. This leads to a total reduction potential of 12.4% for City facilities relative to 2006 (Table 72).

Natural Gas: From 2006 to 2011, a total 8.1% increase in natural gas use has occurred across all City facilities. ECMs that provide a 0.6% reduction in natural gas use have been identified (Table 73).

Total Energy: On-site renewable energy systems can play a key role in reducing GHG emissions. Total building energy use has increased 1.0% from 2006 to 2011. ECMs that provide an additional 3.8% reduction potential in total energy use have been identified. Solar PV systems that can provide an estimated 13.0% reduction potential in total energy use have been identified. A cogeneration plant operating on renewable biogas at the Sanitation Plant that can provide an estimated 24.7% reduction potential in total energy use has been identified. Combining all ECMs and renewable energy leads to an overall building energy reduction potential of 40.5% relative to 2006 (Table 74).

Historic and potential ECMs for specific facilities are outlined in previous sections. The City will prioritize the implementation of ECMs based on a combination of fast payback period and the size of the energy use reduction (Table 75 – Table 79). Appendix B shows the calculation methods and assumptions for the ECMs. All implemented and proposed ECMs will be documented using a standardized template (Table 80).

Retro-commissioning (RCx) can play a significant role in identifying and implementing low and no-cost ECMs. The City facilities thought to benefit the most from RCx are the City Hall, Police Department and possibly the Senior Center. Refer to the City's Retro-Commissioning policy for further details.

ENERGY STAR's Portfolio Manager accounts have been created for the City's 8 main facilities. Monthly data spans 2006 to the present and is automatically updated electronically by the utilities. The City will use these accounts to track progress toward energy reduction goals on an annual basis. Refer to the City's Benchmarking policy for further details.

The City is also using McKinstry's EEM system to track electricity use on a 15-minute basis. EEM will be used to sub-meter and measure and verify ECMs at high resolution. Refer to the City's Benchmarking policy for further details.

Table 72. Building based historic and potential ECMs (electricity).

Site Name & Service Account	Measured Electrical Use (kWh:2006)	Measured Electrical Use (kWh:2011)	Measured Electrical Use Change 2006-2011 (kWh)	Measured Percent Change from 2006 Baseline (%)	Potential Future ECM Reduction (kWh)	Potential ECM Percent Reduction from 2006 Baseline (%)	Total Change from 2006 with Historic and Future ECMs (%)
City Hall	1,062,012	971,067	-90,945	-8.6%	-161,434	-15.2%	-23.8%
Cultural Arts Center	234,720	197,647	-37,073	-15.8%	-5,829	-2.5%	-18.3%
Development Services	439,400	433,840	-5,560	-1.3%	-10,725	-2.4%	-3.7%
Police Department	1,504,738	1,430,850	-73,888	-4.9%	-216,461	-14.4%	-19.3%
Public Services Facility	NA	NA	NA	NA	NA	NA	NA
Sanitation/Waterworks	7,891,940	7,374,786	-517,154	-6.6%	-309,561	-3.9%	-10.5%
Senior Center	445,120	500,880	55,760	12.5%	-45,163	-10.1%	2.4%
Transit Facility	159,544	166,046	6,502	4.1%	-42,088	-26.4%	-22.3%
Totals	**11,737,474**	**11,075,116**	**-662,358**	**-5.6%**	**-791,261**	**-6.7%**	**-12.4%**

Table 73. Building based historic and potential ECMs (natural gas).

Site Name & Service Account	Measured Natural Gas Use (Therms: 2006)	Measured Natural Gas Use (Therms: 2011)	Measured Gas Use Change 2006-2011 (Therms)	Measured Percent Change from 2006 Baseline (%)	Potential Future ECM Reduction (Therms)	Potential ECM Percent Reduction from 2006 Baseline (%)	Total Change from 2006 with Historic and Future ECMs (%)
City Hall	6,356	10,062	3,706	58.3%	0	0.0%	58.3%
Cultural Arts Center	1,697	1,367	-330	-19.4%	0	0.0%	-19.4%
Development Services	4,184	6,322	2,138	51.1%	-2,138	-51.1%	0.0%
Police	27,330	27,637	307	1.1%	0	0.0%	1.1%
Public Services Facility	4,131	3,214	-917	-22.2%	0	0.0%	-22.2%
Sanitation Facility	38,100	60,872	22,772	59.8%	0	0.0%	59.8%
Senior Center	9,599	8,682	-917	-9.6%	0	0.0%	-9.6%
Transit Facility	277,147	280,392	3,245	1.2%	0	0.0%	1.2%
Totals	**368,544**	**398,548**	**30,004**	**8.1%**	**-2,138**	**-0.6%**	**7.6%**

Table 74. Building based historic and potential ECMs and renewable energy potential (total energy).

