RESOLUTION NO. 7540

CITY OF SOUTH GATE
LOS ANGELES COUNTY, CALIFORNIA

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SOUTH GATE ESTABLISHING THE CITY'S ENERGY ACTION PLAN TO MEET ITS VISION OF FISCAL AND ENVIRONMENTAL STEWARDSHIP

WHEREAS, City Council previously approved the Local Government Energy Leader Partnership Program with Southern California Edison that was established to help local governments increase energy efficiency and the use of renewable energy; reduce Greenhouse Gas emissions; protect air quality; and ensure the communities are move livable and sustainable; and

WHEREAS, the City received funding from Southern California Edison to conduct a strategic plan program based on the California Public Utility Commission's California Energy Efficiency Strategic Plan to promote energy efficiency and sustainability practices in the City including the development of an Energy Action Plan; and

WHEREAS, the City created an Energy Action Plan to establish a long-term vision to reduce electricity energy usage and energy cost at municipal facilities by implementing cost effective energy efficiency measures as a key energy resource and strategy; and

WHEREAS, the Energy Action Plan provides direction on energy reduction initiatives and best energy management practices to ensure the City is recognized as a model agency for other cities in the region and state; and

WHEREAS, the City's General Plan update process revealed that "the greening of South Gate" is a top priority which the Energy Action Plan will help achieve the vision of a greener South Gate with the City leading by example through the energy usage practices and efficient operations of municipal facilities;

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF SOUTH GATE DOES HEREBY RESOLVE AS FOLLOWS:

SECTION 1. The above recitals are all true and correct.

SECTION 2. The City of South Gate supports a commitment to sustainable practices through energy efficiency, and provides leadership and guidance in promoting, facilitating, and instituting such practices in municipal operations.

SECTION 3. The City Council of the City of South Gate hereby adopts the Energy Action Plan attached hereon as Exhibit A.

SECTION 4. The City Clerk shall certify to the adoption of this Resolution which shall be effective upon its adoption.

PASSED, APPROVED and **ADOPTED** this 11th day of December 2012.

CITY OF SOUTH GATE

W.H. (Bill) De Witt, Mayor

ATTEST:

Carmen Avalos, City Clerk
(SEAL)

APPROVED AS TO FORM:

Raul F. Salinas, City Attorney

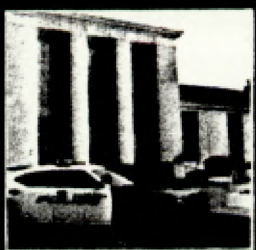
EXHIBIT "A"

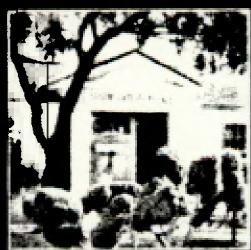
City of South Gate

November 2, 2012

Electricity Chapter

Energy Action Plan





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Executive Summary

The City of South Gate is responsibly committed to enhancing the community's quality of life, and creating opportunities for its residents and businesses to thrive and prosper. Fiscal and environmental stewardship are important elements of this responsibility.

In the City's "Green Element" section of the General Plan, the City has made a bold commitment:

> *"Create a more attractive and livable community by "greening" the City with trees and landscaping, building more parks and open spaces, and promoting a sustainable relationship with nature."*

This *Energy Action Plan* ("Plan") is a critical element of the City's overall strategy to meet its vision of fiscal and environmental stewardship. Energy costs are expected to continue to increase as a result of population growth, climate change regulations, increased demand on limited supplies, and the need to upgrade and expand the aging infrastructure that supplies our electricity. Environmental regulation is expected to only increase as the State of California continues to take a leadership position in dealing with the challenge of global climate change.

The development of this Plan builds on the City's first "green" action, which entailed completing a 2005 inventory of all greenhouse gas emissions. This included inventorying municipal greenhouse gases (GHG) and establishing a GHG emission reduction target.

This Plan is focused on electricity. The Plan will lay out a long-term strategy for significantly reducing the City's electricity consumption and costs. The overall vision of the Plan is as follows:

- Reduce energy consumption and demand in municipal operations by as much as technically and economically feasible
- Achieve as close to a "zero-net energy[1]" city as possible by the year 2030
- Reduce electricity expenditures on an annual basis
- Increase the use of clean energy sources to supply electricity demand from facilities
- Meet or exceed compliance with all mandatory regulatory requirements and other statewide objectives (e.g., AB 32, California Long-Term Energy Efficiency Strategic Plan)

Starting with the 2005 baseline year, the City's goals are to reduce electricity consumption 20% by 2015; 25% by 2020; and 30% by 2030. The potential positive impacts of reaching these goals is significant, including avoiding up to $3 million in cumulative energy costs savings through 2030. The Plan establishes an effective road map on how the City will achieve these municipal energy reduction targets through comprehensive planning and structured implementation.

[1] Net-zero energy is the condition where after implementing all possible energy conservation measures, the remaining annual energy consumption is offset by the production of clean energy by solar photovoltaics such that the annual "net" electricity consumption is zero kWh.

Although these goals may appear aggressive, the City believes that there are several driving factors that will make them readily achievable. These factors include access to rapid improvement in energy efficiency technologies such as solid-state, light emitting diode (LED) lighting that in time will reduce all lighting demand by as much as 80 percent. LED applications are rapidly increasing as prices drop precipitously. As such, we expect most, if not all lighting will be replaced with LEDs by 2030. Additionally, the costs of solar photovoltaic continue to decrease such that solar will soon cost less than can be supplied from the grid. This will drive a rapid increase in the use of solar for municipal facilities by 2030. Another factor is the rapid growth of the availability of innovative financing of energy projects, such as utility on-bill financing and the California Energy Commission's low interest loan. These financing options will help fund more energy saving projects with a neutral or nominal impact on the operating budget. Most importantly, the City is committed to smart energy management practices and will empower key staff to lead the City to a more energy efficient future.

In developing the strategies associated with the Plan, the City (a) analyzed past and current operational conditions by reviewing municipal energy consumption and demand, (b) established target reduction goals and energy management initiatives, (c) identified near-term energy conservation measures, and (d) created an implementation plan to ensure the success of the Plan.

This Plan is an important step forward in the City's acknowledgement that a Green City starts with a strong commitment to smart energy management practices. This Plan is made possible by funding provided through a partnership with Southern California Edison (SCE). The partnership goal is to help municipalities implement several energy efficiency and climate activities, as called for in California's *Long-Term Energy Efficiency Strategic Plan*[2] (CLEESP) promulgated by the California Public Utilities Commission (CPUC).

[2] http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/eesp/

SECTION 1. INTRODUCTION

Increasing energy prices, projected population growth, infrastructure needs, and climate change pose considerable challenges that are expected to have a profound economic, environment, and social impact on the City and its municipal operations. These challenges will directly influence municipal operations through rising operational costs related to energy use; possible electricity supply interruptions; and more stringent climate legislation. As a result, the City needs to take proactive and aggressive actions to improve our energy efficiency and reduce greenhouse gas (GHG) emissions.

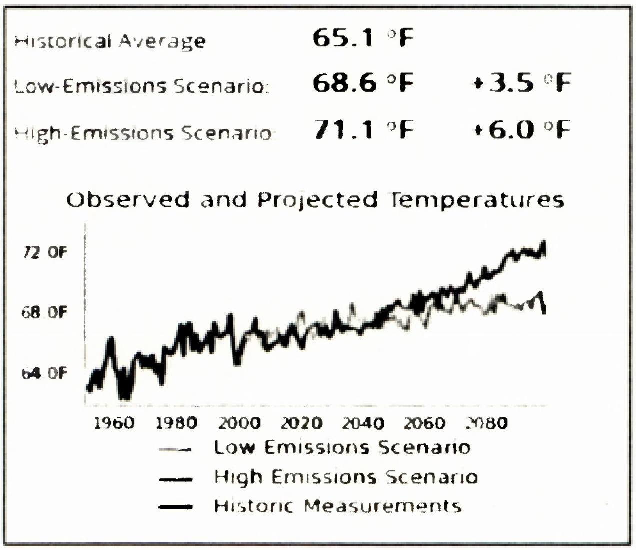

Figure 1: Cal-Adapt – Climate and Emissions Forecast

There is an inextricable relationship between electricity use and GHG emissions. Any reduction in energy usage will result in a commensurate decrease in GHG emissions. The City's electricity use was responsible for about 3,100 $MTCO_2e$ (metric tons of carbon dioxide equivalent) in 2011. Facilities and infrastructure account for approximately 57% of the CO_2 emissions from municipal operations.[3] This Plan is an important contributor to constraining these numbers and helping the state meet its AB 32 requirement to reduce CO_2 emissions to 1990 levels by 2020.[4]

[3] City of South Gate Greenhouse Gas Emissions Inventory (February 2009).
[4] Assembly Bill 32 (the Global Warming Solutions Act) was passed and signed into law in 2006; it set the 2020 greenhouse gas emissions reduction target for the state.

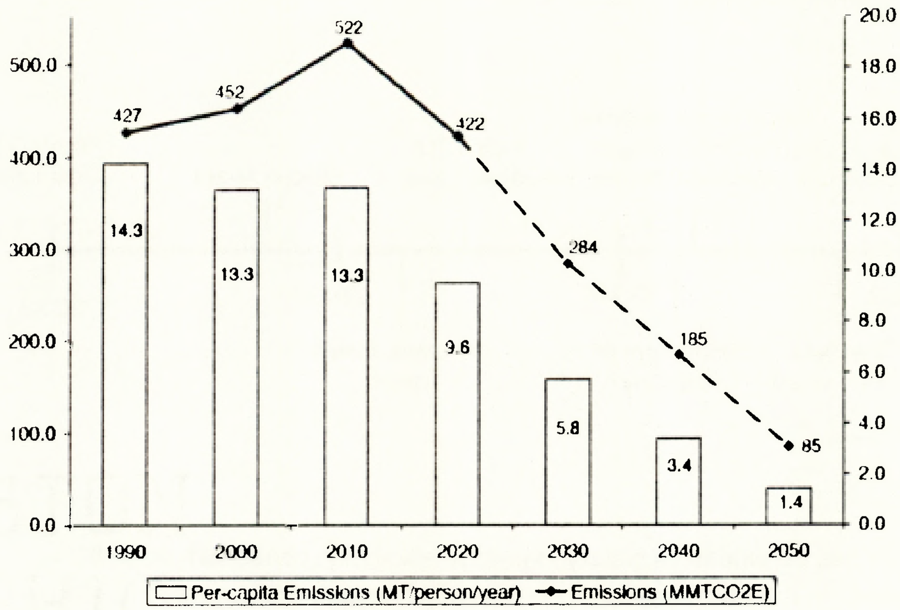

Figure 2: Required Emissions Trajectory to Meet AB32 Mandate (Source: CARB Climate Change Scoping Plan (2008))

There is an inextricable relationship between electricity use and GHG emissions. Any reduction in energy usage or demand will result in a commensurate decrease in GHG emissions. The City's electricity use was responsible for about 3,100 $MTCO_2e$ (metric tons of carbon dioxide equivalent) in 2011. Facilities and infrastructure account for approximately 57% of the CO_2 emissions from municipal operations.[5] This Plan is an important contributor to constraining these numbers and helping the state meet its AB 32 requirement to reduce CO_2 emissions to 1990 levels by 2020.[6]

Through the development of this *Energy Action Plan*, South Gate has created a road map for energy efficiency improvements that can be implemented within our facilities and infrastructure. The Plan will identify specific projects we can undertake in the short term that will result in immediate energy savings and GHG emission reductions, as well as laying the groundwork for longer-term energy management initiatives to meet aggressive, longer-term goals. Our goal is to use this Plan to identify the maximum energy savings and GHG reductions we can expect to achieve through retrofitting and retro-commissioning of our facilities, as well as the increased use of renewable and clean energy sources.

[5] City of South Gate Greenhouse Gas Emissions Inventory (February 2009).
[6] Assembly Bill 32 (the Global Warming Solutions Act) was passed and signed into law in 2006; it set the 2020 greenhouse gas emissions reduction target for the state.

1.1 History of Energy Planning

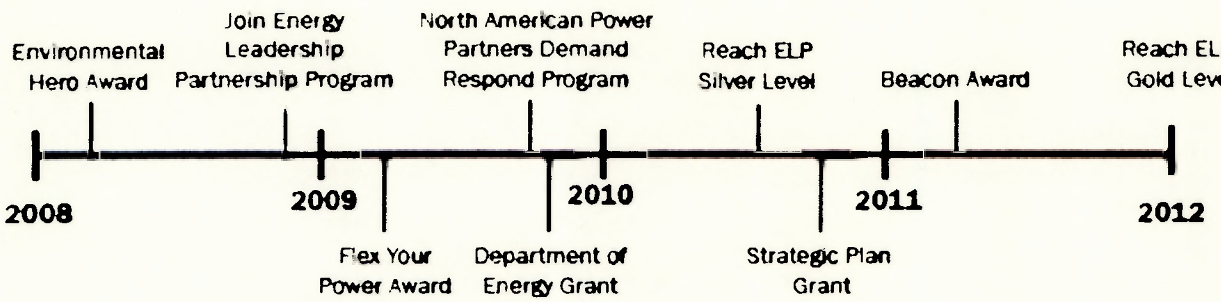

Figure 3: Energy Planning Timeline

The City of South Gate has an extensive history in energy efficiency, conservation, and managing energy usage. In the past decade alone, the City has taken many steps to reduce energy consumption of City-owned facilities:

- Beginning in January 2003, the City entered into an Energy Savings Contract with Chevron Energy Solutions (CES) to implement several energy conservation measures (ECM), including a new cogeneration system for the Sports Center Complex; installation of a 53 kilowatt (kW) photovoltaic system at City Hall; lighting system upgrades throughout multiple facilities; and HVAC upgrades and equipment replacements. These projects alone have accumulated an estimated 12.3 million kilowatt hours (kWh) of energy savings, and approximately 3,300 $MTCO_2e$ of avoided emissions.
- In January 2009, the City Council approved the Energy Efficiency Partnership Program with South California Edison (SCE). The partnership program supports long-term sustainability efforts of local governments. Since 2008, the City has saved approximately 1.2 million kWh in electricity usage and received energy efficiency rebates from SCE totaling almost $100,000. By implementing several energy conservation measures, the City has reduced energy costs by an estimated $200,000 each year.
- In August 2009, the City entered into an agreement with North America Power Partners to enable the City to participate in an SCE demand response program. The program enabled the City to curtail up to 450 kW of demand during time periods of critical supply shortages. As a result, the City not only saves money but also helps reduce the need for new transmission and generation infrastructure.
- In September 2009, the City was awarded a federal stimulus grant of $882,100 from the U.S. Department of Energy to pay for the replacement of high-pressure sodium street lamps with ultra high-efficiency light-emitting diode (LED) lamps, as well as for upgrading series circuits to multiple circuits. The retrofit is ongoing and scheduled for completion in late 2012. The City is diligently planning to convert all city owned streetlights over the

next several years. The installation of LED lamps reduces energy consumption by as much as 80 percent.

- In late 2010, SCE awarded the City $886,000 to develop energy policies, conduct strategic energy planning activities, and purchase a utility management system. Energy audits conducted as part of this effort identified over 335,000 kWh in potential energy conservation measures that could save up to $47,000 per year.
- The City recently resurfaced the roof on the Corporate Yard facility with an energy efficient "cool roof"[7] that will reduce the air-conditioning energy consumption for the facility.

As evidenced by the savings associated with past energy efficiency projects, investing in energy efficiency is a sound investment that can take stress off the City's General Fund, which is particularly important during the ongoing economic downturn.

The City of South Gate Strategic Plan Program will implement activities identified as crucial for local governments to contribute to the California Public Utilities Commission's (CPUC) California Long-Term Energy Efficiency Strategic Plan.[8]

Electric Energy Related Grant Awards and Incentives

Organization	Amount	
Department of Energy	$	882,100
SCE Strategic Grant Program		886,000
SCE Incentives/Rebates		97,800
Total	$	1,865,900

SCE Energy Leader Partnership Program Energy Savings

Electric Energy Savings (kWh)	1,157,000
Annual Energy Cost Reduction	$200,000

[7] Cool roofs are light in color so they reflect more of the sun's energy, reducing the need for cooling.
[8] http://www.cpuc.ca.gov/NR/rdonlyres/A54B59C2-D571-440D-9477-3363726F573A/0/CAEnergyEfficiencyStrategicPlan_Jan2011.pdf

1.2 Purpose of the Energy Action Plan

The overall, long-term vision of the *Energy Action Plan* is as follows:

- Reduce energy consumption and demand in municipal operations by as much as technically and economically feasible
- Achieve as close to a "zero-net energy" city as possible by the year 2030
- Reduce electricity expenditures on an annual basis, despite increasing prices
- Increase the use of clean energy sources to supply electricity demand from facilities
- Meet or exceed all regulatory requirements and other statewide objectives (e.g., AB 32, CLEESP)

The Plan centralizes the City's efforts to reduce electricity usage in municipal operations, and sets specific target reduction goals for energy consumption and energy costs. The Plan sets forth strategies to integrate energy efficiency, clean energy supply, and other demand-side management resources into municipal operations. The City will use the Plan as a road map to reach the established target reduction goals. Moreover, there are economic, environmental, and social benefits associated with smart energy planning, such as the following:

- Reduce utility costs of municipal operations
- Help meet state, regional, and local greenhouse reduction goals
- Reduce the need for additional electricity generation supply, including power plants
- Enable the City to plan for future energy-efficient retrofits and upgrades
- Improve air quality
- Increase reliability of supply
- Lower maintenance costs while increasing the useful life of energy-using equipment
- Conserve natural resources
- Improve building comfort

1.3 Energy Planning Objectives

Resource efficiency and climate change are key concerns of the City. The steady rise of the cost of electricity and potential grid reliability concerns could have a major negative impact on municipal operations and the community. The Plan will call for discrete steps to be taken, as well as development of an adaptive strategy that will continue to build on its successes.

By improving the energy efficiency of municipal operations, the City will serve as a leader in the community, region, and state. The City takes this responsibility seriously. The primary objective of the *Energy Action Plan* is to support the City's effort to integrate energy efficiency into municipal operations, leading to the following:

- Proactive energy management
- Lower energy costs
- Enhanced building performance
- Energy-efficient facilities

SECTION 2. MUNICIPAL ELECTRICITY USE

In order to establish a meaningful energy action plan, it is important to understand the City's past and current electricity usage and trends in use. Understanding where municipal energy use is most concentrated will not only enable the City to focus its efforts on the areas that will return the highest savings; it also establishes a baseline by which we can objectively monitor progress toward meeting our goals. The City will use a 2005 Baseline year where total municipal electric energy consumption was 13,976,488 kWh.

2.1 Current Electricity Use for 2011

The total electricity consumption in 2011 for the City was 11.3 million kWh, and total electricity costs were $1.4 million. The City's electricity use can be attributed to facilities, water pumping, streetlights, traffic signals, and miscellaneous loads, as shown in Table 1. The annual emissions related to the 2011 electricity use amounted to approximately 3,100 $MTCO_2e$.[9]

Pumps	5,058,052	$508,054	44.6	34.4
Street Lighting	2,995,605	$507,275	26.4	34.3
Facilities	2,177,650	$306,978	19.2	20.8
Outdoor Lighting	389,043	$29,718	3.4	2.0
Miscellaneous	380,672	$74,287	3.4	5.0
Traffic Signals	335,887	$51,184	3.0	3.5
TOTAL	**11,336,909**	**$1,477,496**	**100.0%**	**100.0%**

Table 1: Major Municipal End Use

2.2 Electricity Use Trends

From 2005 to 2011 there has been a significant reduction in electricity consumption, and a respectable reduction in energy costs (see Figure 4). The total electricity consumption in 2005 was 13.9 million kWh, and the total electricity costs were $1.5 million. In the intervening period, the City has reduced electricity consumption by 2.6 million kWh (or approximately 19%), and electricity costs by $34,000 (or 2%). In addition, the emissions from electricity consumption

[9] Conversion factor of 603.89 lbs CO_2/MWh from the California Air Resources Board Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions inventories (Version 1.1). May 2010. http://www.arb.ca.gov/cc/protocols/localgov/localgov.htm

decreased by approximately 950 $MTCO_2e$ (or 24%) from 2005, which is the equivalent of avoiding the GHG emissions from 169 passenger vehicles annually.

