Chevron

Comprehensive Energy Analysis

City of Palm Springs
Accelerating the Path to Sustainability
REV. 1

Prepared for

City of Palm Springs
3200 East Tahquitz Canyon Way
Palm Springs, CA 92262

Prepared by

Chevron Energy Solutions Company
A Division of Chevron U.S.A. Inc.
150 E. Colorado Blvd., Ste. 360
Pasadena, CA 91105

June 30, 2011

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I. Executive Summary

Introduction

Chevron Energy Solutions Company (Chevron ES), a Division of Chevron U.S.A. Inc., is pleased to present the results of the Comprehensive Energy Analysis (CEA) and the proposed scope for an energy efficiency and renewable energy project for the City of Palm Springs (City). It has been our pleasure to partner with the City to develop this innovative project and we commend the City for taking a proactive approach as a responsible steward of our environment.

The proposed scope of this CEA supports the City's goal to demonstrate fiscal responsibility in these challenging economic times by generating general fund relief and providing budget predictability through known utility costs. The proposed scope also provides the benefit of a variety of infrastructure upgrades for the City as well as providing opportunities for clean, renewable energy.

The City funds used to pay the debt service for this program come from savings generated by the recommended program through reduced electrical, gas, water and maintenance costs as well as incentives and energy credits provided for implementation of the program energy measures.

This innovative investment grade analysis was developed with direction from the City Council and collaborative efforts with the City's staff and advice and direction of the City's Sustainability Commission. In an effort to determine the program's feasibility, we have outlined the City's immediate facility issues, long-term goals and objectives with input from Dave Barakian (Director of Public Works), Marcus Fuller (Assistant City Engineer and Assistant Director of Public Works) and Jan Anderson (Facilities Maintenance Manager). Also, guidance has been given from Michele Mician (Manager Office of Sustainability), Mark Nichols (Chairman of the Sustainability Commission) and all of the Sustainability Commission members.

All of those involved in the development of this program have expressed their desire to demonstrate to the citizens of Palm Springs the City's commitment to fiscal and environment stewardship. We appreciate the forward thinking and innovative spirit that was evident in all of the inputs we received during the development of this program.

The results of the CEA include much more than technical and financial solutions to facility issues throughout the City. Chevron ES firmly believes that the project summarized below and described in further detail in the CEA technical document will deliver far-reaching, long-lasting benefits for the City, both from a facilities operations management perspective and an economic perspective.

Goals, Objectives and Recommendations

The City of Palm Springs provided the following program goals which have directed our efforts:

- Develop a paid from savings program (no capital required).
- Evaluate existing cogeneration facilities and recommend appropriate actions.
- Reduce electric and gas consumption through energy efficiency opportunities.
- Reduce water consumption.
- Assist in achieving City adopted sustainability goals.

Care must be taken that the objectives and the expectations of the City are clearly understood, and a consensus of these objectives lays the foundation for a successful project.

It is our understanding that the City expects this project to achieve the following:

- Economic Leadership
  - Provide general fund relief by controlling operating expenses.
  - Provide a design/build program that addresses efficiency and infrastructure upgrades that are funded through savings.
  - Reduce the use and cost of energy and water to the City.
  - Provide and design for long-term energy efficiency and utility budget stabilization.
  - Maximize all utility incentives, state grants and loan opportunities.
  - Guarantee a firm contract price with no Chevron-initiated change orders.
- Operational Stewardship
  - Evaluate all electrical and mechanical systems for sustainable efficiency improvements.
  - Provide innovative and comprehensive solutions for long-term building and infrastructure needs that meet the objectives of the City and the community.
  - Replace existing aging, high maintenance infrastructure with new current energy efficient technology and equipment.
  - Improve comfort for staff and occupants of City buildings.
  - Perform all work so as to improve the facilities operation, aesthetics, lighting effectiveness, or structural integrity.
  - Guarantee the City minimal disruption throughout the design and construction program.
- Local and Environmental Stewardship
  - Provide clean, renewable energy and help protect our environment.
  - Evaluate and utilize contractors local to the Coachella Valley for project design and construction.
  - Highlight the City of Palm Springs as a leader in environmental stewardship.

Chevron Analyzed the Following Program Options:

- Do nothing.
- Replace existing cogeneration plants with new efficient equipment upgrade.
- Abandon cogeneration and purchase all electricity from Southern California Edison.
- Abandon cogeneration and replace with solar generation.

Program Scope of Work Recommendations

- Replace the interior lighting with high efficiency fixtures, lamps & ballasts City wide.
- Replace the generators and chiller at Municipal central plant with one (1) new 1100kW engine and (1) new 450-ton double effect direct fired absorber. New cooling towers and ancillary equipment will be installed for a comprehensive and fully functional central plant. Existing pumps and misc. equipment will be utilized where applicable. Utilization of the existing thermal storage system is critical for the central plants maximum capacity. The central plant will have the capacity to serve connected buildings eliminating the need for inefficient building chillers and continuous supply from the airport chillers.
- Replace the generator and chiller at Sunrise central plant with new modern gas heating and electric cooling central plant. Ancillary equipment will be installed for a comprehensive and fully functional central plant. Existing cooling towers and pumps will be replaced. Utilization of the existing thermal storage system is critical for the central plants maximum capacity. The central plant will have the capacity to serve connected buildings eliminating the need for inefficient building chillers.

- Install a 439 kilowatt solar system at the Pavilion Parking lot to provide power to the Sunrise Park facilities.
- Install a 103 kilowatt roof mount solar system at the Convention Center.
- Install new modernized energy management system that will operate the new central plants and communicate with the individual buildings connected to the plant and maximize the control of the required heating and cooling loads.
- Install a City wide irrigation control and remote monitoring system.
- Install a new Palm Canyon Drive lighting control and remote monitoring system.
- Provide new kWh and Btu metering and remote monitoring and recording capabilities of connected building consumption for accurate City billing.

Summary of Proposed Program Benefits

1. The existing equipment, cogeneration plants and infrastructure have served the City well for many years however, much of the equipment is antiquated and over the last few consecutive years the City has spent over $600,000 annually in maintaining and keeping the equipment operational.
2. Chevron has identified energy, maintenance, incentives and renewable energy credits for a total first year program savings of $1,488,319 that can be leveraged to implement the proposed program.
3. Program provides capital cost avoidance by installing needed capital improvements through better utilization of the City's limited resources.
4. Program will reduce energy consumption for City facilities by over 2.7 million kWh – a 15% reduction in total energy usage / per year.
5. Natural gas consumption will be reduced by 250,000 therms – 21% reduction / year.
6. The program proposed will save over 100 million gallons of water per year.
7. The program proposed will result in a reduction of over 3,000 tons of CO2.
8. The program directly stimulates the local economy by implementing the proposed scope and indirectly effects over 192 local jobs bringing in more than $4 million in additional economic stimulus to the City. [1]
9. The City will be eligible for utility incentives and renewable energy credits amounting to over $730,000.
10. Energy efficiency upgrades for facilities being served by the Municipal cogeneration plant will allow for a smaller engine, which lowers capital costs.
11. Proposed program achieves 5 of the City's sustainability goals and assists in accomplishing several of the remaining goals.
12. The proposed program significantly improves the City's air quality.
13. The City will be able to take advantage of a new revenue source from the solar renewable energy credits.
14. City can take advantage of today's current low costs of financing.
15. Program installs approximately $18 million of capital improvements and generates a positive cash flow each and every year over the term of the financing.
16. Chevron will guarantee program energy savings.
17. Cogeneration plant will be SCAQMD compliant.
18. This program will diversify the City's energy generation mix.

[1] Based on National Renewable Energy Laboratory Economic Modeling Study

19. Program installs new utility grade metering system for improved inter-department billing.
20. Program is an affirmation to the citizens of Palm Springs of the City's focus on fiscal and environmental stewardship.

Chevron ES is convinced that using an engineered approach with proven technologies makes it possible to meet these objectives. Therefore we have accepted the financial risk and have committed our team of professionals working in conjunction with the City of Palm Springs to develop the optimum program.

We look forward to a rewarding and successful partnership and the opportunity to help the City of Palm Springs achieve its goals of economic and environmental stewardship.

Program Energy Savings and Cost

Chevron ES worked closely with the City staff over the past 10 months to focus our program development effort, refine recommendations and establish project priorities. These priorities include City infrastructure projects that don't necessarily have significant energy savings but are critical to keeping the facilities on par with the City's overall standards of excellence. The program includes an impressive list of projects that are critical to meeting the infrastructure requirements of this vibrant community. The proposed projects are summarized above in the **Program Scope of Work Recommendations** and in the following Table 1.1.

Our program price to perform the scope of work turnkey and based on a guaranteed maximum price is $18,980,372[2]. This is inclusive of completing all the documentation and assisting the City in obtaining the estimated $732,579 in utility incentives that are available for the energy measures included in your program.

[2] Pricing is valid until July 6th, 2011. Price and scope was previously presented to City on May 3, 2011.

Table 1.1: Proposed Energy Measures for Accelerating the Path to Sustainability

ECM Categories	ECM#	ECM Descriptions	M&V Option	Estimated Rebate/Incentives ($)	Annual Electric Energy Savings (kWh)	Annual Electric Dollar Savings ($)	Annual Gas Energy Savings (Therms)	Annual Gas Dollar Savings ($)	Annual Water Savings (ccf)	Annual Water Dollar Savings ($)	Annual Utility Savings ($)
Energy Conservation Measures - City Wide											
LIGHTING	L1	Lighting Upgrades - Interior and Exterior Citywide	Option A	$ 41,858	756,702	$ 113,205	-	$ -	-	$ -	$ 113,205
	L1-A	Lighting Upgrades - Interior and Exterior Muni	Option C	$ 39,146	1,183,804	$ 136,951	-	$ -	-	$ -	$ 136,951
	L1-B	Lighting Upgrades - Interior and Exterior Sunrise	Option A	$ 8,695	147,852	$ 14,531	-	$ -	-	$ -	$ 14,531
	L2	Palm Canyon Lighting Control & Remote Monitoring	n/a	$ -	-	$ -	-	$ -	-	$ -	$ -
MECHANICAL	M1-A	Central Plant Cogeneration Upgrade - Muni	Option C	$ -	2,850,252	$ 329,737	(93,672)	$ (55,370)	-	$ -	$ 274,367
	M2-A	Energy Management Control System - Muni	Option C	$ 24,181	475,968	$ 55,063	-	$ -	-	$ -	$ 55,063
	M1-B	Central Plant Upgrade (No Cogen) - Sunrise	Stipulated	$ 18,114	(2,128,856)	$ (209,218)	344,081	$ 225,430	-	$ -	$ 16,212
	M2-B	Energy Management Control System - Sunrise	Stipulated	$ -	168,951	$ 16,604	-	$ -	-	$ -	$ 16,604
UTILITY	U1	Utility Sub-Metering & Monitoring System	n/a	$ -	-	$ -	-	$ -	-	$ -	$ -
WATER	W1	Irrigation / Water Management	Stipulated	$ -	-	$ -	-	$ -	144,604	$ 121,222	$ 121,222
SOLAR	PV1-A	Solar Photovoltaic - 103 kW at Convention Center	Option B	$ 111,124	155,442	$ 42,817	-	$ -	-	$ -	$ 42,817
	PV1-B	Solar Photovoltaic - 439 kW City Wide - Connected to Sunrise Plant	Option B	$ 489,460	661,814	$ 69,613	-	$ -	-	$ -	$ 69,613
			Total	$ 732,579	4,271,928	$ 569,303	250,409	$ 170,060	144,604	$ 121,222	$ 860,585

General Notes for Table:

- (1) Lighting savings (L1-A & L1-B) include energy savings from HVAC reduction for reduced heat load. A total of 80,631kWh for Municipal Lighting Measures and 10,214kWh for Sunrise Facilities.
- (2) All incentives are estimated based on available incentives through SCE plus the bonus for the Palm Springs Desert Partnership Silver Level. The Gas Co Incentives are still being pursued.
- (3) Solar incentives are based on California Solar Incentive (CSI), Step 8, Govnm't Non-Profit, $0.015/kWh, PBI Payments. PBI payments are paid monthly over a 5 year period based on actual kWh generated.
- (4) Electric Rates are based on Southern California Edison 2010 rates. TOU-8-B-S for Muni Plant and TOU-GS3-B for Sunrise Plant
- (5) Natural Gas Rates are based upon historical (June'09-July'10) rates. For the Muni buildings, the Cogen has an average rate of 0.657 $/Therm while Sunrise Cogen has an average rate of 0.645 $/Therm.

Utility Incentive Procurement

Chevron Energy Solutions is committed to leveraging the full advantage of any unique financing opportunities and incentives available to our customers. Our first consideration is to find and initiate the application process for any applicable grants, incentives and rebates from federal, state, utility and local sources. Overall, we have secured over **$100 million of incentives and rebates for customers nation-wide.** These reductions in project costs realized through incentives and rebates have significantly strengthened the financial benefits of the energy programs we develop for our public sector customers.

The project for the City of Palm Springs is eligible for the following Rebates and Incentives:

- $ 131,994 Energy Efficiency Rebates from SCE.
- $ 600,584 Incentives from the California Solar Initiative rebate program paid monthly to the City of Palm Springs over a five year period.

The current California Solar Initiative is being paid at Level 8, which equates to a rebate of $0.15/kWh. These rebates are reserved on a first come-first served basis. Funds are limited and Chevron advises that the City should make applications for the proposed solar installations as soon as possible. Applicable incentives for the proposed program are provided in the above Table 1.1.

Project Schedule

We anticipate substantial completion of this project in 12 months, with final completion in 15 months, from the date of notice to proceed. The final project schedule will be developed in coordination with the City staff after award of the construction contract.

Chevron's Experience and Capabilities

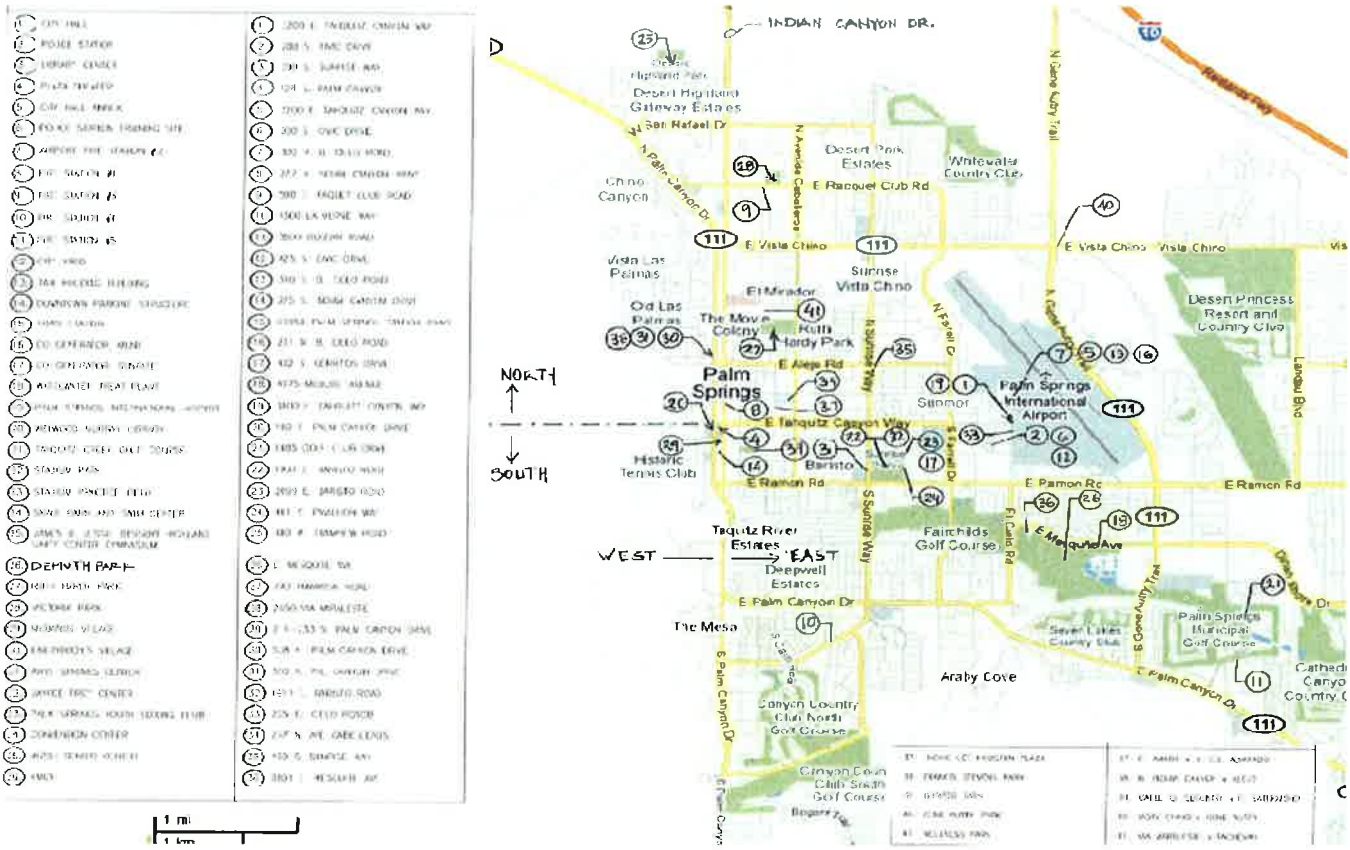
Chevron ES expended more than 3000 engineering hours to develop this program. Extensive data about energy use and cost information was collected and detailed analysis of facility performance was conducted. As described in this submittal, this study has been successfully completed, and unequivocally substantiates our recommendation that the City move towards project implementation.

Performance contracts are unique among contracting methods because they allow for the creation of "win-win" rather than adversarial relationships between the customer and contractor. Both parties involved in a performance contract share a common goal: *to save energy and utility costs in order to improve the facilities.* We genuinely believe that the partnership formed between the contractor and the on-site personnel during this process is the key factor in ensuring long-term project success.

In summary, we believe that we have demonstrated through our meetings together and in this final report that Chevron ES has the technical resources and expertise on staff to handle the full range of technologies that will be required in this program. We now seek the City's approval to implement the project.

II. Data on Present Facilities

The following information describes the various buildings which comprise the City of Palm Springs located in the Coachella Valley desert region.



Site surveys of the City facilities provides valuable information on the existing energy consuming equipment. Chevron ES sent a team of engineers to survey the City and to meet with the facilities staff and building occupants to discuss their concerns. While gathering information on, and recording the conditions of the existing systems, Chevron ES also observed operational information, including hours of use, which have been translated into our audit data. This data was collected on a building-by-building basis and the City personnel contributed further information which was invaluable to us for developing and compiling a list of potential retrofits for further investigation. This is summarized in the *Energy Conservation Measures - Section IV* of this report.

Areas of investigation include usage that impact water, gas and electrical energy consumption. The survey documents heating, building type, occupancy hours, cooling, HVAC equipment, lighting systems and external water usage for irrigation. While there were opportunities for water improvements internal to the buildings, the City water rates are extremely low and the capital cost for improvements outweigh the minimal savings associated. The project development team used available plans and drawings and simulated building profiles with modeling programs to help develop the existing site profiles, this information is utilized to analyze appropriate energy

retrofits and contained herein. In addition, historical energy usage information was assembled from a tabulation of utility bills and generator information, which is summarized in *the Utility Analysis - Section III.* The following information describes the various buildings which comprise the City of Palm Springs located in the Coachella Valley desert region.

General Overview

The City underwent a major energy construction project in 1984 in which they built two central cogeneration plants (Municipal and Sunrise). They also built the associated infrastructure to distribute power, and chilled/hot water to provide thermal cooling heating to the larger of the City facilities. The buildings that are connected to the two central plants include:

- **Municipal Plant**
  - Leisure Center
  - Main Library
  - Pavilion
  - Pool
  - Stadium – (Power only)
- **Sunrise Plant**
  - Leisure Center
  - Main Library
  - Pavilion
  - Pool
  - Stadium – (Power only)

The City Yard and the Stadium receive power only from the two central plants, heating and cooling is provided locally at the buildings. The County Administrative building was recently been taken offline from Municipal plant and supplies its own heating and cooling at the building. The power generated at Municipal plant is distributed at 12kV and the power generated at Sunrise plant is distributed at 5kV. The infrastructure system for both plants is owned and maintained by the City. Transformers, generally located within the building being served, transform the voltage to usable levels. There are old oil filled switches and transformers located throughout the City. The following site plans provide the infrastructure routing of the electrical, chilled water and hot water lines to the various buildings.

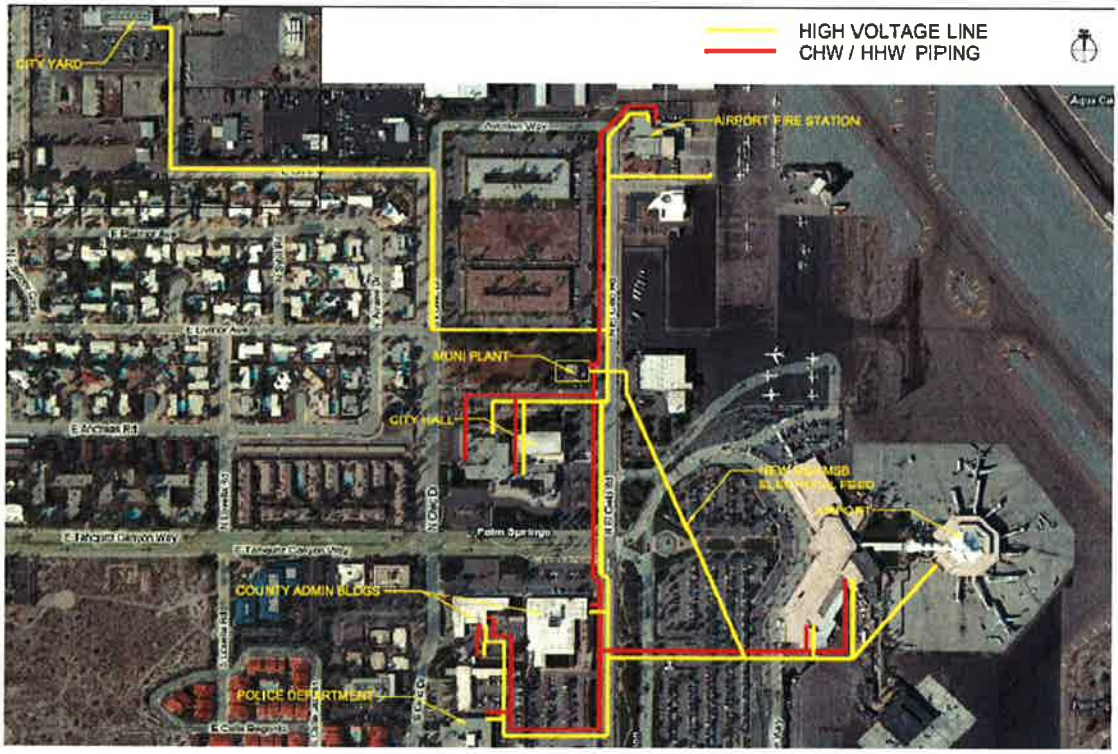


Figure 2-1: Municipal Central Plant Infrastructure

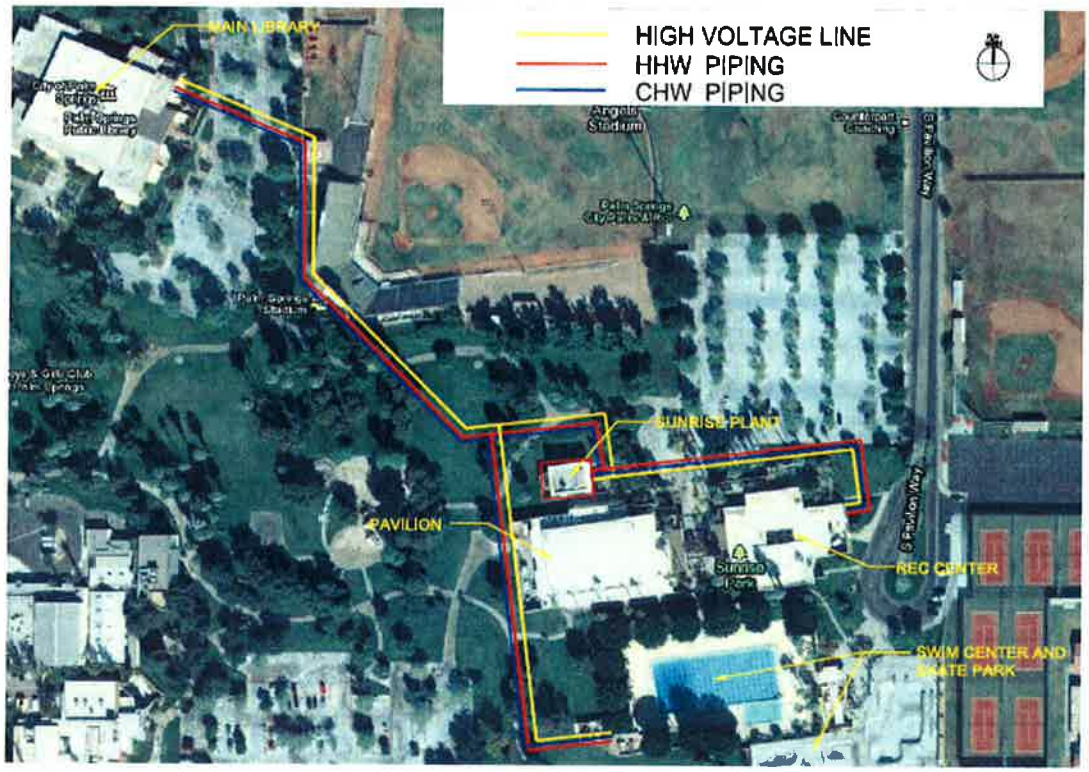


Figure 2-2: Sunrise Central Plant Infrastructure

The following Table 2-1 shows the existing baseline conditions for each of the City buildings that are connected to the central plants.

Table 2-1: Existing Conditions for buildings connected to Municipal and Sunrise Plant

Buildings	[1]Building Size	Current Existing Equipment		[1]Average Annual Internally Billed (2007-2010)		
	Sq.-Ft	Chiller (Tons)	Heating (Mbtu)	Chiller (Ton-hrs)	Heating (Therms)	Electricity kWh
Airport	182,941	500	1800	397,742	18,371	5,459,470
Fire Station #2	11,712	45	500	411,057	733	358,560
City Hall	31,963	150	1,800	62,383	17,579	946,560
City Yard	44,630	60	650	na	na	512,880
Police Station	44,946	90	1,800	9,755	24,599	974,000
Police Training	8,374	30	500	24,385	13	na
Municipal Plant Total	**279,936**	**815**	**6,400**	**905,322**	**61,295**	**8,251,470**
Leisure	15,155	60	450	105,695	368	197,040
Library	33,920	120	1,050	92,016	11,858	811,440
Pavilion	20,200	100	731	61,350	4,971	367,200
Pool	na	na	3,060	70,369	14,968	398,960
Stadium	na	35	na	na	na	1,390,000
Sunrise Total	**69,275**	**315**	**5,291**	**329,430**	**32,165**	**3,164,640**

[1] "Building Size" represents area served by the central plants, except City Yard sq ft. is actual
[2] Jul 2007-Jun 2010

The remaining City buildings have individual electric meters and receiving power from Southern California Edison and have local building heating and cooling systems, typically package units.

Irrigation

Currently, potable water is used for a large majority of the irrigation purposes within the City and is purchased from Desert Water Agency (DWA) at a very reasonable rate. The City has the option of using reclaimed water at ½ the domestic water rate however, currently limited supply and infrastructure is available. The City does use reclaimed water to irrigate Demuth Park and also at the Wastewater Treatment Plant.

Municipal Plant

Address: 201 El Cielo Road
Year Built: 1984
Square Footage: 1,914 Sq. Ft.