Site Name	Measured Total Energy Use (kBTU: 2006)	Measured Total Energy Use Change from 2006 Baseline (kBTU: 2011)	Potential Future ECM Reduction (kBTU)	Potential Future Solar PV Reduction (kBTU)	Potential Future Cogen Reduction (kBTU)	Measured Percent Change from 2006 Baseline (%)	Potential ECM Percent Reduction from 2006 Baseline (%)	Potential PV Percent Reduction from 2006 Baseline (%)	Potential Cogen Percent Reduction from 2006 Baseline (%)	Potential Total Percent Reduction from 2006 Baseline (%)
City Hall	4,260,247	60,205	-550,975	-2,544,030	0	1.4%	-12.9%	-59.7%	-	-71.2%
Cultural Arts Center	970,799	-159,530	-19,895	0	0	-16.4%	-2.0%	0.0%	-	-18.5%
Development Services	1,918,072	194,824	-250,404	-1,170,499	0	10.2%	-13.1%	-61.0%	-	-63.9%
Police Department	7,868,671	-221,480	-738,780	-2,583,171	0	-2.8%	-9.4%	-32.8%	-	-45.0%
Public Services Facility	413,100	-91,700	NA	-879,085	0	-22.2%	NA	-212.8%	-	-235.0%
Sanitation/Waterworks	30,745,191	512,153	-1,056,532	-528,149	-18,999,419	1.7%	-3.4%	-1.7%	-61.8%	-65.3%
Senior Center	2,479,095	98,609	-154,141	-1,527,119	0	4.0%	-6.2%	-61.6%	-	-63.8%
Transit Facility	28,259,224	346,691	-143,646	-739,304	0	1.2%	-0.5%	-2.6%	-	-1.9%
Totals	**76,914,399**	**739,772**	**-2,914,374**	**-9,971,357**	**-18,999,419**	**1.0%**	**-3.8%**	**-13.0%**	**-24.7%**	**-40.5%**

Table 75. Master list of potential ECMs, prioritized by payback period (one of five).

Facility or Service Type	SCE Service Account	Measure Name/ Description	Details	Measure Status (Year Imp-lemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Invest-ment (%)
Transit Facility	3-014-9929-25	Lighting Schedule	Schedule site lighting OFF after gates are locked	Future	21,000	12,732	$3,888	$100	$0	$100	0.0	15	58227%
City Hall	3-000-9628-04	Tighten schedule of operation	Schedule HVAC on at 6 AM vs 5 AM and off at 6 PM vs 10 PM. 20 kW reduction on weekdays.	Future	15,600	9,767	$2,061	$100	$0	$100	0.0	5	10205%
Transit Facility	3-014-9929-25	Air Compressor	Decrease air compressor setpoint	Future	1,000	606	$185	$10	$0	$10	0.1	10	18416%
Development Services	3-001-1589-86 & 3-012-8406-44	HVAC controls	Reduce run hours of HVAC equipment by 1300h per year	Future	10,725	6,715	$1,606	$150	$0	$150	0.1	10	10604%
Police Department	3-014-3193-86	10% reduction in baseload power	Reduce unnecessary loads at night by 10% (15 kW reduction from current baseload of 150 kW)	Future	131,400	82,271	$15,712	$2,500	$0	$2,500	0.2	10	6185%
Sanitation/ Waterworks	3-012-2965-23	Anoxic mixer timing control	Installation of timers for all 21 anoxic mixers.	Future	167,846	101,760	$15,961	$6,500	$3,250	$3,250	0.2	10	4811%
City Hall	3-000-9628-04	10% reduction in baseload power	Reduce unnecessary loads at night by 10% (7.5 kW reduction	Future	65,700	41,136	$8,680	$2,000	$0	$2,000	0.2	5	2070%

			from current baseload of 75 kW)										
Public Services Center	3-012-2965-23	Lighting retrofit	Replace outdoor soffitt lighting with fluorescent or LED lights. Assume 125W Par 38 to 23W fluorescent	Future	5,018	3,142	$477	$120	$0	$120	0.3	10	3877%
City Hall	3-000-9628-04	De-lamp fixtures in open office area	Open office area has lighting levels of 70 f.c. at the work surface - 1/3 of bulbs could be removed or shut off at bi-level switch	Future	21,910	13,718	$2,895	$1,000	$0	$1,000	0.3	10	2795%

Table 76. Master list of potential ECMs, prioritized by payback period (two of five).

Facility or Service Type	SCE Service Account	Measure Name/ Description	Details	Measure Status (Year Imp-lemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Invest-ment (%)
City Hall	3-000-9628-04	Automatic shutdown software on computers	Shuts down 167 computers when not in use	Future	50,100	31,368	$6,619	$4,175	$1,500	$2,675	0.4	7	1632%
Police Department	3-014-3193-86	PC auto-shutdown	Shuts down 120 computers when not in use	Future	36,000	22,540	$4,305	$3,000	$1,200	$1,800	0.4	10	2291%
City Hall	3-000-9628-04	Increase thermostat lower setpoint	Limit thermostat setpoint to 72°F in cooling mode	Future	1,680	1,052	$222	$100	$0	$100	0.5	5	1010%

		limit											
Cultural Arts Center	3-010-0314-31	Lighting	Replace 72 incandescent lamps with CFLs	Future	4,147	2,597	$747	$720	$315	$405	0.5	7	1191%
Sanitation/ Waterworks	3-012-2965-23	Lighting retrofit	35 lamp retrofit of 50W HID to 26 W CFLs (Exterior)	Future	6,665	4,041	$634	$364	$0	$364	0.6	10	1641%
Transit Facility	3-014-9929-25	Lighting retrofit	14 lamp retrofit of 7 incandescent exit signs with LED exit signs	Future	1,717	1,041	$318	$385	$189	$196	0.6	15	2333%
Police Department	3-014-3193-86	Lighting retrofit	Replace incandescent bulbs in 4 fixtures with LED or Fluorescent bulbs	Future	1,798	1,126	$215	$140	$0	$140	0.7	10	1435%
Police Department	3-014-3193-86	Lighting retrofit	75 lamp retrofit of fluorescent exit signs with LED exit signs	Future	11,826	7,404	$1,414	$2,063	$1,125	$938	0.7	10	1408%
Police Department	3-014-3193-86	Vending machine control	Controllers on 2 refrigerated beverage machines	Future	2,400	1,503	$287	$400	$200	$200	0.7	5	617%
Senior Center	3-001-1590-47	Lighting retrofit	Replace 12x halogen flood bulbs with LED or compact fluorescent flood bulbs	Future	4,920	2,983	$1,096	$1,200	$420	$780	0.7	10	1306%
Cultural Arts Center	3-010-0314-31	Lighting	Replace 12 incandescent exit sign lamps with LEDs	Future	1,682	1,053	$303	$660	$324	$336	1.1	10	802%