Most of these energy reductions occurred in the years 2008 through 2011. As much as 75% of these savings can be attributed to pumping, most likely due to the down economy and water conservation measures. Most of the remainder of the energy savings can be attributed to facilities due to the implementation of energy conservation projects and possibly behavioral changes in the operations of facilities. Figure 5 illustrates the breakdown of electricity consumption by end use. The greatest opportunities for energy reductions are likely to be pumping, street lighting, and facilities.

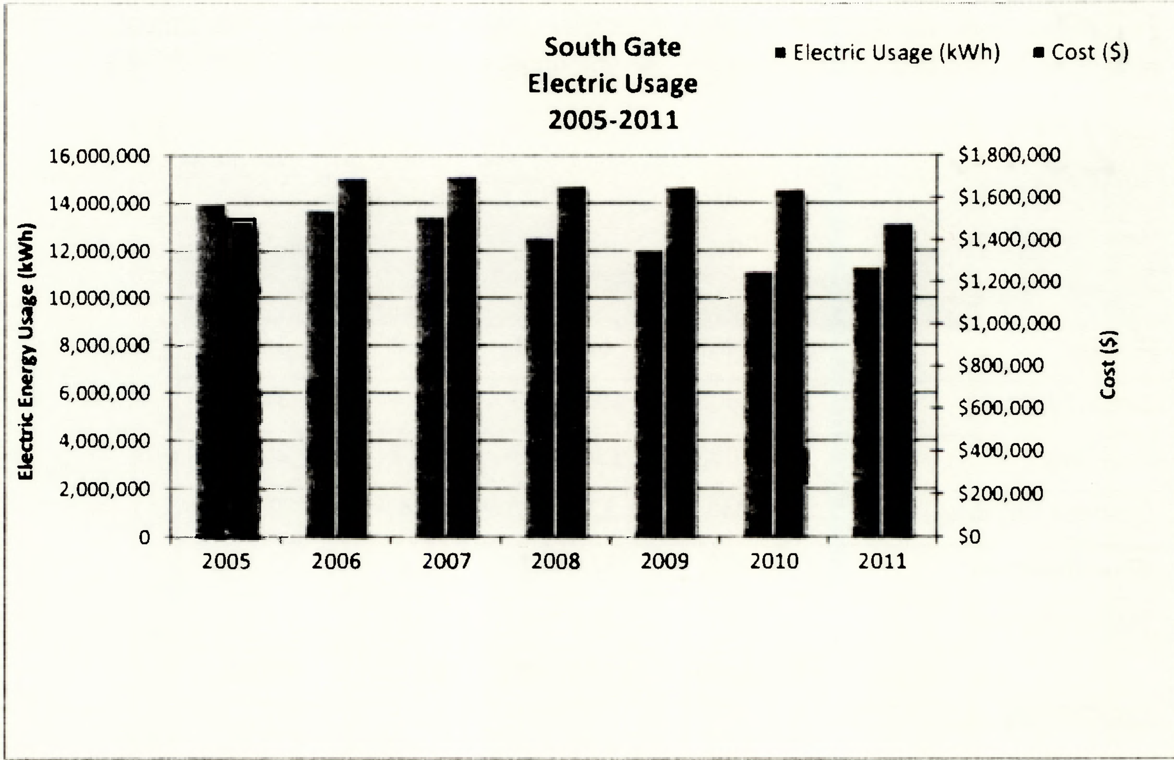

Figure 4: Municipal Electricity Usage, 2005-2011

A portion of the difference in consumption could also be attributed to temperature variations for each year. In 2011 the City had the mildest temperatures for any year since 2005.[10] Both HVAC and pumping loads are temperature dependent, so that portion of the City's load could also have been significantly affected by the weather. Additionally, an extended down economy tends to lower energy usage in municipal operations such as water pumping.

[10] There were 1015 Cooling Degree Days (CDD) in South Gate in 2005, and 860 CDD in 2011. The average CDD for the past 10 years is 1261. "Cooling degree day" refers to the number of degrees that a day's average temperature exceeds 65°F (inducing people to use air-conditioning to cool buildings).

2.3 Electricity Consumption by End Use

An analysis was made of municipal electricity consumption for 2011. The functions requiring the most energy were water pumping (44.6%), street lighting (26.4%), and facilities or buildings (19.2%).

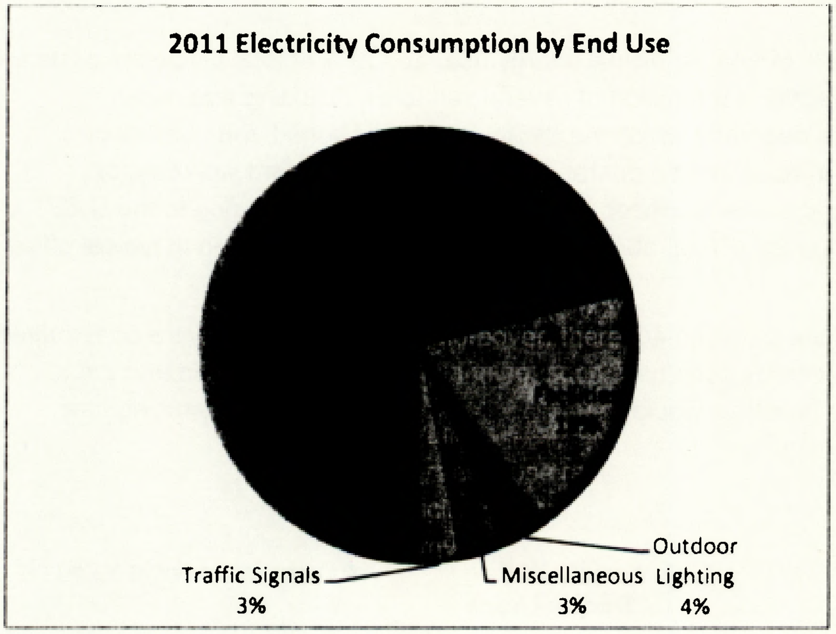

Figure 5: 2011 Energy Consumption Breakdown

2.4 Water Pumping

The City provides water services to over 16,500 connections to residents and businesses. The system includes 135 miles of distribution pipeline, two elevated tanks, a 4-million-gallon underground reservoir, four surface tanks with 8.2 million gallons of storage, and nine active wells. As shown in Table 1, water pumping is the largest user of electricity, consuming almost 45% of total electricity used, and 34% of electricity costs for 2011. As discussed earlier, water pumping loads and costs are dependent on the economy and weather.

2.5 Street Lighting

The City maintains approximately 4,400 streetlights, about 90% of which are City-owned. The streetlight system is made up of 1,095 lights with LED fixtures and 3,343 with high-pressure sodium vapor fixtures. Additionally, the City's lighting system includes 100 parking lot lights and nearly 300 park area lights. Street lighting and other outdoor lighting represent 26% of the City's total energy use, and 34% of electricity costs for 2011.

2.6 Traffic Signals

Traffic signals account for only 3% of the City's total electricity use and cost in 2011. The City implemented a comprehensive retrofit in 2001–2002 by replacing incandescent red and green signals with light-emitting diode (LED) signals, reducing energy consumption for this end use by over 75%.

2.7 Facilities

City facilities account for 19% of total municipal energy use, and 21% of total electricity costs for 2011. Energy use of each facility is a function of several variables, including age, size, orientation, building use, the degree to which the facility is air-conditioned, the number of employees and computers in each facility, operating hours (e.g., a standard workday, or 24/7/365 operation of fire and police facilities), and actual operations. According to the U.S. Environmental Protection Agency (EPA), about 30% of the energy consumption in typical office buildings is wasted.[11]

Most of the City's buildings are between 40 and 62 years old. As a result, they were constructed prior to California's Title 24 energy code being put in place. It would be expected that the building envelopes of these buildings would not be particularly well insulated, resulting in a higher need for air-conditioning.

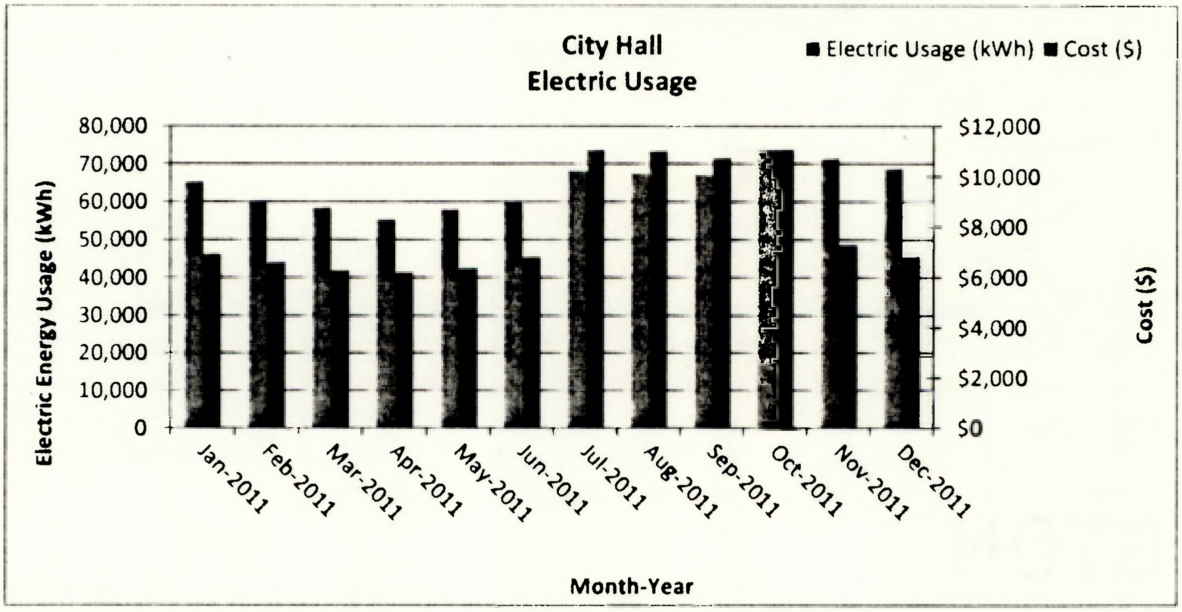

Figure 6: 2011 City Hall Electricity Use and Cost

[11] Lawrence Berkeley National Laboratory, 2005. *Costs and Benefits of Commissioning New and Existing Buildings*. Mills, Evan; Bourassa, Norman; Piette, Mary Ann et al., U.C. Santa Cruz.

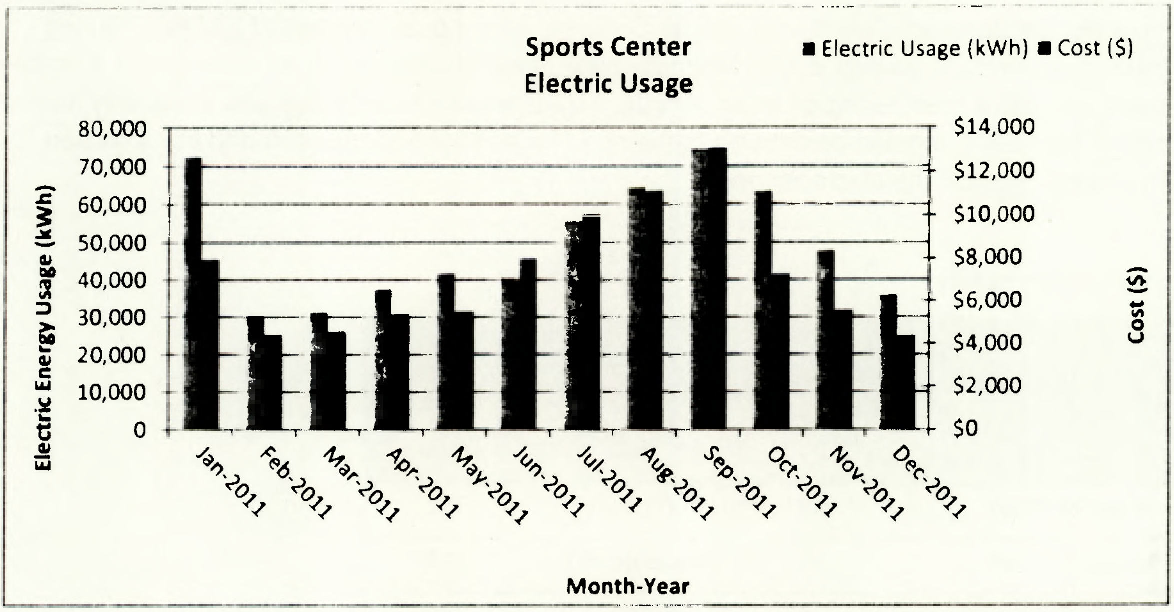

Figure 7: 2011 Sports Center Electricity Use and Cost

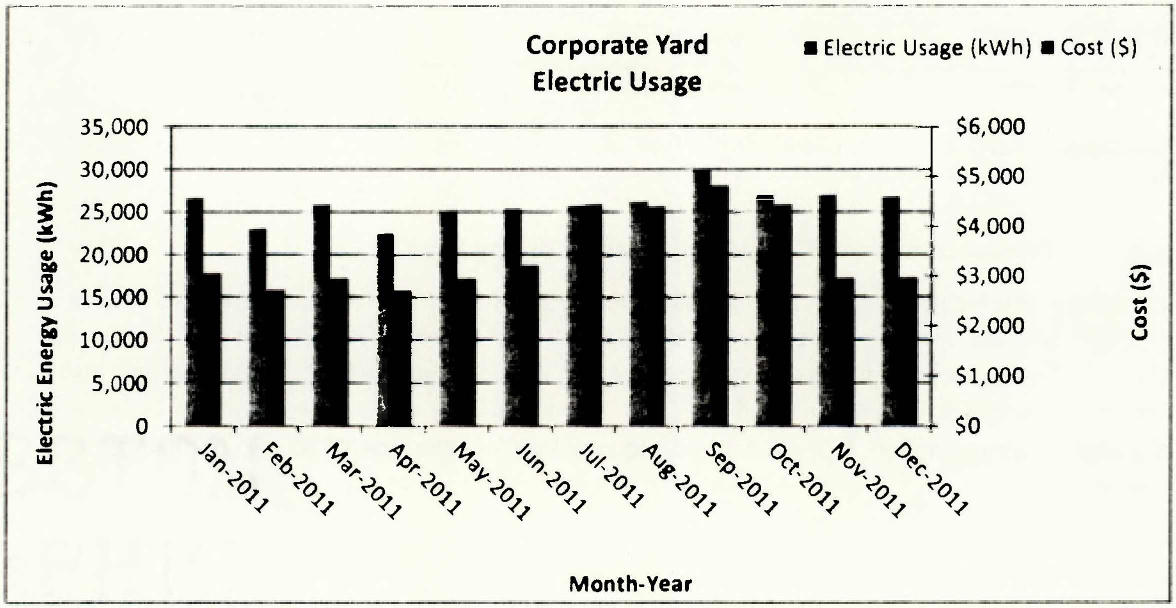

Figure 8: 2011 Corporate Yard Electricity Use and Cost

2.8 Maximum Peak Demand Meters

The highest peak electricity demand for 2011 occurred in two of the nine municipal water pump stations, which have peak demands over 660 kW and 240 kW respectively (see Table 2). The third highest demand is the Sports Center Complex, with a peak demand of 232 kW. During peak summer days, energy during electricity peak demand periods can be more than 2.5 times more expensive than during off-peak periods. Higher electricity peak demand is not only more costly; high peak demand contributes to the need for additional distribution and transmission facilities to support the electricity grid.

Table 2: Highest Peak Demand

[redacted]		
Pump Station	9615 Pinehurst Ave.	662
Pump Station	9021 W. Frontage Rd.	243
Sports Center Complex	9520 Hildreth Ave.	232
Pump Station	3400 Ardmore Ave.	217
City Hall	8650 California Blvd.	173
Pump Station	2757 Tweedy Blvd.	137
Pump Station	2645 Tweedy Blvd.	101
Corporate Yard	4244 Santa Ana St.	79

2.9 Annual Electricity Consumption and Cost by Facility

Looking at the facilities alone, the highest consumers of electricity are City Hall, the Sports Center Complex, and the Corporate Yard, followed by the Police Department and the Senior Center. The highest total energy costs per square include the City Hall, Senior Center, and Police Department. When considering ECMs, highest priority will be placed on the facilities with the highest consumption, highest cost per square foot, or other identified key performance indicator.

Table 3: 2011 Highest Electricity Users by Facility

City Hall	773,644	$97,078	221
Sports Center Complex	594,801	$87,255	170
Corporate Yard	310,955	$41,520	89
Police Department	176,922	$27,060	51
Senior Center	108,787	$15,142	31
Civic Center	81,382	$13,940	23
Hollydale Community Center	69,826	$10,834	20
Westside Resource Center	58,105	$13,397	17
Parks and Recreation	3,228	$752	1

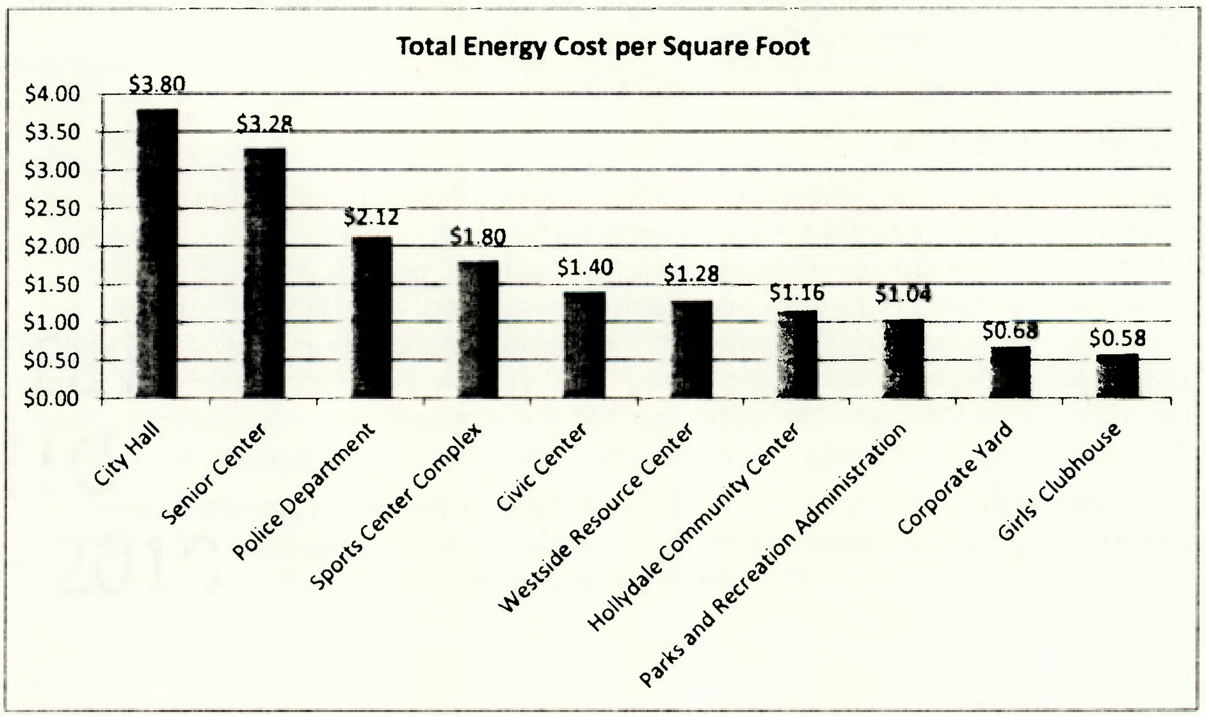

Figure 9: 2011 Total Energy Cost per Square Foot

SECTION 3. CITY OF SOUTH GATE TARGET REDUCTION GOALS

Understanding the current municipal electricity usage is an essential step in establishing feasible goals to reduce the City's energy in the immediate, midterm, and for the long term. The City has developed specific and aggressive energy reduction goals to achieve its internal objectives of minimizing operational costs as well as meeting the legislative requirements of AB 32. This Plan will lay out the potential steps to accomplish these aggressive goals.