Lighting: The main mechanical area is illuminated by high bay fixtures containing eight, 42 watt compact fluorescent lamps. Other areas are illuminated with four foot, 2-lamp 34 watt T-12 lamps operated by magnetic ballasts. The building exterior uses high pressure sodium wall pack fixtures and incandescent spot/flood lights.

Caterpillar Engine Generator(s)

Mechanical: Municipal plant is quite an innovative installation; with a combined cogeneration plant that includes chilled water thermal energy storage (TES). The plant includes two (2) 650kW, 1200-RPM, 930-horsepower Caterpillar G399 engine generator sets for a combined capacity of 1300kW. The generators are driven by natural gas and operate on a partially steam cooled system that cannot be shutdown and restarted readily; meaning that the generators provide a fairly constant power and heat supply 24/7. Waste heat from these engines is used to drive a 360 ton Carrier single effect absorption chiller or used to supplement building heating requirements. When heating or cooling is not required, the waste heat is exhausted through the cooling towers. The primary chilled water (CHW) is pumped through the chiller to and from a 400,000 gallon underground CHW TES storage tank that has a nominal daily capacity of 3600 ton-hours. Secondary CHW pumps circulate CHW from the TES tank to the connected City facilities. The plant, naturally includes ancillary mechanical and electrical equipment; including a two cell cooling tower, condenser, chilled and hot water pumps, heat exchangers, air quality equipment, etc.

Cooling and heating from the plant is sometimes inadequate and building boilers and chillers are automatically started to satisfy any shortfall. The 400,000 gallon CHW storage tank was designed to supply CHW to the buildings at 38 degrees F.

However with one or both of the engines being down for repairs and with the expansion of the Airport the tank has a hard time remaining at 38 degrees F and is often feeding water to the connected buildings at 45 degrees F or higher. When the temperature of the CHW supply delivered to the buildings exceeds 45 degrees F the building chillers start automatically. Many of the building chillers are 20-30 years old with multiple compressor reciprocating units that are relatively inefficient, requiring upwards of 0.85 kW/ton or more. The Airport has more efficient centrifugal chillers which produce CHW at approximately 0.6kW/ton. Often the Airport chillers are operating in the evening hours to assist in re-charging the TES tank and used when the Municipal plant is down.

Municipal plant is considered a qualified facility which allows the exporting of power back to SCE. This occurs during times when the generators are producing more than the City is consuming, which happens rarely. More data on the sell back of power is provided in the Utility Analysis - Section III in this report.

Electrical: Southern California Edison (SCE) provides 12.5kV service to a 1200A, 12.5kV rated metal-clad switchgear located in the outdoor yard at Municipal plant. The switchgear houses the main circuit breaker, one load interrupter switch serving the connected City facilities, one load interrupter circuit breaker connected to a 12.5kV-480V step-down transformer which is then connected to the cogeneration switchgear, corresponding protective relays and related components, and an SCE stand-by meter. The two generators produce electricity into a common 3000A bus in the cogeneration switchgear, and feed a motor control center with plant loads. The cogeneration engines produce power in parallel to the SCE service. SCE currently provides all standby and supplemental power in excess of onsite generation via a single meter located at the Municipal plant.

Power is generated at 480V and then stepped up to 12kV to match what SCE delivers and is sent out to the various buildings. Two feeder circuit breakers on 12 kV switchgear are dedicated to the Airport and the third feeder circuit breaker on a 12kV switchgear feed the Airport as well as the remaining buildings.

Synchronizing Switchgear and MCC

12kV Switchgear

Irrigation: The irrigated turf around the Municipal plant as well as the Dog Park near City Hall is controlled by (1) Rainbird clock located on the west side of Municipal plant building.

Sunrise Plant

Address: 402 S. Cerritos Drive
Year Built: 1984
Square Footage: 1,702 Sq. Ft.

High Bay Lighting Fixture

Lighting: The main mechanical area is illuminated by high bay fixtures containing eight, 42 watt compact fluorescent lamps. Other areas use four foot, 2-lamp, 34 watt T-12 lamps operated by magnetic ballasts.

Mechanical: Sunrise plant is essentially identical to Municipal plant just smaller in scale, as it is a combined cogeneration plant with chilled water thermal energy storage (TES). The plant includes one (1) 650kW, 1200-RPM, 930-horsepower Caterpillar G399 engine generator. Waste heat from the engine is used to drive a 180 ton Carrier single effect absorption chiller or used to supplement building heating requirements or the pool heating requirements. When heating or cooling is not required, the waste heat is exhausted through the cooling towers. The primary CHW pumped through the chiller to and from a 130,000 gallon underground CHW TES storage tank with a nominal daily capacity is 1170 ton-hours. Secondary CHW pumps circulate CHW from the TES tank to the connected City buildings and the swimming pool. All other operations and ancillary equipment are similar to Municipal plant.

Sunrise plant is also considered a qualified facility which allows the export of power back to SCE. This occurs during times when the generator is producing more than the City is consuming, which happens more often than Municipal plant. More data on the sell back of power is provided in the Utility Analysis - Section III.

Electrical: The 650kW engine generator feeds power to the engine-generator synchronizing and control switchgear, which then supplies power to a 600A/480V motor control center distributing to plant motor loads. Excess electricity not consumed by the MCC is routed to a 750kVA 480-4160V step-up transformer. The step-up transformer feeds into City owned outdoor rated 4160V utility interface switchgear located underneath the Stadium. Buildings connected to Sunrise plant are served via 4160V metal clad switchgear with load interrupter switches at the Stadium. Electricity not utilized by the facilities is stepped up to 12kV at SCE's service transformer and sent back to the SCE electrical grid.

Synchronizing Switchgear and MCC

City Hall

Address: 3200 E Tahquitz Canyon Way
Year Built: 1956
Square Footage: 31,963 Sq. Ft.

Lighting: A majority of the lighting consists of four-foot fluorescent fixtures which contain 34 watt T-12 lamps operated by magnetic ballasts. Four-foot fixtures containing 32 watt T-8 lamps and electronic ballasts are also used for illumination in the offices and work areas. The lobby and hallway areas are illuminated with 2-foot fluorescent fixtures operating 34 watt T-12 U-bent lamps with magnetic ballasts, and recessed can fixtures containing 26 watt compact fluorescent lamps.

Lighting

Exterior building lighting consists of a mix of energy efficient compact fluorescent wall sconces, metal halide bollards, and high pressure sodium parking lot pole light fixtures.

HVAC: City Hall is connected to the Municipal central plant which provides it with (CHW), heating hot water (HHW), and electricity. There are two standby Carrier chillers, 160 ton and 30 ton, to provide cooling when the Municipal plant is offline or when it cannot keep up with the building load. The chillers and boiler piping is connected in series with the Municipal plant piping. The City Hall is equipped with four air handlers. Three of the air handlers are constant volume multi-zone units with a total of 13 zones. The fourth air handler has 21 zones and has a variable frequency drive (VFD) on the motor and variable air volume (VAV) boxes on each of the zones.

Multi-zone AHU

There is a 1,800 MBTU/hr boiler that provides HHW to supplement the HHW from the Municipal plant. The following is a list of the HVAC equipment at City Hall.

Below is a list of the HVAC equipment located at the City Hall

Equipment and Area Identification	HP	Volts	Amps	PH	Tons	Operating Hours	CFM	RPM	Type of Control	Comments
Carrier Chiller, Main		460	160	3	120				24 V Electric	
Carrier Chiller, EOC		230	30	3	30				24 V Electric	
Air Handler, Main	10	460	17.2	3		3120	16,146		24 V Electric	VFD, 21 zones
Air Handler, Front half of bldg	15	460		3		3120			24 V Electric	Multi-zone 6-zones w/ H&C decks
Air Handler, EOC	2	460	3.1	3				1750	24 V Electric	Multi-zone 2-zones w/ H&C decks
Air Handler, EOC	7.5	460	22	3		3120		1750	24 V Electric	Multi-zone 5-zones w/ H&C decks
Bryant Flexible Tube Boiler										1.8MM BTUH
BAC - Cooling Tower	15	480	10.3	3			56,460	1800	24 V Electric	
Chilled H2O Pump	7.5	480	10.3	3		3120		1750	24 V Electric	
Chilled H2O Pump	7.5	480	10.3	3		3120		1750	24 V Electric	
Condenser H2O Pump	7.5	480	10.3	3				1750	24 V Electric	
Condenser H2O Pump	7.5	480	10.3	3				1750	24 V Electric	
Chilled H2O Pump	5	480	7.1	3		3120		3500	24 V Electric	
Hot H2O Pump	2									
Hot H2O Pump	2									Backup

Controls: Currently the HVAC system use a combination of 24V electric and pneumatic controls. An Atlantis system is in place that allows the City facility department to manually program, at the building level, a weekly schedule for the air handler units (AHUs) and other HVAC equipment to turn on and off. Personnel at the City Hall communicate with the facility staff weekly to ensure the HVAC equipment is operating during scheduled hours. The Atlantis system does not allow for any temperature control, it simply controls when the HVAC equipment turns on and off. The zone cooling is done through pneumatic controls.

Irrigation: Irrigation at City Hall is currently controlled by (2) clocks located on the front and side of the main City Hall building

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Irrigation Control Clock

Police Department & Training Center

Address: 200 S. Civic Drive
Year Built: 1977
Square Footage: 53,680 Sq. Ft.

Lighting: Illumination of the Police Department ground floor offices and work areas is achieved with four-foot T-12, 34 watt and 32 watt T-8 fluorescent fixtures with magnetic or electronic ballasts. The lobby is illuminated by decorative fixtures containing two-foot, 17 watt, T-8 fluorescent lamps operated by electronic ballasts, while the hallways and common areas use compact fluorescent and incandescent fixtures of varying wattages.

Lighting

The Police Department basement level uses many of the same fixture types as the ground floor with the exception of the remodeled areas which predominantly use four-foot fluorescent fixtures containing 32 watt T-8 lamps and electronic ballasts. The storage warehouse area uses eight-foot fixtures with two high output, 95 watt, T-12 lamps with magnetic ballasts. The Police Department exterior parking areas are illuminated with pole mounted fixtures operating high pressure sodium or mercury vapor lamps. Exterior perimeter and walkways are illuminated with metal halide bollard lights and surface mounted compact fluorescent can fixtures.

The Police Training Center uses four-foot, fluorescent fixtures containing four 34 watt, T-12 lamps operated by magnetic ballasts. The Training Center exterior perimeter walkways are illuminated with recessed fixtures containing 23 watt screw-in type compact fluorescent lamps.

HVAC: The Police Department receives CHW and HHW from the Municipal plant while the Training Department is only provided with chilled water and no hot water. There are three Carrier reciprocating chillers, two 90 ton and one 30 ton to provide supplemental cooling should the Municipal plant's CHW become insufficient for the Police Department's cooling load. The chillers and boiler piping is connected in series with the Municipal plant piping. The main Police building utilizes 4 dual-speed single duct air handlers to distribute cool air throughout the building. There is also a constant volume six-zone air handler that serves the Training Department.

Supplemental heating is supplied by a 1,800MBtu/hr Bryant boiler for the main building. The Training Department uses two 250k Btu/hr furnaces for its heating.

Reciprocating Chiller

Pumps

Below is a list of the HVAC equipment located at the Police Department and Training Center.

Equipment and Area Identification	HP	Volts	Amps	PH	Tons	Operating Hours	CFM	RPM	Type of Control	Comments
Carrier Chiller		460	40/comp	3	90				Manual	Standby
Carrier Chiller		460	40/comp	3	90				Manual	Standby
Carrier Chiller		230	93	3	30			1800	Manual	Standby
Air Dyn Air Handler (TC)	10	230	26	3	30	4380	9900	1745	EMS	Multizone (6) for Training Center
Air Fan Eng. Co., AH # 1	2.0/1	460	4.8	3		8760			Time Clock	Return Air Section
Air Fan Eng. Co., AH # 1	5.0/3	460	11	3		8760	17440		Time Clock	Supply Air Section
Air Fan Eng. Co., AH # 2	3.0/1	460	5.9	3		8760			Time Clock	Return Air Section
Air Fan Eng. Co., AH # 2	7.5/3	460	14.7	3		8760	11160		Time Clock	Supply Air Section
Air Fan Eng. Co., AH # 3	3.0/1	460	5.9	3		8760			Time Clock	Return Air Section
Air Fan Eng. Co., AH # 3	7.5/3	460	14.4	3		8760	12650		Time Clock	Supply Air Section
Air Fan Eng. Co., AH # 4	3.0/1	460	5.9	3		8760			Time Clock	Return Air Section
Air Fan Eng. Co., AH # 4	15/7.5	460	30.2	3		8760	18360		Time Clock	Supply Air Section
BAC Cooling Tower I	5	460	7.3	3	116				Time Clock	Standby
BAC Cooling Tower II	5	460	7.3	3	116				Time Clock	Standby
BAC Cooling Tower III					40				Time Clock	Standby
Bryant Hot Water Boiler									Manual	1.8MM BTUH
Chilled H2O Pump	3	460	4.5	3		8760		1750	Manual	
Chilled H2O Pump	3	460	4.5	3				1750	Manual	Backup
Condenser H2O Pump	2	230	6.2	3				1745	Time Clock	Standby
Condenser H2O Pump	2	230	6.2	3				1745	Time Clock	Backup
Essex Evaporative Cooler	3					4380	18000		Manual	Shooting Range
Hot H2O Pump	3	480		3				1750		85 GPM
Hot H2O Pump	3	480		3				1750		Backup

Controls: Currently the HVAC system runs 24/7. There are pneumatic time clocks but they are not in use. The chillers turn on whenever the CHW from the Municipal plant exceeds 45° F, as explained previously this occurs often. The heating system is essentially manually controlled. Staff can switch the boilers on whenever the supply HHW from the Municipal plant gets to cold and the outside air temperature is also cold for an extended period of time. Much of the building is unoccupied at night and on weekends but with no control system the entire building runs 24/7.

Irrigation: There are (2) clocks at the police stations, (1) Rainbird and (1) Hunter. Due to the low amount of water consumption controlled by the Hunter clock only the Rainbird will be replaced with a new centrally controlled clock.

Fire Department #2 (Airport Fire Station)

Address: 300 North El Cielo Road
Year Built: 1975
Square Footage: 19,609 Sq. Ft.

Lighting: High bay compact fluorescent fixtures are used to illuminate the apparatus bays. The offices and dorm areas are illuminated with four-foot fixtures containing, two 34 watt lamp T-12 fixtures operated by magnetic ballasts. Other areas utilize incandescent lights or compact fluorescent light fixtures of varying wattages. The exterior of the facility is illuminated by metal halide wall packs, halogen flood lights and incandescent light sources, which can be retrofitted with lower wattage metal halides, compact fluorescent, or LEDs.

HVAC: The Airport Fire Station is connected to the Municipal plant to provide the primary source of heating, cooling, and electricity. There is a 45 ton Westinghouse reciprocating chiller to provide supplemental cooling should the Municipal plant's CHW become insufficient for the Fire Station's cooling load. The chillers and boiler piping is connected in series with the Municipal plant piping, with manual valves installed to switch between cooling/heating systems. The building utilizes 2 multi-zone air handlers to distribute cool air throughout the building. Each is equipped with an economizer.

Supplemental heating is supplied by an 1,100MBtu/h Ajax Boiler.

Below is a list of the HVAC equipment located at the Airport Fire Station.

Equipment and Area Identification	HP	Volts	Amps	PH	Tons	Operating Hours	CFM	RPM	Type of Control	Comments
Westinghouse Chiller		208	161	3	45	0				
Air Handler MZ-1	7.5	208		3		8760	7596	1800	Pneumatic	
Air Handler MZ-2	7.5	208		3		870	7596	1800	Pneumatic	
Ajax H2O Boiler		110	12	1		0				1.1 million BTUH
BAC-Cooling Tower	5	208		3	50		11900		Time Clock	
Chilled H2O Pump	5	208	16	3		6000		1745		
Condenser H2O Pump	5	208	16.2	3				1745	Time Clock	

Controls: The Airport Fire Station systems are currently on pneumatic controls with time clocks. The facility runs 24/7. The building chillers turn on whenever the CHW from the Municipal plant exceeds 45 degrees F. The heating system is essentially manually controlled. Staff can switch the boilers on whenever the supply HHW from the Municipal plant gets to cold and the outside air temperature is also cold for an extended period of time. Much of the building is unoccupied at night and on weekends but with no control system the entire building runs 24/7.

Pneumatic Controls on Multi-zone-AHU

Irrigation: There is only (1) Rainbird clock at fire station # 2. Due to the low amount of water used for irrigation purposes the installation of new centrally controlled clocks is not warranted.

Palm Spring International Airport

Address: 3400 E Tahquitz Canyon
Year Built: 1966
Square Footage: 236,098 Sq. Ft.

Lighting: A majority of the main terminal is illuminated with fluorescent fixtures containing four-foot 32 watt T-8 lamps and electronic ballasts. A significant number of two-foot fluorescent fixtures containing 32 watt T-8 "U-tube" lamps are also used. Some four-foot 34 watt T-12 fixtures are used in the storage areas. Two-foot fixtures containing two and three 40 watt twin tube compact fluorescent lamps are also used in the main terminal and surrounding offices.

The Sonny Bono Terminal primary illumination is achieved from four-foot fluorescent fixtures containing 32 watt T-8 lamps and electronic ballasts. The open areas of the terminal also use high intensity discharge fixtures containing metal halide and mercury vapor fixtures. A mixture of compact fluorescent fixtures and halogen incandescent fixtures provide accent illumination.

The Regional Jet (RJ) Terminal uses predominantly two-foot fixtures that operate two or three 40 watt twin-tube compact fluorescent lamps with electronic ballasts. The open terminal area also uses four-foot fluorescent indirect fixtures containing one or two 32 watt T-8 lamps with electronic ballasts. The RJ Terminal receives ample natural light infiltration due to the abundance of windows and large open area. It is noted that many of the light fixtures here are not used during the day time hours

Lighting

The airport exterior parking areas utilize pole mounted 100 watt and 175 watt metal halide fixtures for illumination. The exterior areas between terminals have multiple types of ground mounted spot or flood light fixtures containing 26 watt compact fluorescent, 65 watt halogen incandescent fixtures. Walkways between terminals use pole mounted 70 watt metal halide fixtures for illumination.

HVAC: The Airport is connected to the Municipal plant to provide primary source of CHW and HHW. The Airport is equipped with two 250 Ton Chillers and one 1,800MBtu/hr boiler for times when the Municipal plant is down. The Airport cooling and heating was originally designed as a backup to the Municipal plant, however, lately the Airport chillers have been running 24/7 to supplement the Municipal plant and to charge the TES tank at night as the Municipal plant can no longer meet the City loads during the day. A number of issues need to get addressed at the Airport. When the Municipal plant is down the Airport boiler does not meet the HHW needs. Even with other building boilers kicking in to help such as the Police Department boilers, there is still not enough HHW to satisfy the Airport loads. Also, when the Municipal plant is down, the Airport has trouble operating under low load conditions, this is typical in early mornings.

See below for a list of HVAC equipment located at the airport.

Trane Chiller

Boiler

Outdoor Indirect Evap Cooler

Below is a list of the chiller equipment located at the Airport.

Equipment and Area Identification	Tons	Max kW	Volts	Phase	Type of Control	Comments
CH-1 Trane CentraVac Chiller	250	155	460	3	DDC	R-11 Refrigerant, Charged for 250 Tons
CH-2 York YT Millennium Chiller	250	155	460	3	DDC	R-123 Refrigerant

Below is a list of the HVAC equipment located at the Airport

Equipment and Area Identification	Supply Fan Data					Return Fan Data					Comments
	CFM	Ext. SP (IN)	HP	Volt	PH	CFM	Ext. SP (IN)	HP	Volt	PH	
AH-1 Zone G/F Concourse Hold rooms Inter Term	25,000	1 3/4	30.0	460	3	23,800	1	10	460	3	W/Airside Economizer and VFD
AH-2 Zone G/F Concourse Hold rooms Inter Term	25,000	1 3/4	30.0	460	3	23,800	1	10	460	3	W/Airside Economizer and VFD
AH-3 Zone G Apron Airline OPS Inter Term	2,000	1 3/4	3.0	460	3	-	-	-	-	-	100% OSA W/Bypass
AH-1 (Domestic Terminal)	11,000	4 1/2	15.0	460	3	9,900	1 1/2	5	460	3	Outdoor AHU
EC-1 (Domestic Terminal)						4,000	3/4	1	460	3	Outdoor Indirect Evap Cooler
AH-2 (Domestic Terminal)	11,000	4 1/2	15.0	460	3	9,900	1 1/2	5	460	3	Outdoor AHU
EC-2 (Domestic Terminal)						4,000	3/4	1	460	3	Outdoor Indirect Evap Cooler
EC-3 Dynamic Air (Restroom Domestic Terminal)	3,200	3/4	3.0	460	3	3,200		1	460	3	Outdoor AHU w/ Indirect Evap. Cooler and HW & CHW coils
MZ-1 Trane Climate Changer (Main Term)	8,760	1 3/4	3.0	480	3	7,600	1/2	2	480	3	4 zone Multizone
MZ-2 Trane Climate Changer (Main Term)	13,650	1 1/2	7.5	480	3	6,800	1/2	2	480	3	6 zone Multizone
MZ-3 Trane Climate Changer (Main Term)	9,090	1 1/2	5.0	480	3	7,200	3/8	1	480	3	4 zone Multizone
MZ-4 Trane Climate Changer (Main Term)	14,400	1 3/4	7.5	480	3	12,000	1/2	2	480	3	5 zone Multizone
AH-1 (Main Term)	7,550	1 1/4	3.0	480	3	8,100	3/8		480	3	Single Zone
AH-2 (Main Term)	8,000	1 1/4	3.0	480	3	12,500	3/8	2	480	3	Single Zone

Below is a list of the pump equipment located at the Airport

Equipment and Area Identification	Type	GPM	TDH(ft)	HP	Volt	Phase	Comments
CHWP-1 Cooling Primary	End Suction	375	40	7.5	460	3	Primary -VFD
CHWP-2 Cooling Primary	End Suction	375	40	7.5	460	3	Primary-VFD
CHWP-4 Cooling Secondary	End Suction	1125	100	60	460	3	VFD
CHWP-5 Cooling Secondary	End Suction	1125	100	60	460	3	Standby-VFD
CWP-1 Cooling Tower	End Suction	770	150	50	460	3	
CWP-2 Cooling Tower	End Suction	770	150	50	460	3	
HWP-1	End Suction	300	80	15	460	3	
CTP-1	In-Line	-	-	-	-	-	

Below is a list of the fan coil equipment located at the Airport

Equipment and Area Identification	CFM	SP (IN)	HP	Volt	PH	Comments
FC-1 Mechanical Rm f103	800	0.5	1/4	115	1	
FC-2 Electrical rm	800	0.5	1/4	115	1	
FC-3 Chiller Rm F114	5000	1.25	3	460	3	
FC-4 Electrical Rm F111	4200	1	2	460	3	
FC-5 Fire Control Rm G108	600	0.5	1/4	115	1	
FC-6 Electrical Rm G103	1350	0.5	1/2	460	3	
FC-7 Electrical Rm G124	1350	0.5	1/2	460	3	
FC-8 Telephone Rm G122	550	0.5	1/4	115	1	
FC-9 Electrical Rm G226	600	0.5	1/4	115	1	
FC-10 Electrical Rm G202	600	0.5	1/4	115	1	
FC-11 Storage G101	2400	0.5	1/2	460	3	
FC-12 Storage G101	1600	0.5	1/2	460	3	
FC-13 Workshop Rm F105	160	0.5	1/2	115	1	
FC-14 Workshop Rm F105	600	0.5	1/4	115	1	Heating Coil
FC-15 Corridor Rm F105	600	0.5	1/4	115	1	
FC-16 Elevator Machine Rm G121	800	0.5	1/4	115	1	

Below is a list of the cooling tower equipment located at the Airport

Equipment and Area Identification	Type	No of Cells	HP	RPM	Volts	PH	Comments
CT-1	Forced Draft	1	30	1800	460	3	w/ 5kW electric pan heater
CT-2	Forced Draft	1	30	1800	460	3	w/ 5kW electric pan heater

Controls: The Airport has a fully functioning direct digital control (DDC), energy management system (EMS). The chillers, pumps, and cooling towers run 24/7 as there is always a load in supplementing Municipal plant as explained previously. All AHUs are programmed to shut off during non occupied periods; there is no un-occupied setpoint. Some rooms such as the computer and security rooms are required to run 24/7. Two of the older AHUs in the main terminal do not have economizers and during cooler days the staff manually opens the dampers. The staff is happy with the control system but would like to see more CHW and HHW from the Municipal plant.

DDC EMS

Irrigation: The Airport is one of the highest water consuming facilities within the City and is the only site that is maintained by City employees rather than outsourced to Merchants Landscape Services, Inc, or controlled by a third party (Convention Center). We recommend replacing 18-manual clocks with 17-centrally controlled clocks.

Irrigation Area

County Administrative Building (County Building)

Address: 3111 Tahquitz Canyon Way
Year Built: 1958
Square Footage: 15,041 Sq. Ft.

Lighting: Offices and open work areas utilize four-foot fluorescent fixtures containing three, 34 watt T-12 lamps operated by magnetic ballasts. Offices along the north side of the facility have ample daylight due to the large floor to ceiling windows therefore these areas have a potential for energy savings with the proposed use of day-lighting controls. The north offices also contain recessed down light fixtures with incandescent lamps which have low usage. The hallways are illuminated with two-foot fluorescent fixtures operating two, 34 watt U-tube T12 lamps and magnetic ballasts.

The office, restroom and common area lighting systems are manually controlled by inboard/outboard switching. Upgrading the incandescent and T-12 lighting systems and the introduction of occupancy sensors with some day-lighting control is recommended.

All of the fluorescent fixtures are good candidates for de-lamping with reflector retrofit kits.

Exterior building perimeter lighting consists of compact fluorescent wall sconces and metal halide bollards. High pressure sodium pole lights provide parking area illumination and are excellent candidates for LED retrofits, or lower wattage, more efficient, pulse start metal halides.

HVAC: The County Building, HVAC is currently being upgraded and is not included.

Irrigation: The water consumed by the irrigation system at the County Building is billed directly to Riverside County by DWA and therefore not included.

City Yard

Address: 425 N. Civic Drive
Year Built: 1961
Square Footage: 43,780 Sq. Ft.

Lighting: The lobby area contains recessed down-light fixtures which operate compact fluorescent lamps. Offices along the north side of the facility utilize four-foot fluorescent fixtures containing four 32 watt T-8 lamps operated by electronic ballasts. Hallways are illuminated with wall mounted indirect fixtures containing three and four foot, 30 and 34 watt, T-12 lamps with magnetic ballasts. The restrooms contain surface mounted or recessed fixtures with incandescent lamps. The lunch room and kitchen area utilize four-foot recessed fixtures that operate two 32 watt T-8 lamps and electronic ballasts. Open shop areas are illuminated by pendant mounted low bay fixtures which contain 250 watt metal halide lamps. Eight-foot strip fixtures which operate high output 95 watt T-12 lamps and magnetic ballasts are also used in the workshop areas. The office and storage areas in the workshops contain a variety of four-foot or eight-foot T-12 fluorescent fixtures with magnetic ballasts.

The facility perimeter exterior is illuminated with ground mounted flood lights using 150 watt halogen lamps. The exterior walkways are illuminated by bollard fixtures operating metal halide or compact fluorescent lamps. The exterior south side of the facility is illuminated with wall mounted flood light fixtures that operate 400 watt metal halide lamps.

The maintenance fleet operations facility vehicle bays/workshops are illuminated with a combination of 400 watt and 1,000 watt metal halide fixtures. Office, restroom, and storage areas contain a variety of T-12 fluorescent fixtures operating four-foot and eight-foot lamps with magnetic ballasts. The fleet operations facility exterior parking areas are illuminated by 400 watt metal halide or high pressure sodium fixtures. Building entrances use incandescent fixtures.