Table 77. Master list of potential ECMs, prioritized by payback period (three of five).

Facility or Service Type	SCE Service Account	Measure Name/ Description	Details	Measure Status (Year Imp-lemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Invest-ment (%)
Public Services Facility	3-012-2965-23	Lighting retrofit	14 lamp retrofit of 7 incandescent exit signs with LED exit signs	Future	1,717	1,075	$163	$385	$189	$196	1.2	10	733%
Sanitation/ Waterworks	3-012-2965-23	Motor retrofit	Applied Pump #2. Replace 32 year old 50 HP motor with premium efficiency motor	Future	30,336	18,392	$2,885	$3,500	$0	$3,500	1.2	20	1548%
Sanitation/ Waterworks	3-012-2965-23	Motor retrofit	Applied Pump #3. Replace 32 year old 50 HP motor with premium efficiency motor	Future	30,336	18,392	$2,885	$3,500	$0	$3,500	1.2	20	1548%
Sanitation/ Waterworks	3-012-2965-23	Motor retrofit	WAS Pumps #1. Replace 26 year old 15 HP motor with premium efficiency motor	Future	9,101	5,518	$865	$1,050	$0	$1,050	1.2	20	1548%
Public Services Facility	3-012-2965-23	HVAC controls	Replace thermostats or timers	Future	5,000	3,131	$475	$600	$0	$600	1.3	5	296%
Senior Center	3-001-1590-47	Lighting retrofit	Replace 12x Incandescent accent bulbs with LED or compact fluorescent	Future	2,460	1,491	$548	$1,200	$420	$780	1.4	10	603%
Senior Center	3-001-1590-47	Lighting retrofit	Replace 85x 50W MR-16 pin base architectural lights with LED bulbs	Future	10,455	6,339	$1,467	$2,125	$0	$2,125	1.4	10	590%
Public Services	3-012-2965-	Lighting retrofit	Evaluate de-lamping fixtures	Future	13,120	8,215	$1,248	$2,000	$0	$2,000	1.6	15	836%

Facility	23												
Public Services Facility	3-012-2965-23	Vending machine control	Controllers on 2 refrigerated beverage machines	Future	2,400	1,503	$228	$600	$200	$400	1.8	5	185%
Transit Facility	3-014-9929-25	Lighting retrofit	Retrofit 8' T-12 fixtures with T-8 28W fixtures	Future	7,921	4,802	$1,467	$2,875	$0	$2,875	2.0	15	665%
Police Department	3-014-3193-86	Lighting retrofit	100 lamp retrofit of 90W metal halide with 70W pulse start metal halide.	Future	8,280	5,184	$990	$3,500	$1,500	$2,000	2.0	5	148%

Table 78. Master list of potential ECMs, prioritized by payback period (four of five).

Facility or Service Type	SCE Service Account	Measure Name/ Description	Details	Measure Status (Year Imp-lemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Invest-ment (%)
City Hall	3-000-9628-04	Replace incandescent canister lights with LED fixtures	Replace 6x 75W incandescent downlights with 18W LED fixtures	Future	1,636	1,024	$216	$700	$210	$490	2.3	10	341%
City Hall	3-000-9628-04	Vending machine controllers	Controllers on 3 refrigerated beverage machines	Future	1,200	751	$159	$600	$225	$375	2.4	5	111%
City Hall	3-000-9628-04	Replace 8' T-12 fixtures in storage area	Replace 10x 2 bulb 8 foot T-12 fluorescent fixtures with 2x28W 4' T-8 fixtures	Future	1,558	975	$206	$950	$250	$700	3.4	10	194%

Sanitation/ Waterworks	3-012-2965-23	Motor retrofit	Screened Sludge Circulation #1. Replace 22 year old 25 HP motor with premium efficiency motor	Future	4,424	2,682	$421	$1,750	$0	$1,750	4.2	20	381%
Sanitation/ Waterworks	3-012-2965-23	Motor retrofit	Screened Sludge Circulation #2. Replace 22 year old 25 HP motor with premium efficiency motor	Future	4,424	2,682	$421	$1,750	$0	$1,750	4.2	20	381%
Senior Center	3-001-1590-47	Lighting retrofit	41 lamp retrofit of HID fixtures with induction fixtures in parking areas	Future	27,328	16,568	$3,835	$20,500	$3,075	$17,425	4.5	10	120%
City Hall	3-000-9628-04	Install lighting occupancy sensors	Install occupant sensing on additional private offices, conference rooms, and storage areas	Future	2,050	1,284	$271	$2,000	$700	$1,300	4.8	10	108%
Transit Facility	3-014-9929-25	Lighting retrofit	Replace exterior 8' T-12 exterior lighting with T-8 bulbs and ballasts	Future	6,451	3,911	$1,195	$6,000	$0	$6,000	5.0	15	199%

Table 79. Master list of potential ECMs, prioritized by payback period (five of five).