The goals for reduction in electricity use for municipal operations are as follows (using 2005 as the baseline year):

Table 4: Target Electricity Reduction Goals

Year	Target Reduction Goal	Electricity Consumption Savings (kWh)	GHG Emissions Reduction ($MTCO_2e$)
2015	20%	2,795,000	800
2020	25%	3,494,000	1,000
2030	30%	4,193,000	1,200

Creating target reduction goals is an essential component of any energy action plan. As the adage says, "If you don't know where you are going, you will never get there." These goals are clear statements of where the City intends to go.

The Plan goals are set to three primary time frames:

Short-Term (by 2015)

Short-term goals will be achieved by projects or initiatives that are currently identified and will be completed by 2015. Examples of such projects are the current street lighting retrofit to light-emitting diodes (LEDs); the retro-commissioning of all HVAC package units; and possibly implementing several of the more cost-effective measures that were identified in the recently completed facility and pump station audits. The City plans to leverage an existing SCE HVAC Optimization Program to ensure all qualifying HVAC systems are operating optimally according to ASHRAE 180 Standards. The proper operation of energy systems in city buildings is critical in meeting the short-term energy reduction as well as maintaining energy savings into the future.

Although not specifically related to the purpose of this plan, the City will promote smart energy practices to the broader residential and business community through outreach efforts such as the South Gate Green Building Program and through other events (e.g., Family Day in the Park).

Mid-Term (by 2020)

Mid-term goals will be achieved by projects or initiatives that are not cost-effective at this time; however, it is anticipated that their costs will be reduced sufficiently during this time frame to make the projects cost-effective by 2020. Examples include LED lamps for general illumination applications, and the City-wide LED street lighting project. According to the Department of Energy, white LED costs have declined by half between 2009 and 2010, and are expected to continue to decline by nearly tenfold by 2015.[12]

A second example is solar photovoltaics (PV). In the past decade, solar PV costs have fallen by nearly 50%. Projects today can be justified through power purchase agreements that take advantage of federal tax credits. More important, the industry is expecting that costs will continue to decrease over the next 5 to 10 years such that solar energy costs will become "at par" or even less than the cost of electricity from the utility grid. Also included in this list are projects that are anticipated due to various systems reaching the end of their useful life, and therefore being replaced with more efficient equipment that serves the same purpose (e.g., replacing older HVAC package units with higher-efficiency units).

Long-Term (by 2030)

Long-term goals will be achieved by projects or initiatives that are not currently planned, but that can be expected to become technically and economically feasible options. Such projects will be planned—and likely completed—between 2020 and 2030. Many of these strategies are not cost-effective at this time, and in some cases, the technologies are in early market development (e.g., advanced fuel cells). However, it is anticipated that costs will be reduced sufficiently by this time frame to make these strategies cost-effective. If solar PV costs do not reach "par" with utility costs by 2020, they certainly will between 2020 and 2030; that would allow a very large deployment of solar PV to enable the City to reach its "net-zero" energy goal. By this time it is also anticipated that LEDs will have broadly penetrated general illumination applications, reducing overall lighting consumption by as much as 75%. Finally, it is anticipated that some City facilities may be replaced or renovated by 2030. State-of-the-art new construction techniques (e.g., using better insulation and daylighting techniques) are far superior today to what was in use when most of the current facilities were constructed; therefore, by the time these facilities are replaced or renovated, it is expected that significant energy reductions will be achievable through better design and construction techniques.

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[12] Department of Energy Solid State Lighting Initiative Frequently Asked Questions (May 2011). http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/led_basics.pdf

SECTION 4. ENERGY MANAGEMENT REDUCTION INITIATIVES

Effective management of municipal energy consumption encompasses a broad range of activities and considerations. The decisions and activities of almost every City staff member will be involved in achieving the City's goals. The City will consider integration of energy management reduction initiatives in the next General Plan update or other credible policy planning document. The overall target reduction strategies can be categorized as follows:

- Behavioral practices and staff training
- Policy and programs
- Continued optimization of facility, equipment, and infrastructure efficiency
- Operations and maintenance
- Demand response and peak load-shifting opportunities
- Self-generation and clean fuels

In order to develop a list of potential energy reduction initiatives the City engaged in several efforts, including the following:

- Completed ASHRAE Level II standard energy efficiency audits by an outside contractor of five of the largest facilities (in terms of energy consumption)
- Completed a preliminary Pump Evaluation Study with SCE
- Developed a draft master plan for street lighting in 2012 that evaluated options for improving the efficiency of street lamps
- Engaged maintenance contractor (Honeywell) in discussions to evaluate potential enhanced maintenance activities that can be incorporated into the current HVAC maintenance contract that could improve HVAC efficiency improvements
- Held internal stakeholder meetings
- Had staff attend energy systems training

4.1 Initiative One: Improve Behavioral Practices and Provide Staff Training

A growing body of research suggests that human behavior can contribute significantly to energy reduction strategies. Every employee can contribute to the success of an effective energy management policy. The City should promote and encourage behavioral practices that support the goal of reducing energy usage through training and other educational opportunities. For example, City staff should be encouraged to turn off lights or any devices that are not in use.

Continually educating the staff and building in-house capacity are primary objectives of the City. Staff will be encouraged to attend free training sessions made available through the utilities, particularly those offered by SCE. The City should consider establishing an annual training budget to increase the knowledge of staff, especially those engaged in field operations. Increasing in-house capacity will ensure systems are operating optimally, while reducing costs for subcontracting services. Appropriate City staff should be supported in maintaining membership in industry-recognized associations that focus on energy efficiency (e.g., SEEC, LGC, ICLEI and others) to continue to advance the knowledge of key decision makers and staff and keep them current on trends and new opportunities.

Action Steps

1. Conduct an "all-hands" training session on the City's goals for energy use reduction and the importance of each employee contributing to energy and cost reduction.
2. Recognize employees that recommend new and innovative ideas that reduce energy use and costs, or that consistently exhibit actions that contribute to reduce energy use. Recognize one employee a quarter in City newsletters as the "Energy Champion of the Quarter."
3. Place a reminder in e-mail footers (similar to reminders that say "Think before you print this e-mail") to remind employees to be conscientious in their energy use habits.
4. Using the utility management system, compare each month's total electricity use to the same month the previous year. Send an "all hands" e-mail updating employees on their progress in reducing energy use.
5. Aggressively manage electricity use during peak summer "on-peak" periods when electricity costs are very expensive.
6. Periodically address energy use and efficiency in employee newsletters or in posters displayed throughout the City (e.g., "What have you done today to save energy?").
7. Install signs at appropriate locations to encourage staff to turn off lights when not in use.
8. Develop checklists for end-of-day routines to ensure all office equipment is turned off, such as computers, printers, and other office equipment.
9. Evaluate the quarterly training schedules issued by the utilities and identify appropriate training sessions; designate specific employees to attend.

4.2 Initiative Two: Incorporate Energy Efficiency Policies and Programs

The City has committed to developing policies and programs to ensure facilities are operating optimally, and equipment (e.g., HVAC, lighting controls) is running efficiently. These policies and programs will be focused on operational improvements that are readily undertaken. For example, the goals of the City's Retro-commissioning Policy include both initial reduction in energy use of all facilities as well as an upgrade of the City's existing Operations and Maintenance Program to ensure these savings are sustained over the long term. The City's utility management software will enable Public Works staff to periodically evaluate their progress toward energy-saving goals and promptly identify problems that result in higher-than-necessary energy use.

Action Steps

1. Share the results of the facility energy benchmarking study internally, and encourage employees to contribute to raising their facilities' overall benchmarking score.
2. Make a conscious effort to implement all policies adopted through the recent SCE strategic planning process, and to integrate them into normal operations:
    a. Complete a bill audit of all energy accounts to ensure input into the utility management system is accurately mapped and that all accounts can be accounted for and properly billed.

   b. Adopt routine processes to evaluate energy usage data being reported by the utility management software, looking for expected decreases in energy use. If there are unexplained increases in energy use, investigate the cause to take corrective action.
   c. Put in place a process to retro-commission all facilities in the next five years, maximizing the resources made available through the utilities (such as the HVAC Optimization Program).
3. As part of the Retro-commissioning Policy, undertake the following steps:
   a. Retro-commission all facilities as soon as practicable.
   b. Verify the City has a complete inventory of all energy equipment.
   c. Prepare and issue a request for proposals for a maintenance contractor, and ensure the selected contractor understands and employs the principles of ongoing commissioning.

4.3 Initiative Three: Optimize Efficiency of Facilities, Equipment, and Infrastructure

While the City has been successful in identifying and acting on energy efficiency opportunities in the past, optimizing energy performance is not a one-time practice. It is a "continuous improvement" activity. Decisions are regularly made that could affect the City's energy use; decisions that involve the operation or modification of facilities, equipment, or infrastructure should be made while keeping in mind the potential ramifications on energy use. City staff should be encouraged to look for opportunities to implement cost-effective measures that increase the overall efficiency of facilities and infrastructure. Retrofits and retro-commissioning opportunities will be identified as part of this strategy.

Action Steps

1. Closely evaluate the list of current recommended ECMs for cost-effectiveness and viability of implementation.
2. Evaluate each HVAC ECM for the possibility of including it in the current RFP for an HVAC maintenance contractor, and incorporate as many HVAC improvements as possible under the new maintenance contract. Ensure the new HVAC contractor conducts a detailed evaluation of chiller plant efficiency and identifies possible opportunities to make adjustments or propose modifications that may have significant impacts on energy use.
3. Evaluate the use of the water system's SCADA (supervisory control and data acquisition) system for enabling strategies that could save energy or shift pumping to off-peak periods.
4. Evaluate all ECMs and identify which could be (a) accomplished at no cost to the City, or (b) funded using internal funding, SCE on-bill financing, or other financing mechanisms.
5. Evaluate the possibility of implementing any ECM through a joint procurement with other regional local government entities (e.g., the proposed Los Angeles County Regional Energy Center).
6. Conduct a comprehensive plug-load inventory of all facilities, undertaking the following steps throughout this inspection:

a. Ensure that all appliances and equipment are operating and maintained properly.
b. Install "smart power strips" (available from SCE) wherever practical.
c. Identify any personal space heaters, and ensure heaters are controlled by occupancy sensors.
d. Evaluate printers at individual workstations and identify opportunities to remove and consolidate printing to a central print station.

7. Evaluate the expanded use of high-efficiency LED task lighting to minimize the use of potentially unnecessary office lighting.
8. Identify and implement energy efficiency measures and projects in City-owned infrastructure (e.g. street lighting, water pumping, traffic signals). For example, the City is currently considering the replacement of all high-pressure sodium streetlamps with LED lamps, which will significantly decrease energy consumption.
9. Complete retrofitting of amber traffic signals as soon as possible (or replace with LEDs on burnout).
10. Evaluate the current plan for retrofitting streetlamps with LEDs, and consider opportunities to accelerate the project.
11. Evaluate the SCE pump study recommendations to determine whether they are cost-effective, and consider implementing the recommendations.
12. Consider City-wide water conservation programs that would encourage water usage during off peak periods.

4.4 Initiative Four: Evaluate and Improve Building Operations and Maintenance

The City is currently going to bid to execute a new HVAC maintenance contract. As part of this process, systems will undergo retro-commissioning. The emphasis will be on evaluating current maintenance practices and improving them so that continuous commissioning through better maintenance practices will sustain energy savings over the long term.

Action Steps

1. As part of the current effort to retain a new maintenance contractor, ensure all equipment is properly inventoried, and maintenance plans are developed and implemented in accordance with each equipment manufacturer's recommended practices and in accordance with ASHRAE/ACCA Standard 180-2008 (Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems).
2. Evaluate which maintenance practices could be accomplished by internal staff, and add these maintenance activities to the City's computerized maintenance management system.
3. Ensure appropriate staff in the Public Works Department achieve and maintain certifications such as Building Operators Certification (BOC) for Level 1 and Level 2.
4. Develop a training program to prepare existing and new staff for professional training (e.g., BOC) to increase staff capacity to execute new policies (e.g., RCx Policy) and to identify and implement energy savings strategies.

4.5 Initiative Five: Evaluate Demand Response, Energy Storage, and Permanent Load Shifting

Although the City currently participates in SCE demand response programs through North American Power Partners (NAPP), the City should evaluate its capability to use its SCADA system to participate in this program directly. This would retain a greater share of the savings for the City. Additional facilities should be considered for the potential of implementing DR strategies (e.g., the Sports Center Complex). There is an increasing emphasis on "permanent load shifting (PLS),"[13] and an SCE program is specifically designed to help fund PLS opportunities. The City should evaluate the cost-effectiveness and the benefits of participating. The current SCE PLS program will replace older package HVAC units while marrying them with a thermal energy storage system. This thermal energy storage system runs the refrigeration compressor at night to create ice, and then draws cooling from the ice during the peak demand periods in the middle of the day.

Action Steps

1. Prior to the termination of the current contract with NAPP, ask SCE to provide a TA/TI audit to evaluate the feasibility of including the Sports Center Complex in the demand response program.
2. Evaluate the available inventory of packaged HVAC units to assess the feasibility of including them in SCE's HVAC Optimization and Permanent Load Shifting Program.

4.6 Initiative Six: Explore Additional Self-Generation Opportunities

The City currently has a cogeneration system at the Sports Center Complex, and a 53 kW solar photovoltaic system at City Hall that provides approximately 11% of the electricity needs of City Hall, about 4% of the electricity needs of other City facilities, and about 0.7% of the City's total annual energy needs. The City is considering an expansion of the current system. The City should also consider a broader usage of solar energy throughout municipal operations, but should do so only after completing as much cost-effective energy efficiency work as possible. Emergency energy preparedness is a critical part of a broader emergency plan. The City should evaluate emerging technologies such as fuel cells to provide power generation for the City.

Action Steps

1. Conduct a thorough evaluation of the current operation of the existing PV system to ensure it is meeting its designed performance parameters.
2. Complete an evaluation of potential locations for solar energy systems throughout the City on existing facilities, parking structures, or vacant land.
3. Analyze emerging technologies (e.g., fuel cells, thermal storage) to support both self-generation goals and, if possible, the emergency energy preparedness plan.

[13] Permanent load shifting is accomplished by shifting loads to "off-peak" periods from "on-peak" periods. This can be done operationally (by precooling facilities prior to on-peak periods) or through various technology approaches, such as thermal energy storage that shifts HVAC compressor demand from on-peak to off-peak.

SECTION 5. IMPLEMENTATION PLAN

STEP 1	STEP 2	STEP 3	STEP 4	STEP 5
Form Team	Review EAP Status	Identify ECM/Energy Projects	Locate Funding	Measure and Verify

5.1 Activate Energy Management Team

With the support of other relevant City departments, including City Management and Finance, the Department of Public Works is the lead group responsible for tracking the implementation activities of this Plan—including monitoring energy usage and identifying ECMs. Public Works has already identified the team that is capable of achieving successful outcomes, including external resources (such as SCE and an outside energy consultant).

It will be the responsibility of this team to ensure buildings and facilities will be operated in the most energy-efficient manner. However, this must be accomplished without diminishing the quality of municipal services provided to the community, and without unduly interfering with City staff.

5.2 Review Energy Action Plan Status

Managing the progress of the Plan is an essential responsibility of the energy management team. The team will regularly review the status of the Plan, noting accomplishments, challenges, and Plan revisions. The goal of the team is to review all energy management initiatives for integration into the implementation process of the Plan. The team will meet periodically (at least quarterly) to assess additional opportunities, such as new programs and funding opportunities. Updates to the Plan will be prepared annually as part of the reporting process. The success of the Plan is dependent on the team's ability to reach milestones and to create contingency plans as challenges arise.

5.3 Identify Cost-Effective Energy Conservation Measures

The City will identify ECMs through in-house staff recommendations and technical assistance provided by the SCE Local Government Partnership. For example, the City had investment-grade energy audits performed on five buildings as part of the Strategic Plan Program. The recommended ECMs are included later in this report. To reach the energy savings goals, the City will capture all potential energy projects in a central repository. The team will vet all projects for viability, cost-effectiveness, financing requirements, and general fit in the City's overall Plan. The team will prioritize projects based on cost-effectiveness, simple payback, lowest life-cycle cost analysis, and immediate needs of the City.

5.4 Locate Funding and Leverage Resources

The team will coordinate efforts to locate funding to implement energy conservation measures. To date, the City has been relatively successful at attracting funds through grants to fund energy conservation measures and energy planning. To the greatest extent possible, the City will leverage available funding through state and federal grants, utilities, and regional energy networks to implement ECMs.

To successfully implement this Plan, obtaining funding from outside sources or using innovative funding mechanisms is a critical component. This is particularly true when the City is operating with tight fiscal constraints on the General Fund.

A prolonged economic downturn is likely to continue to inhibit the City's ability to fund energy projects. Accordingly, the City will need to take advantage of grants and awards provided by utilities (such as SCE) and federal and state agencies (including the Department of Energy and the California Energy Commission). Continued pursuit of funding from outside groups is a primary goal for the City. Below is a list of funding sources the City will utilize to implement future projects:

- Federal and state grants
- Local utility partnership programs and core programs
- On-bill financing
- Community Development Block Grants
- California Energy Commission low-interest loans
- Master lease agreements (e.g., through the Los Angeles County Regional Energy Network)
- Power purchase agreements
- Energy service company financing

The City must be positioned to take advantage of these resources as they become available, and anticipate future opportunities and needs in order to benefit from these programs and funding opportunities. For example, the CoolCalifornia Funding Wizard is a tool that will be monitored for grants, incentive programs, and other financial assistance available for local governments.

The availability of zero-interest "on-bill financing" from the utilities has made funding available at very attractive terms. Innovative approaches to reducing project costs and funding are being developed, such as master lease agreements that are being negotiated and made available though the Los Angeles County Regional Energy Center. These options could provide opportunities for collaborative purchasing and innovative project financing. Last, but not least, the industry is making significant advances in technology that will enable deeper cuts in energy usage, such as the optimization of energy use through the use of a utility management system and the evolving "smart grid."

5.5 Measure, Report, and Manage Results

The City now has a Benchmarking Policy in place, and has created an account on the U.S. Environmental Protection Agency's Portfolio Manager for 10 facilities. The primary purpose of the tool is to benchmark energy usage and to compare the benchmark against future periods. Key indicators that are provided by Portfolio Manager include an energy utilization index (EUI) and an energy costs index (ECI) for each facility.

The City will soon have a utility management system in place. The utility management system will allow City staff to closely monitor total energy use and trends that may affect future decisions on where to invest limited resources to improve overall energy use. The system will enable the City to measure energy usage prior to implementing projects, then measure and verify anticipated energy savings after projects are closed out and completed.

Reporting energy savings and cost savings—in addition to other Plan successes—is an essential element to gain buy-in from all stakeholders. Accordingly, Public Works will work with the team to develop an annual summary report highlighting Plan status and other performance indicators, such as the EUI and ECI of municipal buildings.

Table 5: Key Performance Indicators

Key Performance Indicators	Objective
Energy Use Intensity	Based on a previously assigned benchmark (i.e., prior year EUI), the City will attempt to reduce EUI scores of each facility.
Energy Cost Index	Based on a previously assigned benchmark (i.e., prior year ECI), the City will attempt to reduce ECI scores of each facility.
Baseline Year Comparison	Annual energy usage will be compared to the selected baseline year (e.g., 2005), with the objective of meeting reduction goals.
ENERGY STAR Rating	For buildings eligible for ENERGY STAR ratings, the City will work to improve scores to above 75.