HVAC: The City Yard is connected to the Municipal plant for its electricity, but not for any heating or cooling. The cooling load is met using a 60 ton Carrier Reciprocating and Balhmore Air Coil Cooling Tower. HHW is made by a 650kBtu Bryant Boiler. There are five Carrier air handlers on the roof that distribute air throughout the building. Each is equipped with an economy cycle to use unconditioned outside air whenever possible.

Carrier Chiller

Below is a list of all the HVAC equipment located at the City Yard.

Equipment and Area Identification	HP	Volts	Amps	PH	Tons	Operating Hours	CFM	RPM	Type of Control	Comments
Carrier Chiller		460	40/Comp	3	60	2860			Johnson	2 Recip Compressors
Carrier Air Handler # 1	3	460	4.5	3		2860	4500		Time Clock	Johnson Controls
Carrier Air Handler # 2	5	460	7.2	3		2860	6000		Time Clock	Johnson Controls
Carrier Air Handler # 3	5	460	7.2	3		2860	6000		Time Clock	Johnson Controls
Carrier Air Handler # 4	5	460	7.2	3		2860	6000		Time Clock	Johnson Controls
Carrier Air Handler # 5	5	460	7.2	3		2860	6000		Time Clock	Johnson Controls
BAC Cooling Tower	7.5	460		3		2860	10,330	1750	Time Clock	
Bryant Boiler									OSA Control	650K BTUH input
Condenser H2O Pump	1.5	460	2.5	3		2860			Time Clock	
Condenser H2O Pump	1.5	460	2.5	3		0			Time Clock	Backup
Chilled H2O Pump	2	480		3		2860		1725		
Hot H2O Pump	1	230	3.2	3		1183		1740		
Hot H2O Pump	1	230	3.2	3		0		1740		Backup

Controls: The building is currently on pneumatic Johnson controls with the HVAC equipment on timers.

Irrigation: At the City Yard, there is (1) Rainbird clock associated with irrigation. This clock is located on the south end of the maintenance building.

Palm Springs Library

Address: 300 S. Sunrise Way
Year Built: 1975
Square Footage: 33,920 Sq. Ft.

Lighting: The Library book stack open reading area is illuminated by two-foot recessed 400 watt metal halide fixtures, and a variety of four-foot fluorescent fixtures containing 34 watt T-12 lamps with magnetic ballasts. The perimeter multi-purpose, reading, office, and service areas are illuminated primarily with four-foot fluorescent fixtures with either two or four 34 watt T-12 lamps and magnetic ballasts.

HVAC: The Library is on the Sunrise plant for electrical and heating/cooling loads. There is a 120 ton Carrier reciprocating chiller to provide supplemental cooling should the Sunrise plant's CHW become insufficient for the Library's cooling load. The chillers and boiler piping is connected in series with the plant piping, with manual valves installed to switch between cooling/heating systems. Supplemental heating is supplied by a 1,050MBtuh Thermo-Pak boiler. The cooling tower pump and fans are on standby, but are run one hour/day to cycle the system and minimize algae build-up. The building utilizes two multi-zone air handlers to distribute cool air throughout the building. Each is equipped with an economizer. Below is a list of the HVAC equipment located at the Library.

Carrier Chiller

Below is a list of all the HVAC equipment located at the Library.

Equipment	HP	Volts	Amps	PH	Tons	Operating Hours	CFM	RPM	Type of Control	Comments
Carrier Chiller		208	108/Comp	3	120				EMS	Standby
Carrier Air Handler MZ-B	10	208	34.4	3		2495			EMS	Multizone (4)
Carrier Air Handler MZ-A	10	208	34.4	3		2495			EMS	Multizone (9)
BAC Cooling Tower	1	230		3			26400	1750	EMS	405 GPM,
Thermo-Pak Boiler									OSA Control	1.05MM BTUH
Chilled H2O Pump	7.5	208	23.2	3		2495		1735	EMS	
Hot H2O Pump	3	208	8.8	3		774			EMS	
Con Pump	15	200	47	3				1755	EMS	

Controls: Currently the HVAC systems use a combination of 24V electric and pneumatic controls. The Library is controlled by an Atlantis front end system that is located at the Leisure Center. The Atlantis system does not allow for any temperature control, it simply controls when the HVAC equipment turns on and off. The system is rarely modified nor utilized for specific scheduling of HVAC units. Room temperatures are set by whatever the zone thermostats are set to.

Irrigation: Included in Sunrise Park irrigation section.

Convention Center

Address: 277 N Avenida Caballeros
Year Built: 1987
Square Footage: 183,677 Sq. Ft.

Lighting: The lobby uses recessed can fixtures with incandescent lamps for illumination. The Oasis conference rooms No. 1 and 2 use 400 watt metal halide fixtures. Oasis conference room No. 3A uses a combination of high bay fixtures with 42 watt compact fluorescent lamps and other high bay fixtures with 400 watt metal halide fixtures. Oasis conference rooms No. 3B and 4 use high bay fixtures with only 42 watt compact fluorescent fixtures. The Primrose ballroom areas are illuminated primarily by 400 watt metal halide fixtures, some of which have dimming capability, and recessed fixtures with compact fluorescent lamps. The peripheral office, dressing, and storage rooms are illuminated with a combination of two and four foot fluorescent fixtures with a variety of T-12 and T-8 lamps of varying wattages powered by either magnetic or electronic ballasts.

Corridors also use a variety of fixtures including two and four-foot fluorescent fixtures that operate multiple wattage lamps with magnetic or electronic ballasts. The exterior perimeter of the facility uses a combination of halogen, compact fluorescent, and metal halide fixtures of varying wattages. The loading dock area uses four-foot, 32 watt, T-8 fluorescent fixtures with electronic ballasts and metal halide fixtures of varying wattages. The parking and driveway areas are illuminated by metal halide fixtures which operate 175 watt or 250 watt lamps.

HVAC: The Convention Center is not connected to either cogeneration plant and has its own central plant to provide CHW throughout the building. There are three chillers, two York gas fired absorbers (one 150 ton, one 521 ton), and one 350 ton electric York screw chiller. There are two cooling towers, one rated at 200 tons, and one rated at 350 ton. The 200 ton cooling tower was replaced about five years ago. The 350 ton tower is older and could use replacement as part of a capital improvement project. 26 air handlers are utilized to distribute cooling/heating air throughout the building. The newer air handlers have functioning demand control ventilation. All of the pumps in the central plant have variable speed drives. There are two old Rite 1,050MBtuh boilers that are used for making HHW. They are both starting fail and need replacing. When events are not being held at the convention center, the cooling load is minimal and only needed in the admin offices. The pumps are run at near full capacity all the time, creating a low delta T when little cooling is needed. Other than capital improvements the Convention Center operates very efficiently.

Below is a list of all the HVAC equipment located at the Convention Center.

Equipment and Area Identification	HP	Volts	Amps	PH	Tons	Operating Hours	CFM	RPM	Type of Control	Comments
York Chiller	-	230/460	18.2	3	150	-	-	-	EMS	Gas-Fired Absorption
York Chiller	-	230/460	45.6	3	521	-	-	-	EMS	Gas-Fired Absorption
York Chiller	352	230/460	398	3	350	-	-	-	EMS	Electric Screw (Standby)
Carrier AHUs 1,2,4,5,7-23	Varies	230/460	Varies	3	-	-	Varies	1765	EMS	Robert Shaw System
Carrier AHUs 3,6	Varies	230/461	Varies	4	-	-	Varies	1766	EMS	Alerton System

York AHU 24	50	230/460	120/60	3	-	916		1765	EMS	Alerton System
York AHU 25	50	230/460	120/60	3	-	612		1765	EMS	Alerton System
BAC Cooling Tower	10	-	-	3	200	-	53000		EMS	-
BAC Cooling Tower	25	-	-	3	350	-	91000		EMS	-

Controls: The Convention Center has two main HVAC controls systems. There is an old pneumatic Robert Shaw system and a newer Alerton DDC system that controls the central plant. Many of the pneumatic valves on the Robert Shaw system have been switched to electric Belimo valves, but they are having trouble communicating with the EMS. The pneumatic system has many leaks that force the air compressor to run nearly 24/7 to maintain operating pressure. Repairing of the leaks will be costly and the compressor is small and does not draw a significant amount of electricity.

Alerton DDC

Irrigation: There are (4) clocks at the convention center located far apart. These include Hunter and Rainbird clocks in the same box. It is recommended these be added to the central irrigation system. Currently the Convention Center staff maintain the irrigation system.

Irrigation Control Clock

Swim Center and Skate Park

Address: 401 South Pavillion Way
Year Built: 1979/2003
Square Footage: 39,248 Sq. Ft.

Lighting: The pool office is illuminated with four-foot fluorescent fixtures containing four-34 watt T-12 lamps operated by magnetic ballasts. The exterior is illuminated with 75 watt halogen quartz and 75 watt incandescent fixtures. The skate park is illuminated by 48 pendant mounted, 250 watt high pressure sodium fixtures. Based on discussions with staff the skate park has limited hours when the lighting is operated.

HVAC: The swimming pool is kept at a desired temperature of 84°F. During summer months when the pool water gets to warm the Sunrise plant sends CHW to cool the pool. If the Sunrise plant is down or unable to supply enough CHW to meet the loads of all buildings and the swimming pool then the Sunrise Library chiller will help supplement the CHW needs at the pool. The pool is equipped with two boilers built in 2003 with nameplate outputs of 1,530MBtu/h each.

Swimming Pool Boilers

The Sunrise plant also supplies HHW for the pool as "free energy" is much more efficient then the pool boilers. Unfortunately the Sunrise plant cannot always supply enough hot water to satisfy the loads and the pool and the boilers are required to run (roughly 8–9 months out of the year.) See Appendix A for more details on the historical usage of the boilers. Any HHW or CHW that is supplied from the Sunrise plant goes through a heat exchanger located at the pool building. There are pumps 50 hp circulation pump that pumps water from the pool through the heat exchanger.

Cogeneration HHW Supplementing Pool Heating

Controls: The pool water is kept at 84°F year round. This temperature is first met using the Sunrise plant. If the water leaving the heat exchanger is still below 84°F then the pool boilers provide the remaining needed HHW. At one point time clocks were in place but did not prove to be useful.

Irrigation: Included in Sunrise Park irrigation section.

Stadium & Stadium Park

Address: 1901 E Baristo Rd
Year Built: 1949
Square Footage: 16,906 Sq. Ft.

Lighting: Offices, locker rooms, restrooms, hallways, and storage areas contain surface mounted wrap-around four-foot fluorescent fixtures operating 34 watt T-12 lamps with magnetic ballasts. Some fixtures throughout the facility use screw-in type compact fluorescent lamps.

The stadium exterior is illuminated primarily with wall mounted high pressure sodium fixtures although some metal halide and incandescent fixtures are used as well. The playing field lighting uses high output 1,500 watt pole mounted metal halide flood light fixtures. Due to their relatively low usage and the requirement for high illumination for stadium activities the retrofit of these fixtures is not cost effective.

HVAC: The Stadium is connected to the Sunrise plant for its electrical needs, but not cooling or heating. The Stadium has 7 evaporative coolers that are used for cooling the locker rooms and concession stands.

Stadium Concession Stand

Controls: The evaporative coolers are operated manually with no controls being used. An on/off switch is thrown any time cooling is needed.

Irrigation: Included in Sunrise Park irrigation section

Pavilion

Address: 401 S Pavilion Way
Year Built: 1975
Square Footage: 20,200 Sq. Ft.

Lighting: The lobby and restrooms are illuminated with recessed compact fluorescent fixtures and four-foot fluorescent fixtures containing 32 watt T-8 lamps powered by electronic ballasts. The ballroom areas are illuminated by a combination of recessed 400 watt metal halide fixtures and four-foot fluorescent fixtures with 34 watt T-12 lamps operated by magnetic ballasts. The kitchen, storage areas, and dressing rooms are illuminated with a variety of fixture types including four-foot 34 watt T-12 fluorescent fixtures with magnetic ballasts, compact fluorescent and incandescent fixtures of varying wattages.

HVAC: The Pavilion is on the Sunrise plant for electrical and heating/cooling loads. There is a 100 ton Carrier reciprocating chiller to provide supplemental cooling should the Sunrise plant CHW become insufficient for the Pavilion's cooling load. The chillers and boiler piping is connected in series with the Sunrise plant piping, with manual valves installed to switch between cooling/heating systems. Supplemental heating is supplied by a 731K BTUH Thermo-Pak Boiler. The building utilizes one McQuay multi-zone air handler, equipped with an economizer, to distribute cool air throughout the building. Below is a list of the HVAC equipment located at the Pavilion.

Below is a list of all the HVAC equipment located at the Pavilion Center.

Equipment and Area Identification	HP	Volts	Amps	PH	Tons	Operating Hours	CFM	RPM	Type of Control	Comments
Carrier Chiller	100	230	244	3	100	0		1765		Standby
McQuay Air Handler	20	230	40	3		3120		1750	EMS	Supply Fan - Multizone (4)
McQuay Air Handler	7.5	230	23	3		3120		1745	EMS	Return Fan
Thermo-Pak Boiler						0			Manual	731K BTUH
BAC Cooling Tower	10	200		3		1 hr/day	25000	1750	EMS	306 GPM
Chilled H2O Pump	5	460	6.9	3		3120			EMS	
Hot H2O Pump	1.5	200	5.8	3		774		1735	EMS	

Controls: Currently the HVAC systems use a combination of 24V electric and pneumatic controls. The Pavilion is controlled by an Atlantis front end system that is located at the Leisure Center. The Atlantis system does not allow for any temperature control, it simply controls when the HVAC equipment turns on and off. The system is rarely modified nor utilized for specific scheduling of HVAC units. Room temperatures are set by whatever the zone thermostats are set to.

Irrigation: Included in Sunrise Park irrigation section.

BAC Cooling Tower

Leisure Center

Address: 401 S Pavilion Way
Year Built: 1975
Square Footage: 15,155 Sq. Ft.

Lighting: Multi-purpose rooms, activity rooms, locker rooms, and office areas use four-foot fluorescent fixtures containing a combination of 32 watt T-8 lamps with electronic ballasts and 34 watt T-12 lamps with magnetic ballasts. The facility exterior uses a number of recessed fixtures containing 65 and 75 watt incandescent lamps.

HVAC: The Leisure Center is connected to the Sunrise plant for all of its electrical and heating/cooling loads. There is a 60 ton Carrier reciprocating chiller to provide supplemental cooling should the Sunrise plant CHW become insufficient for the Leisure Center's cooling load. Supplemental heating is supplied by a 450K BTUH Thermo-Pak Boiler. The chillers and boiler piping is connected in series with the Sunrise plant piping, with manual valves installed to switch between cooling/heating systems. The cooling tower pump and fans are on standby, but are run one hour/day to cycle the system and minimize algae build-up. The building utilizes one Mc Quay multi-zone air handler, equipped with an economizer, to distribute cool air throughout the building. Below is a list of the HVAC equipment located at the Leisure Center.

Below is a list of all the HVAC equipment located at the Leisure Center.

Equipment and Area Identification	HP	Volts	Amps	PH	Tons	Operating Hours	CFM	RPM	Type of Control	Comments
Carrier Chiller	60	200	169	3	60	0		1775		Standby
McQuay Air Handler	15	208		3		2340			EMS	Multizone (6)
Thermo-Pak Boiler						0			Manual	450K BTUH
BAC Cooling Tower	15	230		3		1 hr/day	22,500	1750	EMS	
Chilled H2O Pump	3	460	4.5	3		2340			EMS	
Hot H2O Pump	1.5	460		3		774			EMS	
Condenser Pump	5	200	16.2	3		1 hr/day		1745	EMS	

Controls: Currently the HVAC systems use a combination of 24V electric and pneumatic controls. The Leisure Center is controlled by an Atlantis front end system that also controls the Library and the Pavilion Center HVAC equipment. The Atlantis system does not allow for any temperature control, it simply controls when the HVAC equipment turns on and off. The system is rarely modified nor utilized for specific scheduling of HVAC units. Room temperatures are set by whatever the zone thermostats are set to.

Irrigation: Included in Sunrise Park irrigation section.

Fire Stations#1, 3, 4, 5

Address: 277 N. Indian Canyon Dr, 590 E Racquet Club Rd, 1300 S La Verne Way, 5800 Bolero Rd
Year Built: 1957, 1964, 1971, 1981
Square Footage: 5,364 Sq. Ft., 5,807 Sq. Ft., 4,608 Sq. Ft., 3,764 Sq. Ft.

Lighting: Fire Station No. 1 lobby and office uses four-foot fluorescent fixtures containing 32 watt lamps powered by electronic ballasts. The apparatus bays use four-foot fluorescent high bay fixtures which operate four high output 54 watt T-5 lamps with electronic ballasts. The other areas within the facility use a variety of incandescent fixtures of varying wattages and fluorescent fixtures containing 34 watt T-12 lamps.

Fire Station No. 3 apparatus bay uses four-foot fluorescent high bay fixtures which operate two high output 54 watt T-5 lamps with electronic ballasts. The other areas of the facility use a variety of incandescent fixtures of varying wattages in combination with fluorescent fixtures containing 34 watt T-12 lamps.

Fire Station No. 4 interior spaces are illuminated by four-foot fluorescent fixtures containing 34 watt T-12 lamps operated with magnetic ballasts in conjunction with a variety of incandescent fixtures of varying wattages. The apparatus bays use recessed four-foot fluorescent fixtures each containing four 34 watt T-12 lamps operated by magnetic ballasts. The facility exterior is illuminated with a variety of incandescent flood and spotlight fixtures of varying wattages.

Fire Station No. 5 uses a variety of compact fluorescent and incandescent fixtures of varying wattages in most of the interior spaces. Several four and three-foot fluorescent fixtures containing 34 watt and 30 watt T-12 lamps operated by magnetic ballasts illuminate the kitchen area. The apparatus bay uses a combination of recessed compact fluorescent and incandescent fixtures with a variety of wattages. The exterior of the facility is illuminated with a variety of fixture types including compact fluorescent, incandescent, and high pressure sodium.

HVAC: Each of the fire stations utilizes similar cooling methods. The heating/cooling loads are met using gas pack rooftop units and evaporative coolers. They are not connected to the cogeneration plants.

Controls: The systems run 24/7 at the fire stations as they are occupied 100% of the time.

Irrigation: Each fire station only has (1) small clock. The amount of water used for irrigation purposes does not warrant replacing the clock.

Plaza Theater

Address: 128 S. Palm Canyon
Year Built: 1938
Square Footage: 15,100 Sq. Ft.

Lighting: The lobby and auditorium seating areas use dimmable incandescent light sources for illumination. Hallways, restrooms, and storage areas utilize surface mounted four-foot fluorescent fixtures operating one or two 32 watt T-8 lamps with electronic ballasts. Due to the decorative, historical, and theatrical nature of these light fixtures, in addition to relatively low usage, retrofits would be too costly to justify the energy savings.

HVAC: The Plaza Theater utilizes six heat pumps to provide heating and cooling throughout the building. It is not connected to either cogeneration plant.

Manual Thermostat

Controls: The Theater currently utilizes manual thermostats that are controlled by the staff.

Irrigation: This is a very small park with minimal irrigation requirements. Staff would like the ability to control the existing older water fountains as they often malfunction or are broken.

Desert Arts Center

Address: . 550 N. Palm Canyon Dr.
Year Built: 1950
Area: 5,073 sq. ft.

Lighting: The Desert Arts Center is a two building facility, one housing the gallery, an office, and storage closets, and the other a classroom, a kitchen, and restrooms. The gallery is illuminated mainly by day-light provided by windows, and halogens mounted track lighting. Offices were still equipped with four-foot two lamp 34 watt T12 lamps with magnetic ballasts. The other building was equipped by eight-foot two lamp 75 watt T12 lamps with magnetic ballasts. The restrooms were lit with incandescent bulbs. The exterior of the buildings were provided lighting with incandescent flood lamps.

Window Day-lighting and Halogen Track Lighting

HVAC: The Desert Arts Center is cooled by four ground-mounted package units. Two Carrier 7-ton and two Carrier 3.5-ton units. The units are quite old and one has failed but is being replaced.

Controls: The HVAC system is controlled by analog thermostats inside the Art Center. When the building is occupied they are manually controlled by the staff.

Irrigation: Included in Frances Stevens Park irrigation section

James O. Jessie Desert Highland Unity Center

Address: 480 Tramview Rd.
Area: 11,903 sq. ft.

Gym Lights

Lighting: The Highland Unity Center consists of two buildings, one housing the gym, weight room, kitchen, offices, and storage, and the other offices, media center, kitchen, and storage. The gym area was illuminated by high bay 400A metal halide fixtures. The office, kitchen, and weight room had installed 4 foot fluorescent 32 watt T8 lamps in a combination of magnetic and electronic ballasts, within wrap fixtures, box fixtures, or louvers, as well as compact fluorescent bulbs.

The other building had a similar lighting setup minus the high bay metal halide lamps found in the gym. Decorative fixtures could be found in the meeting area, and existing Solatube day-lighting was installed in the restrooms. A two lamp, eight-foot fluorescent 75 watt T12 fixture can be found in the storage room converted into an office.

Exterior building lighting consists of a mix of energy efficient compact fluorescent wall sconces, metal halide bollards, and high pressure sodium parking lot pole light fixtures.

HVAC: This Facility utilizes evaporative coolers to provide cooling for the occupants.

Controls: There are programmable thermostats installed to control the HVAC units

Irrigation: Included in Desert Highland Park irrigation section

S. Palm Canyon Palm Trees Decorative Lighting

Address: From E. Palm Canyon Dr. to W. Gateway Dr.

Palm Tree Lights

Lighting: The palm tree light fixtures illuminate the palm tree canopies for aesthetic purposes. These open fixtures use 65 watt halogen lamps and are controlled via numerous time-clocks which turn the lights on at dusk and turn them off at 2am.

The City owns and maintains hundreds of mature palm trees bordering both sides of S. Palm Canyon Dr. in the Downtown District. Each tree has one or two decorative spot lights that are controlled 48-mechanical clocks located in electric meter boxes. Additionally, the City maintains security lights for many downtown parking lots. The parking lot lights are also controlled by the same 48 mechanical clocks. The clocks require resetting many times during the year.

For a myriad of good reasons, the City would like the ability to control and read lighting wattage consumption. Ability to do so will save many man hours each year and eliminate merchant and customer angst caused by lighting timer problems.

Tahquitz Creek Golf Course

Address: 1885 Golf Club Drive
Year Built: 1962
Square Footage: 19,970 Sq. Ft.

Lighting: The golf pro shop is illuminated with a combination of compact fluorescent and incandescent flood or spot lights. The office and storage areas use four-foot fluorescent fixtures which operate two, 34 watt T-12 lamps with magnetic ballasts. The shop office also uses round fluorescent fixtures which operate with 32 watt "circline" lamps and magnetic ballasts.

The golf cart storage area uses various fluorescent fixtures including four-foot and eight-foot fixtures all with T-12 lamps of different wattages powered by magnetic ballasts. The restrooms contain four-foot recessed fluorescent fixtures and several incandescent fixtures. The fluorescent fixtures contain two, 34 watt T-12 lamps operated by magnetic ballasts.

The clubhouse dining area uses decorative ceiling fan fixtures with incandescent lamps as well as wall and ceiling mounted fixtures with dimmable incandescent lamps of varying wattages. The kitchen area contains four-foot and eight-foot fixtures that operate either 34 watt or 60 watt T-12 lamps with magnetic ballasts.

The golf course maintenance workshop uses pendant mounted eight-foot fluorescent fixtures with 60 watt T-12 lamps powered by magnetic ballasts. Some of these fixtures have been de-lamped and fitted with square 300 watt quartz halogen fixtures. Incandescent fixtures are used in the restrooms and four-foot recessed fluorescent fixtures containing four 34 watt T-12 lamps with magnetic ballasts are used in the break room/lounge area.

Irrigation: The majority of the reclaimed water purchased from DWA is used on the two City owned golf courses. Both already have smart controllers designed specifically for golf courses. Additionally, the courses are maintained by a professional agronomist/superintendant.

Demuth Park

Address: Mesquite Avenue
Year Built: 1973
Square Footage: 4,774Sq. Ft.

Lighting: Concession and restroom buildings use a variety of four-foot fluorescent fixtures for general illumination. Some of the fluorescent fixtures use three, 32 watt T-8 lamps powered by electronic ballasts and others operate two, 34 watt T-12 lamps with magnetic ballasts. Incandescent light fixtures illuminate storage areas. The exterior is primarily illuminated with wall or pole mounted high pressure sodium fixtures of varying wattages.

Pump Station

Irrigation: There are (14) Rainbird clocks at Demuth Park which is currently the only park using reclaimed water. The clocks are located in six separate locations far from one another. This is an ideal park too add onto a central irrigation management system.

Sunrise Park

Address: 401 S Pavilion Way
Year Built: 1975
Area: 37.17 acres

Lighting: The exterior walkways are illuminated with pole mounted 150 watt metal halide fixtures. The parking areas are illuminated with 250 watt pole mounted high pressure sodium fixtures.

Irrigation: There are (13) Rainbird clocks located throughout the landscaped areas (37 acres) of Sunrise Park complex. These clocks currently control irrigation around the Library, Stadium, Cerritos Field, The Pavilion, Boys & Girls Club, Mizell Senior Center, JC Building, Skate Park, and Swimming Pool. Equipment savings can be realized by replacing these (13) clocks with new centrally controlled clocks. Replacing some existing nozzles in certain parts of the park with more efficient nozzles will produce additional savings.

Chevron ES has looked at the possibility of converting Sunrise Park to reclaimed water for irrigation purposes. Conversion to reclaimed water is complicated by the fact that domestic water currently coming in to the park is used for human consumption as well as irrigation purposes. In order to convert to reclaimed water, the irrigation infrastructure would have to be upgraded.

Ruth Hardy Park

Address: 700 E Tamarisk Road
Year Built: 1965
Square Footage: 684 Sq. Ft.

Lighting: The restroom building uses four-foot fluorescent fixtures with 34 watt T-12 lamps with magnetic ballasts. Incandescent light fixtures illuminate storage areas. The exterior is primarily illuminated with wall mounted high pressure sodium fixtures or pole mounted high pressure sodium fixtures.

Irrigation: There are currently (4) clocks at Ruth Hardy Park controlling the irrigation of the park. This is a large park (21 acres) and uses substantial amounts of water. Replacement of the existing four clocks with two new centrally controlled clocks will produce savings in water and equipment costs. Additionally, retrofitting some the existing heads with more efficient nozzles will increase water pressure and insure proper head to head coverage.

Baristo Park

Address: 302 S. Calle Encilia
Year Built: 2005
Area: 1.36 acres

Irrigation: There is (1) clock controlling the irrigation at Baristo Park. Installation of a new, centrally controlled clock will produce only minimal savings but will give the control needed at this pocket park. Retrofitting some of the existing heads with new, position specific heads and more efficient nozzles will provide additional water savings. These actions will also help reduce slipping hazards on the sidewalks caused by pooling overspray from improper nozzles.

Irrigation Control Clock

Desert Highland Park

Address: 480 N. Tramview Road
Year Built: 1974
Area: 17.58 acres

Irrigation: There are (4) clocks controlling the landscape irrigation at Desert Highland Park. Because of the high consumption of water for irrigation, replacement of these clocks with new, centrally controlled clocks will produce substantial water savings. Replacement of some existing heads with new and more efficient heads and nozzles will provide additional water savings. Continuous high winds at this area are an issue for the irrigation spray.

Irrigation Control Clock

Our analysis revealed many irrigation problems at this park that need to be corrected. The issues consist of: wiring problems, broken heads, inoperative valves, incorrect and/ or missing nozzles. In some cases entire stations have been inoperative for long periods so those turf areas have not been properly irrigated. This causes maintenance personnel to "flood irrigate" with nearby stations.