Facility or Service Type	SCE Service Account	Measure Name/ Description	Details	Measure Status (Year Imp-lemented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Invest-ment (%)
Police Department	3-014-3193-	Lighting retrofit	46 lamp retrofit of HID fixtures with induction	Future	24,757	15,501	$2,960	$23,000	$3,450	$19,550	6.6	10	51%

	86		fixtures in parking areas										
Sanitation/ Waterworks	3-012-2965-23	Lighting retrofit	27 lamp retrofit of 75W mercury vapor lamps with 2 -26 W CFLs	Future	203	123	$19	$170	$0	$170	8.8	10	14%
Transit Facility	3-014-9929-25	Lighting retrofit	28 lamp retrofit of 250 W HPS to 4-lamp T5 HO fixtures	Future	3,998	2,503	$740	$7,000	$0	$7,000	9.5	15	59%
Sanitation/ Waterworks	3-012-2965-23	Lighting retrofit	Retrofit 152 T12 fixtures and magnetic ballast with T8 lighting and electronic ballasts	Future	5,066	3,071	$482	$13,832	$2,100	$11,732	24.4	10	-59%
Public Services Facility	3-012-2965-23	HVAC retrofit	Replace 6 old HVAC with high efficiency package unit	Future	23,905	14,967	$2,273	$57,000	$0	$57,000	25.1	10	-60%
Senior Center	3-001-1590-47	Controls retrofit	Add HVAC points on the building's energy management system and control HVAC to minimize reheat energy	Future	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Totals & Averages	791,261	488,640	$94,044	$182,274	$20,842	$161,432	2.9		3259%

Current Total Annual Electricity Usage (2011)	11,075,116
ECM Electricity as a Percent of Current Annual Electric Usage	7.1%

Table 80. Standardized template for tracking future energy conservation measures.

Facility Name	SC Edison Service Account #	SC Gas Service Account #	Measure Name/ Description	Details	Measure Status (Month & Year Imple-mented)	Annual Energy Savings (kWh/yr)	Annual GHG Emission Reduction (Lbs CO_2/year)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Rebates ($)	Installed Cost-After Rebates ($)	Payback Period (Years)	Estimated Project Lifetime (Years)	Return on Investment (%)
City Hall	3-000-9628-04	NA	Controls: Optimized scheduling of HVAC operation	EMS used to schedule HVAC to operate on City "flex" schedule	9/2013	5,000	3,173	$600	$500	$0	$500	0.8	5	500%
City Hall	3-000-9628-04	NA	Component replacement: Economizer dampers replaced	5 rusted out dampers replaced	9/2013	15,000	9,519	$1,800	$12,500	$1,500	$11,000	6.1	7	15%
City Hall	3-000-9628-04	NA	Retrofit: HVAC unit replaced	1 new 5 ton rooftop package unit replaced with 15 SEER unit	9/2013	10,000	6,261	$1,200	$10,000	$1,000	$9,000	7.5	15	100%
				Totals & Averages		30,000	18,953	$3,600	$23,000	$2,500	$20,500	5		205%
				Current Annual Electricity Usage (2011)		971,067								

ECM Electricity as a Percent of Current Annual Electric Usage	3.1%

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APPENDIX A – RENEWABLE ENERGY

Introduction

Based on the analysis of the City's historic energy use, implementation of energy conservation measures between 2006 and 2011, and the expected savings from future energy conservation measures, the City will consider implementing renewable energy measures after maximizing energy efficiency and demand reduction opportunities in order to achieve a 20 percent reduction in energy use.

Solar Photovoltaic Analysis

The potential to establish site solar photovoltaic (PV) arrays at City facilities was investigated. PV produces renewable energy, with no GHG emissions or fuel costs. Both rooftop and carport PV arrays were analyzed. The analysis used the California Solar Initiative (CSI) PV calculator to determine output from a horizontal array under the solar irradiance conditions found in Simi Valley. The base array utilized Sharp 240 Watt (ND-240QCJ) panels and a Satcon 30 kW, 208V inverter. In this scenario, the system produces 11.71 Watts AC per square foot (SF) of array and 18.92 kilowatt-hours per square foot per year (kWh/SF*yr).

Using aerial views of rooftop conditions, a viable area for PV was estimated as a percent of total roof area. Next, annual energy production from the rooftop PV array was compared to annual electricity use in 2006 at the site. The results of the analysis can be found in Table A1.

Table A1. Estimated rooftop solar PV potential by site.

Site Name	Total Roof Area (SF)	Percent Roof Viable for PV (%)	Viable Roof Area (SF)	Rooftop PV Output (kWh/yr)	2006 Facility Electricity Use (kWh/yr)	Rooftop PV Annual Electricity as Percent of 2006 Use (%)
City Hall	43,771	40%	17,508	331,286	1,062,012	31%
Cultural Arts Center	12,105	0%	0	0	234,720	0%
Development Services	18,125	50%	9,063	171,477	439,400	39%
Police Department	50,000	30%	15,000	283,823	1,504,738	19%
Public Services Facility	18,150	15%	2,723	51,514	NA	NA
Sanitation/Waterworks	18,174	15%	2,726	51,582	7,891,940	1%
Senior Center	29,559	0%	0	0	445,120	0%
Transit Facility	12,720	60%	7,632	144,409	159,544	91%

A similar exercise was used to estimate the viable area for PV in carport applications. Parking areas were estimated as a percent of total roof area. Next,

annual energy production from the rooftop PV array was compared to annual electricity use in 2006 at the site.