5.6 Seek Out Continuous Education and Training

Technologies and programs change rapidly. Ongoing training of staff on energy efficiency topics is critical to the sustainability and success of the Plan.

Public Works personnel are currently participating in Building Operator Certification training to improve their technical skills and knowledge. That will lead to better-performing facilities and more energy-efficient operations. The team is also committed to participating in education and training workshops offered by the local utilities and others—as many as possible, since most of this training is available at no cost to the City. In particular, the City will leverage the free workshop offerings provided by SCE to increase staff knowledge. Additionally, active participation in the Local Government Statewide Energy Efficiency Collaborative will enable the staff to participate in peer-to-peer information sessions, collaborative purchasing opportunities, and other opportunities that will be made available through innovative partnerships and collaboration between local governments.

The energy management team will also provide workshops for City stakeholders, covering topics such as the benefits of energy efficiency for local governments and the goals of the CLEESP to establish and maintain a heightened sense of awareness. Recently the City invited Patrick Stoner, the Statewide Local Government Energy Efficiency Best Practices Coordinator, and Howard Choy, General Manager of the Los Angeles County Office of Sustainability, to speak at a City Council Meeting on local energy programs and the benefits of energy management. The energy management team will seek additional opportunities to have industry leaders present value-added energy-related information to key stakeholders on a periodic basis.

Table 6: Implementation Plan Timeline

Implementation Plan – Short-Term Timeline			
Milestones	**Action Steps**	**Schedule**	**Responsible Department**
1. Encourage no-cost measures to reduce energy usage, such as turning off computers, lights, and other energy devices when not in use.	Install plug-load sensors and educate city staff on energy conservation to reduce electricity usage.	2012	All City Departments
2. Establish policies and procedures to ensure municipal buildings are operating efficiently.	Develop the following policies to promote efficient municipal buildings: - Energy benchmarking - Retro-commissioning	2012	Public Works
3. Identify and implement energy projects through an SCE partnership and energy audits.	Capture energy efficiency measures City-wide and in buildings with highest energy usage to meet reduction goals. Develop high-level project implementation strategy.	Ongoing	Public Works
4. Procure utility manager (e.g., EnergyCAP).	Incorporate a solution to track and monitor the energy usage of all City facilities. Establish tracking and reporting protocol.	2012	Public Works
5. Locate funding opportunities for energy projects.	Collaborate with SCE, SEEC, LGC, and others to leverage network in pursuit of funding opportunities. Centralize process for communicating all available funding resources.	Ongoing	All City Departments
6. Develop training program for operations staff.	Build in-house capacity to improve staff's ability to participate in energy management initiatives. Establish library of training collateral for education program.	2012–2013	Public Works

SECTION 6. ENERGY CONSERVATION MEASURES

Identifying, evaluating, and implementing cost-effective energy conservation measures are essential elements of the EAP. The City combined internal and external resources to develop a summary of feasible near-term projects to meet the City's target energy reduction goals. For example, to help identify building energy conservation projects for near-term consideration, the Public Works staff teamed with a consultant and SCE to conduct ASHRAE Level II audits on five of the largest municipal facilities (the audits are provided in Appendix A). In addition, a number of other ECMs were identified as potential opportunities to reduce the City's overall energy use and costs, such as a preliminary water Pump Evaluation Study that identified potential energy savings.[14]

This section will present each of these opportunities and provide the information necessary for City management to make informed decisions as to whether to pursue these potential projects.

As a matter of standard operational practice, the City will, as appropriate, incorporate and prioritize energy conservations measures based on the following energy resource loading order:

1. Cost-effective energy efficiency
2. Demand response
3. Renewable energy and clean distributed generation
4. Clean fossil fuels

6.1 Water Energy Efficiency Project and SCADA System

A recently completed Pump Study by SCE indicated that there are still opportunities to improve energy efficiency at several pump stations. According to SCE, completion of these retrofits could produce annual energy savings in excess of 500,000 kWh, and annual energy cost savings in excess of $50,000. Implementing these projects could represent energy savings of about 10% of all pumping loads, and 4% of the entire City consumption.

A second potential opportunity is the development of a community-wide water conservation program. There is a strong water-energy nexus; as water is conserved, so is the electricity required to power the pumps that supply that water. Senate Bill X7-7 was enacted in November 2009, requiring all water suppliers to increase water use efficiency. The legislation sets an overall goal of reducing per capita urban water use by 10% by 2015 and 20% by 2020. In response to this legislation, the City completed an Urban Water Management Plan.[15] This plan identified a number of potential demand management measures; however, the study concluded that most are either currently being implemented or their impact is not easily quantifiable. It should be noted that—relative to other regional water agencies—the City is considered to be quite efficient, as measured by its per capita water usage of 97 gallons per capita per day (which is 46% below the regional average).

[14] The City has not yet received specific recommendations for what improvements could be made to the pump stations. The City should request this information so that the recommendations can be properly vetted and considered for implementation.

[15] *City of South Gate Urban Water Management Plan* (2011).

The City is finalizing the installation of a new SCADA system that will contribute to managing pumping operations more efficiently. The City should benchmark the existing energy usage and report on the energy savings after the system goes live. By leveraging the capabilities of the SCADA system, it is expected that the City will be able to incorporate additional energy conservation measures and potentially increase participation in demand response.

6.2 Street Lighting Project

The City is implementing a City-wide conversion of 515 streetlights from high-pressure sodium to light-emitting diodes (LED), and replacing series with multiple circuits. The estimated annual energy savings is approximately 220,000 kWh.

The City has a City-wide streetlight master plan in development to convert the remaining 75% of its streetlights to high-efficiency LED lamps, which are 50%–75% more efficient than the streetlamps currently in use. Over time, converting 100% of the city's streetlights would save as much as1.5 million kWh per year, and reduce the total annual energy consumption by as much as 13%. According to the draft Streetlight Master Plan, the City could save approximately $400,000 annually in utility costs by upgrading to more energy-efficient lighting systems.

6.3 Building Retrofits

ASHRAE-level whole-building energy audits were performed to identify ECMs in five of the City's buildings. The audits identified HVAC, lighting, controls, and opportunities for retro-commissioning. If all recommended ECMs were implemented, it would result in an estimated annual electric energy savings of 335,000 kWh and cost savings of $47,494. Table 7 includes some of the more cost-effective energy-efficient projects identified through the energy audits.

South Gate is looking to combine the benefits of SCE's HVAC Optimization Program with its HVAC maintenance service contract. The HVAC Optimization Program ensures that eligible units are operating optimally and efficiently by bringing all systems up to a baseline performance level. Better-maintained, better-operated HVAC units are expected to result in annual energy usage savings of up to 5% of current building usage. The City receives SCE incentives based on the contractor's inspection findings.

Table 7: Energy Conservation Measures for City Buildings

Facility	ECM	Description
City Hall	Install VFD on supply fans and reduce VAV minimum flow	Existing AHUs operate with discharge dampers, and would benefit greatly from a combination measure of installing a VFD on the supply fan motors and reducing the VAV minimum flow to 50% for the areas served (by commissioning existing zone dampers as necessary). This recommended retrofit includes the retro-commissioning and repair of the existing VAV.
City Hall	Garage fan CO sensor and VFD	The existing garage fan runs continuously to exhaust air from the garage, since there is no control to reduce the fan's operation when CO levels are acceptable. Installing CO sensors and a controller can reduce the runtime of the exhaust fan by more than 90%. Installing a VFD on the fan will also reduce noise levels and wear on the motor resulting from the more frequent starts and stops the CO controller will add.
City Hall	Chill water reset	City Hall is currently served by an 80-ton screw chiller, which provides chilled water to the system at a constant temperature of 45°F. It is recommended that the City implement a load reset by raising the chilled water temperature during times of decreased internal load, up to a maximum reset temperature of 53°F.
Corporate Yard	Lighting	The Corporate Yard lighting is served by a number of interior and exterior HPS fixtures that vary from 70W to 200W. It is recommended that the facility change these to compact fluorescent for fixtures <200W, and high-output T5 lamps for fixtures >200W.
Police Station	Install VFD on supply fans and reduce VAV minimum flow	Existing AHUs operate with discharge dampers and would benefit greatly from a combination measure of installing a VFD on the supply fan motors and reducing the VAV minimum flow to 50% for the areas served (by commissioning existing zone dampers as necessary). This recommended retrofit includes the retro-commissioning and repair of the existing VAV.
Police Station	Lighting	A majority of the facility already uses high-efficiency lighting; however, some opportunities were identified during the audit. One of the restrooms was observed to use incandescent lights, which can cheaply and easily be replaced with a CFL equivalent. The exterior lighting for the station uses low- and high-wattage HPS fixtures. The lower-wattage bulbs can be replaced with CFLs, and the higher-wattage fixtures can be replaced with T5 fluorescent lamps for additional savings.
Senior Center	Thermostat scheduling	Existing thermostats are currently programmed incorrectly, resulting in excessive use during unoccupied periods. Savings can result from reprogramming existing thermostats or replacing them with additional programmable settings. Programming should include setback

		temperatures for unoccupied periods.
Sports Center Complex	Lighting	Exterior lights consist of 100W and 250W HPS fixtures. 100W fixtures can be replaced with similar compact fluorescent fixtures, and 250W fixtures can be replaced with high-output linear T5 fluorescent lamps.

6.4 Plug Loads

According to a study conducted by the National Renewable Energy Laboratory (NREL), plug loads could account for an average of 9% (but as much as 28%) of the electricity consumption in office buildings.[16] These loads include computer workstations, monitors, printers, fax machines, space heaters, task lighting, radios, fans, electric staplers, coffee pots, cell phone chargers, and other items. The City should conduct a comprehensive audit of plug loads throughout City facilities. It is not uncommon for workstations to have their own single-user machines (copiers, printers, fax machines, and scanners).

If it has not already been done, IT and management should consider putting in place policies that eliminate personal single-function print/copy/fax machines wherever possible. The City should also make "smart" power strips available (ones that use an occupancy sensor to control several outlets on the power strip). When the area is not occupied for a preset time, the sensor cuts power to the controlled outlets for non-essential equipment (e.g. fans, heaters, chargers).

The City is working with SCE to install plug-load sensors throughout City facilities. The estimated annual energy savings could amount to 14,000 kWh.

6.5 Demand Response and Permanent Load Shifting

South Gate is currently participating in SCE's demand response program. Once the SCADA system goes live, the City will evaluate opportunities for increased participation in the demand response program.

Additionally, the City should have the Sports Center Complex evaluated for potential demand response capability since this facility has a large peak demand and is likely to have loads (e.g., pool pumps, lighting) that could be temporarily reduced during critical peak periods.

Finally, the City will consider participating in SCE's permanent load shifting program. The PLS program employs technology that would enable the City to reduce energy bills by shifting peak load to off-peak periods with lower rates. City Hall and the Sports Center Complex are ideal candidates for shifting peak loads.

6.7 Clean Energy Systems

The City has taken steps toward supplying its energy needs with a local, clean, plentiful energy supply through the installation of a 53 kW solar PV system at City Hall. Solar system costs have decreased significantly in the past decade, and they are expected to continue to decline—

[16] Plug Load Behavioral Change Demonstration Project. Ian Metzger, Alicen Kandt, and Otto VanGeet. National Renewable Energy Laboratory (NREL), August 2011.

to the point that producing electricity from such systems could be less expensive than buying power from the utility grid (referred to as "grid parity"). The City will consider the benefits of a large-scale increase in solar usage over the next several years. In the meantime, the City will explore installing solar PV systems on a smaller scale and targeted basis at the Sports Center Complex, the Corporate Yard, and the Auditorium. The City will leverage the incentives and resources made available through programs such the California Solar Initiative to assist with funding the solar projects. Furthermore, the City will continue to explore and research the benefits of implementing the use of emerging clean energy technology such as fuel cells in municipal facilities. As fuel cells or other emerging technology become more cost-effective, the City will be positioned to integrate the technology into municipal operations based on prior research. The City will leverage programs that provide incentives

In support of reducing greenhouse gas emissions and an increasing rate of adoption of electric and hybrid vehicles, the City plans to participate in the California Energy Commission's Reconnect California Program which provides funding to upgrade public electric vehicle stations. These new systems will be more energy efficient and "smart grid" ready which will allow participation in demand response.

SECTION 7. SUSTAINING ENERGY SAVINGS

The City of South Gate recognizes energy efficiency best practices established by the state, the Department of Energy, regional agencies, and local institutions. In support of the Plan and in recognition of established best practices, the City will institute the following local government best practices as energy efficiency guidelines City-wide and in its daily operations:

7.1 City-Wide Energy Efficiency Guidelines

1. Buildings and facilities will be operated in the most energy-efficient manner possible without diminishing the quality of municipal services provided to the community, or interfering with the operations of City staff.
2. Energy efficiency will be the City's primary energy resource; as such, all cost-effective energy efficiency measures will be given highest considerations for implementation.
3. Energy efficiency improvement measures will be identified to the greatest extent possible, and all necessary steps will be undertaken to seek funding for their implementation and (upon securing availability of funds) to expeditiously implement the measures.
4. All energy projects and energy equipment will be implemented or procured, within budget constraints, for optimum energy utilization, lowest life-cycle operating costs, short payback periods, and in compliance with all applicable energy codes (Title 24 energy codes/CALGreen) and regulations.
5. Demand response, cost-effective renewable energy, and emerging clean energy technology will be considered wherever possible. Permanent load-shifting technologies such as thermal energy storage will also be considered.
6. The City will cooperate with federal, state, and regional agencies in accomplishing energy conservation and utilities management objectives, and educate City staff on the need for and methods of energy conservation and management.
7. The *Energy Action Plan* will be updated to account for progress in meeting established energy reduction goals.

7.2 Operations Energy Efficiency Integration Guidelines

1. An account of the energy systems and equipment will be inventoried by facility, and recorded in the electronic management system.
2. Retro-commissioning activities will be integrated into O&M procedures to achieve optimal performance of buildings and equipment.
3. The building management system will be monitored periodically to control calibration of HVAC and lighting systems.
4. HVAC systems will be operated and maintained to achieve greater energy efficiency, resulting in improved air quality, enhanced system reliability, and longer equipment life.
5. When replacing energy equipment, the most cost-effective models will be considered (such as life-cycle cost analysis instead of "initial capital cost only"). This will be a basis for all future equipment selection. Efforts will be made to secure additional funding (if required) to effect lowest life-cycle cost procurement.

6. Building temperature set points for heating and cooling will be established to attain both efficient building performance and optimal comfort level.
7. Lighting, except that required for security purposes, will be turned off when buildings and facilities are unoccupied (e.g., after close of business).
8. All nonessential electrical devices such as space heaters, fans, and chargers must be unplugged during unoccupied periods.
9. Municipal infrastructure (e.g., buildings, well pump stations, streetlights) will be maintained to operate efficiently, and preventive maintenance schedules will be followed to maintain the highest possible system efficiencies and, hence, lowest operating costs.
10. Additional opportunities to participate in demand response programs will be leveraged to reduce noncritical loads and relieve demand on the electrical grid and improve system reliability.
11. The most pragmatic and safest energy management practices will be observed in the execution of these guidelines.

7.3 Going Forward

As natural resources become more constrained and energy costs climb due to increasing domestic and global demand, climate change, and population growth, effective energy management will be critical if the City is to remain operationally viable. Managing municipal electricity consumption is an essential component if the City is to actively participate in responsible energy usage and planning. The development of this Plan promotes the centralization of efforts between key decision makers and staff to a singular goal of continuously improving energy management practices.

Through implementation of the energy management initiatives, the City will be strongly positioned to reduce electricity usage and energy costs. One of the first orders of business will include taking action to meet the SCE Energy Leader Partnership (ELP) Platinum Tier as a milestone in progress to reach reduction goals (refer to table 6). The City will implement cost effective efficiency measures such as building or pumping station retrofits to reach the 20% energy savings. Additionally, the City will finalize the energy benchmarking and retro-commissioning policies and seek city council approval to adopt each policy. Lastly, the City will complete procurement of a utility manager system (e.g., EnergyCAP) as part of a broader energy management strategy. Meeting the requirements of the ELP Platinum Tier will result in enhanced incentives in the amount of 12 cents per kWh paid above SCE's core programs from implementation of energy conservation measures.

In the end, this Plan will serve as a model to incorporate future reduction strategies for resources such as water and natural gas. Because of the relationship of energy use and greenhouse gas emissions, reducing electricity usage also reduces associated emissions—thereby supporting local and state mandates as well. South Gate accepts the responsibility of leading by example through the smart management of energy usage in municipal facilities. By undertaking this responsibility, South Gate can position the City as a more vibrant and sustainable community for current and future generations to enjoy.

SECTION 8. Appendixes

WILLDAN

Appendix A

February 2012

Energy Study

South Gate City Hall

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List of Tables and Figures

FIGURES

Tables

1. Facility Information

1.1 Site Description

The South Gate City Hall is a single story 26,900 square-foot facility located at 8650 California Ave in South Gate, California. The City Hall houses many of the key departments that manage operations throughout the city.

The annual energy usage of this facility was 804,463 kWh of electricity and 7,806 therms of natural gas based on available utility data from 2010 thru 2011. The facility's average annual energy usage intensity is 29.91 kWh/ft^2 and 0.2901 therms/ft^2 of building area.

1.2 Historical Energy and Gas Profiles

Historical profiles based on monthly utility data are shown in the following graphs:

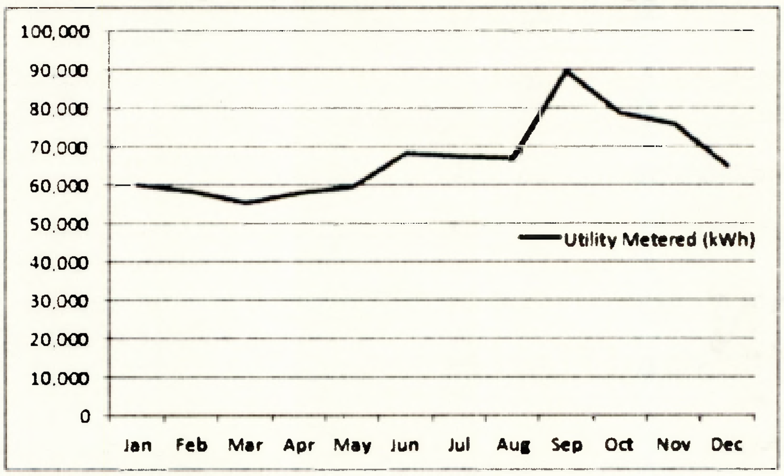


Figure 1.1: Historical Electricity Billing Data

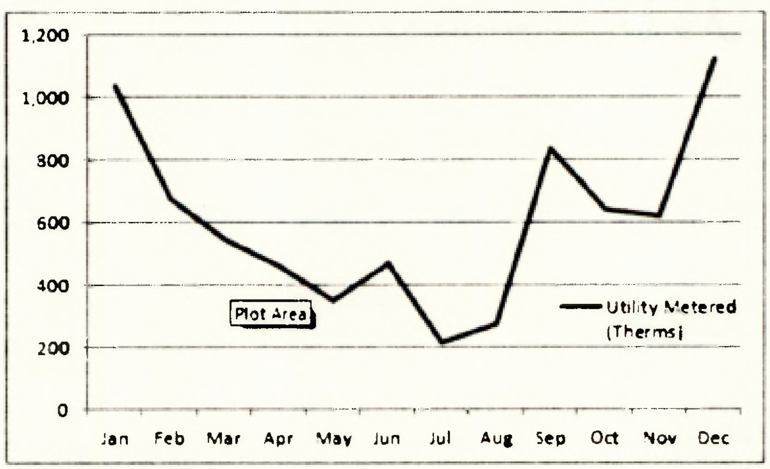


Figure 1.2: Historical Gas Billing Data

1.3 Baseline Energy Use

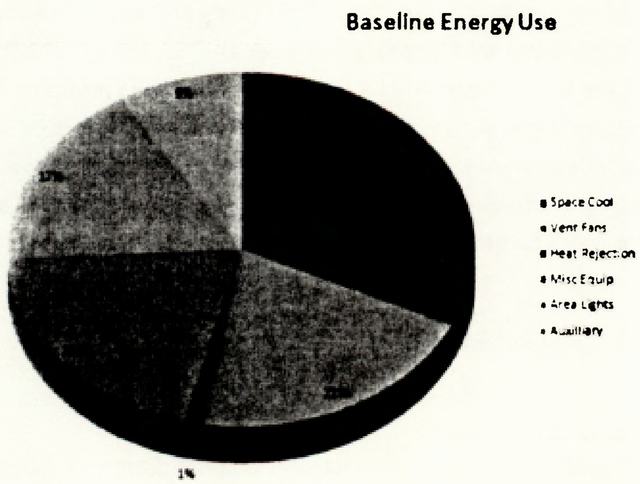


Figure 1.3: Baseline Energy Use by Demand Area

1.4 Utility Accounts

Electricity Meter #: 3-000-0152-67
Gas Account #:0139007300-0139007300

1.5 Audit

A whole building energy audit was performed on the South Gate City Hall. From the information collected during the audit a number of energy conservation measures (ECM) are proposed to reduce the energy and gas consumption.