Frances Stevens Park

Address: 555 N. Palm Canyon Dr.
Year Built: 1974-1975
Square Footage: 4 acres

Irrigation: There are (3) existing Rainbird clocks at this facility. Replacement with two new centrally controlled clocks and retrofitting of some heads with more efficient nozzles will produce moderate savings. As important, there is a water feature at this park that often has water blowing on the intersection, cars, and pedestrians creating potential traffic accidents, and pedestrians slip hazards when the wind exceed 10mph [sustained] blowing in the direction of the traffic intersection. Facilities staff would like this addressed to reduce risk of traffic accidents.

Victoria Park

Address: 2744 N. Via Miraleste
Year Built: 1974-1975
Area: 7.7 acres

Irrigation: There is one clock controlling 24 stations for this 7.7 acre park. Replacement of this clock with a new, centrally controlled clock will produce moderate water savings / costs. Replacement of some existing head nozzles with more efficient nozzles will increase the water savings even more.

The "Wellness" Park

Address: 1010 Via Miraleste
Year Built: 2004
Area: 5.5 acres

Irrigation: The "Wellness" Park is a relatively new park located next to Ruth Hardy Park. It takes advantage of some of the facilities (parking/ restrooms) at Ruth Hardy, There are (2) AQUA CONSERVE clocks servicing this 5.5 acre park. Replacement of this clock with a new, centrally controlled clock will produce moderate water savings / costs. Replacement of some existing head nozzles with more efficient nozzles will increase the water savings even more.

Irrigation Control Clock

Exterior roadways, parkways, and medians:

Tahquitz Canyon Medians – El Cielo Rd. W. to Indian Canyon Dr.
Riverside Dr. N. – Sunrise Way to S. Palm Canyon Dr.
Mid. Valley PKY - Mesquite – Gene Autry Trail to Dinah Shore Bridge
Palm Canyon & Baristo – El Cielo Rd. W. to Indian Canyon Dr.
Palm Canyon Dr. East – El Cielo Rd. W. to Indian Canyon Dr.
E. Palm Canyon & Farrell – El Cielo Rd. W. to Indian Canyon Dr.


Exterior Lighting Fixture

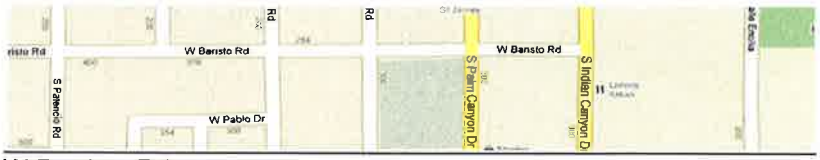
Lighting: The exterior roadways, parkways, and medians are primarily illuminated with pole mounted low wattage high pressure sodium fixtures.

Irrigation:
Of the many parkways and medians, six medians have either the highest visibility and/ or greatest amount of water consumption. Controlling these medians will provide moderate water savings. However one of the biggest benefits is demonstrating to the community that water is not being wasted.

E Tahquitz Canyon Way

N Riverside Dr

E Mesquite Ave



W Barristo Rd

E Palm Canyon Dr

III. Utility Rate Analysis

This section of the report contains historical energy usage and associated costs of all major utility meters within the City of Palm Springs for electricity, gas and water. The purpose of this section is to generate a baseline that represents the energy/water consumed under the existing site conditions and schedules. Establishing a baseline is an important step in understanding how the City uses its energy and to have a benchmark from which to compare energy conservation measures and verify their savings.

Electric and Gas

For several years and with approval from SCE, the City has owned and operated two central cogeneration plants; Municipal plant and Sunrise plant. Each plant distributes power, thermal heating, and cooling to respective City owned buildings. The power generated is distributed via electrical infrastructure systems that are owned and maintained by the City. SCE currently provides all standby and supplemental power in excess of onsite generation via dedicated meters located at each of the plants. Additionally, for all buildings not connected to the plants, they are serviced directly by SCE. There are a number of different SCE rate tariffs within the City. The applicable tariff depends on the meter load and service voltage; City facilities are billed according to the applicable SCE utility tariff (also listed in Table 3-1.)

Unlike the electrical infrastructure, regardless of which buildings are connected to the cogeneration plants, all buildings within the City have their own respective gas meters and service provided by the Southern California Gas Company (SCGC). A vast majority of the buildings metered by SCGC are on the GN-10 tariff which accommodates for both transportation and commodity.

With onsite electric generation at each of the cogeneration plants and using less than three million therms per year at each site, the City is required to be on special "direct access" rate structure for gas distribution to the central plants. For direct access customers the commodity and the transportation are provided by two separate companies; allowing the City to negotiate for better rates on the commodity. Currently the City purchases natural gas commodity on a "take or pay" fixed rate from Occidental Energy Marketing. Transportation is provided by SCGC on the GT-F5D tariff; for transportation only. Recent changes to the gas regulations now allow customers generating less than 1MW the option to stay on SCGC regular GN-10 service if they elect.

Additional information on specifics about the gas and electric tariffs can be found in Appendix A.

The City spends approx. $2.6MM annually on gas and electricity for all City facilities listed below:

- **Municipal Plant**
  - Airport – All facilities
  - Airport Fire Station
  - City Hall
  - City Yard
  - Police Dept & Training Facility
- **Other Buildings**
  - Arts Spring Center
  - Convention Center
  - Denmuth Park
  - Downtown Parking Structure
  - Everybodyy's Village
  - Fire Station #1
  - Fire Station #3
  - Fire Station #4
  - Fire Station #5
  - J.O.J Dessert Highland Unity Center
  - Jaycee Frey (Homeless Shelter)
- **Sunrise Plant**
  - Leisure Center
  - Main Library
  - Pavilion
  - Pool
  - Stadium
  - McManus Village
  - Mizell Senior Center
  - Palm Springs Youth Boxing Club
  - Plaza Theater
  - Ruth Hardy Park
  - Tahquitz Creek Golf Course
  - Taxi Holding Building
  - Train Station
  - Victoria Park
  - Wastewater Treatment Plant
  - YMCA

Figure 3.1 below provides a graphical representation of where the majority of the gas and electric costs are being spent. Roughly 59% of the electric and gas consumption come from the Municipal and Sunrise plants and their respective buildings.

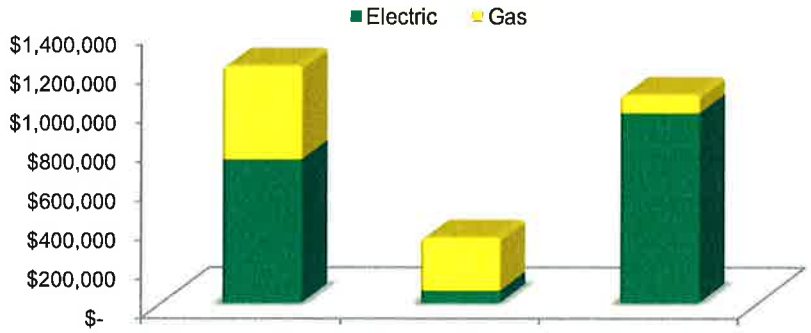


Figure 3.1 Utility Cost by Facility
(July 2009 - June 2010)

Municipal Plant: $1,213,183	**Sunrise Plant: $333,528**	**All Other Buildings: $1,066,314**

A more detailed breakout of the buildings consumption, utilizing the most recent 12 months of data available, July 2009-June 2010, is provided in the following Table 3-1. This data is used to determine the average $/kwh and $/ccf offset at each of the buildings not connected to the cogeneration plant when determining the savings per energy conservation measures.

Table 3-1 Energy Consumed By Building

Pre-Retrofit Indices July 2009 - June 2010														
	Area	Electric			Gas			Total			KWH/	CCF/	BTU/	SCE Rate
Location	Sq Ft	KWH	$	$/KWH	CCF[4]	$	$/CCF	Utility $	$/kWh	$/SF	SF	SF	SF	Structure
Municipal Plant	**402,085**	**10,908,872[1]**	**$ 735,381[2]**	**$0.07**	**714,808**	**$484,302**	**$ 0.68**	**$1,219,683**	**$0.11**	**$3.03**	**27.1**	**1.78**	**270,373**	TOU-8-B-S
Airport - All facilities	236,098	5,459,470[3]			11,822	$10,981	$ 0.93				23.1			
Airport Fire Station	19,609	358,560[3]			8,984	$7,972	$ 0.89				18.3			
City Hall	31,963	946,560[3]			12,170	$10,649	$ 0.88				29.6			
City Yard	43,780	512,880[3]			13,064	$10,280	$ 0.79				11.7			
Police Dept & Training Cente	53,680	974,000[3]			30,297	$24,056	$ 0.79				18.1			
Sunrise Plant	**87,883**	**2,670,456[1]**	**$ 78,461[2]**	**$0.03**	**412,545**	**$270,378**	**$ 0.66**	**$348,839**	**$0.13**	**$3.97**	**30.4**	**4.69**	**573,134**	TGS3-B-S
Leisure Center	15,155	197,040[3]			5,485	$4,720	$ 0.86				13.0			
Main Library	33,920	811,440[3]			3,291	$2,946	$ 0.90				23.9			
Pavilion	20,200	367,200[3]			4,993	$4,137	$ 0.83				18.2			
Pool	39,248	398,960[3]			52,518	$34,579	$ 0.66				NA			
Stadium	16,906	1,390,000[3]			3,256	$2,930	$ 0.90				82.2			
All City Facilities (Subtotal)	**544,096**	**6,550,307**	**$ 917,592**	**$0.14**	**131,039**	**$ 92,597**	**$ 0.71**	**$1,010,189**	**$0.15**	**$1.86**	**12.04**	**0.24**	**65,173**	**See Below**
Arts Springs Center	5,073	72,520	$13,372	$0.18				$13,372		$2.64	14.3		48,790	GS-2
Convention Center	264,479	2,248,817	$334,454	$0.15	120,941	$82,307	$ 0.68	$416,761		$1.58	8.5	0.46	74,748	TOU-8-CPP
Demuth Park	4,774	56,710	$4,176	$0.07				$4,176		$0.87	11.9	-	40,543	AL-2-A
Downtown Parking Structure	124,251	119,720	$17,853	$0.15				$17,853		$0.14	1.0	-	3,289	GS-2
Everybody's Village	13,199	51,733	$7,437	$0.14				$7,437		$0.56	3.9	-	13,377	GS-1
Fire Station #1	5,364	92,760	$13,077	$0.14	443	$563	$ 1.27	$13,640		$2.54	17.3	0.08	67,280	GS-2
Fire Station #3	5,807	85,120	$12,362	$0.15	530	$658	$ 1.24	$13,020		$2.24	14.7	0.09	59,155	GS-2
Fire Station #4	4,608	76,940	$11,529	$0.15	1,069	$1,172	$ 1.10	$12,701		$2.76	16.7	0.23	80,186	GS-2
Fire Station #5	3,764	33,528	$5,035	$0.15	486	$619	$ 1.27	$5,654		$1.50	8.9	0.13	43,313	GS-1
J.O.J Unity Center	11,903	143,850	$25,610	$0.18	3,537	$3,265	$ 0.92	$28,875		$2.43	12.1	0.30	70,962	GS-2
Jaycee Frey (Shelter)	3,617	55,704	$9,152	$0.16	643	$687	$ 1.07	$9,839		$2.72	15.4	0.18	70,339	GS-2
McManus Village	7,851	90,780	$15,325	$0.17	72	$226	$ 3.14	$15,551		$1.98	11.6	0.01	40,381	GS-2
Mizell Senior Center	14,262	108,174	$23,032	$0.21	3,318	$3,100	$ 0.93	$26,132		$1.83	7.6	0.23	49,151	GS-2
Palm Springs Boxing Club	2,095	36,982	$5,787	$0.16				$5,787		$2.76	17.7	-	60,248	GS-1
Plaza Theater	15,100	255,219	$52,960	$0.21				$52,960		$3.51	16.9	-	57,686	TGS3-B-CPP
Ruth Hardy Park	684	29,980	$10,348	$0.35				$10,348		$15.13	43.8	-	149,593	GS-2/GS1
Tahquitz Creek Golf Course	26,210	290,554	$47,940	$0.16				$47,940		$1.83	11.1	-	37,835	GS-2
Taxi Holding Building	1,990	54,360	$9,694	$0.18				$9,694		$4.87	27.3	-	93,231	GS-2/GS1
Train Station	1,483	40,658	$5,750	$0.14				$5,750		$3.88	27.4	-	93,571	GS-1
Victoria Park	684	13,006	$2,013	$0.15				$2,013		$2.94	19.0	-	64,897	GS-1
Wastewater Treat Plant	5,467	2,593,192	$290,687	$0.11				$290,687		$53.17	474.3	-	1,618,907	TGS3-B-CPP
YMCA	21,431										-	-	-	
Remaining Electric Accounts (Subtotal)		**3,193,503**	**$ 509,858**	**$0.16**										
GS1		577,857	$100,891	$0.17										
GS2		211,563	$46,655	$0.22										
TC-1		410,651	$62,180	$0.15										
PA-1		373,845	$58,907	$0.16										
PA-2		94,980	$15,010	$0.16										
TOU-PA		410,901	$61,157	$0.15										
LS-1		353,442	$85,935	$0.24										
LS-2		351,708	$39,836	$0.11										
LS-3		272,684	$27,066	$0.10										
AL-2-A		135,872	$10,109	$0.07										
Misc		0	$2,111											
City Total	**631,979**	**23,323,138**	**$2,266,415**	**$0.10**	**1,407,526**	**$963,780**	**$ 0.68**	**$2,578,712**		**$4.08**	**11.84**	**2.23**	**263,131**	

General Notes for Table:

(1) Total kWh = Engine Production + (plus) SCE Purchased - (minus) sold to SCE

(2) Electricity Purchased from SCE - (minus) Electricity sold to SCE

(3) kWh as reported by internal city billing

(4) All Gas Rates on GN-10 except the Plants which are on a GPT-10 rate. Also the Plants do not include the individual bldg gas meters, they are additional consumption and costs as I

(5) Palm Canyon Drive street lighting and palm tree lights based on remaining blended GS-1 and LS-3 accounts at 0.15 $/kWh

Electric Tariff Structures

The City facilities are billed according to different SCE utility tariffs. There are a number of different SCE rate structures within the City. The applicable tariff depends on the meter load and service voltage. The following is a brief description of tariffs that cover a large majority of the City meters:

Schedule TOU-8, TOU-GS-3: is a time of use (TOU) tariff designed for large and medium sized commercial and industrial customers who register demands greater than 500 kilowatts (for TOU-8) and demands of 200kW through 500kW (for TOU-GS-3). A TOU account is a three-tiered time of use rate based on season (summer or winter) and time of day usage.

SCE defines the following Time of Use Periods (TOU):

Summer:	Season begins at 12:00 a.m. on June 1 and continues until 12:00 a.m. on October 1.
Summer Peak:	Noon - 6:00 p.m., Monday through Friday (except holidays)
Summer Mid-Peak:	8:00 a.m. – noon, and 6:00 p.m. to 11:00 p.m., Monday through Friday (except holidays)
Summer Off-Peak:	11:00 p.m. - 8:00 a.m., Monday through Friday, all day weekend and holidays
Winter:	Season begins at 12:00 a.m. on October 1 and continues until 12:00 a.m. on June 1.
Winter Mid-Peak:	8:00 a.m. - 9:00 p.m., Monday through Friday (except holidays)
Winter Off-Peak	9:00 p.m. - 8:00 a.m., Monday through Friday, weekends and holidays

Schedule S ("-S"): SCE provides "standby" service, meaning that SCE is ready to provide service when the customer's generator is not in operation. This applies during the generator's scheduled or unscheduled outages or when load requirements exceed local generation capacity. Both Municipal and Sunrise Plants are on a "TOU-S" tariff.

Schedule GS-1/GS-2: is designed primarily for small and medium-sized commercial customers with demands of 20 kilowatts or less for GS-1 and demands greater than 20 kilowatts (kW) but less than 500 kilowatts for GS-2. GS-1 energy rates are higher in the summer season than they are in the winter season.

Schedule LS-1/LS-2/LS-3: these rates apply to street and highway lighting. LS-1 and LS-2 rates apply to unmetered lighting, the difference between the two being LS-1 lights are owned and maintained by SCE while LS-2 lights are owned and maintained by the city. LS-3 lights are metered and are owned and maintained by the city.

A more detailed breakout of the City's electric tariff structures are provided in Appendix A.

Gas Tariff Structures

Southern CA Gas Company (Facility Buildings)
All buildings within the City have their own respective gas meters and service provided by the SCG. A vast majority of the building metered by SCG are on the GN-10 tariff which accounts for both transportation and commodity.

Occidental Energy Contract
Unlike the buildings, the two cogeneration plants, because of the large natural gas consumption by the engine generators, are on special "direct access" rate structured accounts. For "direct

access" customers the commodity and the transmission are provided by two separate companies allowing the City to negotiate for better rates. Currently the City purchases natural gas commodity from Occidental Energy Marketing and is provided transmission by Southern California Gas Company on the GPT-10 tariff, for transportation only.

The following Tables 3.2 and 3.3 provide summaries of the gas rates:

Table 3.2 – Summary of Southern CA Gas GN-10 Rate for Facility Buildings

		Tier I2/	Tier II2/	Tier III2/
GN-10:	**Applicable to natural gas procurement service to non-residential core customers, including service not provided under any other rate schedule.**			
Procurement Charge: 3/	G-CPNR	27.004¢	27.004¢	27.004¢
Transmission Charge:	GPT-10	37.20¢	20.639¢	7.66¢
Commodity Charge:	GN-10	64.204¢	47.643¢	34.67¢

Table 3.3 – Summary of Southern CA Gas Transmission Rates for Cogen Plants

GT-10:	**Applicable to natural gas transportation only service to non-residential core customers**			
		Tier I2/	**Tier II2/**	**Tier III2/**
Transmission Charge:	GPT-10	37.20¢	20.639¢	7.66¢

A more detailed breakout of the City's gas tariff structures are provided in Appendix A.

Water (Irrigation)

There are several hundred water meters throughout the City serving both building potable water and irrigation for parks, golf courses, medians, etc. The City is currently serviced water by the Desert Water Authority at an average rate of 0.84 $/CCF (2009). In 2011 this is expected to increase by 19%. The City also purchases approximately 165,000 CCF per year of reclaimed water at roughly 0.49 $/CCF used for irrigation at Demuth Park and for the Waste Water Treatment Plant. From the most recent data provided, the City has spent an average of $974M, annually, on all City water meters between 2007 and 2009.

There are seven major billing groups that make up the total water bill for the City. Table provides a breakout of the different groups and their associated usage, costs and total meters. The amount of water that flows through a water meter is measured in hundred cubic feet (CCF).

Table 3-4 City Wide Water Meters (Annual Average 2007-2009)

Name	Average ($) Spent	Total CCF Consumed	$/CCF	# of Meters	Included in Analysis
Commercial	$7,196	6,078	$1.18	15	Yes
Commercial Mains	$2,104	234	$8.99	4	No
Fire Private	$3,168	38	$82.64	11	No
Public Auth. Mains	$15,050	17,319	$0.87	2	No
Public Authority	$571,621	720,152	$0.79	207	Yes
Residential	$14,172	14,770	$0.96	17	No
Golf Course	$360,437	747,802	$0.48	2	No
Total	**$973,747**	**1,506,395**	**$0.65**	**257**	

*1CCF = 748 gallons of water

As part of the comprehensive energy analysis we focused on the larger consuming irrigation meters. These account for over 670,000CCF (500 million gallons) or 89% of the consumed water listed above, per year, excluding the golf courses. Due to the type and size of meters all; Public Authority Mains, Commercial Mains, Fire Private, Residential and all meters that had annual expenditure of less than $1200 were not included in the energy efficiency analysis for irrigation. In addition, the two golf courses were excluded as they already have computerized controllers and are operated by a professional agronomist superintendant with Arnold Palmer Management.

A more detailed breakout of the 2007-2009 water consumption data is provided in Appendix A. As well as a listing of the meters that were included for the irrigation analysis.

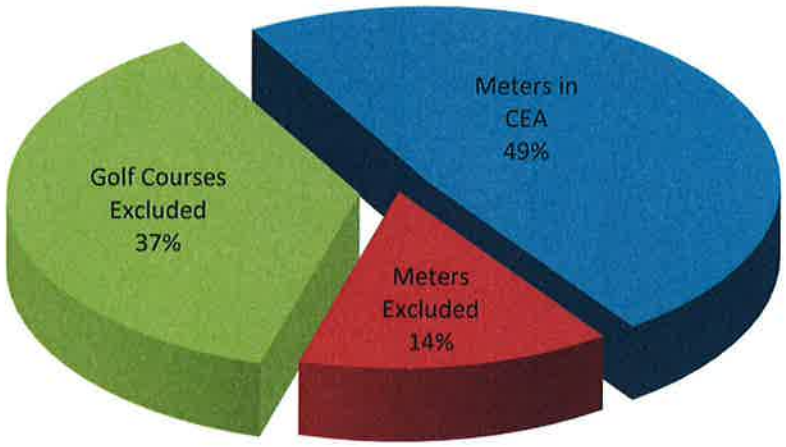


Figure 3-2: Breakout of Water Meters

Municipal Plant Cogeneration

The Municipal Plant currently has (2) 650 kW cogeneration engines that distributes power and thermal heating and cooling to five of the City owned buildings. As described above, SCE currently provides all standby and supplemental power in excess of onsite generation. The Municipal Plant services the following buildings:

- Airport
- Airport Fire Station
- City Yard (Electric Only) peripheral
- City Hall
- Police Department & Training Center

The power consumption, as billed by the City, is broken out as provided in Figure 3.3:

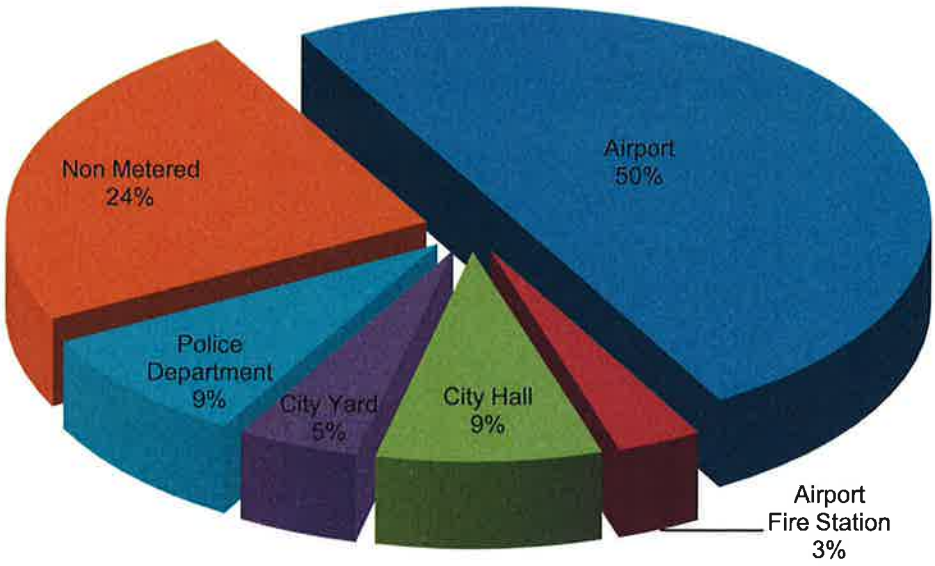


Figure 3.3 Municipal Plant Annual Electric End Use Allocation
July 2009 - June 2010

The Airport currently has three dedicated feeders from Municipal plant and it is evident that the Airport is the City's largest electric consumer. Each of the City departments, listed above, is billed monthly based on manual meter readings taken at each of the building electric meters and then manually entered into the billing database. From the graph above it is evident that the City is utilizing more power than it currently bills as 24% of the power is "non-metered". It is expected that a small portion of this "non-metered" power is consumed to operate the ancillary loads at the Municipal plant and additional losses in the system for transportation, etc. However, this "non-metered" or non-billed value has increased from 6.5% in 2006[3] to 24% today. During our survey we noted that the Airport has 12 meters, however only 11 of the meters are currently being billed by the City.

The Municipal plant has a maximum generating capacity of 1300 kW (650 kW * 2 engines). Currently there are several periods of the year when the power consumption at the Municipal plant (including the buildings connected to it) exceeds 1,800 kW. When this occurs, the building electrical load requirements are greater then what the engines can produce and power is purchased from SCE to supplement the load. There are also times, although rare, when Municipal plant is generating more power than required and this small amount of electricity is sold back to SCE at the time in which it is generated. This typically occurs during off peak hours.

[3] Information based on the Cogeneration System Operating Cost Study for the City of Palm Springs by Water & Energy Management Co. Inc. to determine the current conditions and operating cost for Municipal Cogeneration and Sunrise Cogeneration Facilities.

Based on information provided by the City, Figure 3.4 represents the actual operation of the Municipal engines (red line) over the past three years. As can be seen there were several months when the engines were down or not operating at full capacity, specifically in the summer of 2009 and most of 2010. The "No Losses" line at the top provides a representation of what the ideal condition would have been if the engines were never down per the following equation:

$$650kW \times 2engines \times 730\frac{hrs}{month} = 949{,}000\ kWh/month$$

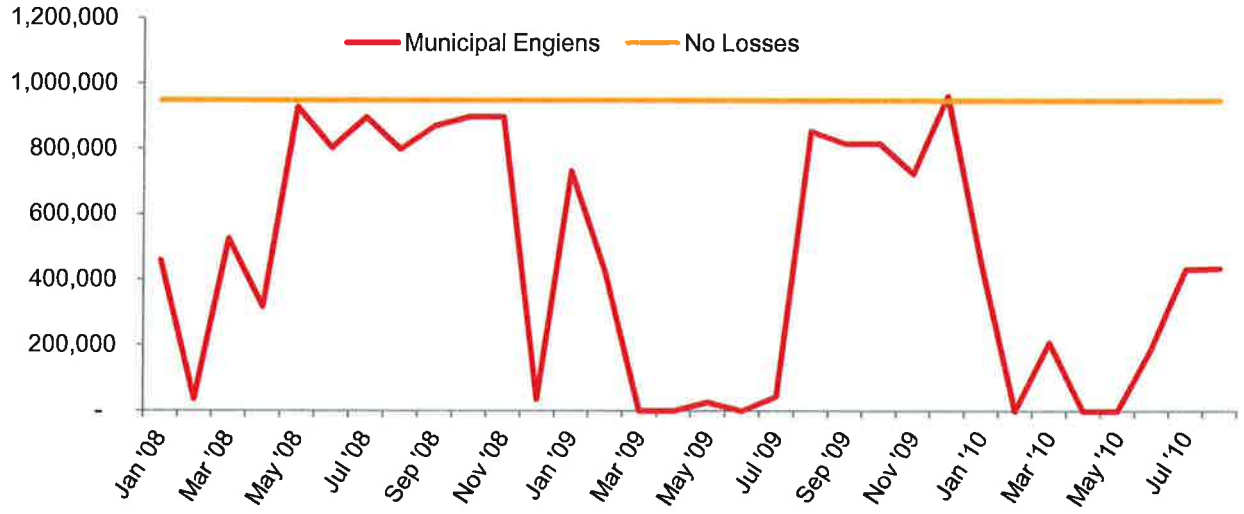


Figure 3.4 Monthly kWh Production From Municpal Engines

Figure 3.5 below depicts the rare times when Municipal plant is generating more power than required and the electricity is sold back to SCE. Alternately the figure provides information on when Municipal plant is being supplemented power by SCE. As expected a vast majority of the electricity purchased from SCE, occurs when the engines are down (opposite the red line from the table above).