The results of the analysis can be found in Table A2.

Table A2. Estimated carport solar PV potential by site.

Site Name	Total Roof Area (SF)	Percent Parking Area Viable for PV (%)	Viable Parking Area (SF)	Carport PV Output (kWh/yr)	2006 Facility Electricity Use (kWh/yr)	Carport PV Annual Electricity as Percent of 2006 Use (%)
City Hall	43,771	50%	21,886	414,108	1,062,012	39%
Cultural Arts Center	12,105	0%	0	0	234,720	0%
Development Services	18,125	50%	9,063	171,477	439,400	39%
Police Department	50,000	50%	25,000	473,039	1,504,738	31%
Public Services Facility	18,150	60%	10,890	206,056	NA	NA
Sanitation/Waterworks	18,174	30%	5,452	103,164	7,891,940	1%
Senior Center	29,559	80%	23,647	447,442	445,120	101%
Transit Facility	12,720	30%	3,816	72,205	159,544	45%

The combined total PV output for both rooftop and carport arrays as a fraction of annual electricity use in 2006 at the site is shown in Table A3. Solar PV potential is quite good at most sites. In some cases, the PV can offset more than the total annual electrical use on the service account. In these cases, the array may be tied into another service account in close proximity. For example, the arrays at the Transit Facility can meet an estimated 136% of the load and could be tied into the Sanitation/Waterworks account instead.

Table A3. Estimated rooftop and carport solar PV potential by site.

Site Name	Total Rooftop & Carport PV Annual Electricity as Percent of 2006 Use (%)
City Hall	70%
Cultural Arts Center	0%
Development Services	78%
Police Department	50%
Public Services Facility	N/A
Sanitation/Waterworks	2%
Senior Center	101%
Transit Facility	136%

Cogeneration Analysis

The potential to site a cogeneration plant at the Sanitation Plant was investigated. Currently, the biogas that is generated as part of the anaerobic digestion process is flared. This renewable "opportunity" fuel contains a significant amount of methane (the primary constituent of pipeline natural gas) that can be used to generate power and heat. The power generated can be used to directly meet site electrical requirements and the heat captured can be used to offset heating requirements within the Plant. Three chemical analyses of the biogas, conducted between 2008-2011, show relatively stable methane content, ranging from 56-59% (Table A4).

Carbon dioxide content in the fuel is also relatively steady, ranging from 39-40%. The estimated flow rate of the biogas is 150,000-180,000 cubic-feet (CF) per day. The average heating value of the biogas is 582 BTU/CF. by assuming a biogas-fired reciprocating engine is used (Make: MAN. Model: Biogas Engine E 2842 LE 322, designed to operate on 60% methane and 40% carbon dioxide), with an electrical efficiency of 37.5% and heat capture efficiency of 53.0%, it is estimated that the cogeneration plant can meet 48% of the electricity requirements based on the Sanitation/Waterworks service account in 2006. The cogeneration plant can meet 32% of the 2006 aggregate municipal facility electricity requirement (Table A5). This project also provides a substantial GHG reduction potential. All biogas that is currently flared produces CO_2 and contributes to City GHG emissions.

The cogeneration plant has the potential to capture waste heat from the power production process to offset Sanitation Plant heating requirements. The anaerobic digesters are the only gas-fired process heating load at the Plant. It is estimated that the cogeneration plant can meet 479% of the heating requirements based on the Sanitation service account in 2006 (Table A5).

Therefore, the heat captured in the cogeneration plant can meet all process heating loads within the Sanitation Plant. It may also be possible to utilize available waste heat to meet the building heating loads at the site, although this was not explored in detail. 100% of the gas consumed at the Sanitation Plant could be offset with waste heat capture from the cogeneration plant. In this case, the combined electricity and heat from the cogeneration plant can meet 24.7% of the total energy used on all municipal facility service accounts in 2006. This single measure meets the City goal that all municipal facilities reduce energy use by 20% by 2020, as compared to 2006.

Table A4. Sanitation plant biogas cogeneration potential.

Test Date	Sample #	Methane Content by Volume (%)	Heating Value of Methane (BTU/CF)	Heating Value of Biogas (BTU/CF)	Estimated Flow Rate of Biogas (CF/day)	Estimated Annual Energy in Biogas (MMBTU/yr)	Estimated Energy Flow in Biogas (kW)	Assumed Electrical Efficiency of Cogen (%)	Assumed Waste Heat Capture Efficiency of Cogen (%)	Electrical Output (kW)	Annual Electrical Energy Output @ 90% Availability (kWh/yr)	Annual Heat Energy Output @ 90% Availability (Therms/yr)
1/30/2008	1	59.33%	1,000	593.3	180,000	38,980	1,304	37.5%	53.0%	489	3,854,581	185,934
1/30/2008	2	59.42%	1,000	594.2	180,000	39,039	1,306	37.5%	53.0%	490	3,860,428	186,216
10/22/2008	1	58.33%	1,000	583.3	180,000	38,323	1,282	37.5%	53.0%	481	3,789,613	182,800
10/22/2008	2	58.14%	1,000	581.4	180,000	38,198	1,278	37.5%	53.0%	479	3,777,269	182,204
8/3/2011	1	55.94%	1,000	559.4	180,000	36,753	1,229	37.5%	53.0%	461	3,634,338	175,310
	Averages	**58.23%**		**582.3**	**180,000**	**38,258**	**1,280**	**37.5%**	**53.0%**	**480**	**3,783,246**	**182,493**

Table A5. Sanitation/Waterworks 2006 energy consumption and estimated cogeneration output.