2. Description of Existing Equipment

2.1 HVAC

Existing HVAC systems were found to be managed and maintained by Honeywell. The site was observed to be served by an 80 Ton Trane Screw Chiller which supplies 45°F water to the facilities air handlers. The site is currently maintained by (3) Carrier Air Handling Units. These AHUs are constant air volume systems with chilled water coils. Each zone is provided with discharge damper and hot water reheat coils. AHU 1 and 2 serve the west portion of the City Hall and AHU 3 serves the East. The system is controlled by pneumatic thermostats located throughout the building. No existing economizers or reset controls are in place. The building's HVAC schedule is 4AM – 6PM Monday through Thursday; however, per city personnel there is difficulty in achieving warm up for the Monday following a weekend. As a result, the city must operate 24/7 in order to meet comfort levels of the buildings occupants during colder months.

A single Patterson Kelly boiler serves the Hot Water Reheat coils at the facility.

2.2 Existing Lighting Equipment and Conditions

The interior lighting is primarily 4 ft T8 25 W and 17 W lamps with electronic ballasts. Some recessed lights are screw-in fluorescent type. A large number of rooms are controlled by a switch and occupancy sensor combination.

Exterior lights were found to be 100 watt HPS lights and are operated during night time hours only

2.3 Other

An exhaust fan currently serves the underground parking area which is used by city staff. Currently this fan is uncontrolled and runs continuously to exhaust potential CO from the area served.

The City Hall contains a server room which is not served by the buildings HVAC system and operates with its own, smaller, split AC unit.

3. Analysis

3.1 Energy Conservation Measures

The following ECMs were evaluated using spreadsheet calculations and eQuest. AESC evaluated several possible Energy Conservation Measures (ECMs) for the South Gate City Hall to determine which solutions are economically viable. The following ECMS can achieve additional savings and in addition provide easier operation and improved thermal comfort.

ECM – 1: Economizer

The existing air handling units do not currently have the controls or capability in place to take advantage of "free cooling" using 100% outside air during optimal conditions. By expanding the OSA intake, adding motorized dampers and associated economizer controls, significant savings can be realized, particularly during colder weather.

- *Estimated annual savings 14,243 kWh and -3.7 kW and -1,227 Therms*

ECM – 2: Install VFD on supply fans and reduce VAV minimum flow

Existing AHUs operate with discharge dampers and would benefit greatly with a combination measure of installing a VFD on the supply fan motors and reducing the VAV minimum flow to 50% for the areas served by commissioning existing zone dampers as necessary. This recommended retrofit includes the retro-commissioning and repair of the existing VAV.

- *Estimated annual savings 133,890 kWh and 0 kW and 6,207*

ECM – 3: Chilled Water Reset

The City Hall is currently served by an 80 ton screw chiller which provides chilled water to the system at a constant temperature of 45° F. It is recommended that the city implement a load reset by raising the supply chilled water temperature during times of decreased internal load up to a maximum reset temperature of 53° F.

- *Estimated annual savings 28,605 kWh and 6.5 kW*

ECM – 4: Garage Fan CO sensor and VFD

The existing garage fan runs continuously to exhaust air from the garage as there is no existing control to reduce operation when CO levels are acceptable. Installing CO sensors and a controller can reduce the runtime of the exhaust fan by more than 90%. Installing a VFD on the fan will also reduce wear and noise levels on the motor due to the more frequent start and stops the CO controller will add.

- *Estimated annual savings 31,928 kWh and 3.7kW*

ECM – 5: Exterior Lighting

Some existing exterior lights use 100 Watt HPS lamps which can be replaced with 38 watt pinned CFL equivalent lamps.

- *Estimated annual savings 566 kWh and 0 kW*

3.2 Results

The estimated energy and cost savings, incentives (gas and electric), installed project costs, and simple payback time per ECM are summarized in the following table:

Table 8: Summary of Energy Conservation Measures

EEM #	Based on EEM	Recom mended Y?	EEM	Electrical Savings (kWh)	Electrical Savings (kW)	Natural Gas Savings (Therms)	Electrical Energy Cost Savings ($)	Natural Gas Energy Cost Savings ($)	Total Cost Savings ($)	Electrical Incentive w/o cap ($)	Natural Gas Incentive w/o cap ($)	Total Incentive w/o cap ($)	Install & Design Costs ($)	Total Incentive w/ cap ($)	Simple Payback Time w/o Incentive (Yrs)	Simple Payback Time w/ Incentive (Yrs)
1	0	N	Economizer	14,243	-3.7	-1,227	$1,994	$0	$1,994	$2,193	$0	$2,193	$30,000	$2,193	15.0	13.9
2	**1**	**Y**	**VAV and VFD**	**133,890**	**0.0**	**6,207**	**$18,745**	**$6,207**	**$24,951**	**$24,100**	**$6,207**	**$30,307**	**$40,000**	**$26,207**	1.6	0.6
3	2	Y	CHW Reset	28,605	6.5	0	$4,005	$0	$4,005	$5,802	$0	$5,802	$10,000	$5,000	2.5	1.2
4	**0**	Y	**CO Fan Sensors & VFD**	**31,928**	**3.7**	**0**	**$4,470**	**$0**	**$4,470**	**$6,112**	**$0**	**$6,112**	**$7,500**	**$3,750**	1.7	0.8
5	0	Y	Lighting	566	0.0	0	$79	$0	$79	$79	$0	$79	$105	$53	1.3	0.7
			Recommended	**194,989**	**10.2**	**6,207**	**$27,298**	**$6,207**	$33,505	**$36,093**	**$6,207**	**$42,300**	**$57,605**	**$35,009**	1.7	0.7

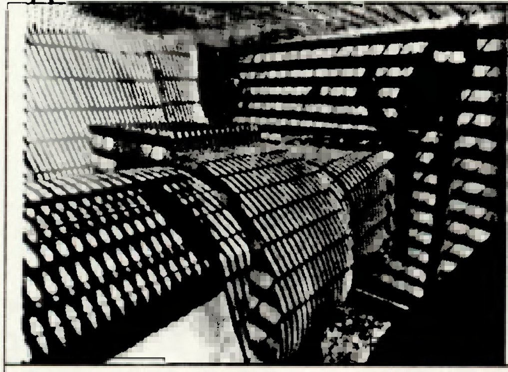
Notes:

1) Based on an average cost of $0.14/kWh and $1.00/Therm

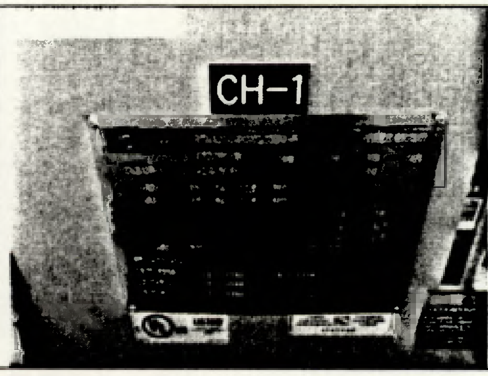
4. Limitations and Disclaimer

The intent of this energy analysis report is to estimate energy savings associated with recommended upgrades to the HVAC system. Appropriate detail is included in this report to make decisions about implementing energy efficiency measures at this facility. However, this report is not intended as a detailed engineering design document. While the recommendations in this report have been reviewed for technical accuracy and are believed to be reasonably accurate, the findings are estimates and actual results may vary.

5. Appendix A – Photos

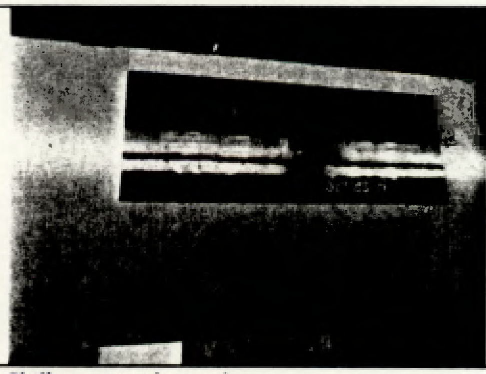


Garage CO Exhaust Fan

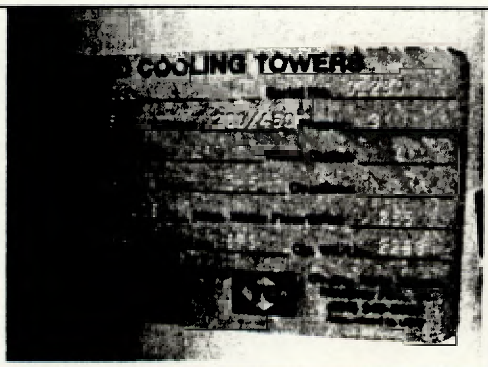


Chiller nameplate

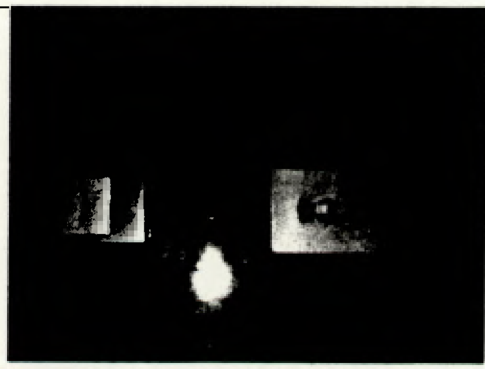
Compressor nameplate



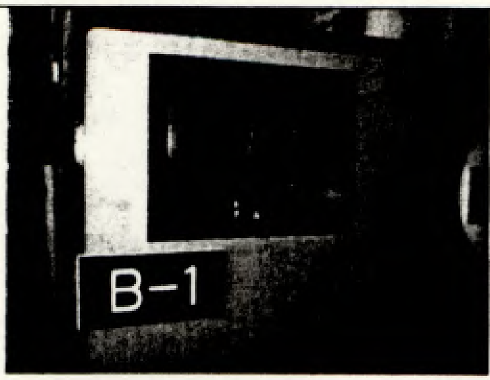
Chiller control panel



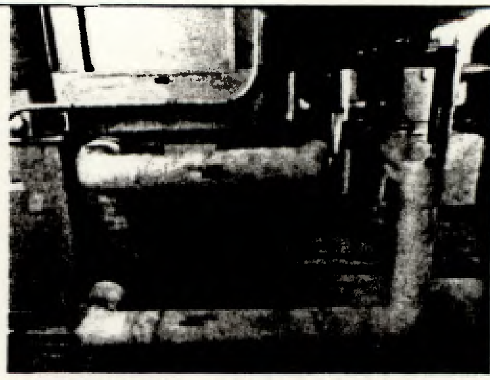
Cooling tower nameplate

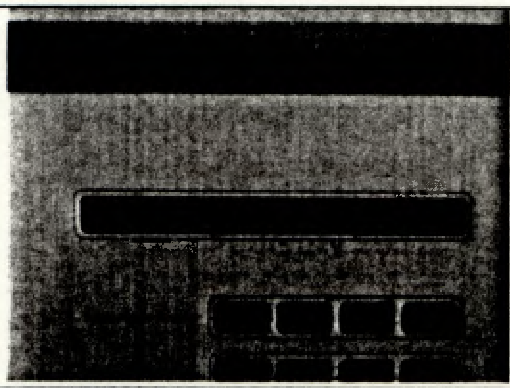


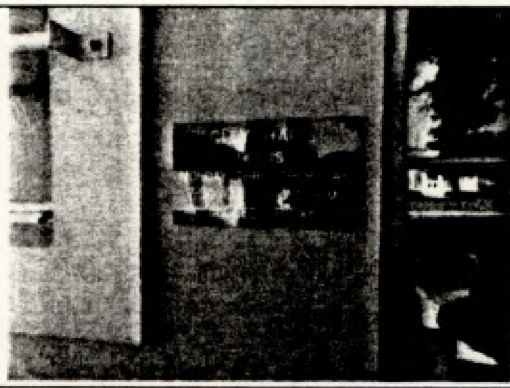
Thermostats



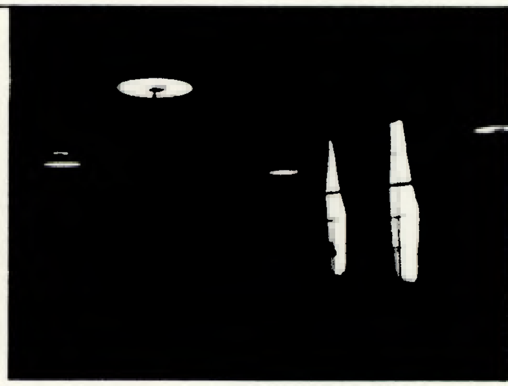
Boiler control panel


Basement AHUs


Chilled water setpoint readout


City hall building schedule


Front-West side of City Hall


Council Chambers

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Appendix B

February 2012

Energy Study

South Gate Sports Center

  

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FIGURES

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1. Facility Information

1.1 Site Description

The South Gate Sports Complex is a 2-story 75,330 square-foot facility located at 9520 Hildreth Ave. in South Gate, California.

The average annual energy usage of this facility is 528,523 kWh of electricity and 69,917 therms of natural gas based on available utility data from 2010 thru 2011. The facility's average annual energy usage intensity is 7.02 kWh/ft^2 and 0.928 therms/ft^2 of building area.

1.2 Historical Energy and Gas Profiles

Historical profiles based on monthly utility data are shown in the following graphs:

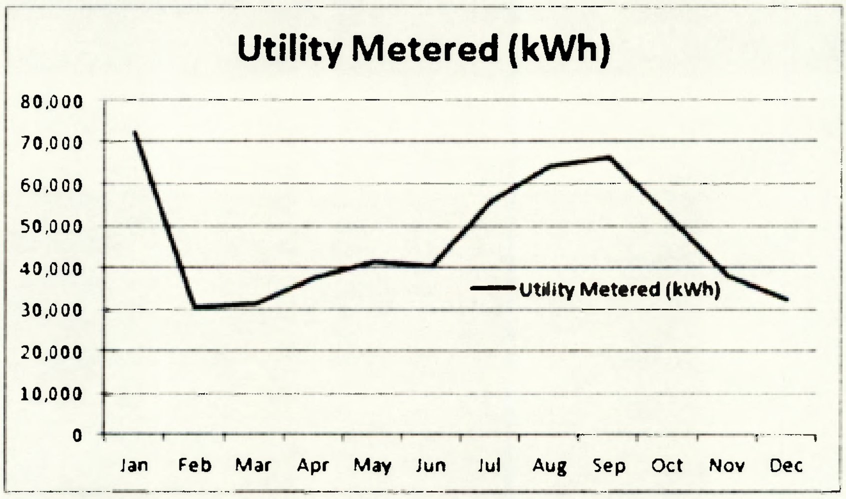


Figure 1.1: Historical Electricity Billing Data

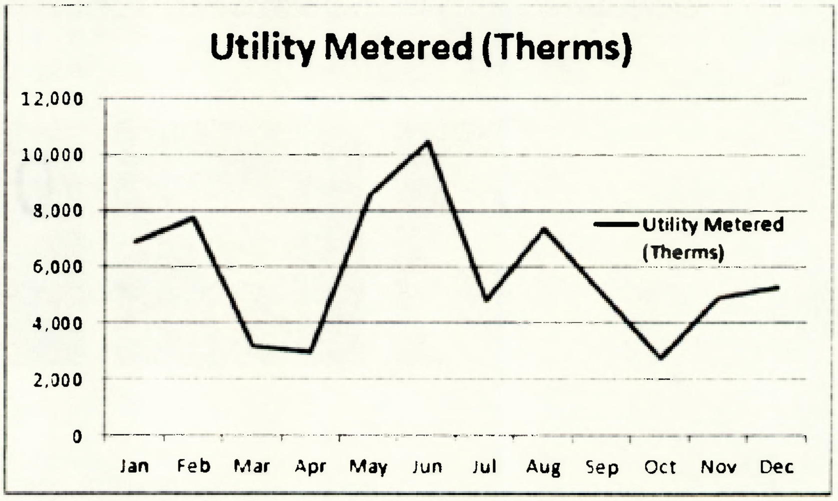


Figure 1.2: Historical Gas Billing Data

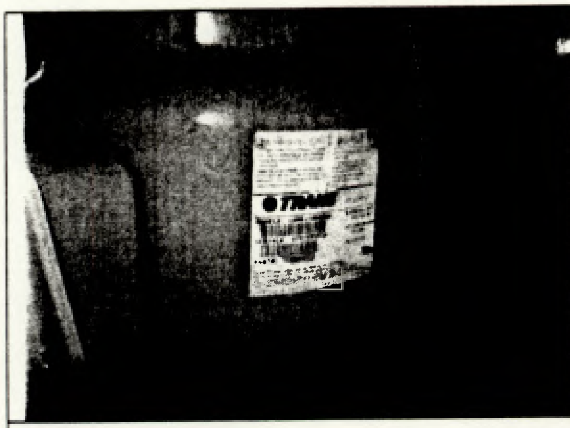
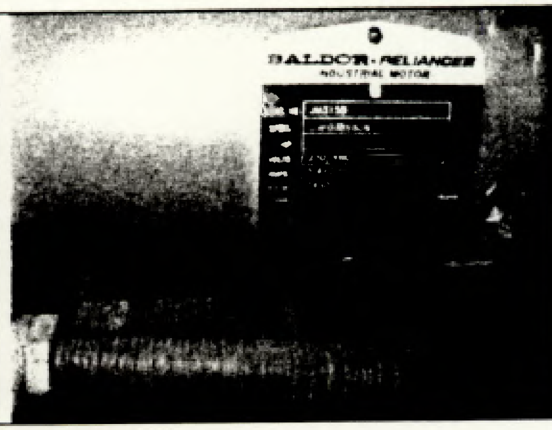
Appendix E

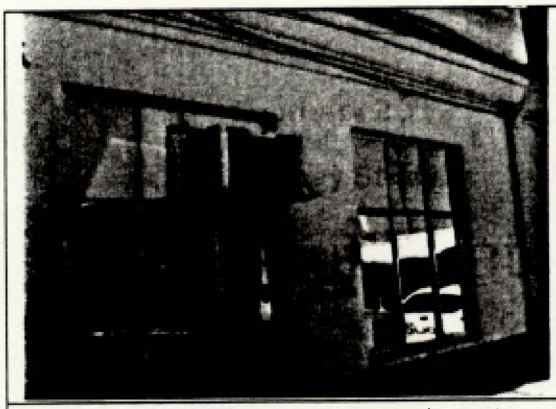
February 2012

Energy Study

South Gate Senior Center



	
Chiller compressor	CHW pump

	
PTAC serving small server room inside station	Sample exterior lights

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1. Facility Information

1.1 Site Description

The South Gate Senior Center is a single story 7,340 square-foot facility located at 4855 Tweedy Boulevard in South Gate, California.