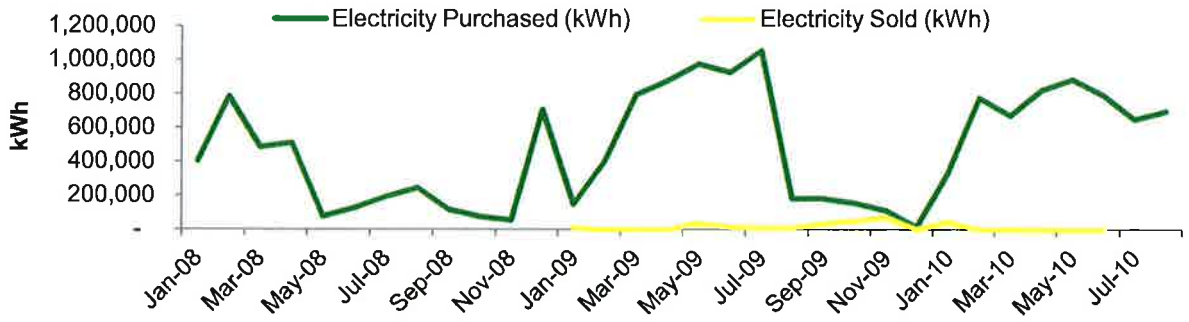
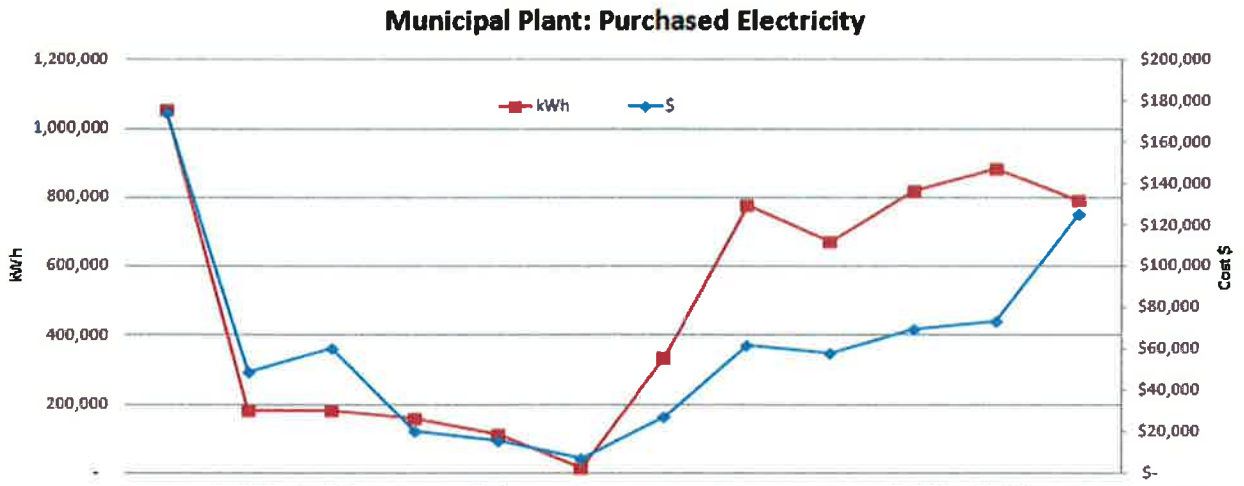


Figure 3.5 Municipal Plant - Purchased and Sold Energy from SCE

The following Figure 3.6 and 3.7 (July'09-June'10) low electrical purchases from SCE indicates that the Municipal engines were fully operational, the months with high electrical purchases indicates that the engines were down for maintenance or repair.

SCE TOU-8-B Standby Tariff

kWh Purchased: 5,986,704	SCE Costs:$741,708	Average: $0.12/kWh



	Jul'09	Aug'09	Sep'09	Oct'09	Nov'09	Dec'09	Jan'10	Feb'10	Mar'10	Apr'10	May'10	Jun'10	Total
$	$ 174,549	$49,009	$59,977	$20,077	$15,598	$6,931	$27,128	$61,889	$58,008	$69,759	$73,763	$125,020	$ 741,708
kWh	1,056,576	183,072	183,200	156,720	112,280	14,688	332,256	777,048	672,168	821,824	885,728	791,144	5,986,704
$/kWh	$ 0.17	$ 0.27	$ 0.33	$ 0.13	$ 0.14	$ 0.47	$ 0.08	$ 0.08	$ 0.09	$ 0.08	$ 0.08	$ 0.16	$ 0.12

Figure 3.6 Municipal Plant Purchased Electricity from SCE

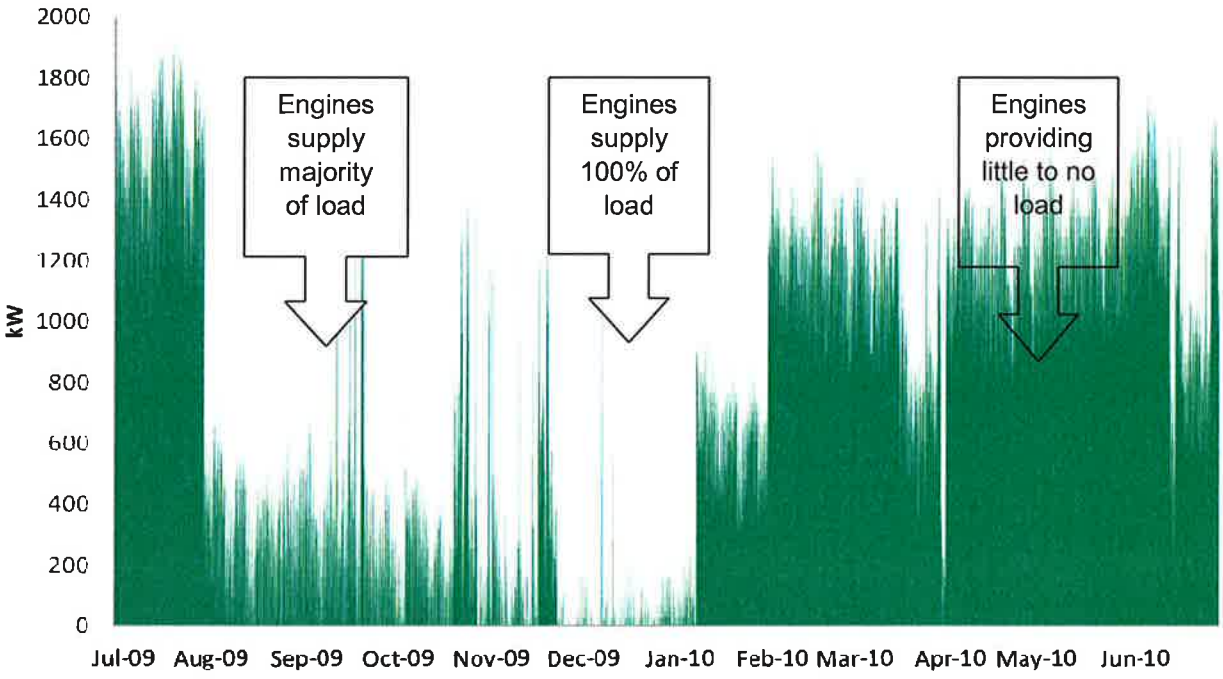
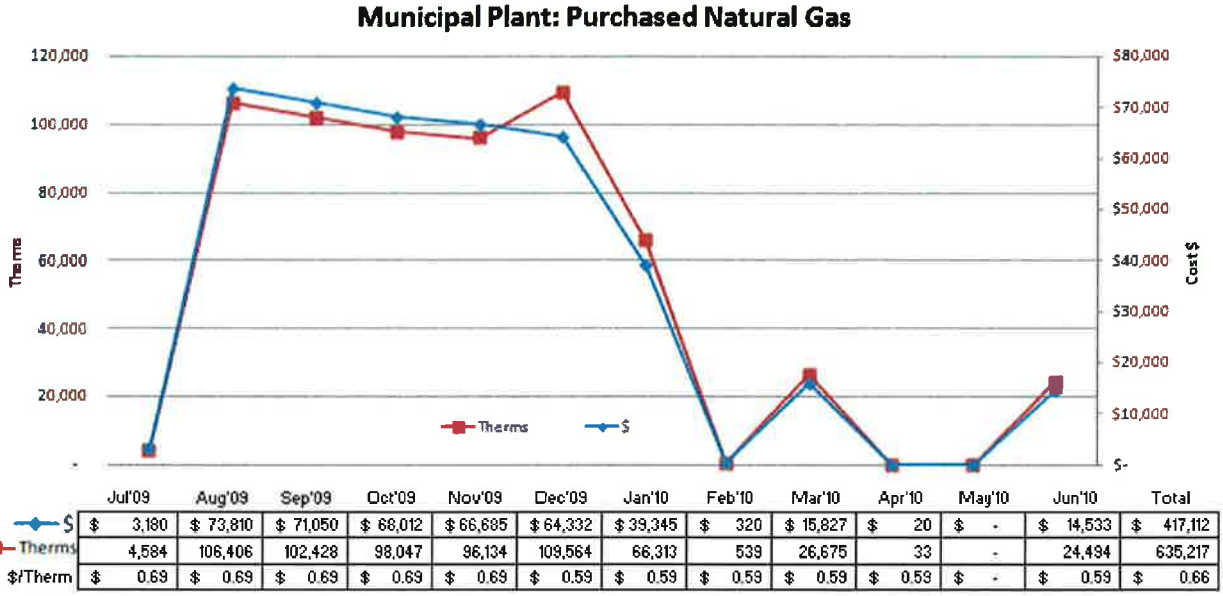


Figure 3.7 Municipal Plant Purchased Power vs. Engines Operating

The Municipal plant uses natural gas strictly to run its engines. The months with little to no consumption indicates the engines were down during those months as shown in the following Figures 3.8 and 3.9.

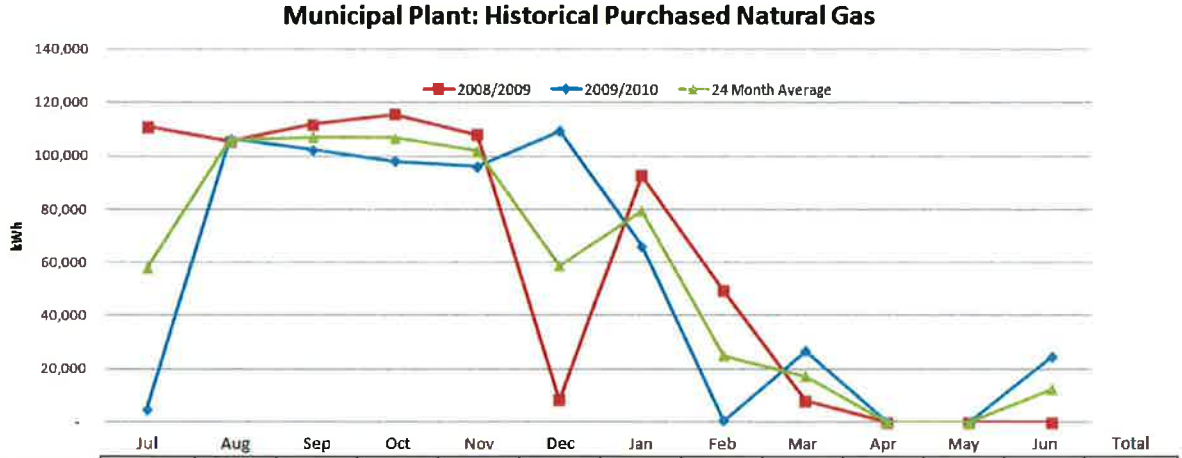
The Gas Company GT-10 Transportation Tariff & Occidental Energy Commodity Charges

Total Therms: 635,217	Total Gas Cost: $417,112	Average: $0.66/Therm



	Jul'09	Aug'09	Sep'09	Oct'09	Nov'09	Dec'09	Jan'10	Feb'10	Mar'10	Apr'10	May'10	Jun'10	Total
$	$ 3,180	$ 73,810	$ 71,050	$ 68,012	$ 66,685	$ 64,332	$ 39,345	$ 320	$ 15,827	$ 20	$ -	$ 14,533	$ 417,112
Therms	4,584	106,406	102,428	98,047	96,134	109,564	66,313	539	26,675	33	-	24,494	635,217
$/Therm	$ 0.69	$ 0.69	$ 0.69	$ 0.69	$ 0.69	$ 0.59	$ 0.59	$ 0.59	$ 0.59	$ 0.59	$ -	$ 0.59	$ 0.66

Figure 3.8 Municipal Plant: Natural Gas Consumption Dollars Spent July 09-Jun10



	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
2008/2009	111,122	105,591	111,934	115,677	108,034	8,360	92,822	49,457	7,943	4	-	4	710,948
2009/2010	4,584	106,406	102,428	98,047	96,134	109,564	66,313	539	26,675	33	-	24,494	635,217
24 Month Average	57,853	105,999	107,181	106,862	102,084	58,962	79,568	24,998	17,309	19	-	12,249	673,083

Figure 3.9 Municipal Plant: Historic Natural Gas Consumption

Additional information on specifics about the power purchased, the power generated and the power sold by Municipal plant as well as information on energy consumption by the individual buildings is provided in Appendix A.

Overall the Municipal Plant purchased 54% of their energy from SCE, generated 46%, and sold back 1% of their generated power back to SCE as shown in Figure 3.10.

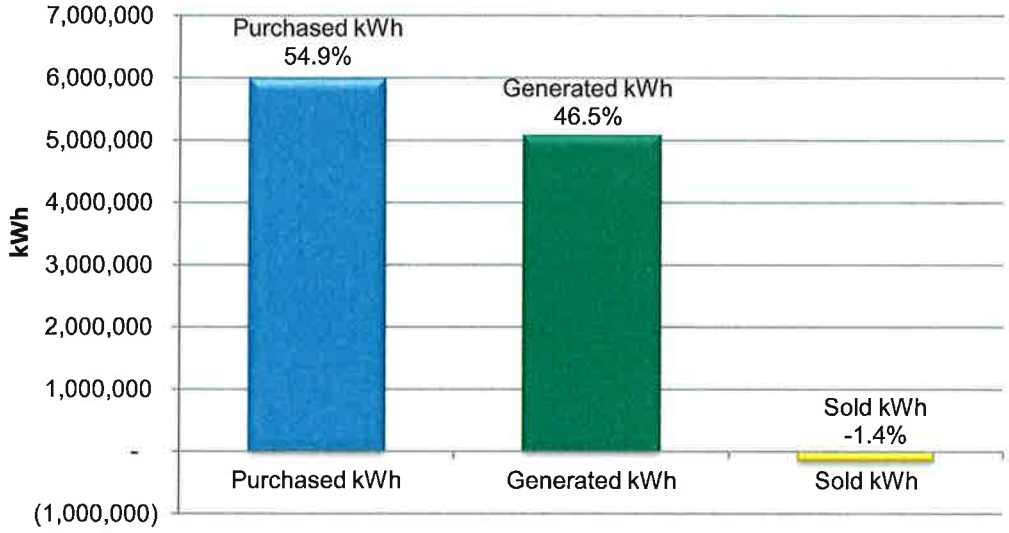


Figure 3.10 Municipal Plant Annual Purchased, Sold, and Generated Electricity 2009/2010

	kWh	Cost*	$/kWh
Purchased	5,986,704	$ 741,708	$ 0.12
Generated	5,077,440	$ 417,112	$ 0.08
Sold	-155,272	$ -6,327	$ -0.04
Total	**10,908,872**	**$ 1,152,493**	**$ 0.11**

* The cost of generation does not include any non-fuel related costs nor gas purchased for building boilers.

Sunrise Plant Cogeneration

The Sunrise Plant currently has one (1) 650 kW cogeneration engines that distribute power, thermal heating and cooling to six of the City owned buildings. Similar to Municipal plant, SCE currently provides all standby and supplemental power in excess of onsite generation. The Sunrise Plant services the following building:

- Leisure Center
- Library
- Pavilion Center
- Skate Park
- Stadium
- Sunrise Pool

The power consumption, as billed by the City, is broken out as provided in Figure 3.11:

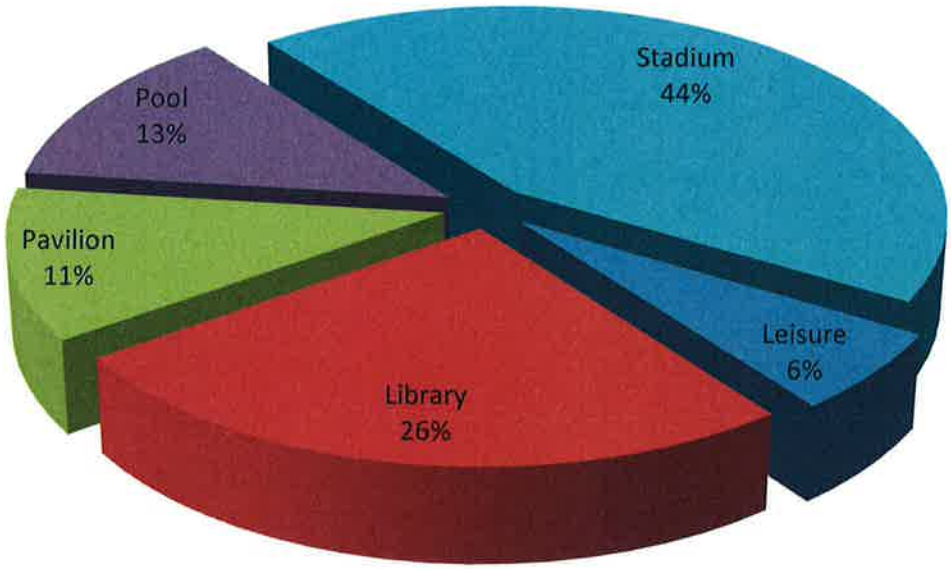


Figure 3.11 Sunrise Plant Annual Electrical End Use Allocation
July 2009 - June 2010

Each of the City departments, listed above, is billed monthly based on manual meter readings taken at each of the building electric meters and then manually entered into the billing database. Unlike the Municipal Plant where a large portion of the consumption is "Non-Metered", the Sunrise Plant actually appears to bill out more then it consumes on an annual basis. The total plant consumption is approximately 2.67 million kWh however the internal billing per the chart above is based on 3.16 million kWh. The City is internally billing approximately 19% more than in consumes. *See Appendix A for table on power purchased, generated, and consumed at Sunrise Plant.*

Based on information provided by the City, Figure 3.12 represents the actual operation of the Sunrise engine (red line) over the past three years. As can be seen there were a couple of months when the engines were down or not operating at full capacity. The "No Losses" line at the top provides a representation of what the monthly production would have been if the engines operated at 100%.

$$650kW \times 1engine \times 730\frac{hrs}{month} = 474{,}500\ kWh/month$$

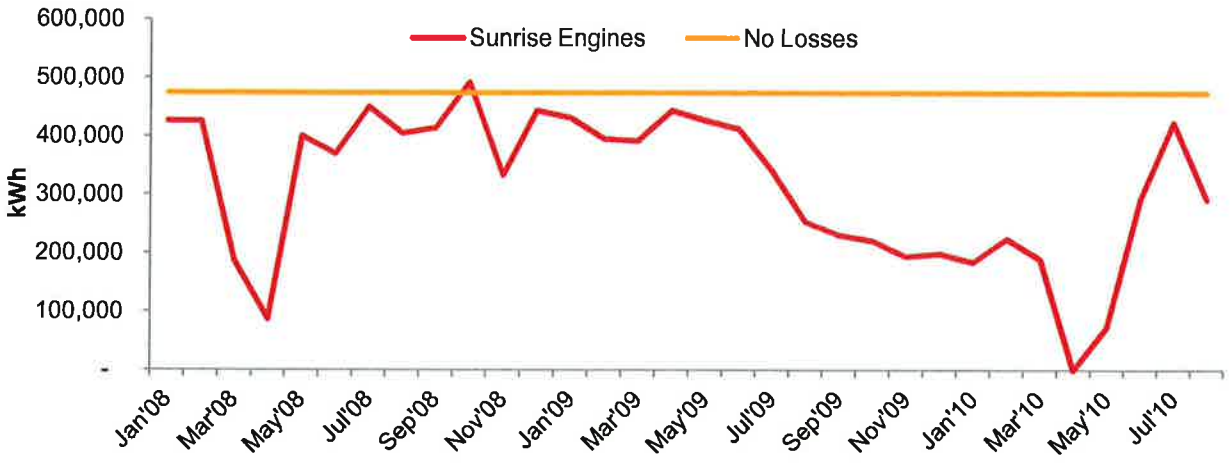


Figure 3.12 Monthly kWh Production From Sunrise Engine

Figure 3.13 depicts the times when Sunrise plant is generating more power than required and the electricity is sold back to SCE. Between Aug 2009 and May 2010 the SCE transformer was down. The buildings connected to the Sunrise Plant had to rely completely on the cogeneration engines as no electricity was either purchased or sold back to SCE during this period.

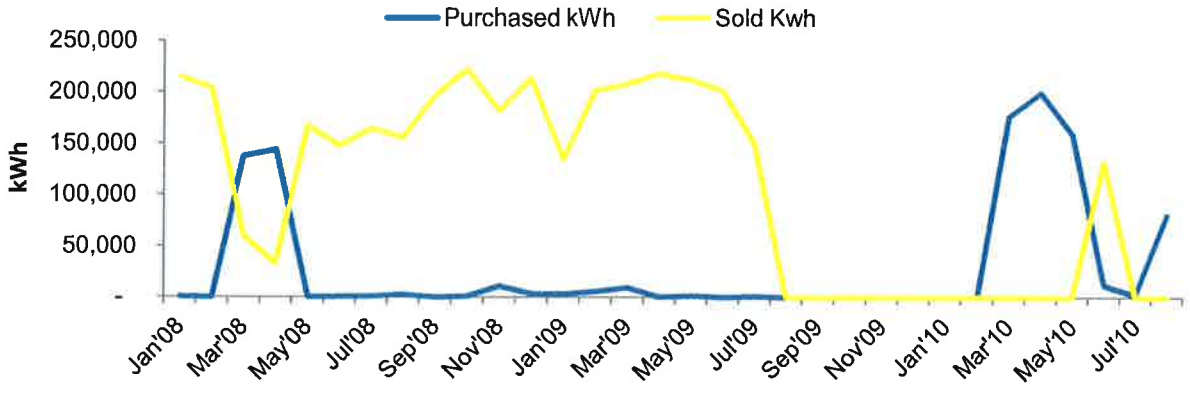
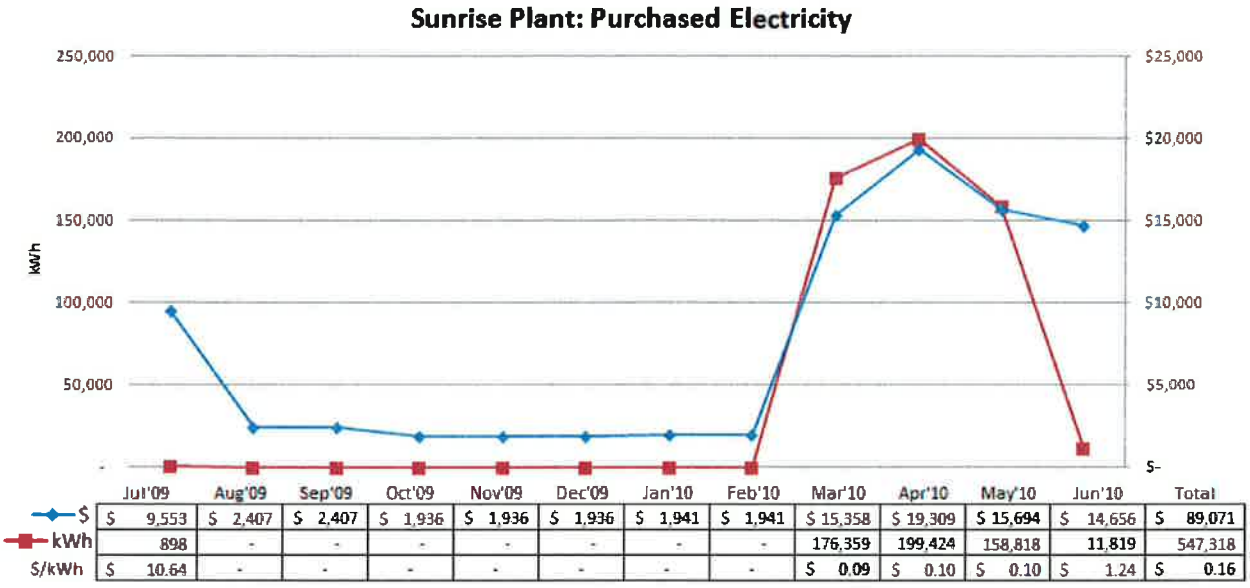


Figure 3.13 Sunrise Plant - Purchased and Sold Energy from SCE

Electricity purchased from SCE, occurs mostly when the engine is down and a few rare times when the loads exceeded the engine capacity. In the following Figures 3.14 and 3.15 (July'09-June'10) minimal or no electrical usage indicates that the Sunrise engine was fully operational.

SCE TOU-3-B Standby Tariff

kWh Purchased: 547,318	**SCE Costs:$89,071**	**Average: $0.16/kWh**



	Jul'09	Aug'09	Sep'09	Oct'09	Nov'09	Dec'09	Jan'10	Feb'10	Mar'10	Apr'10	May'10	Jun'10	Total
$	$ 9,553	$ 2,407	$ 2,407	$ 1,936	$ 1,936	$ 1,936	$ 1,941	$ 1,941	$ 15,358	$ 19,309	$ 15,694	$ 14,656	$ 89,071
kWh	898	-	-	-	-	-	-	-	176,359	199,424	158,818	11,819	547,318
$/kWh	$ 10.64	-	-	-	-	-	-	-	$ 0.09	$ 0.10	$ 0.10	$ 1.24	$ 0.16

Figure 3.14 Sunrise Plant Purchased Electricity from SCE

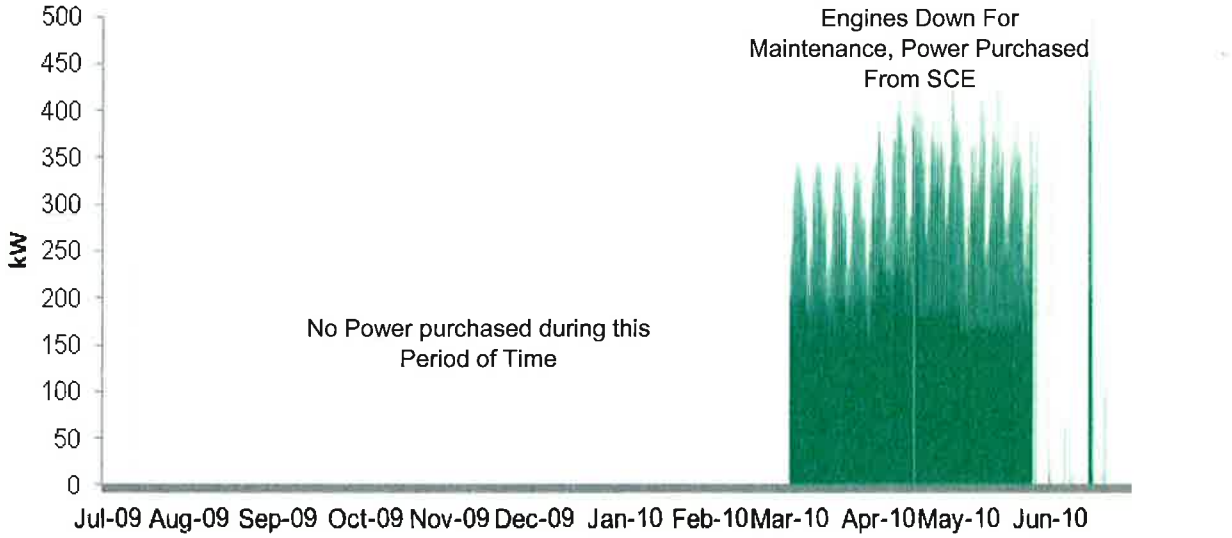


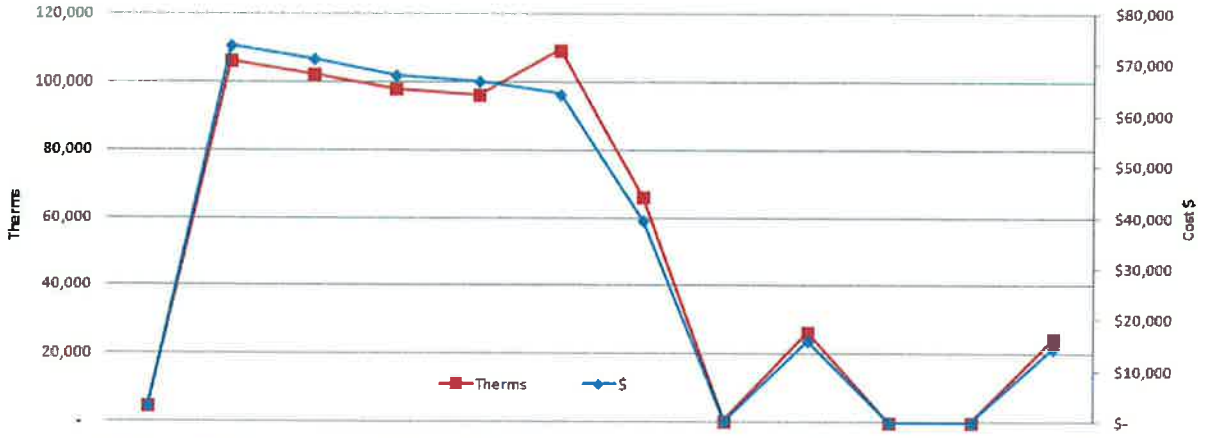
Figure 3.15 Sunrise Purchased Power From SCE

The Sunrise Plant uses natural gas strictly to run the engine. The months with little to no consumption indicates the engines were down during those months as shown in the following Figures 3.16 and 3.17.