Energy Use or Production	Value	Percent Change from 2006 (%)	Reduction Baseline
Sanitation/Waterworks Measured 2006 Annual Electricity Usage (kWh/yr)	7,891,940		
All Municipal Facility Measured 2006 Annual Electricity Usage (kWh/yr)	11,737,474		
All Municipal Facility Measured 2006 Annual Energy Usage (kBTU/yr)	76,914,399		
Cogeneration Estimated Electricity Production (kWh/yr)	3,783,246	-47.9%	Sanitation/ Waterworks 2006 Electricity Use
Cogeneration Estimated Electricity Production (kWh/yr)	3,783,246	-32.2%	All Municipal Facility 2006 Electricity Use
Cogeneration Estimated Electricity Production (kBTU/yr)	12,912,219	-16.8%	All Municipal Facility 2006 Energy Use
Sanitation/Waterworks Measured 2006 Annual Natural Gas Usage (Therms/yr)	38,100		
Cogeneration Estimated Heat Capture (Therms/yr)	182,493	-479.0%	Sanitation/ Waterworks 2006 Gas Use
Sanitation/Waterworks Measured 2011 Annual Natural Gas Usage (Therms/yr)	60,872		
Sanitation/Waterworks Measured 2011 Annual Natural Gas Usage-Assuming 100% of Gas Use on Service Account is at Sanitation Plant (kBTU/yr)	6,087,200		
Cogeneration Estimated Total Viable Energy Production (kBTU/yr)	18,999,419	-24.7%	All Municipal Facility 2006 Energy Use

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APPENDIX B - CALCULATIONS

Table B1. Energy conservation measure assumptions and calculation methods (one of five).

Facility or Service Type	Measure Name/ Description	Details	Annual Energy Savings (kWh/yr)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Assumptions and Calculation Methods (All Energy Cost Savings Assume 2011 Facility Specific Electricity Rates)
City Hall	Automatic shutdown software on computers	Shuts down 167 computers when not in use	50,100	$6,619	$4,175	Energy savings calculated by SCE. See Audit Report 6/13/08. Assume 30,000 kWh for 100 computers based on SCE estimate. $25/computer http://gigaom.com/cleantech/zonbu-green-subscription-pc/.
City Hall	Vending machine controllers	Controllers on 3 refrigerated beverage machines	1,200	$159	$600	Energy savings calculated by SCE. See Audit Report 6/13/08. $200 for vending miser and City installation
City Hall	10% reduction in baseload power	Reduce unnecessary loads at night by 10% (7.5 kW reduction from current baseload of 75 kW)	65,700	$8,680	$2,000	Assume 7.5 kW reduced 8760 hrs/yr
City Hall	Increase thermostat lower setpoint limit	Limit thermostat setpoint to 72°F in cooling mode	1,640	$217	$100	20 kWh/4100 hours/year with an average of 2% savings.
City Hall	Replace incandescent canister lights with LED fixtures	Replace 6x 75W incandescent downlights with 18W LED fixtures	1,636	$216	$700	Assume 7 fixtures from 75W incandescent to 18W LED at 4100 hours per year. HVAC additional savings not included.
City Hall	Replace 8' T-12 fixtures in storage area	Replace 10x 2 bulb 8 foot T-12 fluorescent fixtures with 2x28W 4' T-8 fixtures	1,558	$206	$950	Assume 4100 hours of operation of 20x 75W magnetic ballast with 40 x 28W T-8 electronic ballast. Assume $50/fixture for 20 pendant fixtures.
City Hall	Install lighting occupancy sensors	Install occupant sensing on additional private offices, conference rooms, and storage	2,050	$271	$2,000	Assume 10% reduction in 5kW of lighting in infrequently occupied spaces and $100 installed cost per occupant sensor. (Incentive of $35/sensor if <500W, $55/sensor if >500W)

		areas				

Table B2. Energy conservation measure assumptions and calculation methods (two of five).