The average annual energy usage of this facility is 111,320 kWh of electricity and 10,680 therms of natural gas based on available utility data from 2010 thru 2011. The facility's average annual energy usage intensity is 15.16 kWh/ft^2 and 1.45 therms/ft^2 of building area.

1.2 Historical Energy and Gas Profiles

Historical profiles based on monthly utility data are shown in the following graphs:

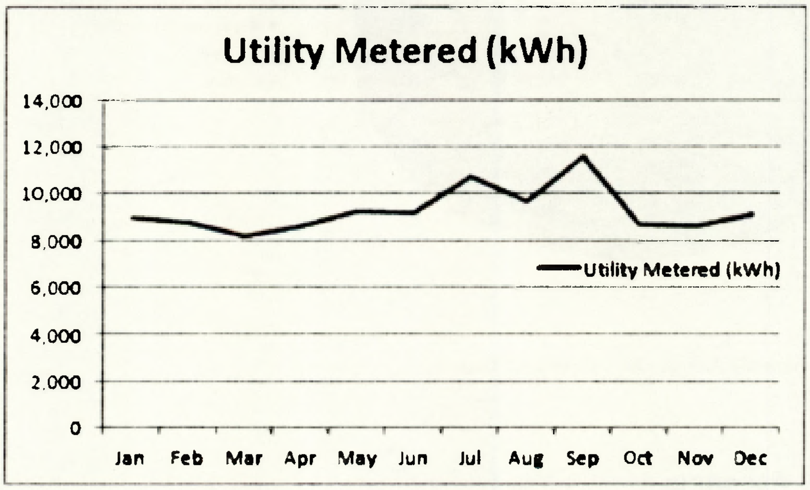


Figure 1.1: Historical Electricity Billing Data

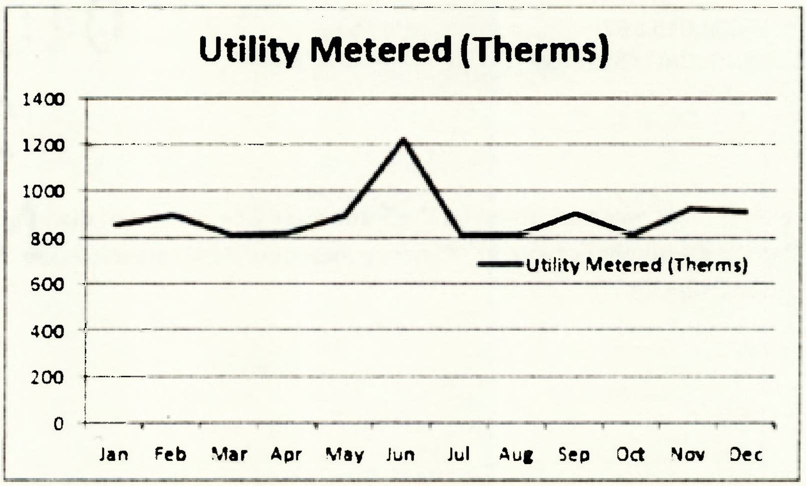


Figure 1.2: Historical Gas Billing Data

1.3 Baseline Energy Use

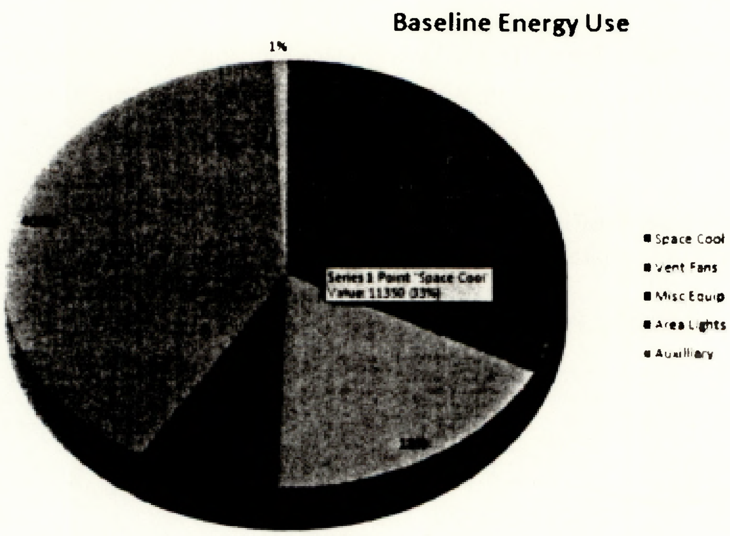


Figure 1.3: Baseline Energy Use by Demand Area

1.4 Utility Accounts

Electricity Meter #: 3-000-0152-67
Gas Account #:0139007300-0139007300

1.5 Audit

A whole building energy audit was performed on the South Gate City Hall. From the information collected during the audit a number of energy efficiency measures (EEM) are proposed to reduce the energy and gas consumption.

2. Description of Existing Equipment

2.1 HVAC

The South Gate Senior Recreation Center is served by (2) 5-Ton DX units. While programmable thermostats were identified in the facility, the programming found on the thermostats demonstrated that they are currently bypassing any potential automation allowed by the installed controllers. This conclusion is based on the programming showing unrealistic cooling and heating set points.

2.2 Existing Lighting Equipment and Conditions

The interior lighting is primarily 4 ft T8 25 W and 17 W lamps with electronic ballasts. Some recessed lights are screw-in fluorescent type. A large number of rooms are controlled by a switch and occupancy sensor combination.

Exterior lights were found to be 100 watt HPS lights and are operated during night time hours only

3. Analysis

3.1 Energy Conservation Measures

The following ECMs were evaluated using spreadsheet calculations and eQuest. AESC evaluated several possible Energy Conservation Measures (ECMs) for the South Gate Senior Center to determine which solutions are economically viable. The following ECMS can achieve additional savings and in addition provide easier operation and improved thermal comfort.

The following ECMs were evaluated using spreadsheet calculations and eQuest.

ECM – 1: High EER DX HVAC units

By replacing the existing (2) standard efficiency DX units with High EER units (13 EER), the cooling usage of the recreation center can be reduced.

- *Estimated annual savings: 9,878 kWh, 3.4 kW, 9 Therms*

ECM – 2: Thermostat Scheduling

Currently, existing thermostats are programmed incorrectly, resulting in excessive use during unoccupied periods. Savings can result from the reprogramming of existing thermostats or replacing existing thermostats with programmable settings. Programming should include setback temperatures for unoccupied periods.

- *Estimated annual savings: 22,347 kWh, 5.0 kW, 767 Therms*

ECM – 3: Closet and Storage Area Occupancy Sensors

The facility is stated to only operate from 7AM to 3PM, Mondays through Fridays. During the visit all storage area lights were found to be on and only controlled via light switch. A conservative estimate was used to assess the probable baseline hours of operation.

- *Estimated annual savings: 1,310 kWh, 0.8 kW, 0 Therms*

ECM – 4: Exterior Lighting

Some existing exterior lights use 70 Watt HPS lamps which can be replaced with a fluorescent lamp type as a quick and low cost solution to reduce lighting energy usage at the facility. Additionally a screw-in incandescent type lamp was located in the water heater room which can quickly and cheaply be replaced with a screw-in CFL type lamp.

- *Estimated annual savings : 4,351 kWh, 0 kW, 0 Therms*

3.2 Results:

The estimated energy and cost savings, incentives (gas and electric), installed project costs and simple payback per ECM are summarized in the following table:

Table 12: Summary of Energy Conservation Measures

EEM #	Based on EEM	Recommended Y?	EEM	Electrical Savings (kWh)	Electrical Savings (kW)	Natural Gas Savings (Therms)	Electrical Energy Cost Savings ($)	Natural Gas Energy Cost Savings ($)	Total Cost Savings ($)	Electrical Incentive w/o cap ($)	Natural Gas Incentive w/o cap ($)	Total Incentive w/o cap ($)	Install & Design Costs ($)	Total Incentive w/ cap ($)	Simple Payback Time w/o Incentive (Yrs)	Simple Payback Time w/ Incentive (Yrs)
1	0	Y	High EER DX	9,878	3.4	9	$1,383	$9	$1,392	$342	$9	$352	$10,000	$352	7.2	6.9
2	1	Y	Thermostat Scheduling	22,347	5.0	767	$3,129	$767	$3,896	$504	$767	$1,271	$4,000	$1,271	1.0	0.7
3	2	Y	Occupancy Sensors for Storage Rooms	1,310	0.8	0	$183	$0	$183	$268	$0	$268	$500	$250	2.7	1.4
4	0	Y	Exterior Lighting	4,351	0.0	0	$609	$0	$609	$609	$0	$609	$810	$405	1.3	0.7
			Recommended	37,887	9.3	776	$5,304	$776	$6,081	$1,723	$776	$2,499	$15,310	$2,499	2.5	2.1

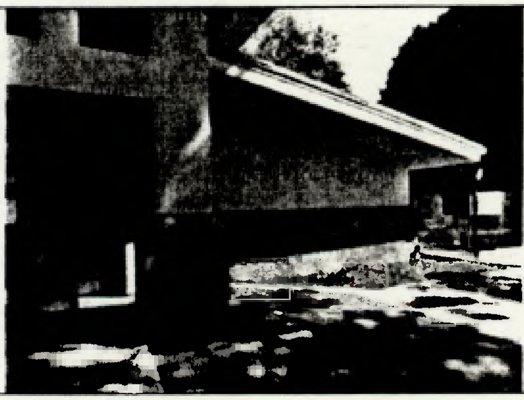
Notes:

Based on an average cost of $0.14/kWh and $1.00/therm

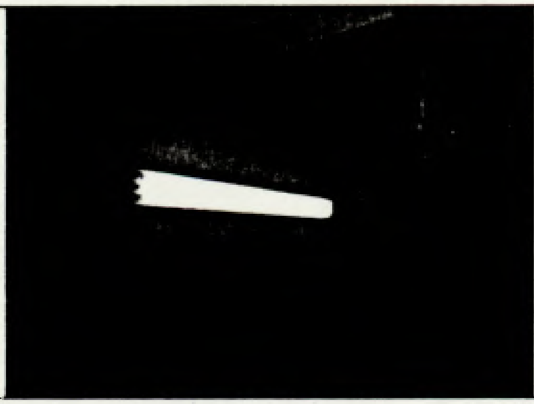
4. Limitations and Disclaimer

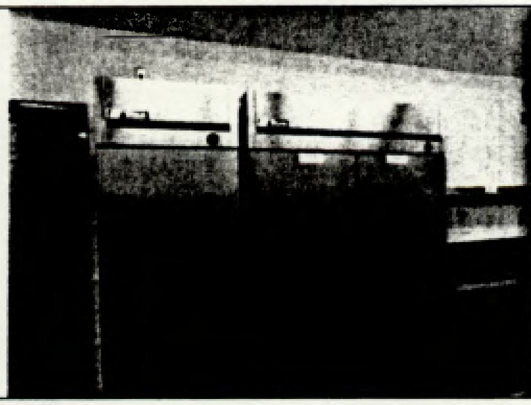
The intent of this energy analysis report is to estimate energy savings associated with recommended upgrades to the HVAC system. Appropriate detail is included in this report to make decisions about implementing energy efficiency measures at this facility. However, this report is not intended as a detailed engineering design document. While the recommendations in this report have been reviewed for technical accuracy and are believed to be reasonably accurate, the findings are estimates and actual results may vary.

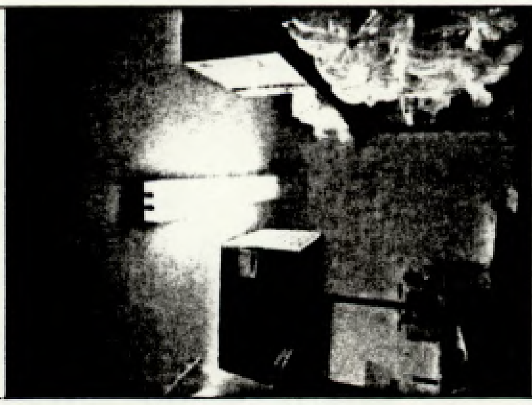
5. Appendix A – Photos


Rec Center Exterior

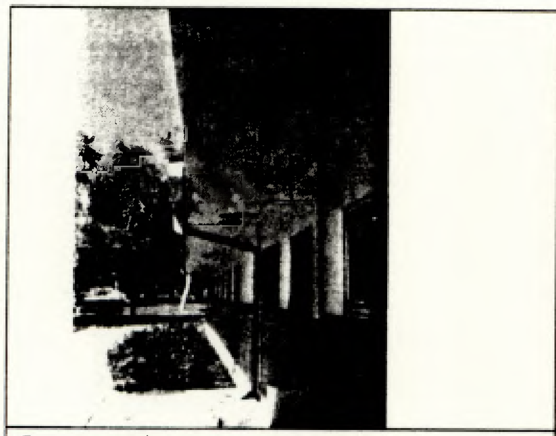
Existing Programmable Thermostat

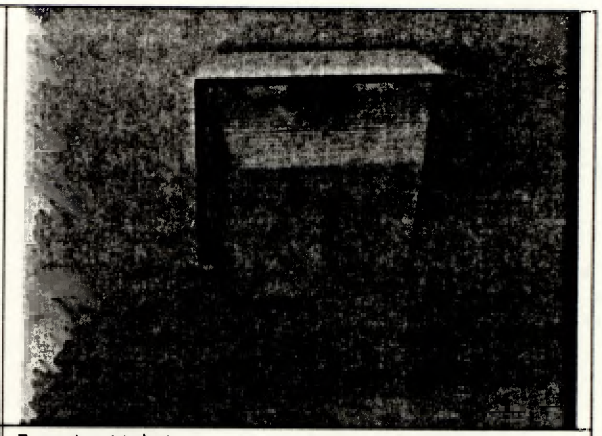

Restroom closet/storage lighting

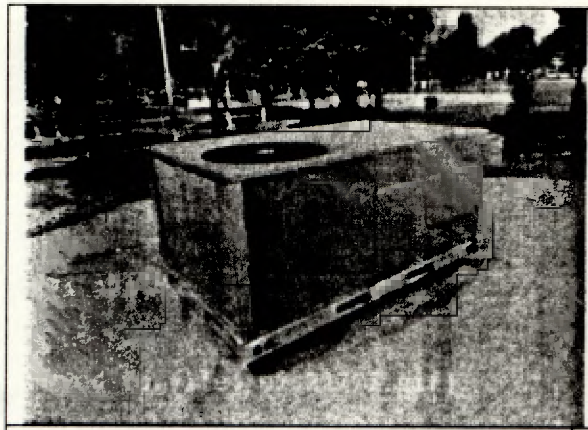

Kitchen

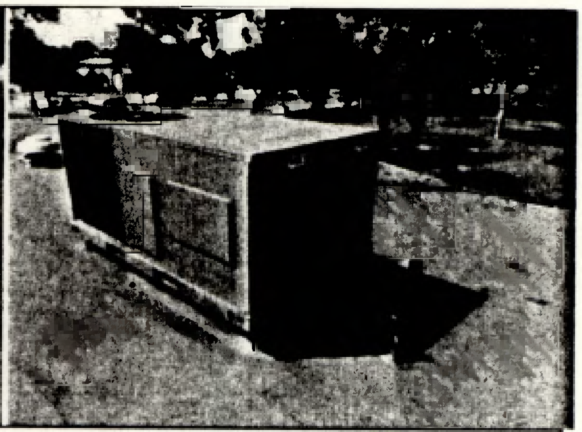

Kitchen Storage


Dining Area


Exterior Lighting


Exterior Lighting


Existing 5-Ton RHEEM DX


Existing 5-Ton RHEEM DX

1.3 Baseline Energy Use

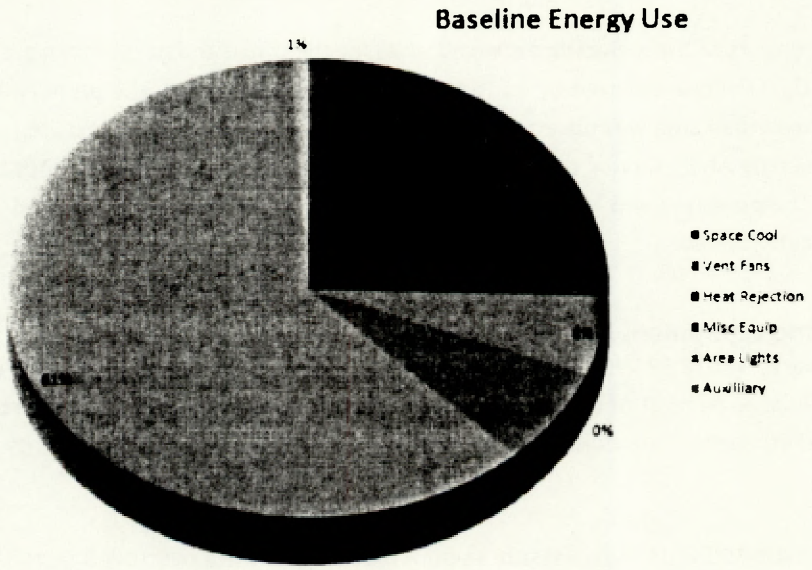


Figure 1.3: Baseline Energy Use by Demand Area

1.4 Utility Accounts

Electricity Meter #: 3016465083
Gas Account #: 1158009600-0000005316

1.5 Audit

A whole building energy audit was performed on the South Gate City Hall. From the information collected during the audit a number of energy efficiency measures (EEM) are proposed to reduce the energy and gas consumption.

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2. Description of Existing Equipment

2.1 HVAC

Existing HVAC equipment consists of 3 gas electric packaged units for the office and game room areas. The remaining portions of the facility are served by a 110 ton air cooled screw chiller. The primary air handling unit serving the basketball area was observed to operate with a VFD and static pressure reset controls. However the remaining AHUs serving the hallways, lobby, and exercise area did not appear to operate with VFD control. The pool area was located indoors, however it is heated year round and therefore the space is not conditioned.

2.2 Existing Lighting Equipment and Conditions

The interior lighting is primarily 4 ft T8 32 W lamps with electronic ballasts. Some recessed lights are screw-in fluorescent type. A large number of rooms are controlled by a switch and occupancy sensor combination. The main basketball stadium utilized T5 lamps and lighting levels were augmented by available sky lighting.

Exterior lights were found to be 100 watt high pressure sodium fixtures and were controlled by time clocks.

2.3 Other

The pool utilizes a 40 HP pump with a sand filtration system. The pump is currently controlled by a smart pump control system which adjusts the pump speed as needed to meet filtration requirements during occupied and unoccupied hours. The pool filter typically backwashes at 15 psi differential to an initial 8 psi differential.

The pool and HVAC system is primarily heated by a natural gas cogen system. Additional heat is provided by (2) Raypak boilers m/n H9-1532. However, per site interviews the cogen system is able to provide enough heat for the entire facility. The boilers are only required as backup.

3. Analysis

3.1 Energy Conservation Measures

The following ECMs were evaluated using spreadsheet calculations and eQuest. AESC evaluated several possible Energy Conservation Measures (ECMs) for the South Gate Sports Center to determine which solutions are economically viable. The following ECMS can achieve savings in addition to facilitating operations and improving thermal comfort.

ECM – 1: Install demand control ventilation sensors on return air

The basketball court area ventilation is sized to meet the OSA requirements for its peak capacity. Under typical conditions the amount of people in the area is much fewer. Installing CO2 sensors on the occupancy spaces will allow the system to actively monitor the carbon dioxide levels and increase or reduce the OSA brought in. Re-circulating more conditioned air will provide both cooling and heating savings.

- *Estimated annual savings 4,314 kWh and 1.5 kW*

ECM – 2: New economizers on AHUs

The existing economizer for the primary AHU does not appear to be in optimal condition to properly modulate and control the OSA used by the system. All other AHUs were found to not be equipped with economizers. A properly installed and optimized economizer schedule will provide savings during optimal outdoor conditions.