The Gas Company GT-10 Transportation Tariff & Occidental Energy Commodity Charges

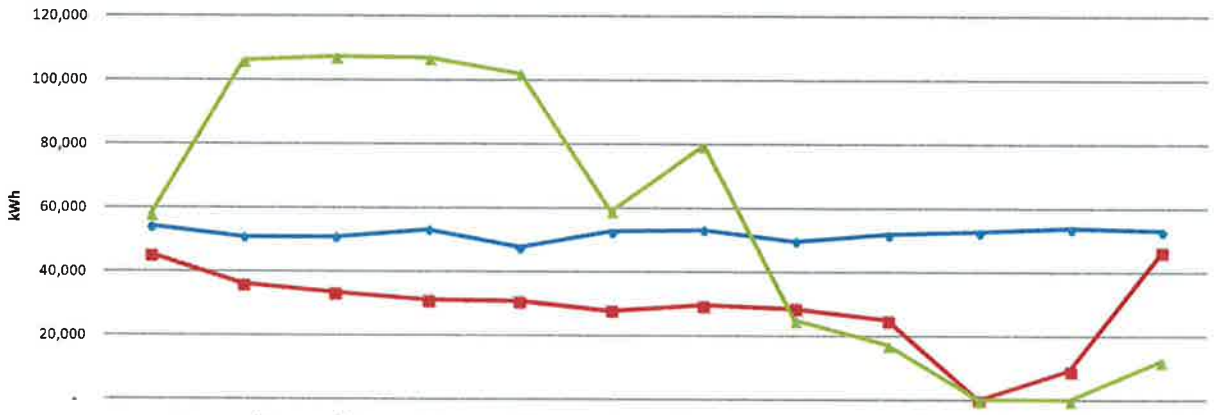
Total Therms: 343,002 **Total Gas Cost:$221,066** **Average: $0.64/Therm**

Sunrise Plant: Purchased Natural Gas



	Jul'09	Aug'09	Sep'09	Oct'09	Nov'09	Dec'09	Jan'10	Feb'10	Mar'10	Apr'10	May'10	Jun'10	Total
$	$ 31,440	$ 25,043	$ 23,213	$ 21,559	$ 21,292	$ 16,298	$ 17,517	$ 17,007	$ 14,819	$ -	$ 5,453	$ 27,424	$ 221,066
Therms	45,325	36,103	33,464	31,080	30,695	27,757	29,524	28,664	24,977	-	9,191	46,222	343,002
$/Therm	$ 0.69	$ 0.69	$ 0.69	$ 0.69	$ 0.69	$ 0.59	$ 0.59	$ 0.59	$ 0.59	-	$ -	$ 0.59	$ 0.64

Figure 3.16 Sunrise Plant: Natural Gas Consumption Dollars Spent July 09 – June10



	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
2008/2009	54,075	50,951	50,841	53,229	47,663	52,657	53,118	49,788	51,897	52,640	53,842	52,919	623,620
2009/2010	45,325	36,103	33,464	31,080	30,695	27,757	29,524	28,664	24,977	-	9,191	46,222	343,002
24 Month Average	57,853	105,999	107,181	106,862	102,084	58,962	79,568	24,998	17,309	19	-	12,249	483,311

Figure 3.17 Sunrise Plant Historical Purchased Natural Gas

Additional information on specifics about the power purchased, the power generated and the power sold by Sunrise Plant as well as information on energy consumption by the individual buildings is provided in Appendix A.

Currently, Sunrise Plant is the more reliable of the two cogeneration plants in terms of uptime and it often produces more power than what the buildings are consuming on an hourly basis. The additional power production is then sold back to SCE. There are few times when the Sunrise power is not generating enough power and the required power is then supplemented by SCE. Based on 15 minute data provided by SCE, Figure 3.18 represents the actual operation of the Sunrise engine. The engine often operates at full capacity and supplies 100% of the connected buildings electric load. This past year, 2010, the engines were offline for several continuous months for extensive maintenance.

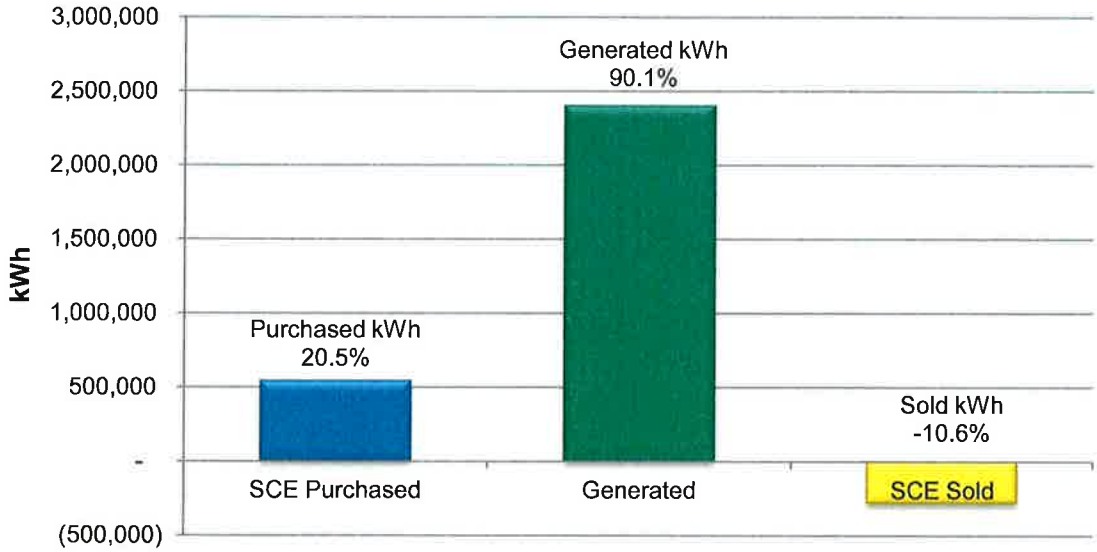


Figure 3.18 Sunrise Plant Annual Purchased, Sold, and Generated Electricity 2009/2010

	kWh	Cost*	$/kWh
Purchased	547,318	$ 89,071	$ 0.16
Generated	2,405,952	$ 221,066	$ 0.09
Sold	-282,814	$ -10,610	$ 0.04
Total	**2,670,456**	**$ 299,527**	**$ 0.11**

*The cost of generation does not include any non-fuel related costs nor cost of building boilers.

Note: In the previous 12 months (prior to the SCE tranformer going down) 2008/2009, Sunrise Plant sold back to SCE approximatly 70% of the total energy consumed.

IV. Energy Conservation Measures

The primary purpose of this project is to evaluate the City's cogeneration plants, and to recommend cost effective improvements that enable the plants to run more efficiently and secondly, to reduce the City's overall energy consumption. Other goals of the project are to:

- Lower electric consumption
- Reduce water consumption
- Lower green house gases
- Reduce natural gas consumption
- Achieve the City's adopted Sustainability Goals
- Develop a "paid from savings" project requiring no capital contribution from the City, and paid for entirely with energy and operation & maintenance ("O&M") savings resulting from implementation of the ECMs

This section of the report identifies and quantifies all feasible Energy Conservation Measures (ECMs), cost savings measures, and some needed facility capital improvements throughout the City. The scope of work in this section is the result of a collaborative process with Chevron ES and the City's representatives through a series of meetings and site audits.

As part of the CEA, Chevron ES investigated numerous ECMs. Some are simple retrofits with a relatively quick return on investment and others are more strategic in nature that leverage the savings benefits of an integrated project approach in lieu of line item measurements. The goal was to investigate all the potential opportunities for the City and to bring the information to the City in a clear and unbiased format. With that premise, the City can implement the ECMs under and integrated project approach and realize both short and long-term benefits while addressing the overall plans for their future growth and development.

The ECMs and improvements that have been prioritized by the City and are provided in more detail herein including but not limited to:

- Modernizing the Cogeneration central plants
- Optimizing building mechanical system utilization and control through an integrated automated energy management control system
- Addressing lighting measures Citywide including Palm Canyon Drive palm trees
- Reducing annual water consumption through irrigation control and
- Adding solar power to capture renewable energy

These ECMs will help the City meet pressing environmental challenges they face today and will face in the future.

ECM L1: Energy Efficient Lighting Modifications

Typically, the first ECM to be evaluated and included in a performance contract is a lighting retrofit project. The reason this ECM is evaluated first is because there generally are much more energy savings to be realized as compared to other ECMs. This savings opportunity is made available because of lighting fixtures hours of use and the constant advances in new technologies.

Chevron ES, with direction from the City, has investigated a comprehensive lighting retrofit. We have taken a detailed survey of the City's facilities and have provided a table of the results in Appendix B. Chevron ES worked toward the City's goals of saving energy and encourages the City to take advantage of the benefits associated with these lighting conservation measures:

- Electrical energy savings
- Maintenance savings
- Electric utility rebate
- Improved light quality and consistency
- Reduced mercury – environmental friendly
- Heat reduction – less load on cooling systems

The following facilities are currently included in one or more of the recommended lighting energy conservation measures described below:

- Angels' Stadium
- City Hall and Annex
- City Yard
- Convention Center
- Demuth Park
- Desert Arts Center
- Downtown Street Lights
- Downtown Parking Garage
- Everybody's Village
- Fire Station #1
- Fire Station #2 (Airport)
- Fire Station #3
- Fire Station #4
- James O. Jessie Center
- Jaycee Frey Center
- McManus Village
- Municipal Golf Course
- Municipal Plant
- Palm Springs Airport
- Palm Springs Leisure Center
- Palm Springs Pavilion
- Police Station
- Police Training Center
- Skate Park & Swim Center
- Sunrise Park
- Sunrise Plant
- Taxi Holding Building
- Train Station
- Wastewater Treatment Plant
- YMCA
- Youth Boxing Club

Group Re-Lamp and Ballast Replacement

The City of facilities surveyed currently utilize fluorescent fixtures that contain antiquated magnetic ballasts with T12 lamps in conjunction with older generation electronic ballasts and T8 lamps. A majority of the fixtures included in this ECM contain lamps and ballasts that are near if not at the end of their useful life expectancy. This ECM considers retrofitting the existing fluorescent fixtures with energy saving, low mercury content, 28 watt "super T8" lamps and newest-generation, premium quality, ultra-efficient electronic ballasts.

The proposed combination of 28 watt T8 lamps and premium electronic ballasts is considered to be the most energy efficient fluorescent lighting system currently available. The electronic

ballasts operate at high frequencies to reduce the power requirements, while maintaining the appropriate light level.

Areas where luminaires have been installed end-to-end can be tandem ballasted. Tandem ballasted fixtures contain the ballast in one luminaire, while operating lamps in one, or more, of the nearby luminaires. In addition to lamp and ballast replacement, lenses will be cleaned and any broken lamp holders or sockets will be replaced. These retrofits will reduce the energy consumption of the luminaires while maintaining appropriate light levels and improving the overall consistent quality of light.

Additional maintenance savings will be achieved by replacing all of the existing, older lamps and ballasts which are nearing or at the end of their expected life ratings. The new lamps and electronic ballasts have expected life ratings of approximately 30,000 and 50,000 hours respectively and are guaranteed by the manufacturers for 3 years (lamps) and 5 years (ballasts).

De-lamp and Install Reflectors

The City facilities utilize "troffer" light fixtures that contain three or four fluorescent lamps with electronic ballasts. This ECM considers retrofitting the three or four lamp fixtures with two, 28 watt T8 lamps, enhanced aluminum specular reflectors, and new electronic ballasts. This ECM also considers retrofitting the fixtures containing two U-tube lamps with two 17 watt T8 lamps, reflectors, and new electronic ballasts.

Most of these troffer fixtures have a poor reflective cavity design, resulting in light being trapped within the luminaires and never emerging as "usable" light. This energy is converted to heat within the luminaire, which shortens lamp and ballast life as well as contributes to additional cooling load.

The lighting industry has seen continued advances in the field of light reflection, resulting in the introduction of specular reflectors. With the specular reflector system, up to half of the lamps and ballasts can be removed with little to no reduction of light level on the work surface. Each reflector is custom designed using sophisticated optical engineering and computer-aided design and is bent at optimum angles for each fixture type. This induces even distribution of light and reduces glare. The reflector produces uniform lighting that is comfortable and aesthetically pleasing without changing the appearance of existing fixtures.

Rooms or areas with luminaires installed end-to-end can be tandem ballasted. Tandem ballasted fixtures house the ballast in one luminaire, while operating lamps in one, or more, of the nearby luminaires. In addition to lamp and ballast replacement, lenses will be cleaned and any damaged lamp holders or sockets will be replaced. These retrofits will reduce the energy consumption of the luminaires while maintaining appropriate light levels and improving the overall consistent quality of light.

This ECM will generate considerable maintenance savings in addition to energy savings by reducing the amount of lamps and ballasts to maintain and standardizing the types of lamps to maintain in stock. The new lamps and electronic ballasts have average life ratings of approximately 30,000 and 50,000 hours respectively and are guaranteed by the manufacturer for 3 years (lamps) and 5 years (ballasts).

Retrofit Incandescent to Compact Fluorescent

The City utilizes incandescent luminaires in a wide variety of areas. This ECM considers replacing virtually all incandescent lamps, which have significant operating hours, with screw-in compact fluorescent lamps into the existing luminaire.

Incandescent sources provide such desirable qualities as instant light, good color rendition, low replacement cost, and ease of control in dimming situations. However, they are the least efficient type of light source currently available. The typical life of an incandescent bulb ranges between 750 and 1,000 hours, and the typical efficacy of the incandescent source is 20 lumens per watt. Of the total input power, only 10% emerges as visible light.

Compact fluorescent lamps are a much more efficient light source with the typical efficacy of 50 to 70 lumens per watt, and having an average rated lamp life of between 8,000 and 10,000 hours. Long lamp life results in reduced maintenance costs associated with lamp replacements. The higher efficiency, lower wattage compact fluorescent lamp can provide light levels of the same intensity as a higher wattage incandescent lamp without sacrificing lighting quality.

The implementation of this ECM will also generate maintenance savings due to the longer life of the fluorescent lamps as compared to the incandescent lamps.

Replace Existing Fixtures with New High Efficiency T-8 Fixtures

This ECM considers replacing older or damaged existing fixtures with new 4-foot linear fluorescent fixtures. In these instances, an aesthetic improvement will also accompany the advantages of the new T-8 system. Due to advanced technology, the new low wattage T-8 system is an excellent replacement since it is the most efficient fluorescent system currently available.

The fixtures recommended for this ECM use less common lamp types including 6-foot, 8-foot, and circular lamps, and older fixtures that use incandescent lamps. Eliminating the less common lamp types, will increase re-lamping efficiency by allowing the maintenance staff to carry only one lamp type. This will provide maintenance savings as well as energy savings.

The electronic ballasts operate at high frequencies to reduce the power requirements, while maintaining the appropriate light level. T8 lamps use rare earth phosphor minerals, which provide superior color rendition similar to the familiar energy saver or warm white lamps. The combination of electronic ballasts and the more efficient T8 lamps, along with new fixture design, allows more usable light to exit the fixture.

Replace Incandescent and CFL Exit Signs

This ECM recommends replacing or retrofitting all incandescent exit signs with new light emitting diode (LED) exit fixtures and battery backups.

The incandescent sources provide such desirable qualities as instant light, good color rendition, and low replacement cost. However, they are the least efficient types of luminaire on the market.

The typical lamp life of an incandescent exit light bulb ranges from 2,000 to 3,000 hours, with an efficacy light source rating of 20 lumens per watt. Only 10% of the total input power emerges as visible light in an incandescent lamp.

Chevron ES recommends replacing these fixtures with Light Emitting Diode (LED) type exit fixtures. LED's utilize a completely different technology in comparison to traditional halogen, incandescent or even fluorescent lighting systems. An LED consists of a silicon semi-conducting material, similar to what is used to make modern microchips. The color rendering index (CRI) is nearly 100, and the typical lamp life ranges from 50,000 to 100,000 hours. Long lamp life results in reduced maintenance costs associated with lamp replacements. LED exit fixtures meet or exceed IES standards for exit lighting levels, while using only 2 watts of energy. The LED exit fixtures have a five-year warranty and a twenty-five year projected life.

LED fixtures meet or exceed standards for exit lighting levels, while using only 2 watts of energy. These LED exit fixtures have a five-year warranty and a twenty-five year projected life. This will reduce nearly all maintenance labor and material costs associated with replacing bulbs.

Replace High Bay HID and CFL fixtures with new High Intensity Fluorescent fixtures

Currently, The City utilizes metal halide (MH) fixtures in the shop areas of the City Yard facilities, the Convention Center, and the Gymnasiums of the YMCA and James O. Jessie Desert Highland Community Center. This ECM recommends the replacement of these MH fixtures with new high intensity fluorescent fixtures that use less energy while increasing light levels and adding more control capability.

A standard MH lamp provides desirable qualities such as 100 lumens per watt and a lamp life of 15,000-20,000 hours. However, the MH fixture has a 5-10 minute warm-up time and even greater 15 minute re-strike (re-start) time before any usable light is produced by the lamp. MH lamps degrade rapidly between 12,000 and 15,000 hours which usually causes a "color-shift". As the typical MH lamp is used, the color temperature begins to change or shift which affects lumen output and the lamps color rendering index (CRI). A typical Metal Halide lamp has a lumen output depreciation of approximately 40 % over its average life rating.

High bay compact fluorescent fixtures that are used in both co-gen facilities as well as the convention center provide energy efficiency with adequate light levels, however, each 42 watt compact fluorescent lamp used in these fixtures has an average rated lamp life of between 8,000 and 10,000 hours. These lamps need to be replaced three times as much as the proposed T-5 linear fluorescent lamps.

New linear fluorescent fixtures provide nearly the same efficacy as the MH fixtures at 80 to 100 lumens per watt but have a greater average life expectancy of 24,000-30,000 hours. The fluorescent fixtures are instant start (on/off), and produce a constant, more uniform lumen output during an average life cycle. Due to the instant start, increased control capability, and increased light output, the new fluorescent fixtures are recommended for this ECM.

Retrofit Exterior HID with LED

The City of Palm Springs utilizes high intensity discharge (HID) light fixtures to illuminate roadways, walkways, and parking areas. These exterior fixtures consist mainly of High Pressure Sodium (HPS), but some standard Metal Halide (MH) fixtures and Mercury Vapor (MV) fixtures are also used. These exterior fixtures are typically controlled automatically via time clock or photocell therefore they have high usage due to year schedule. This ECM proposes the HID fixtures be retrofitted with new, more energy efficient LED replacement lamps.

The proposed LED retrofits have an average rated life of 50,000 to 90,000 hours. These lamps will greatly reduce energy consumption as well as maintenance costs.

Retrofit Existing Exterior Metal Halide with High Efficiency Metal Halide

The City utilizes some metal halide light fixtures to illuminate building perimeters, driveways, walkways, and parking areas. Since these are exterior fixtures, they are typically controlled automatically and have high usage due to 7-day/week 365-day/year schedule. This ECM proposes these fixtures be retrofitted with new, more energy efficient pulse-start metal halide kits.

Metal halide (MH) pulse-start lamps are much more efficient light sources than the standard MH fixtures. The pulse-start MH lamp system provides greater initial light output and more lumens per Watt than non-pulse-start MH lamps. With higher efficacy, pulse-start MH lamps can provide higher light levels with less wattage.

The optimized pulse-start ballast/lamp system increases both lamp life and lumen output by 25 to 50 percent. The MH lamp life of 20,000 hours and the pulse–start MH ballast/lamp systems improves lighting output while increasing efficiency.

Incandescent Palm Tree Spot Lights to LED

The City currently uses 65 watt PAR 38 halogen lamps in open fixtures to illuminate the Palm Canyon Drive palm trees for aesthetic purposes. These fixtures are controlled via time clock and are generally on 7 to 8 hours per night 365 days per year. Since the halogen lamps have a 2,500 to 3,000 hour average life rating each lamp needs to be replaced at least once every other year. The proposed LED replacement fixtures use less than 10 watts and have an approximate average life rating between 50,000 and 90,000 hours. These fixtures have a warm white color temperature and will provide more than adequate illumination for the architectural accent lighting of the palm trees.

This ECM is recommended to improve aesthetic characteristics along Palm Canyon Drive, significantly increase energy efficiency and decrease maintenance costs for replacing the existing halogen fixtures.

Lamp Recycling and Ballast Disposal

Fluorescent lamps containing mercury, ballasts containing PCB's, or other mandated hazardous wastes that are to be removed as part of the recommended lighting modifications will be collected and stored in containers until they are transported to an approved recycling facility. Lamp recycling is the most environmentally friendly way of disposing the fluorescent lamps. Recycling also reclaims both the glass and mercury from the lamps and cuts down on pollution. Incineration is the best way of disposing of ballasts containing PCB's or other mandated hazardous wastes.

All federal, local, state, regulations including the legal manifests for lamp and ballast disposal will be adhered to. Certificate(s) of disposal will be furnished to the owner upon final completion of the proposed lighting modifications.

Table 4.1 - Lighting Summary by Building:

Buildings	Group Re-Lamp and Ballast Replacement	De-lamp and Install Reflectors	Retrofit Incandescent to Compact Fluorescent	Replace Existing Fixtures with New High Efficiency T-8 Fixtures	Replace Incandescent and CFL Exit Signs	Replace High Bay HID and CFL fixtures with new High Intensity Fluorescent fixtures	Retrofit Exterior HID with LED	Retrofit Existing Exterior Metal Halide with High Efficiency Metal Halide
Municipal Central Plant	✓				✓	✓	✓	
Sunrise Central Plant	✓					✓	✓	
City Hall	✓	✓	✓	✓	✓		✓	
Police Department & Training Center	✓	✓	✓	✓	✓		✓	✓
Fire Station 2 (Airport)	✓		✓			✓	✓	
Palm Springs International Airport	✓	✓	✓	✓	✓		✓	✓
County Admin.	✓	✓	✓		✓		✓	
City Yard	✓	✓	✓	✓	✓	✓	✓	
Palm Springs Library	✓	✓	✓		✓		✓	
Convention Center	✓	✓	✓			✓	✓	✓
Swim Center & Skate Park	✓	✓	✓				✓	
Stadium & Stadium Park	✓		✓		✓		✓	
Palm Springs Pavilion	✓	✓	✓				✓	
Fire Stations 1, 3, & 4	✓	✓	✓				✓	
Plaza Theater								
Demuth Park	✓		✓				✓	
Sunrise Park	✓		✓				✓	
Taquitz Creek Golf Course	✓	✓	✓	✓	✓		✓	
Palm Springs Leisure Center	✓	✓	✓					✓
Senior Center								
YMCA - Boys & Girls Club	✓		✓			✓	✓	
City-Wide								
Arts Springs Center (Desert Arts Center)	✓	✓	✓	✓	✓		✓	
Everybody's Village (Center of the Arts - Palm Canyon Theat	✓	✓	✓	✓	✓		✓	
James O. Jessie Dessert Highland Unity Center	✓	✓	✓	✓			✓	
Jaycee Frey Center (Homeless Shelter)	✓	✓	✓	✓	✓			
Mcmanus Village AKA Village Green	✓		✓					
Palm Springs Youth Boxing Club	✓	✓	✓		✓		✓	
Ruth Hardy Park	✓		✓				✓	
Taxi Holding Building	✓	✓					✓	
Train Station	✓						✓	
Victoria Park	✓		✓				✓	
Wastewater Treatment Plant	✓	✓	✓				✓	
Utility Savings	💡	💡	💡	💡	💡	💡	💡	💡
O&M Savings	🛠	🛠	🛠	🛠	🛠	🛠	🛠	🛠
Improve Reliability & Performance	🔑	🔑	🔑	🔑	🔑	🔑	🔑	🔑
Available Grants/Incentives	$	$	$	$	$	$	$	$

More detailed information on the lighting survey is provide in Appendix B

ECM L2: Palm Canyon Lighting Control and Remote Monitoring

The City owns and maintains hundreds of mature palm trees bordering both sides of S. Palm Canyon Drive in the downtown district. Each tree has one or two decorative spot lights that are controlled via 48-mechanical clocks located in electric meter boxes.

Additionally, the City maintains security lights for many downtown parking lots. The parking lot lights are also controlled by the same 48 mechanical clocks. The clocks require resetting many times during the year.

For a myriad of reasons, the City needs the ability to control the lighting centrally and remotely. This can be done through the centrally controlled irrigation system we are proposing (ECM W1). Through this system the facility staff will have the ability to remotely monitor the lights and the power consumption drawn.

Ability to do so will save many man hours each year and eliminate merchant and customer angst caused by lighting timer problems. Interfacing palm tree and parking lot security lighting with the irrigation central system is a cost effective solution.

ECM M1: Central Plant Upgrade – Municipal Plant and Sunrise Plant

Municipal Plant

The Municipal Plant was built in 1985. It was, and still is quite an innovative installation with cogeneration and chilled water thermal energy storage (TES). The Municipal plant includes two natural gas 650 KW Caterpillar G399 engine generator sets. Waste heat from these engines is used to drive a 360 ton Carrier single effect absorption chiller. Chilled water from the chiller feeds a 400,000 gallon underground chilled water TES tank. More information about the existing plant and current operation can be found in *Data on Present Facilities - Section II* of this report. For a variety of reasons the maintenance costs for this plant have been costly and the City has experienced significant downtime in the actual operation of the plant, more information on this can be found in *Utility Rate Analysis - Section III.*

Chevron ES studied all of the available utility and load data provided from 2007 – 2009 and partial of 2010. This data was used to simulate a baseline of the actual operation of the Municipal central plant and the associated loads. Chevron ES used the data provided by the City and data gathered from the site surveys to generate a building by building simulation model (based on building type, occupancy and usage) using an industry recognized modeling software program Trace 700. The Trace 700 simulation model is used to generate a year round hour by hour heating and cooling load profile which is then normalized to historical trend data as provided by the City. Utilizing the heating and cooling load profile and the actual electric load profile as determined from 15minute interval data provided from SCE, Chevron ES can simulate the annual baseline operation of the existing plant and determine the best option alternative for providing power, heating and cooling to the City buildings.