Facility or Service Type	Measure Name/ Description	Details	Annual Energy Savings (kWh/yr)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Assumptions and Calculation Methods (All Energy Cost Savings Assume 2011 Facility Specific Electricity Rates)
City Hall	De-lamp fixtures in open office area	Open office area has lighting levels of 70 f.c. at the work surface - 1/3 of bulbs could be removed or shut off at bi-level switch	21,910	$2,895	$1,000	Assume 167x 32w bulbs permanently shut off that were running for 4100 hours/year.
City Hall	Tighten schedule of operation	Schedule HVAC on at 6 AM vs 5 AM and off at 6 PM vs 10 PM. 20 kW reduction on weekdays.	15,600	$2,061	$100	Assume 20 kW, 3 hrs per weekday, 5 days a week, 52 weeks/yr (this is a controls change and is simple - assumed 1 hour for programming)
Cultural Arts Center	Lighting	Replace 72 incandescent lamps with CFLs	4,147	$747	$720	Assume wattage of 65 and a replacement wattage of 17. Assume $10/reflector CFL and install by City staff, operation for 1200 hours/year
Cultural Arts Center	Lighting	Replace 12 incandescent exit sign lamps with LEDs	1,682	$303	$660	Energy savings calculated by SCE. See Audit Report 5/23/11. Assume $55/LED (RS Means) exit sign retrofit kit and install by City staff
Development Services	HVAC controls	Reduce run hours of HVAC equipment by 1300h per year	10,725	$1,606	$150	Align schedule and reduce HVAC run hours by 1300 hours per year on A/C 1 15ton unit running 1.1 kW/ton at 50% loading assumed.
Police Department	Lighting retrofit	100 lamp retrofit of 90W metal halide with 70W pulse start metal halide.	8,280	$990	$3,500	Energy savings calculated by SCE. See Audit Report 5/23/11. Assume $35/lamp and City staff installation

Police Department	Lighting retrofit	46 lamp retrofit of HID fixtures with induction fixtures in parking areas	24,757	$2,960	$23,000	Energy savings calculated by SCE. See Audit Report 5/23/11. Assume $350/lamp and $150/other material and labor. City staff installation
Police Department	Lighting retrofit	75 lamp retrofit of fluorescent exit signs with LED exit signs	11,826	$1,414	$2,063	Assume 75 x 18w reduction 8760 hours. Assume $55/LED (RS Means) exit sign retrofit kit and install by City staff
Police Department	PC auto-shutdown	Shuts down 120 computers when not in use	36,000	$4,305	$3,000	Energy savings calculated by SCE. See Audit Report 5/23/11. assume 120 PCs. $25/computer http://gigaom.com/cleantech/zonbu-green-subscription-pc/.

Table B3. Energy conservation measure assumptions and calculation methods (three of five).

Facility or Service Type	Measure Name/ Description	Details	Annual Energy Savings (kWh/yr)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Assumptions and Calculation Methods (All Energy Cost Savings Assume 2011 Facility Specific Electricity Rates)
Police Department	10% reduction in baseload power	Reduce unnecessary loads at night by 10% (15 kW reduction from current baseload of 150 kW)	131,400	$15,712	$2,500	Assume 15 kW baseload reduced 8760 hrs/yr (This is half of the 30 kW fluctuation seen). Assume RCx based reduction
Police Department	Lighting retrofit	Replace incandescent bulbs in 4 fixtures with LED or Fluorescent bulbs	1,798	$215	$140	Assume 4 bulbs replace 125W bulbs with 18W bulbs. 4,100 hrs/yr
Police Department	Vending machine control	Controllers on 2 refrigerated beverage machines	2,400	$287	$400	Energy savings calculated by SCE. See Audit Report 5/23/11. $200 for vending miser and City installation
Public Services Facility	Lighting retrofit	14 lamp retrofit of 7 incandescent exit signs with LED exit signs	1,717	$163	$385	Energy savings calculated by SCE. See Audit Report 6/13/08. Assume $55/LED (RS Means) exit sign retrofit kit and install by City staff

Public Services Facility	HVAC retrofit	Replace 6 old HVAC with high efficiency package unit	23,905	$2,273	$57,000	Assume HVAC 1-6 replaced; that 25 tons of cooling went from 5.2 EER to 12 EER; operates 4 hours per day at 50% of rated capacity. $9500/unit nd 6 units (RS Means)
Public Services Facility	HVAC controls	Replace thermostats or timers	5,000	$475	$600	Current unit schedules are running many longer hours than necessary
Public Services Facility	Lighting retrofit	Replace outdoor soffit lighting with fluorescent or LED lights. Assume 125W Par 38 to 23W fluorescent	5,018	$477	$120	Replace outdoor soffit lighting with fluorescent or LED lights - assume 125W Par 38 to 23W fluorescent and 4100 run hours/year
Public Services Facility	Lighting retrofit	Evaluate de-lamping fixtures	13,120	$1,248	$2,000	Open office area is overlit - assume removal of 100x 32w T-8 bulbs running 4100 hours per year.
Public Services Facility	Vending machine control	Controllers on 2 refrigerated beverage machines	2,400	$228	$600	Energy savings calculated by SCE. See Audit Report 6/13/08. $200 for vending miser and City installation
Sanitation/ Waterworks	Lighting retrofit	Retrofit 152 T12 fixtures and magnetic ballasts with T8 lighting and electronic ballasts	5,066	$482	$13,832	Assume $4/28 watt T8 lamp, 152 lamps. 3 lamp 4' T12 and $75/fixture installed based on City Hall retrofit. Assume 152 fixtures.
Sanitation/ Waterworks	Lighting retrofit	27 lamp retrofit of 75W mercury vapor lamps with 2 -26 W CFLs	203	$19	$170	Assume $2.50/A line flood CFL and City staff installation.

Table B4. Energy conservation measure assumptions and calculation methods (four of five).