- *Estimated annual savings 4,648 kWh and 0.0 kW*

ECM – 3: Chilled Water Reset

The Sports Center is currently served by a 110 ton screw chiller which provides chilled water to the system at a constant temperature of 45° F. It is recommended that the city implement a load reset by raising the supply chilled water temperature during times of decreased internal load up to a maximum reset temperature of 53° F.

- *Estimated annual savings 2,069 kWh and 0.4 kW*

ECM – 4: Chilled Water Pump VFD

The chilled water system presently operates with a 10 HP pump and bypass valves within the loop. Installation of a VFD and 2-way valves will allow for variable flow within the system, thereby resulting in energy savings.

- *Estimated annual savings 8,987 kWh and 2.0 kW*

ECM – 5: Exterior Lighting

Exterior lights are comprised of 100 and 250 W HPS fixtures. 100 W fixtures can be replaced with similar compact fluorescent type fixtures and 250 W fixtures can be replaced with high output linear T5 fluorescent lamps. Each respective replacement will provide the light levels necessary at a reduced energy usage.

- *Estimated annual savings 8,303 kWh and 0.0 kW*

3.2 Results:

The estimated energy and cost savings, incentives (gas and electric), installed project costs and simple payback per ECM are summarized in the following table:

Table 9: Summary of Energy Conservation Measures

EEM #	Based on EEM	Recommended Y?	EEM	Electrical Savings (kWh)	Electrical Savings (kW)	Natural Gas Savings (Therms)	Electrical Energy Cost Savings ($)	Natural Gas Energy Cost Savings ($)	Total Cost Savings ($)	Electrical Incentive w/o cap ($)	Natural Gas Incentive w/o cap ($)	Total Incentive w/o cap ($)	Install & Design Costs ($)	Total Incentive w/ cap ($)	Simple Payback Time w/o Incentive (Yrs)	Simple Payback Time w/ Incentive (Yrs)
1	0	Y	DCV Controls	4,314	1.5	46	$604	$46	$650	$1,190	$46	$1,237	$3,500	$1,237	5.4	3.5
2	**1**	**Y**	**Economizer**	**4,648**	**0.0**	**0**	**$651**	**$0**	**$651**	**$1,116**	**$0**	**$1,116**	**$3,000**	**$1,116**	**4.6**	2.9
3	2	Y	CHW Reset	2,069	0.4	-28	$290	-$28	$262	$409	-$28	$381	$2,000	$381	7.6	6.2
4	**3**	**N**	**CHW Pump VFD**	**8,987**	**2.0**	**0**	**$1,258**	**$0**	**$1,258**	**$1,814**	**$0**	**$1,814**	**$18,000**	**$1,814**	**14.3**	12.9
5	0	Y	Lighting	8,303	0.0	0	$1,901	$0	$1,901	$1,162	$0	$1,162	$946	$473	0.5	0.2
			Recommended	**19,334**	1.9	**18**	**$3,445**	**$18**	**$3,464**	**$3,877**	**$18**	**$3,896**	**$9,446**	**$3,896**	2.7	1.6

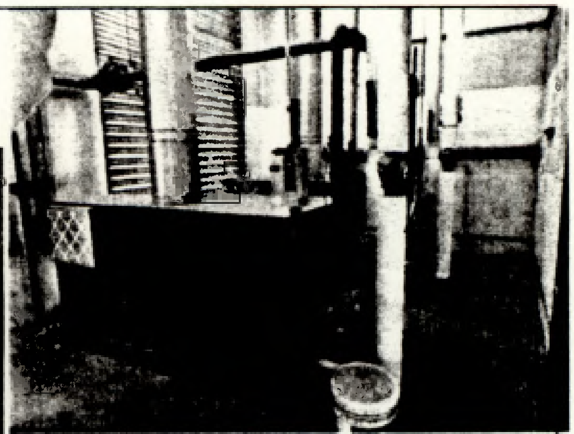
Notes: Based on an average cost of $0.14/kWh and $1.00/Therm

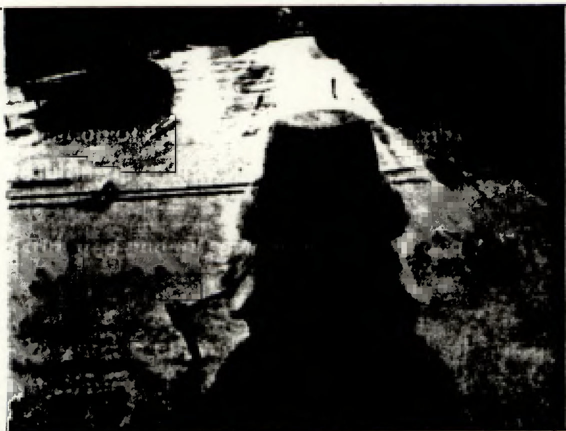
4. Limitations and Disclaimer

The intent of this energy analysis report is to estimate energy savings associated with recommended upgrades to the HVAC system. Appropriate detail is included in this report to make decisions about implementing energy efficiency measures at this facility. However, this report is not intended as a detailed engineering design document. While the recommendations in this report have been reviewed for technical accuracy and are believed to be reasonably accurate, the findings are estimates and actual results may vary.

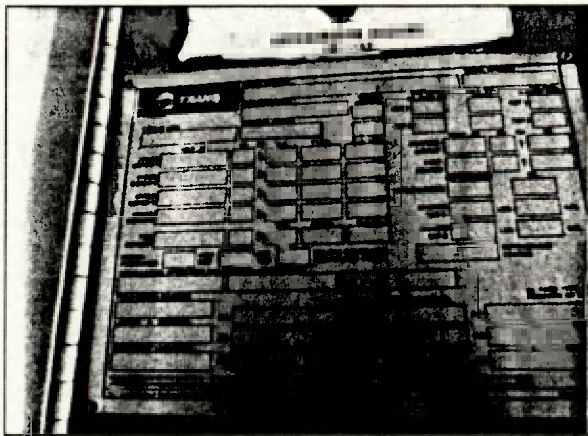
5. Appendix A – Photos

Sports Center Exterior

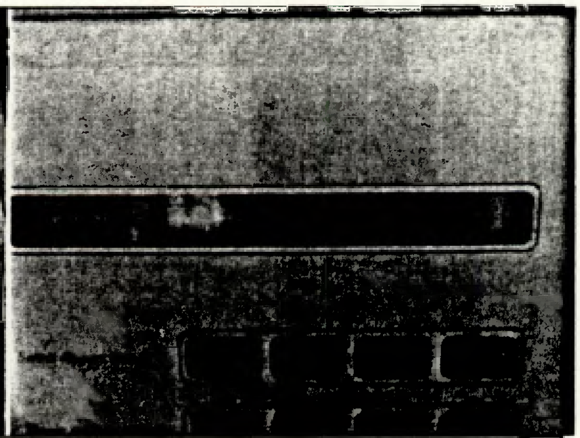

Boilers used to heat pool and supply HVAC when cogen is offline


Sample Exhaust Fan


Air cooled screw chiller



Chiller nameplate

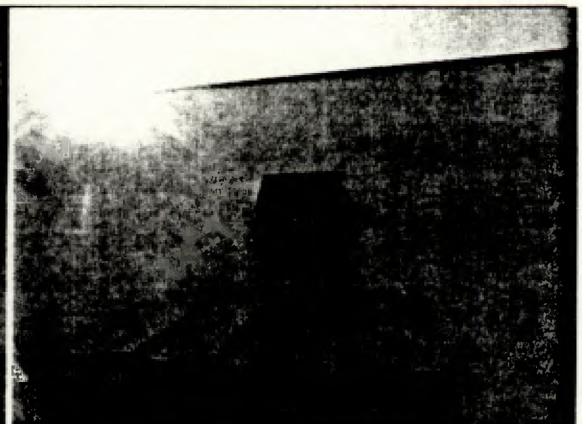


Chilled Water Setpoint

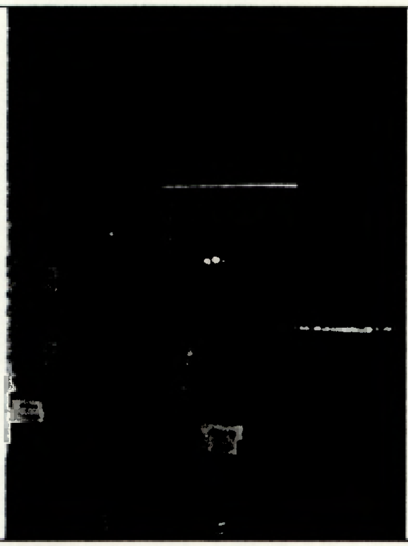
Pump nameplate

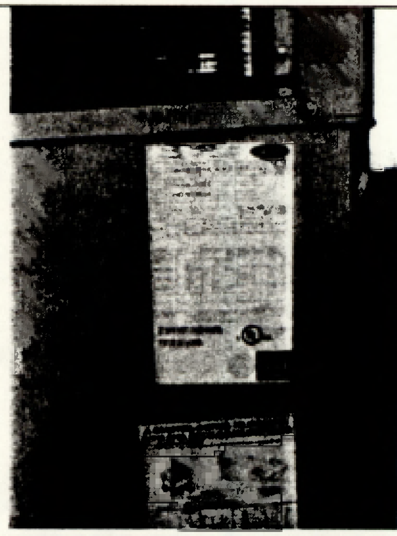
Pump Motor nameplate

Interior Lighting Sample



Exterior Lighting Sample





AHU 1 VFD	Sample DX split unit

Appendix C

February 2012

Energy Study

South Gate Corporate Yard

Table of Contents

List of Tables and Figures

FIGURES

Tables

1. Facility Information

1.1 Site Description

The South Gate Corporate Yard is a single story 63,751 square-foot facility located at 4244 Santa Ana Street in South Gate, California. This location includes a large amount of outdoor space where vehicles and replacement equipment are stored and serviced. Also included is the South Gate Employee Credit Union.

The annual energy usage of this facility was 300,120 kWh of electricity and 1,381 therms of natural gas based on available utility data from 2010 thru 2011. The facility's average annual energy usage intensity is 4.71 kWh/ft^2 and 0.0217 therms/ft^2 of building area.

1.2 Historical Energy and Gas Profiles

Historical profiles based on monthly utility data are shown in the following graphs:

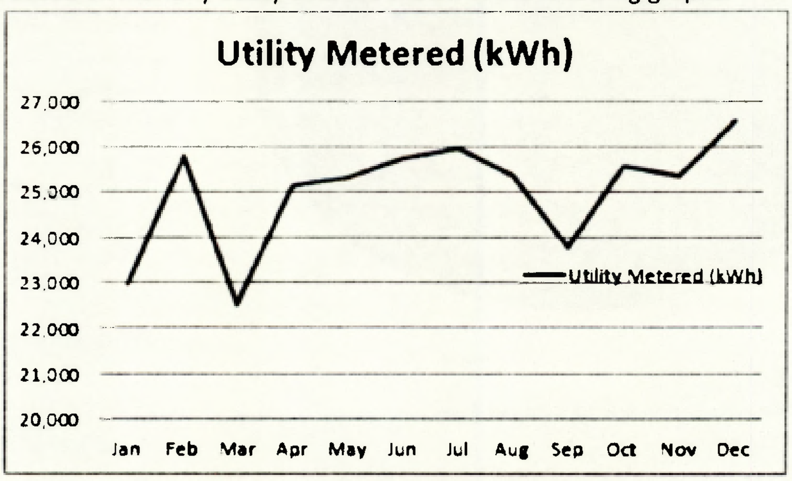


Figure 1.1: Historical Electricity Billing Data

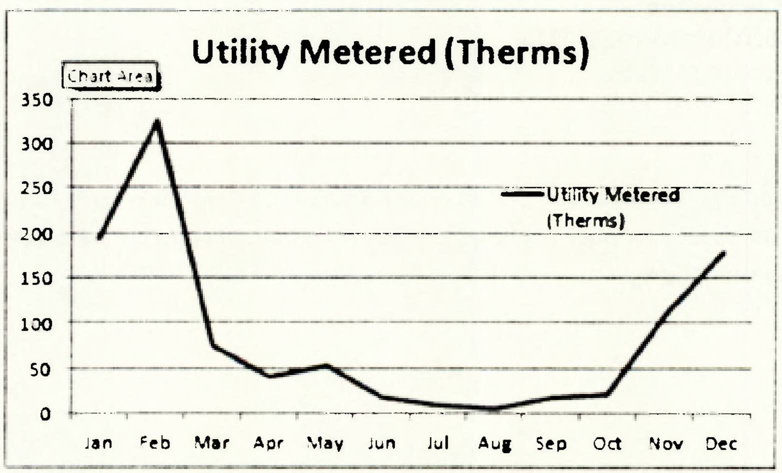


Figure 1.2: Historical Gas Billing Data

WILLDAN

1.3 Baseline Energy Use

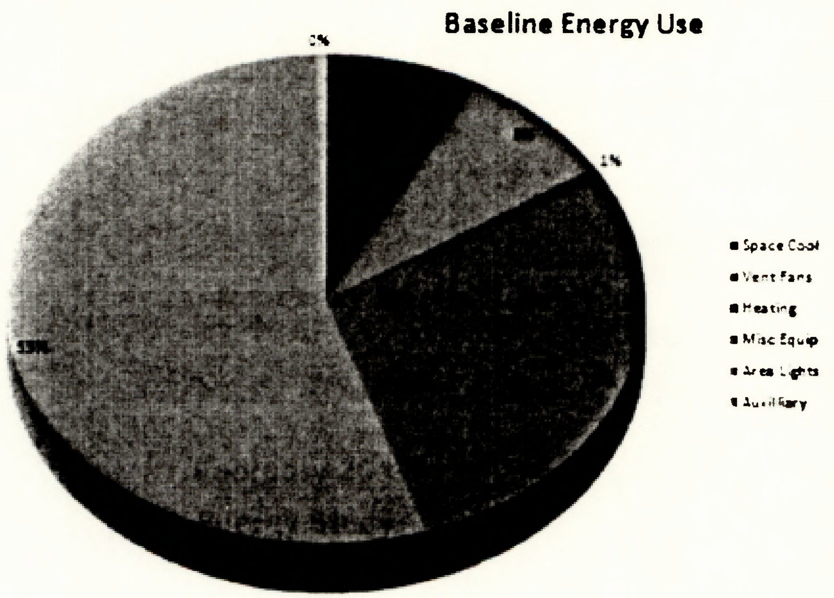


Figure 1.3: Baseline Energy Use by Demand Area

1.4 Utility Accounts

Gas Account #: 1020008100-1020008100
Electricity Meter #: 3002519210

1.5 Audit

A whole building energy audit was performed on the South Gate Corporate Yard. From the information collected during the audit a number of energy conservation measures (ECM) are proposed to reduce the energy and gas consumption.

2. Description of Existing Equipment

2.1 HVAC

Existing HVAC systems were found to be managed and maintained by Honeywell. A total of (5) Carrier units were found serving the facility, with (4) gas/electric units serving the main building and (1) Heat Pump serving the credit union. The main building's HVAC schedule is 6AM – 6PM Monday through Thursday. The credit union operates from 7AM-4PM Monday through Thursday.

2.2 Existing Lighting Equipment and Conditions

The interior lighting is primarily 4 ft T8 25 W and 17 W lamps with electronic ballasts. Some recessed lights are screw-in fluorescent type. The main warehouse area and the mechanics' garage were served by high bay metal halide fixtures, with lighting requirements largely handled by daylight sensors and skylights.

Exterior lights were found to be 100 watt HPS lights and are operated during night time hours only.

3. Analysis

3.1 Energy Conservation Measures

The following ECMs were evaluated using spreadsheet calculations and eQuest. AESC evaluated several possible Energy Conservation Measures (ECMs) for the South Gate City Hall to determine which solutions are economically viable. The following ECMS can achieve energy savings as well as facilitating easier operations and improved thermal comfort.

The following ECMs were evaluated using spreadsheet calculations and eQuest.

ECM – 1: High efficiency package units

It is recommended the existing (5) carrier units, which are a mix of older low efficiency and more recent standard efficiency (8.5 – 11 EER) units, be replaced with high efficiency packaged units with an EER of 13.

- *Estimated annual savings 1,554kWh and 1.1 kW*

ECM – 2: Interior and Exterior Lighting

The corporate yard lighting is served by a number of interior and exterior HPS fixtures that vary from 70 to 200 W. It is recommended that the facility change these to compact fluorescent for fixtures <200 W and high output T5 lamps for fixtures >200W.

- *Estimated annual savings 49,088 kWh and 7.6 kW*

3.2 Results:

The estimated energy and cost savings, incentives (gas and electric), installed project costs, and simple payback time per ECM are summarized in the following table:

Table 10: Summary of Energy Conservation Measures

EEM #	Based on EEM	Recommended Y?	EEM	Electrical Savings (kWh)	Electrical Savings (kW)	Natural Gas Savings (Therms)	Electrical Energy Cost Savings ($)	Natural Gas Energy Cost Savings ($)	Total Cost Savings ($)	Electrical Incentive w/o cap ($)	Natural Gas Incentive w/o cap ($)	Total Incentive w/o cap ($)	Install & Design Costs ($)	Total Incentive w/ cap ($)	Simple Payback Time w/o Incentive (Yrs)	Simple Payback Time w/ Incentive (Yrs)
1	0	N	High EER Rooftop Units	1,554	1.1	0	$218	$0	$218	$487	$0	$487	$13,000	$487	59.7	57.5
2	0	Y	Lighting	49,088	7.6	0	$6,872	$0	$6,872	$7,627	$0	$7,627	$13,001	$6,501	1.9	0.9
			Recommended	49,088	7.6	0	$6,872	$0	$6,872	$7,627	$0	$7,627	$13,001	$6,501	1.9	0.9

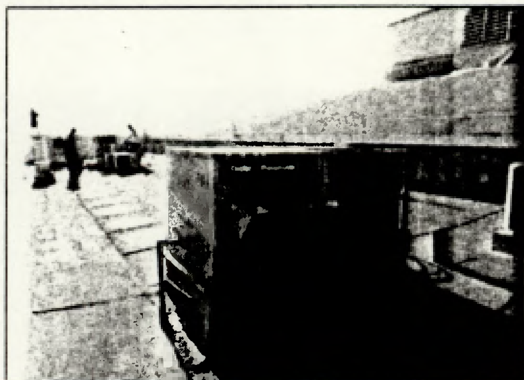
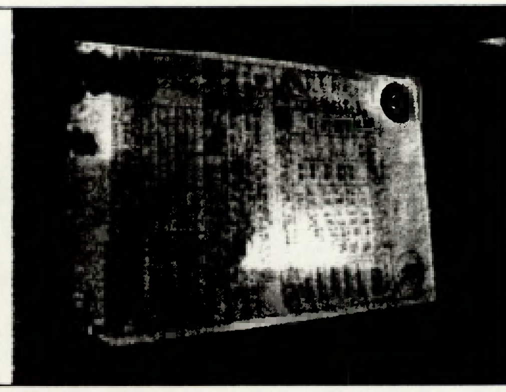
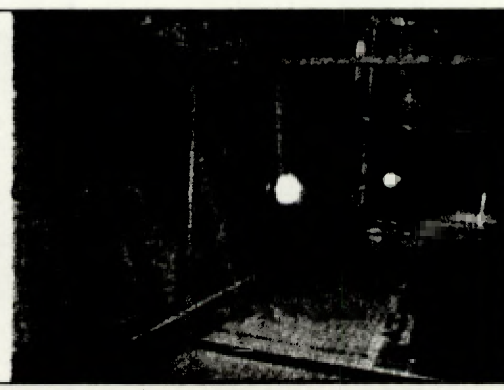
Notes:

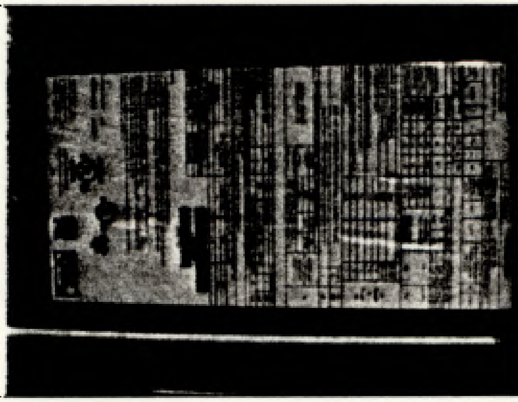
Based on an average cost of $0.14/kWh and $1.00/therm

4. Limitations and Disclaimer

The intent of this energy analysis report is to estimate energy savings associated with recommended upgrades to the HVAC system. Appropriate detail is included in this report to make decisions about implementing energy efficiency measures at this facility. However, this report is not intended as a detailed engineering design document. While the recommendations in this report have been reviewed for technical accuracy and are believed to be reasonably accurate, the findings are estimates and actual results may vary.