Table 4.2 below is a tabulation of the cooling and heating load requirements for the buildings served by the Municipal Plant:

Table 4.2 Municipal Plant – Heating and Cooling Loads

Building	[1]Building size	Current Existing equipment		[2]Actual Load	
	Sq.-Ft	Chiller (Tons)	Heating (Mbtu)	Chiller (Tons)	Heating (MBtu)
Airport - Main Terminal	83,580	500	1,800	556	
Airport - Sony Bono	78,401				3,800
Airport - R.C Terminal	20,960				
Fire Station #2	11,712	45	500	28	238
City Hall	31,963	150	1,800	102	690
Police Station	44,946	90	1,800	98	647
Police Training	8,374	30	500	39	216
Municipal Plant Total	**279,936**	**815**	**6,400**	**823**	**5,591**

[1] Building size represents area served by central cooling, not necessarily actual square footage of building
[2] Actual load represents post retrofit loads

Chevron ES modeled the Municipal plant under multiple scenarios

- Baseline - Municipal plant as it exists and operates today.
- Option 1 – Upgrading central plant with new cogeneration system
- Option 2 – Abandoning cogeneration and adding solar PV to offset electric purchase/generation

- Option 3 - Upgrading central plant without cogeneration or solar.
- Option 4 – Upgrading central plant with cogeneration and solar.

In considering all of these options it's necessary to keep in mind the goals of the City which are described at the beginning of this section; the ultimate goal being a "paid from savings" project requiring no capital contribution from the City. Thus, Option 4 was quickly disqualified as the technical[4] considerations and the high capital costs for installing solar ***and*** a new cogeneration plant on the same power loop proved to be beyond the goal of a "paid from savings" project.

All the Options have their pros and cons[5] but when looking at all the design and selection criteria Option 1 provided the best overall economic performance. One of the biggest criteria considered; *"is it beneficial for the City to be in the cogeneration business?"* The analysis determined there is a net benefit for the City to cogenerate at the Municipal plant, even if they continued to operate as they do today. Not only does cogeneration provide a majority of the electric power consumed it also supplements the heating and cooling requirements at the City buildings which would otherwise have to be supplemented by some other means of heating/cooling. Since cogeneration does have a positive impact on the utility savings both Options 2 and 3 would have an instantaneous negative impact on utility savings as they suggest going away from the baseline operation of cogeneration.

Municipal Plant Recommendation (Option 1- Upgrading Central Plant with New Cogeneration System):

In analyzing all the recommendations, some of the design criteria and constraints included:

- Paid for from savings
- Technical limitations of new and existing equipment both electrical and mechanical
- Physical limitations of existing building floor space
    - placed limitations on new equipment sizes
    - placed limitations on how to satisfy the building loads.
- New equipment needs to be SCAQMD compliant

In overcoming the design challenges and constraints and with advances in technology Chevron ES recommends cogeneration with the installation of a lean burn engine and a double effect absorption chiller. A lean burn engine is approximately 25% more efficient than the existing rich burn engines and the new chiller can provide more cooling capacity than the single effect chiller that is installed today.

The new Municipal Plant will include a natural gas 1135 kW Jenbacher engine generator, a 450 ton cooling/4,606 MBtu double effect absorption chiller which can accept waste heat from the engines as well as supplement with natural gas for both cooling and heating and two new 2:MM Btu boilers (combined 3.4 Million Btu output) to supplement the heating requirements at the buildings. These boilers are 85% efficient and fall under SCAQMD Rule 219 as not requiring annual permitting. A new primary-secondary chilled and hot water pumping system, with variable speed control on the secondary side will be installed for enough capacity to satisfy the instantaneous building loads as described in Table 4.2. New equipment housekeeping pads to support the new engine generator, chiller, boilers and electrical equipment, will be poured. Concrete or structural steel piers will be installed to support the new cooling tower. The new cooling tower will include variable speed drives and associated sweeper piping connected to a new centrifugal filtering system installed in the cooling tower yard. Most of the existing mechanical equipment, piping and controls at the central plant will be removed and replaced with new. All existing underground piping and TES piping will remain and be utilized as is.

[4] More information about the technical considerations for synchronizing solar PV power systems and cogeneration on the same power distribution loop is provided under the solar ECM.PV 1

[5] A comparison table of the options pros and cons is provided in Appendix D

The plant described above offers a very good solution to satisfying up to an 850 ton instantaneous cooling load and an 8 million Btu heating load at minimum operating cost. The 450 ton chiller operates to maintain the existing thermal energy storage (TES) tank chilled water temperature at 38^{0}F. The absorption chiller will maximize the waste heat consumption by continuously charging the TES to ensure sufficient chilled water is available to satisfy the buildings loads.

Equipment	Cooling Capacity (Tons)	Heating Capacity (MBtu)
[1]Absorption Chiller	450	4,606
[2]Thermal Energy Storage (TES)	400	n/a
Boilers	n/a	3,400

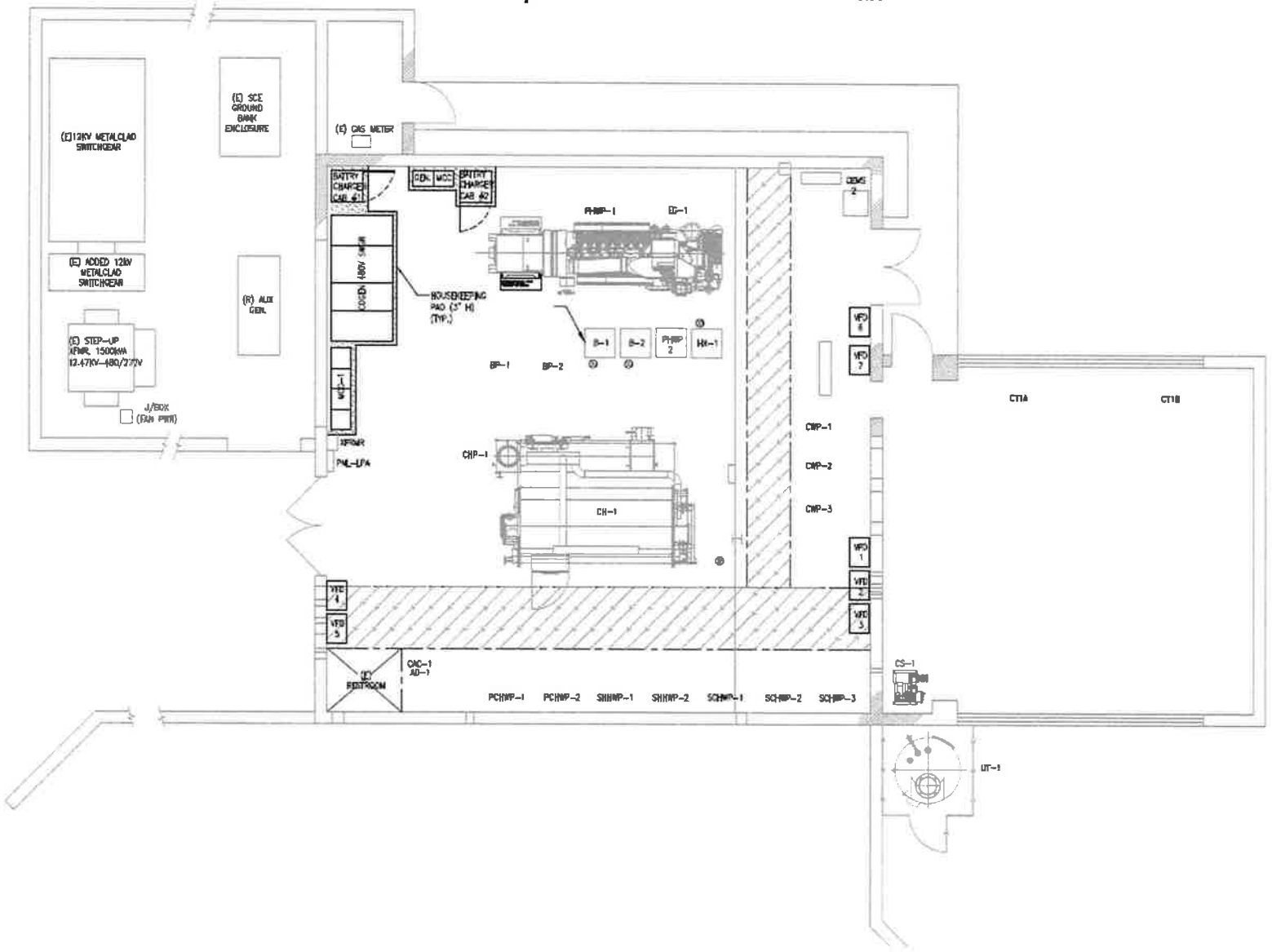
[1]Absorption chiller capacity listed is not for simultaneous heating and cooling. (Partial of each for simultaneous heating and cooling or the max of one)
[2]400 ton TES capacity based upon design day loads

Some of the ancillary benefits of this new cogeneration plant as compared to existing:

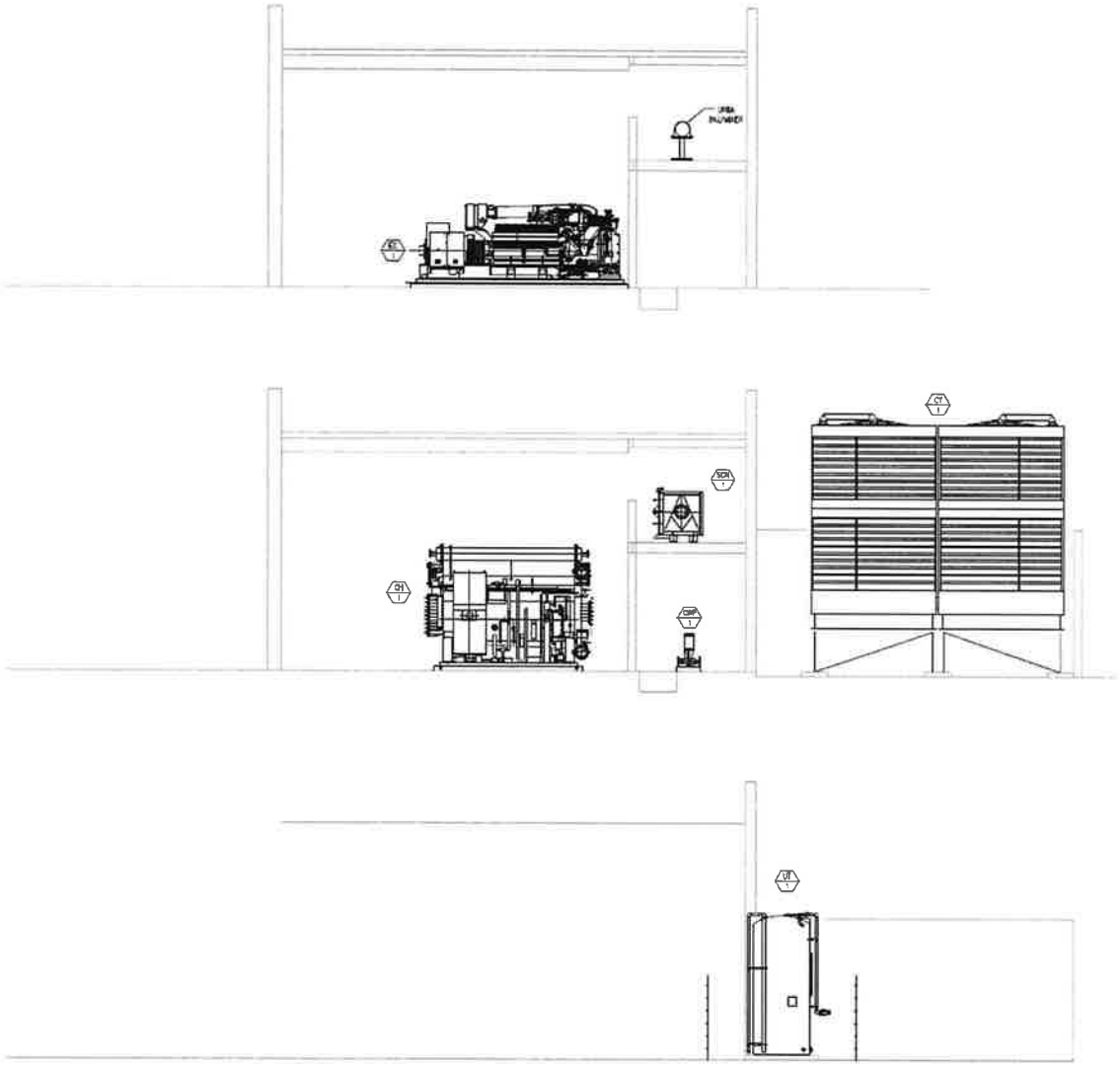
1. The engine generators will be controlled primarily to load follow; only producing the electricity that is being consumed by the City buildings, minimizing excess power being sold back to SCE.
2. Increases the capacity of the chiller to 450 tons and takes advantage of the existing TES to offset the peak cooling load *and* low load requirements eliminates the need for additional mechanical cooling at the buildings.
3. New plant does not utilize steam concept and therefore can be easily shutdown and restarted. Additionally, the new engines have a significant turndown ratio (up to 50%). Existing engines have no turndown.
4. New boilers located at the Municipal plant are available when engines are down for maintenance. Therefore, many of the existing older building boilers can be abandoned.
5. New absorber will be a double effect direct fired natural gas driven. Which means the chiller can accept waste heat from the cogeneration and additionally supplement with natural gas to increase the cooling or heating output.
6. New absorber is capable of much lower chilled water production temperatures providing additional benefit and capacity out of the existing TES.
7. The "direct fired" benefit allows the absorber to provide heating and/or cooling even if the engine generators are down (ie scheduled maintenance).
8. Existing chiller is sized only for the waste heat of the engines however the new chiller is sized larger (limited on floor space) to satisfy cooling load requirements.
9. Enhances the central plant's control logic to enable components when they are truly needed to service the actual building HVAC load demands City wide. (Integrates with ECM M-2)
10. New Chiller will allow Airport Chillers to shut down and operate as they were designed, as backup chillers.

The following is a layout of the recommended Municipal plant with cogeneration:

New Municipal Plant Mechanical Floor Plan



New Municipal Plant Mechanical Section View



1 MECHANICAL SECTIONS

Sunrise Plant

Sunrise Plant is essentially identical to Municipal Plant just smaller in scale. It is also a combined cogeneration plant with chilled water (TES). The plant includes one 650kW Caterpillar G399 engine generator. Waste heat from the engine is used to drive a 180 ton Carrier single effect absorption chiller or used to supplement building heating requirements or the pool heating requirements. Chilled water from the chiller feeds a 130,000 gallon underground CHW storage tank. More information about the existing plant and current operation can be found in *Data on Present Facilities - Section II, Utility Analysis - Section III* of this report.

Like Municipal plant Chevron ES studied all of the available utility and load data provided from 2007 – 2009 and partial of 2010 for Sunrise plant. This data was used to simulate a baseline of the actual operation of the Sunrise central plant and the associated loads. Chevron ES used the data provided by the City and data gathered from the site surveys to generate a building by building simulation model (based on building type, occupancy and usage) using an industry recognized modeling software program Trace 700. The Trace 700 simulation model is used to generate a year round hour by hour heating and cooling load profile and normalized to historical trend data as provided by the City. Utilizing the heating and cooling load profile and the actual electric load profile as determined from 15minute interval data provided from SCE, Chevron ES can simulate the annual baseline operation of the existing plant and determine the best option alternative for providing power, heating and cooling to the City buildings.

Table 4.3 below is a tabulation of the cooling and heating load requirements for the buildings served by the Sunrise Plant:

Table 4.3 Sunrise Plant – Heating and Cooling Loads

Building	Building Size	Current Existing Equipment		Actual Load	
	Sq.-Ft	Chiller (Tons)	Heating (MBtu)	Chiller (Tons)	Heating (MBtu)
Leisure	15,155	60	450	49	334
Pavilion	20,200	100	731	91	697
Library	33,920	120	1,050	108	686
Pool	NA	NA	3,060	110	2,880
Sunrise Total	**69,275**	**280**	**5,291**	**358**	**4,597**

Chevron ES modeled the Sunrise Plant under multiple scenarios

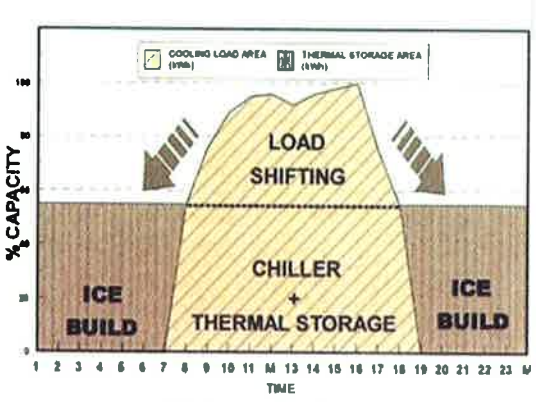
- Baseline - Sunrise plant as it exists and operates today.
- Option 1 – Upgrading central plant with new cogeneration system.
- Option 2 – Abandoning cogeneration and adding solar PV to offset electric purchase/generation.
- Option 3 - Upgrading central plant without cogeneration or solar.
- Option 4 – Upgrading central plant with cogeneration and solar.

During the analysis it was discovered that the City buildings served by this plant rarely, if ever, draw 650 kW and that an electrical load of approximately 350kW more closely reflected the current average baseline load.

Unfortunately, the present system cannot load follow nor be shut down and restarted readily therefore the City is often over producing and selling power back to SCE at a discounted rate. Same as Municipal plant, Option 4 was quickly disqualified as the technical considerations and the high capital costs for installing solar and a new cogeneration plant on the same power loop proved to be beyond the goal of a "paid from savings" project. One of the biggest criteria considered; *"is it beneficial for the City to be in the cogeneration business?"* Based on the size requirements of this plant, are not of sufficient capacity to warrant a *new* cogeneration plant. While upgrading the cogeneration plant will offer additional energy savings, the annual benefit is minimal when compared to the high capital cost to install. Additionally the limited size ranges of today's generating equipment and associated long term maintenance and permitting costs did not secure upgrading the Sunrise central plant with a new cogeneration plant (Option 1). When looking at all the parameters for Sunrise Plant, Option 3 provided the best overall economic performance.

Sunrise Plant Recommendation (Option 3):
Due to the smaller size and load requirements of Sunrise plant Chevron ES recommends installing a modern, high efficiency, 250 ton electric chiller, taking advantage of the existing TES system and installing two new 2-MM Btu boilers to supplement the heating requirements at the buildings. These boilers are 85% efficient and fall under SCAQMD Rule 219 as not requiring annual permitting. A new primary-secondary chilled and hot water pumping system, with variable speed control on the secondary side will be installed for a capacity to satisfy the instantaneous building loads as described in the Table 4.3 above. New equipment housekeeping pads to support the new chiller and boilers will be poured. Concrete or structural steel piers will be installed to support the new cooling tower. Most of the existing mechanical equipment, piping and controls at the central plant will be removed and replaced with new. All existing underground piping and TES piping will remain and be utilized as is.

Traditional (TES) is a load shifting strategy that involves making and storing chilled water (or ice) at night, when the lowest electrical rates apply, and then utilizing this water as the main cooling source for the next days cooling needs. It is an effective way of reducing demand capacity of the electric supply grid by reducing chiller loads during peak periods. Chevron recommends operating Sunrise' existing thermal storage system in this traditional fashion to reduce the electric demand capacity during peak and mid-peak periods ultimately reduce energy cost resulting in an efficient plant for the City.



TES Load Shift Strategy

Operating Strategies

There are several strategies for charging and discharging TES storage to meet cooling demand during peak hours, but primarily there are two extremes. They are:

- **Full storage:** A full-storage strategy shifts the entire on-peak cooling load to off-peak hours. The system is typically designed to operate at full capacity during all non-peak hours to charge the storage tanks. This strategy is most attractive where on-peak demand charges are high or the on-peak period is relatively short.
- **Partial storage:** In the partial-storage approach, the thermal storage is used to serve part of the campus load up to a max tonnage per hour, each hour that the load exceeds the storage capacity the chiller will run to meet the remaining cooling load.

Chevron recommends the following control strategy for the City:

SUNRISE CENTRAL PLANT SUMMER SEASON OPERATION (Jun 1 - September 30)

	12:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00
250 Ton Chiller	Charge tank						Satisfy load						OFF/Run part load if needed						Satisfy load					
1,264 Ton-Hour TES Tank	Build thermal storage						OFF						Draw from Storage						OFF					
AVAILABLE CAPACITY FOR COOLING COMFORT																								
250 Ton Chiller	0	0	0	0	0	0	250	250	250	250	250	250	0-100	0-100	0-100	0-100	0-100	0-100	250	250	250	250	250	250
1,264 Ton-Hour TES Tank	0	0	0	0	0	0	0	0	0	0	0	0	200	200	200	250	200	200	0	0	0	0	0	0
Total Tons Available	0	0	0	0	0	0	250	250	250	250	250	250	200-300	200-300	200-300	250-350	200-300	200-300	250	250	250	250	250	250

SCE PEAK PERIOD

SUNRISE CENTRAL PLANT WINTER SEASON OPERATION (October 1 - May 31)

	12:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00
250 Ton Chiller	Charge tank						Sat load		OFF/Run part load if needed													Sat load		
1,264 Ton-Hour TES Tank	Build thermal storage						OFF		Draw from Storage													OFF		
AVAILABLE CAPACITY FOR COOLING COMFORT																								
250 Ton Chiller	0	0	0	0	0	0	250	250	0-200	0-200	0-200	0-200	0-200	0-200	0-200	0-200	0-200	0-200	0-200	0-200	0-200	250	250	250
1,264 Ton-Hour TES Tank	0	0	0	0	0	0	0	0	50	50	50	50	100	150	150	150	150	150	100	50	50	0	0	0
Total Tons Available	0	0	0	0	0	0	250	250	0-250	0-250	0-250	0-250	0-250	0-350	0-350	0-350	0-350	0-350	0-300	0-250	0-250	0-250	0-250	0-250

Southern California Edison High $ Demand Charges
Summer: Noon to 6:00pm
Winter: 8:00am to 9:00pm

Automatic controls will be used to determine the full or partial storage based on the ambient conditions, load profile history and the most economical operation. There are few design days where the cooling load requirements have an instantaneous capacity of 350 tons. This is when the swimming pool is requiring cooling from the central plant. During these times the chiller will operate to provide supplemental cooling along with the TES under a partial storage operation.

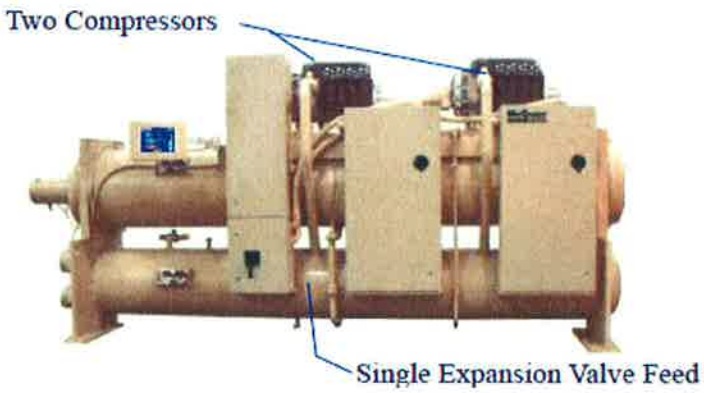
The plant described above offers a very good solution to satisfying up to a 350 ton instantaneous cooling load and a 3.4 million Btu heating load at minimum operating cost. The 250 ton chiller operates to maintain the existing thermal energy storage (TES) tank chilled water temperature at 38°F.

Equipment	Cooling Capacity (Tons)	Heating Capacity (MBtu)
High Efficiency Chiller	250	n/a
[(1)]Thermal Energy Storage (TES)	100	n/a
Central Plant Boilers	n/a	3,400
Swimming Pool Boilers	n/a	3,060

[(1)]100 ton TES capacity based upon design day loads

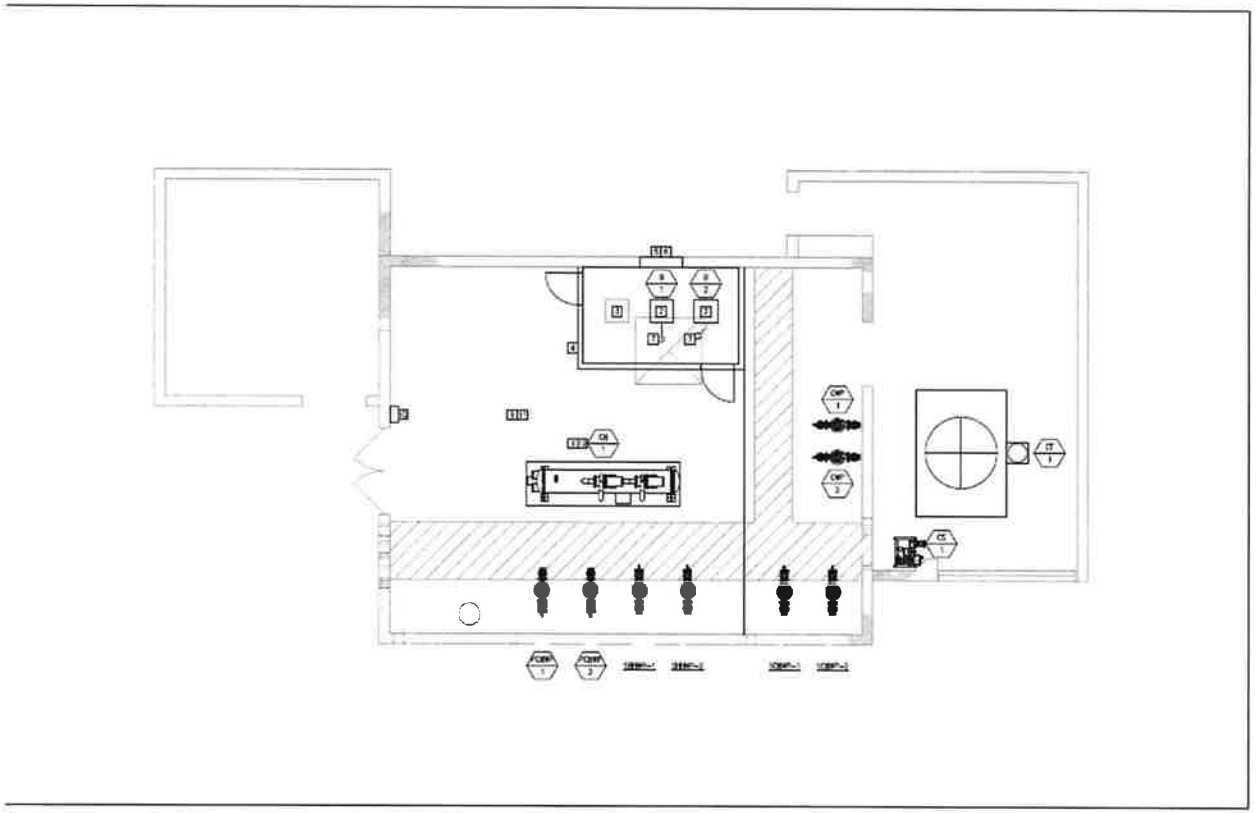
Some of the ancillary benefits of this central plant:

1. All power provided by SCE therefore no standby rates for cogeneration will be applied.
2. Increases the capacity of the chiller to 250 tons and takes advantage of the existing TES to offset the peak cooling load and low load requirements eliminating the need for additional mechanical cooling at the buildings.
3. New plant does not utilize steam concept and therefore can be easily shutdown and restarted.
4. New boilers located at the Sunrise plant are available when engines are down for maintenance. Therefore, many of the existing older building boilers can be abandoned.
5. Advanced chiller technology offers many great benefits:
    a. At part-load, where most of the operating hours occur, the chiller provides extremely efficient operation.
    b. Reduced maintenance costs with oil free compressor.
    c. Environmentally responsive using CFC-free R-134a refrigerant.
    d. Dual compressors provide system reliability.
6. No cogeneration significantly reduces maintenance costs.
7. No annual permitting.