Facility or Service Type	Measure Name/ Description	Details	Annual Energy Savings (kWh/yr)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Assumptions and Calculation Methods (All Energy Cost Savings Assume 2011 Facility Specific Electricity Rates)
Sanitation/ Waterworks	Lighting retrofit	35 lamp retrofit of 50W HID to 26 W CFLs (Exterior)	6,665	$634	$364	Assume $14/A line flood CFL and City staff installation.
Sanitation/ Waterworks	Motor retrofit	WAS Pumps #1. Replace 26 year old 15 HP motor with premium efficiency motor	9,101	$865	$1,050	Assume 85% efficient motor replaced with 95% efficient. Duty cycle = 24/7. Operates at 75% of capacity. Assume $70/HP installed based on WW motor retrofit costs

Sanitation/ Waterworks	Motor retrofit	Screened Sludge Circulation #1. Replace 22 year old 25 HP motor with premium efficiency motor	4,424	$421	$1,750	Assume 85% efficient motor replaced with 95% efficient. Duty cycle = 7/24. Operates at 75% of capacity. Assume $70/HP installed based on WW motor retrofit costs
Sanitation/ Waterworks	Motor retrofit	Screened Sludge Circulation #2. Replace 22 year old 25 HP motor with premium efficiency motor	4,424	$421	$1,750	Assume 85% efficient motor replaced with 95% efficient. Duty cycle = 7/24. Operates at 75% of capacity. Assume $70/HP installed based on WW motor retrofit costs
Sanitation/ Waterworks	Motor retrofit	Applied Pump #2. Replace 32 year old 50 HP motor with premium efficiency motor	30,336	$2,885	$3,500	Assume 85% efficient motor replaced with 95% efficient. Duty cycle = 24/7. Operates at 75% of capacity. Assume $70/HP installed based on WW motor retrofit costs
Sanitation/ Waterworks	Motor retrofit	Applied Pump #3. Replace 32 year old 50 HP motor with premium efficiency motor	30,336	$2,885	$3,500	Assume 85% efficient motor replaced with 95% efficient. Duty cycle = 24/7. Operates at 75% of capacity. Assume $70/HP installed based on WW motor retrofit costs
Sanitation/ Waterworks	Anoxic mixer timing control	Installation of timers for all 21 anoxic mixers.	167,846	$15,961	$6,500	SCE-Simi Valley Partnership energy reduction estimate and 50% cap on project costs
Senior Center	Lighting retrofit	41 lamp retrofit of HID fixtures with induction fixtures in parking areas	27,328	$3,835	$20,500	Energy savings calculated by SCE. See Audit Report 5/23/11. Assume $350/lamp and $150/other material and labor. City staff installation
Senior Center	Lighting retrofit	Replace 85x 50W MR-16 pin base architectural lights with LED bulbs	10,455	$1,467	$2,125	Assume $25/bulb and city labor. Lamp wattage of 50 and a replacement wattage of 20. 4,100 hrs/yr.
Senior Center	Lighting retrofit	Replace 12x halogen flood bulbs with LED or compact fluorescent flood bulbs	4,920	$1,096	$1,200	Assume a cost of $100/LED flood fixture, a halogen fixture wattage of 150 and a replacement fixture wattage of 50. 4,100 hrs/yr

Table B5. Energy conservation measure assumptions and calculation methods (five of five).

Facility or Service Type	Measure Name/ Description	Details	Annual Energy Savings (kWh/yr)	Annual Energy Cost Savings ($/yr)	Installed Cost-Before Rebates ($)	Assumptions and Calculation Methods (All Energy Cost Savings Assume 2011 Facility Specific Electricity Rates)
Senior Center	Lighting retrofit	Replace 12x Incandescent accent bulbs with LED or compact fluorescent	2,460	$548	$1,200	Assume wattage of 100 and a replacement wattage of 50. 4,100 hrs/yr

Senior Center	Controls retrofit	Add HVAC points on the building's energy management system and control HVAC to minimize reheat energy	NA	NA	NA	Existing building controls do not have points for the boxcar gas-pack serving the recent expansion. Adding controls points and doing a reset based on warmest zone should save significant amounts of natural gas energy.
Transit Facility	Lighting retrofit	14 lamp retrofit of 7 incandescent exit signs with LED exit signs	1,717	$318	$385	Energy savings calculated by SCE. See Audit Report 6/13/08. Assume $55/LED (RS Means) exit sign retrofit kit and install by City staff
Transit Facility	Lighting retrofit	28 lamp retrofit of 250 W HPS to 4-lamp T5 HO fixtures	3,998	$740	$7,000	Assume 250W bulbs and ballasts replaced with 4x 54W 48" T-5 HO fixtures 4200 hours/year
Transit Facility	Lighting retrofit	Retrofit 8' T-12 fixtures with T-8 28W fixtures	7,921	$1,467	$2,875	Assume 23 x 2 bulb 96W 8' T-12 retrofitted with electronic ballasts and 56W 96" T-8 bulbs 4100 hours/year
Transit Facility	Lighting Schedule	Schedule site lighting OFF after gates are locked	21,000	$3,888	$100	Site is secured behind gates after hours with no third shift - shut off site lighting after hours. Assume 10 kW of lighting off for 2100 hours/year
Transit Facility	Air Compressor	Decrease air compressor setpoint	1,000	$185	$10	Air compressor pressure setpoint is 190 psi - too high for tools.
Transit Facility	Lighting retrofit	Replace exterior 8' T-12 exterior lighting with T-8 bulbs and ballasts	6,451	$1,195	$6,000	Assume 48 x 2 bulb 96W 8' T-12 retrofitted with electronic ballasts and 56W 96" T-8 bulbs 3200 hours/year
			791,221	$94,039	$182,274	