5. Appendix A – Photos

	
Split rooftop units serving corp yard office areas	RTU nameplate
	
Split rooftop units serving credit union	Lighting located in backroom of garage
	
Front side garage showing exterior lighting type	Warehouse/storage area interior lighting

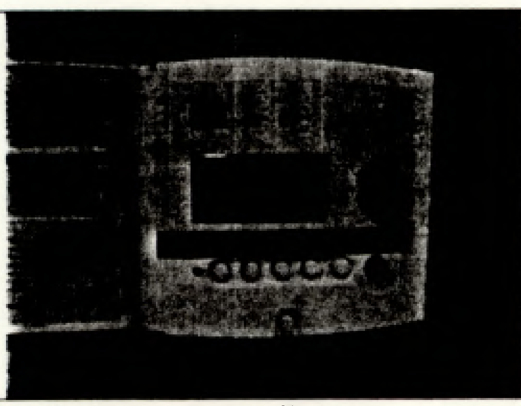


RTU nameplate

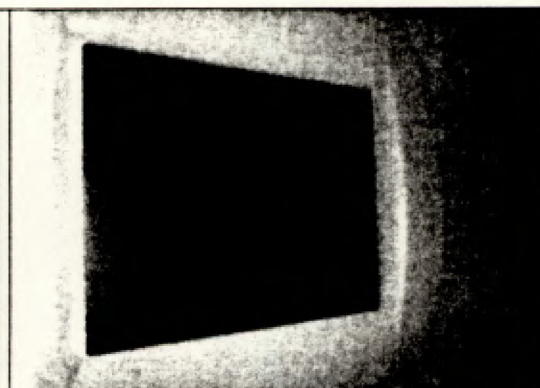
Exterior pole mounted fixtures

100 W metal halide lamps

25W T8 lamps



Existing thermostat for office area



Existing thermostat also serving office area.

Appendix D

February 2012

Energy Study

South Gate Police Department



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List of Tables and Figures

FIGURES

Tables

1. Facility Information

1.1 Site Description

The South Gate Police Station is a 2-story, 13,641 square-foot facility located at 8620 California Ave in South Gate, California.

The average annual energy usage of this facility is 156,520 kWh of electricity and 8,683 therms of natural gas based on available utility data from 2010 thru 2011. The facility's average annual energy usage intensity is 11.47 kWh/ft^2 and 0.637 therms/ft^2 of building area.

1.2 Historical Energy and Gas Profiles

Historical profiles based on monthly utility data are shown in the following graphs:

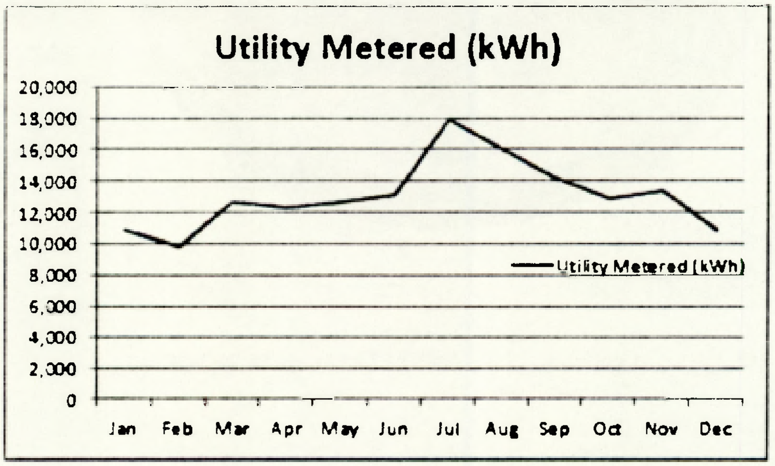


Figure 1.1: Historical Electricity Billing Data

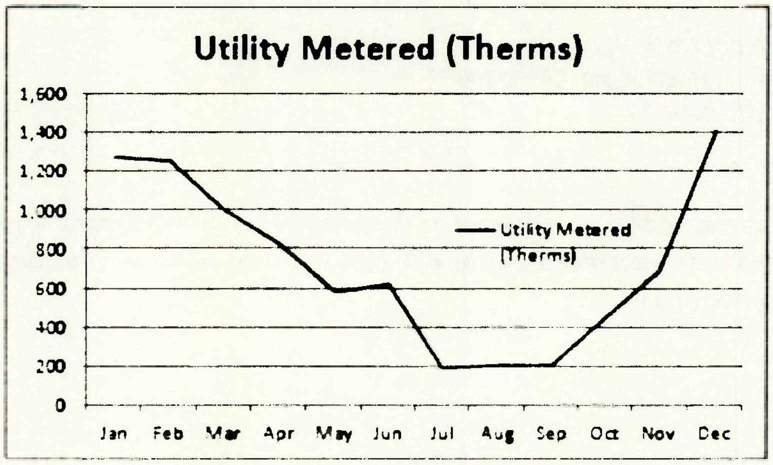


Figure 1.2: Historical Gas Billing Data

1.3 Baseline Energy Use

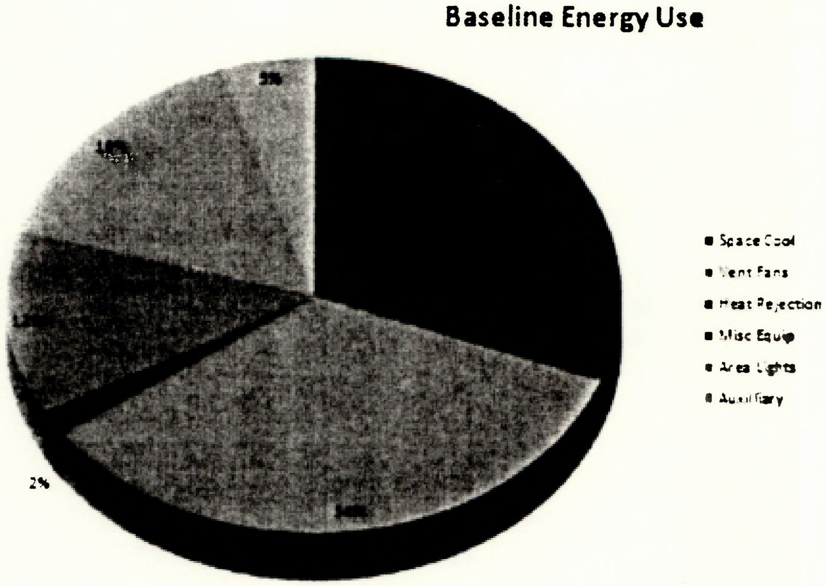


Figure 1.3: Baseline Energy Use by Demand Area

1.4 Utility Accounts

Electricity Meter #: 0139007300-0139007300
Gas Account #: 3-000-0152-67

1.5 Audit

A whole building energy audit was performed on the South Gate City Hall. From the information collected during the audit a number of energy efficiency measures (EEM) are proposed to reduce the energy and gas consumption.

2. Description of Existing Equipment

2.1 HVAC

Existing HVAC systems were found to be managed and maintained by Honeywell. The police station is served by a combination of packaged AC units and a TRANE GCWD 30 Ton Scroll Chiller. The chiller serves the coils for AHUs 1-3. Two of the units were found to be CAV, while the third was observed to be dual duct CAV.

Heating is satisfied by a Raypak Hi-Delta 992B-2342B boiler with an output of 630,000 BTU/HR, located in the top floor of the station, serving AHUs 1-3.

2.2 Existing Lighting Equipment and Conditions

The interior lighting is primarily 4 ft T8 25 W lamps with electronic ballasts. Some recessed lights are screw-in fluorescent type. A large number of rooms are controlled by a switch and occupancy sensor combination.

Exterior lights were found to be 100 watt HPS lights and are operated during night time hours only.

2.3 Other

The Police Station contains a server room which is not served by the buildings HVAC system and operates with its own, smaller, split AC unit.

3. Analysis

3.1 Energy Conservation Measures

The following ECMs were evaluated using spreadsheet calculations and eQuest. AESC evaluated several possible Energy Conservation Measures (ECMs) for the South Gate Police Station to determine which solutions are economically viable. The following ECMS can achieve energy savings in addition to facilitating operations and improving thermal comfort.

The following ECMs were evaluated using spreadsheet calculations and eQuest.

ECM – 1: Install VFD on Supply Fans and reduce VAV minimum flow

Existing Dual Duct AHU operates with discharge dampers and would benefit greatly with a combination measure of installing a VFD on the supply fan motors and reducing the VAV minimum flow for the Dual Duct units to 30%. Each dual duct zone pneumatic control will be modified from one operator to two operators; one for cold deck and one for hot deck.

- *Estimated annual savings 24,492 kWh and 1.9 kW and 1,593 Therms*

ECM – 2: New economizers on AHUs

Existing dual duct and CAV AHUs used by the station operate with little to no OSA based on observation of the OSA ductwork used by the AHUs.

- *Estimated annual savings 6,470 kWh and 0.0 kW and -193 Therms*

ECM – 3: Chilled Water Reset

The Police Station is currently served by a 30 Ton screw chiller which provides chilled water to the system at a constant temperature of 45 F. It is recommended that the city implement a load reset by raising the supply chilled water temperature during times of decreased internal load up to a maximum reset temperature of 53 F.

- *Estimated annual savings 1,441 kWh and 0.4 kW and 0 Therms*

ECM – 4: Cold Deck and Hot Deck Reset for Dual Duct System

The southern zones are currently served by a dual duct system which could benefit from cold deck and hot deck reset controls. This would require additional costs to convert the pneumatic system to a DDC system which would make it uneconomical for this measure alone.

- *Estimated annual savings 1,492 kWh and -0.7 kW and 1,183 Therms*

ECM – 5: Boiler Lockout

The Police Station is currently served by a 630 kBTU Raypak boiler which can be locked out during higher ambient temperatures. This is a gas savings measure only.

- *Estimated annual savings -170 kWh and 0 kW and 197 Therms*

ECM – 6: Lighting, Exterior and Interior

A majority of the facility already uses high efficiency lighting; however some opportunities were identified during the audit. One of the restrooms was observed to use incandescent lights which can cheaply and easily be replaced with a CFL equivalent. The exterior lighting for the station uses low and high wattage HPS fixtures. The lower wattage ones can be replaced with CFLs and the higher wattage fixtures can be replaced with T5 fluorescent lamps for additional savings.

- *Estimated annual savings 1,744 kWh and 0.0 kW*

3.2 Results

The estimated energy and cost savings, incentives (gas and electric), installed project costs and simple payback per ECM are summarized in the following table:

Table 11: Summary of Energy Conservation Measures

EEM #	Based on EEM	Recommended Y?	EEM	Electrical Savings (kWh)	Electrical Savings (kW)	Natural Gas Savings (Therms)	Electrical Energy Cost Savings ($)	Natural Gas Energy Cost Savings ($)	Total Cost Savings ($)	Electrical Incentive w/o cap ($)	Natural Gas Incentive w/o cap ($)	Total Incentive w/o cap ($)	Install & Design Costs ($)	Total Incentive w/ cap ($)	Simple Payback Time w/o Incentive (Yrs)	Simple Payback Time w/ Incentive (Yrs)
1	0	Y	VAV and VFD	24,456	1.9	1,593	$3,424	$1,593	$5,017	$6,056	$1,593	$7,649	$15,000	$7,649	3.0	1.5
2	1	Y	Economizer	6,470	0.0	-193	$906	$0	$906	$1,553	$0	$1,553	$9,000	$1,553	9.9	8.2
3	2	N	CHW Reset	1,441	0.4	0	$202	$0	$202	$304	$0	$304	$7,000	$304	34.7	33.2
4	3	N	Deck Reset	1,492	-0.7	1,183	$209	$1,183	$1,392	$196	$1,183	$1,379	$20,000	$1,379	14.4	13.4
5	4	N	Boiler Lockout	-170	0.0	197	$0	$197	$197	$0	$197	$197	$5,000	$197	25.3	24.3
6	0	Y	Lighting	1,744	0.0	0	$244	$0	$244	$246	$0	$246	$945	$246	3.9	2.9
			Recommended	32,670	1.9	1,400	$4,574	$1,593	$6,167	$7,854	$1,593	$9,447	$24,945	$9,447	4.0	2.5

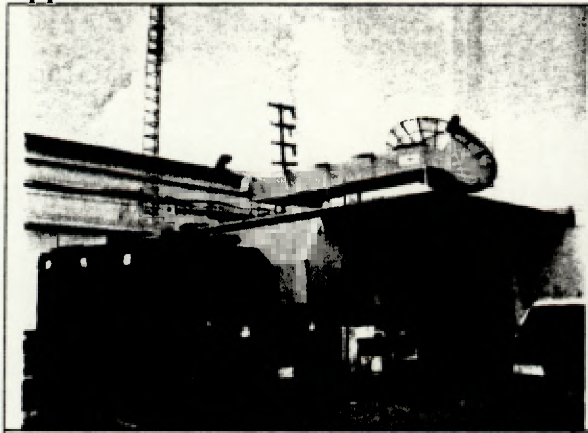
Notes:

Based on an average cost of $0.14/kWh and $1.00/Therm

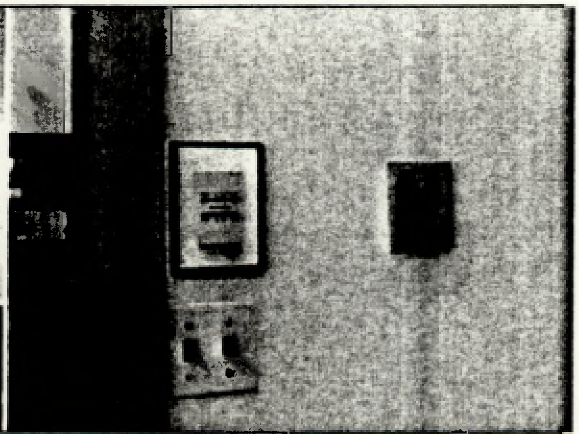
4. Limitations and Disclaimer

The intent of this energy analysis report is to estimate energy savings associated with recommended upgrades to the HVAC system. Appropriate detail is included in this report to make decisions about implementing energy efficiency measures at this facility. However, this report is not intended as a detailed engineering design document. While the recommendations in this report have been reviewed for technical accuracy and are believed to be reasonably accurate, the findings are estimates and actual results may vary.

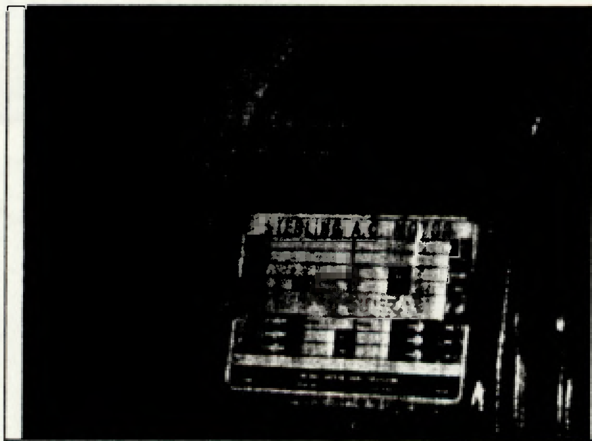
5. Appendix A – Photos



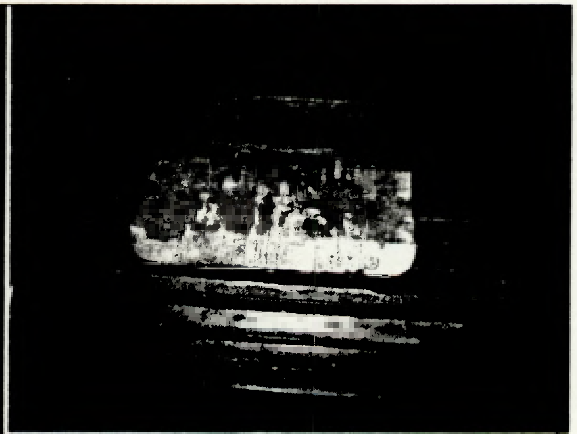
Condenser for chiller



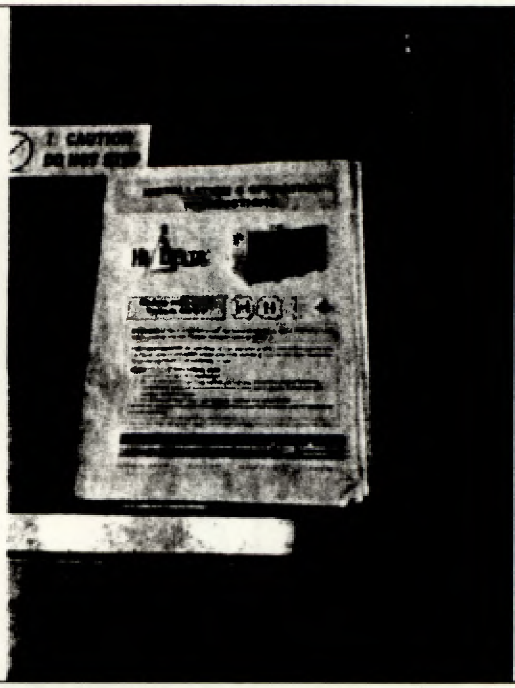
Thermostats inside police station

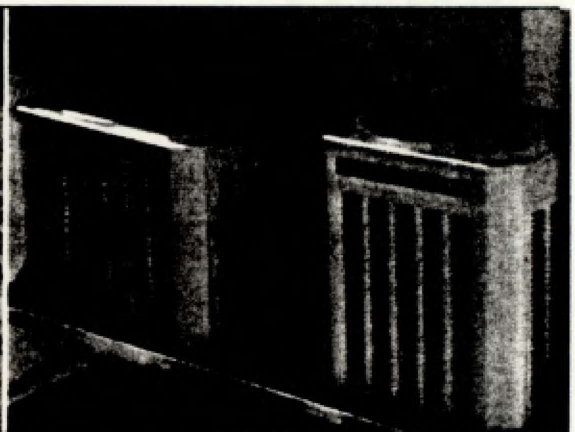


Supply fan motor for AHU



HW pump motor

	
Boiler	Boiler Literature

	
Package unit serving areas not served by CHW system	Package units serving areas not served by CHW system

RESOLUTION CERTIFICATION PAGE

STATE OF CALIFORNIA)

COUNTY OF LOS ANGELES) SS

CITY OF SOUTH GATE)

I, Carmen Avalos, City Clerk of the City of South Gate, California, hereby certify that the whole number of Members of the City Council of said City is five; that Resolution No. 7540 was adopted by the City Council at their Regular Meeting held on December 11, 2012, by the following vote:

Ayes:	Council Members:	De Witt, Hurtado, Gonzalez, Morales and Davila
Noes:	Council Members:	None
Absent:	Council Members:	None
Abstain:	Council Members:	None

Witness my hand and the seal of said City on January 22, 2013.

Carmen Avalos, City Clerk
City of South Gate, California