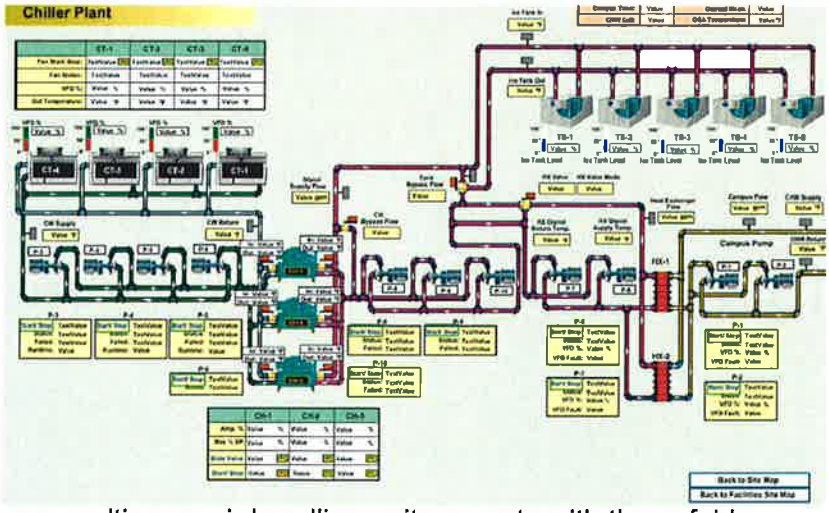
The following is a layout of the recommended Sunrise plant with high efficiency chillers and boilers:

Sunrise Electric Central Plant



1 FIRST FLOOR PLAN

ECM M2: Energy Management Controls System Upgrade

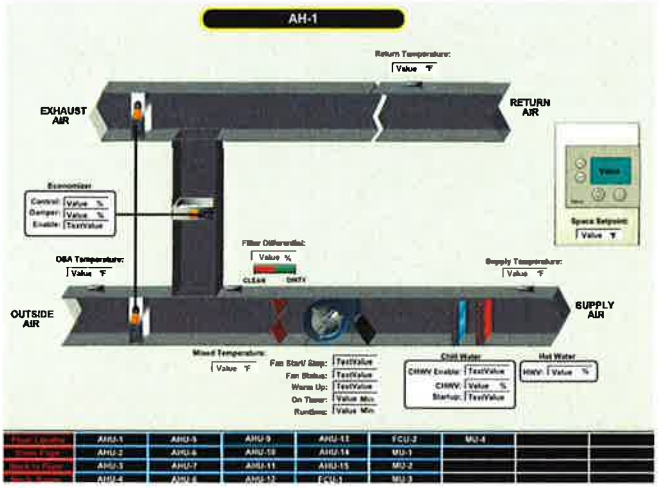


The City currently has no *comprehensive* Energy Management System (EMS) to integrate the buildings with the central plant systems. This is critical for enhanced efficiency at both the buildings and the central plant. Currently the City buildings have antiquated controls; no control, pneumatic control, electric direct digital control or time clocks, all local to the individual building. During our surveys it was noted that many of the existing constant volume multi-zone air handling units operate with these fairly antiquated controls described and in several cases were observed to be operating 24/7.

Installing a city wide EMS can make many features available that could be quite beneficial to the City facility maintenance staff and the end user. Most beneficial is a building automation system which has a program that can be easily modified based on each facility's unique environmental requirements. Installing an EMS will provide continuity in controlling comfort and costs in many of the City facilities.

A City-wide EMS with remote access can be a powerful tool for energy savings that will allow operating personnel to monitor current conditions, program alarm conditions and allow most controls' modifications such as scheduling, set-point modifications, calibration procedures and pro-active maintenance scheduling to be conducted from a central station or via remote access on the internet, significantly reducing operating costs.

With the use of Web Windows based software packages, the EMS will be capable of meter reading, energy reporting, schedule logging, billing, and several other features presently unavailable to the City. Savings for this measure are generated by scheduling HVAC equipment operation to match each building's normal occupied schedule. Each HVAC system will be scheduled to operate when the building or occupied spaces are in use. An optimal start routine will ensure that the space is at a comfortable temperature by the beginning of the occupied time. Proper scheduling will be verified during commissioning by Chevron ES and will be setup per the HVAC standards of controls as provided in Appendix C, which is the basis for the energy savings. The main purpose of this measure is to integrate the buildings with the central plant operation and to allow the City facility maintenance staff to more effectively operate the mechanical systems.



Chevron ES proposes providing a full retrofit to replace existing controls with electric DDC controls. All pneumatics, time clocks,

existing controls will be removed including the air compressor and all associated accessories will be disposed of, thus eliminating the need for current maintenance for the compressor, drier and filter elements as described in table 4.5:

- City Hall
- Police Department
- Police Department Training
- Airport Fire Station #2
- Leisure Center
- Pavilion Center
- Pool (for proper control of heating/cooling requirements from Sunrise Plant)

Table 4.5 Modifications to Building Controls

Buildings	Existing Controls System	Number of Zones on AHUs	Description of Modifications
Fire Station #2	Pneumatic	14	Convert zone and AHU controls from pneumatic to electric DDC on EMS.
City Hall	Pneumatic & Electric	34	Convert zone and AHU controls from pneumatic and upgrade VAV electric controls to new electric DDC on EMS.
Police Station	Pneumatic /Manual	52	Convert zone and AHU controls from pneumatic to electric DDC on EMS
Police Training	Pneumatic	6	Convert zone and AHU controls from pneumatic to electric DDC on EMS.
Leisure	Pneumatic & Electric	7	Convert zone and AHU controls from pneumatic to electric DDC on EMS.
Pavilion	Pneumatic & Electric	7	Convert zone and AHU controls from pneumatic to electric DDC on EMS.
Pool	N/A	N/A	For heating and cooling requirements from Sunrise plant only.

For proper operation of the EMS the City will need to provide a TCP/IP connection and a static IP address for each building or alternate means of communicating between buildings and back to central plants. For some of the buildings Chevron has included wireless communication (ie pool) however this solution may have its limitations due to distance and obstructions. If this solution is not feasible the City will need to provide alternate means for internet capabilities.

3-way control valve and pump and chiller bypass

All of the building air handlers served by the Municipal and Sunrise central plants utilize 3 way control valves to control the flow of chilled and hot water to the air handlers. This was standard practice when these building were built as 3-way valves are utilized in constant speed pumping systems to avoid dead-heading when the demand for HVAC is low. The result is that 100% of the chilled and hot water flow to these air handlers all of the time regardless of what the cooling or heating load is. The flow not required to offset loads is bypassed by the "3rd port" on the 3-

way control valve. The result is that only a fraction of the water actually passes through the air handling unit cooling coil and the rest through the bypass. This result in a very low water "delta T" (the change in temperature of the chilled/hot water) to around 4-6 degrees, when these systems are designed for around 10-12 deg F and sometimes upwards of 16-18 deg F. In addition, the pumping energy is always 100% when only a fraction is needed for effectiveness.

Chevron ES recommends installing variable frequency drives (VFDs) to convert a normally fixed 60 hertz frequency of supply power into infinitely variable frequency power to feed the pump motor. With this arrangement, the pump motor has a built in "soft-start" system that significantly reduces stress on the motor and bearings.

Example of a Variable Frequency Drive

In conjunction with installing VFDs on building pumps, existing 3-way valves should be replaced with 2-way control valves. These valves only allow the chilled water and hot water required to offset the load to reach the air handler coil. The pressure in the supply piping of system rises when flow is less than 100% which is sensed back at the central plant, via the EMS and allows the site chilled water and hot water supply pumps (secondary) to be reduced, thus saving on pumping energy. Additionally Chevron recommends a chilled water bypass which allows the central plants to control the site water distribution and enables the buildings pumps to be shut off further reducing pumping power from being consumed unecessarily. The buildings pumps will be turned on by the EMS automatically only in rare times when the building requires more pressure.

ECM U1: Utility Sub-Metering and Monitoring System

In 1984 when the Municipal and Sunrise cogeneration plants were built, meters were installed at the buildings connected to the plants to monitor the monthly amount of electricity, HHW, and CHW being delivered and consumed at each. All of the buildings have at least one meter per service:

- Electricity – kWh meter
- Chilled Water - Bty meter
- Heating hot water – Btu meter

Existing Electrical Meter

These meters are manually read by facility staff and the resulting values used for the City internal billing to each of the buildings.

As seen in the Utility Analysis – Section III of this report, the existing metering system has some flaws. It appears that Municipal plant is billing for energy use is inaccurate as the total billed out to each of the buildings is far less than the energy being generated and provided by SCE. At Sunrise plant it appears what is billed out is more energy then what is generated or provided by SCE. In addition to the electric energy billed out not matching what is utilized, another issue is the CHW and HHW Btu-meters. When surveyed it appeared that some of these meters were not on and not working properly.

Existing BTU-Meter not Working

Chevron ES recommends the installation of new revenue grade utility sub-meters for the individual building electric, CHW and HHW meters. Specific to the Airport only, it currently has three main electric feeds from Municipal plant, therefore all three feeds will have a new electric meter. Table 4.6 provides a list of the new meters that will be installed at both Municipal and Sunrise buildings to enhance the current manually billing process. The new meters will feed automatically into the UtilityVision® and or EMS programs so they can be viewed anytime online, eliminating this manual read process. The new meters will have near real-time energy information as well as 15-minute load profile data and graphs for each meter. With this information the City can accurately bill out the correct amount of electricity, HHW and CHW to its connected buildings. Along with accurate billing information UtilityVision® also provides the City and Chevron ES with information that will help in the measurement, verification, and the maintenance of the energy savings. More about UtilityVision® and the benefits it offers can be found in the Monitoring & Verification – Section VI of this report.

Table 4.6 – New Building Meters

Building	Electric	CHW	HW
Airport	3 (12 kV)	1 (4")	1 (2.5")
Fire Station	1 (480/277)	1 (2.5")	1 (2.5")
City Hall	1 (480/277)	1 (2")	1 (2")
City Yard	1 (480/277)	n/a	n/a
Police	1 (480/277)	1 (4")	1 (2.5")
Police Training	n/a	1 (2")	n/a
County Bldg	1 (480/277)	n/a	n/a
Leisure	1 (120/208)	1 (2")	1 (1.5")
Pavilion	1 (120/208)	1 (3")	1 (2")
Pool	1 (120/208)	1 (4")	1 (3")
Library	1 (120/208)	1 (3")	1 (2")
Stadium	1 (120/208)	n/a	n/a
Total	**13**	**9**	**8**

ECM W1: Irrigation / Water Management

Chevron ES, with direction from the City, has investigated and recommends a centralized irrigation control system inclusive of a centrally located weather station. The main benefits of this ECM are the reduction of landscape watering, maintaining or improving plant quality, the reduction of labor and the reduction of water damage to sidewalks.

This measure will require modifications to the system piping, pumping and wiring that will incorporate the use of evapotranspiration[6] and flow-management[7] methods to enable the City to more closely manage its irrigation water resources. Smart controllers will be installed that automatically update the watering schedule to allow for changes in water needs as dictated by the weather throughout the year. Controllers will be fine-tuned to the actual conditions of the City. In addition to controllers, Chevron will ensure existing heads are fitted with the proper nozzles, there is sufficient head-to-head coverage, inoperative heads will be replaced and water pooling reduced. This will provide uniformity of water distribution throughout the City, resulting in a reduction of water, energy and lower maintenance costs.

Specific to Highland Park, we will be replacing many traditional pop-up spray nozzles with low trajectory, water-saving rotating nozzles. Benefits include less wind-resistance, and reduced runoff, for water reduction.

The irrigation Central Control System we propose will consist of the following:

- *System Monitoring* – incorporates a weather station with a rain gauge, many different sensors including flow meters, and wind sensors. These sensors monitor site conditions and report to the central computer.
- *System Control* – Will allow all actions to be carried out easily and efficiently from a central location. Such as automatically adjusting watering or stopping irrigation in the event of rain without requiring a technician to visit individual field controllers.
- *System Communications* – Wireless communication via a 450 MHZ radio/ transmitter system with each controller reporting back to a centralized computer.

The benefits include:

- Regulating the frequency of landscape watering by automatically turning the valves/ sprinklers on and off and eliminating over-watering.
- Helps ensure your landscape receives the right amount of water based on best practices and weather conditions.
- Reduced labor cost by regulating irrigation schedules from a single centralized location, the user no longer needs to make schedule adjustments at each controller.
- Reduce Parts / Equipment Replacement Cost – Accountability of what parts are being replaced, their warranties and by whom during the manufacturer's warranty period upon City staff request
- Monitors flow rates at eight locations and automatically takes action to prevent washout in the event of pipeline breaks.

In addition to the above, Chevron will utilize the irrigation controls system to incorporate the added benefit of monitoring and controlling the lights at Demuth and Sunrise Parks and the

[6] Evapotransportation - using your soil type, plant type, plant or turf stage, and sun exposure to regulate irrigation.
[7] Flow-management – managing the total flow demand placed on the water source(s) by optimizing both, the available water, and the watering window

water feature at Francis Stevens Park allowing City personnel the unique benefit of turning on or off each of these systems remotely. In addition Chevron ES will tie in some lighting control back to the irrigation controllers for Demuth, Sunrise, Ruth Hardy, Wellness, Baristo, Victoria, Cerritos and Francis Stevens parks.

There are several hundred City water meters serving both building potable water and irrigation for parks, golf courses, medians, etc. With input from the City we learned there are four main areas that make up the irrigation system. These areas are the regional airport, all city parks, the larger parkways and medians, and City Hall. In doing the analysis we studied all the City meters however focused on the 75-main meters, with significant usage, to consider for new controllers. These account for over 500 million gallons or 89% of the consumed water per year, excluding the golf courses. Chevron ES performed a detailed review of all the City's controllers, and water meters and have included a summary of the results in Table 4.7.

There are two City owned golf courses that were not included due to the fact that they already have computerized controllers and are operated by a professional agronomist superintendant with Arnold Palmer Management.

In the future, landscaping as much as possible with drought tolerant or "xeriscape"™ landscaping will minimize irrigation requirements, and further increase water savings. This is being considered for Tahquitz Canyon Drive in a separate study by the City.

Table 4.7 Irrigation Controllers and Replacement Schedule

LOCATION	# OF CONTROLLERS	TYPE	STATION IN USE	STATUS
PARKS				
Desert Highland Park	4	ESP-12MC	10	Replace with (1) 48-station
		ESP-12MC	11	
		ESP-12MC	12	
		ESP-12MC	10	
Ruth Hardy Park	4	ESP 16-LX Plus	14	Replace with (1) 30-station and (1) 42-station
		ESP-12MC	15	
		ESP-16MC	17	
		ESP-24MC	24	
Desert Wellness Park	2	AQUA Conserve 16	25	Replace with (1) 48-station
		AQUA Conserve 16	23	
Demuth Park	6 (inside storage)	ESP-12MC	10	Replace with (1) 48-station and (1) 24-station
		ESP-12MC	10	
		ESP-12MC	8	
		ESP-12MC	12	
		ESP-12MC	11	
		ESP-12MC	7	
	1 (outside storage)	ESP 8-LX Plus	8	Replace with new
	1 (baseball fields 7&8)	ESP-16MC	16	Replace with new
	2 (Soccer field)	Hunter Pro-C	8	Replace with (1) 18-station
		ESP 12-LX Plus	10	
	1 (baseball fields 5&6)	ESP-16MC	11	Replace with new
	3 (Pic-nic area)	ESP 24-LX Plus	24	Replace with new
		ESP-16MC	14	Replace with (1) 30-station
		ESP-16MC	12	
Sunrise Park	3 (By the Library)	ESP 16-LX Plus	13	Replace with (1) 24-station
		ESP 16-LX Modular	12	
		ESP 16-LX Plus	10	Replace with new 12-station
	4 (Loading by pavillion)	ESP-12MC	10	Replace with (1) 24-station
		ESP-12MC	12	
		ESP-12MC	12	Replace with (1) 18-station
		ESP-8MC	6	
	1 (Mizell Senior Center)	ESP 12-LX Plus	11	Replace with new 12-station
	1 (Stadium)	ESP 12-LX Plus	12	Replace with new 12-station
	1 (Cerritos)	ESP-12MC	12	Replace with new 12-station
	3 (Boys & Boys Club)	ESP 12-LX Plus	12	Replace with new 12-station
		ESP-12MC	12	Replace with (1) 30-station
		ESP-12MC	14	
Baristo Park	1	ESP 12-LX Plus	15	Replace with new 18-station
Victoria Park	1	ESP-24MC	24	Replace with new 24-station
Francis Stevens Park	3	ESP-12MC	12	Replace with (1) 24-station
		ESP-12MC	12	
		ESP-12MC	12	Replace with new 12-station

Table 4.7 Irrigation Controllers and Replacement Schedule (Cont)

LOCATION	# OF CONTROLLERS	TYPE	STATION IN USE	STATUS
ADDITIONAL MISC. OTHER AREAS				
City Hall	2	Rainbird Home Model	2	Replace with new 6-station
		ESP-16MC	16	Replace with new 16-station
City Hall on Co-gen Bldg.	1	ESP-16MC	19	Replace with new 16-station
Riverside Dr. N.	1	ESP-16MC	14	Replace with new 16-station
Mid. Valley Pky - Mesquite	3	ESP-24MC	22	Replace with new 24-station
		ESP-24MC	15	Replace with new 24-station
		ESP-12MC	10	Replace with new 12-station
Gene Autry St. Median	1	LEIT 4000 (Solar)	6	Battery Operated To repair
Palm Canyon & Baristo	1	ESP-24MC	24	Replace with new 24-station
Palm Canyon Dr. East	1	ESP-12MC	12	Replace with new 12-station
E. Palm Canyon & Farrell	1	ESP-12MC	12	Replace with new 12-station
Tristar, Grass, San Rafael	1	ESP-16MC	16	Replace with new 16-station
AIRPORT				
A	1	ESP-32MC	22	Replace with new
B	1	ESP-24MC	18	Replace with new
C	1	ESP-40MC	38	Replace with new
D	1	ESP-24MC	19	Replace with new
E	1	ESP-24MC	17	Replace with new
F	1	ESP-24MC	24	Replace with new
G	1	ESP-40MC	35	Replace with new
H	1	ESP-40MC	40	Replace with new
I	1	ESP-40MC	35	Replace with new
J	1	ESP-24MC	18	Replace with new
K	1	ESP-16MC	9	Replace with new
L	1	ESP-12MC	14 (2 Doubles)	Replace with new
M	1	ESP-40MC	34	Replace with new
N	1	ESP-40MC	38	Replace with new
Vista Chino & Farrell	1	LEIT 8000 (Solar)	12 (Not Operating)	Battery Operated To repair
Vista Chino & Parkview	1	LEIT 8000 (Solar)	4 (Not Operating)	Battery Operated To repair
Near Gate 39	1	ESP-4	2	Replace with new
Tahquitz & El Cielo	1	ESP-8	8	Replace with new
AP Terminal	3	ESP-40MC	8	Replace with new
		ESP-24MC	19	Replace with new
		ESP-32MC	25	Replace with new
Total	**75**		**1152**	

ECM PV: Solar Photovoltaics – Carport Shade Structure and Roof-Mounted

In addition to implementing energy efficiency measures at each of the facilities, the City is also interested in installing renewable energy as part of their sustainability goals. A solar photovoltaic (PV) system is the preferred solution because it is a renewable source of energy that is clean, quiet, reliable, safe and requires little maintenance.

It is exciting that the City's sustainability initiative pushes for the installation of photovoltaic systems throughout the City. Chevron ES looked at the possibility of solar energy at several facilities and determined the City definitely had the space to accommodate solar. A few locations that would normally be candidates for solar installations were removed from scope subsequent to meetings with City staff where it was determined that these locations should not be considered. (For example, the main parking lots of City Hall.)

The following will describe the potential capacity of solar throughout the City:

Table 4.6 Potential Solar Production

Facility	Location	Max Possible System Size kW_{dc}	Total kWh/yr Generated by Max (PV Syst)
City Hall	Parking Lot	237	358,143
City Hall	Roof	96	145,338
Administration	Parking Lots	319	482,662
Airport	Parking Lots	268/484/494/466	2,480,050
Convention Center	Roof	847	1,277,133
Sunrise Park / Pavilion	Parking Lot	439	661,814
Library	Parking Lot	230	335,297
Library	Roof	123	186,161

* The power production potential for these selected areas is dependent on the manufacture of the PV modules and direction o f the installation.

The solar systems have the following major components:

- Rugged and weather resistant photovoltaic modules
- Support structure to stabilize the modules and/or secure to the roof
- High-efficiency, utility interactive, three-phase DC to AC inverters
- Balance of System; combiner boxes, switchgear, transformers, lighting
- Performance monitoring and display kiosk

Note: In reviewing the City's energy profile, consumption, and the existing Municipal and Sunrise cogeneration plant operations, Chevron ES did not recommend installing all of the solar listed above. The Sustainability Committee selected a minimum level of solar to enhance the City's sustainability goals which is the basis for the proposed installations in this report.

Technical Considerations

In considering the installation of solar within the City it is important to remember that all of the buildings listed above are connected electrically to either Sunrise or Municipal cogeneration plants (more detailed is provided in previous sections of this report). There are inherent technical complications that need to be evaluated when considering the installation of a solar generating plant connected to the same power distribution loop where an engine-generator is also interconnected. It can be done however, if pursued there are technical and cost implications to be considered. Specifically there needs to be a protection plan in place to prevent the solar generation system from back feeding the cogeneration system. Failure to do so could cause damage to the engine generators. A couple of options on how this can be accomplished are described by the following protection schemes:

Option 1

Solar PV system can supply power to the local loads on the distribution loop downstream of the cogeneration interconnection point by using a reverse power protection relay. As long as the PV power is not back fed into the utility grid, it can stay online. If the local load drops on the distribution loop and the solar power starts back feeding into the utility grid where cogeneration plant is also supplying power, the reverse power relay will detect this power flow and sends a trip signal to trip the PV system off the grid. This will prevent mixing of power produced by two different generation systems which are synchronized on to the same electric loop.

Disadvantages

- The solar system does not qualify for incentive under the CSI program.
- Should the reverse power protection trip, this will temporarily shutdown power to the system it is connected to until resolved.

Option 2

Another scheme is to provide an interlock between the PV inverter and the engine-generator. When the PV system starts producing power and the inverter output contactor is closed, it sends a stop signal to the engine-generator control panel to shutdown the engine generator. When the solar is not producing power and inverter output contactor is open, it will reset the stop signal and enable the generator to come on line, if required.

Disadvantages

- The solar and the engine generators cannot operate at the same time.

When considering solar power as the main generating source ***in lieu of*** cogenerating there are additional items to bear in mind:

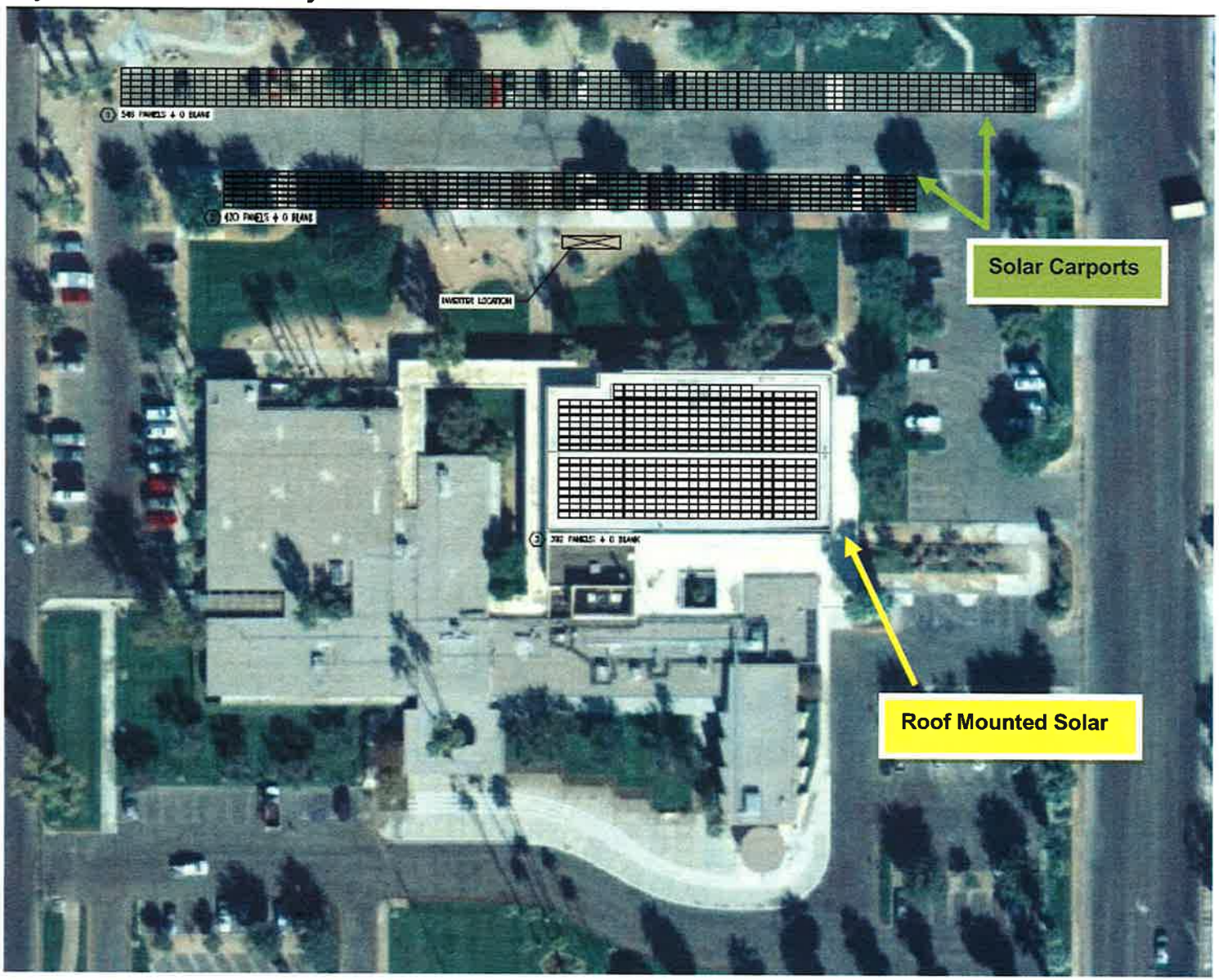
Pros/Cons of Solar vs. Cogeneration

PROS	CONS
Renewable power generated from the sun	Only generates when sun is shining, not 24/7
Reduced maintenance cost for solar as compared to a cogeneration plant	Does not offer the heating and cooling benefit like a cogeneration plant. Therefore the capital cost for new heating and cooling equipment need to be considered
Provides shade (carports)	At Municipal plant; need to install more than 1MW before realizing significant savings. 1MW of solar does not produce the same amount of power as 1MW of cogeneration.
Addresses sustainability goals	Over 1MW on one meter has additional SCE requirements, adding to system cost
Reduction in carbon footprint	Cannot be shaded (requires removal of trees)
No SCAQMD reporting, no annual permitting	Does not operate as backup power
Offers Renewable Energy Credits (RECs) = "Go Green"	Available incentives only applicable up to 1MW

Based on the Sustainability Committee recommendation we have included a small 103kW system at the Convention Center which is sized to take advantage of the renewable R-Rate as described at the end of this section. The R-Rate provides additional dollar savings in addition to the benefit of the solar generation. Another installation included in the proposal is a 439kW installation at Sunrise Park in the Pavilion parking lot. Both of these locations allow the City to hedge against electrical price increases and to showcase the City's commitment to sustainability and renewable power.

Preliminary layouts of all the locations are provided on the following page:

City Hall Potential Solar Layout



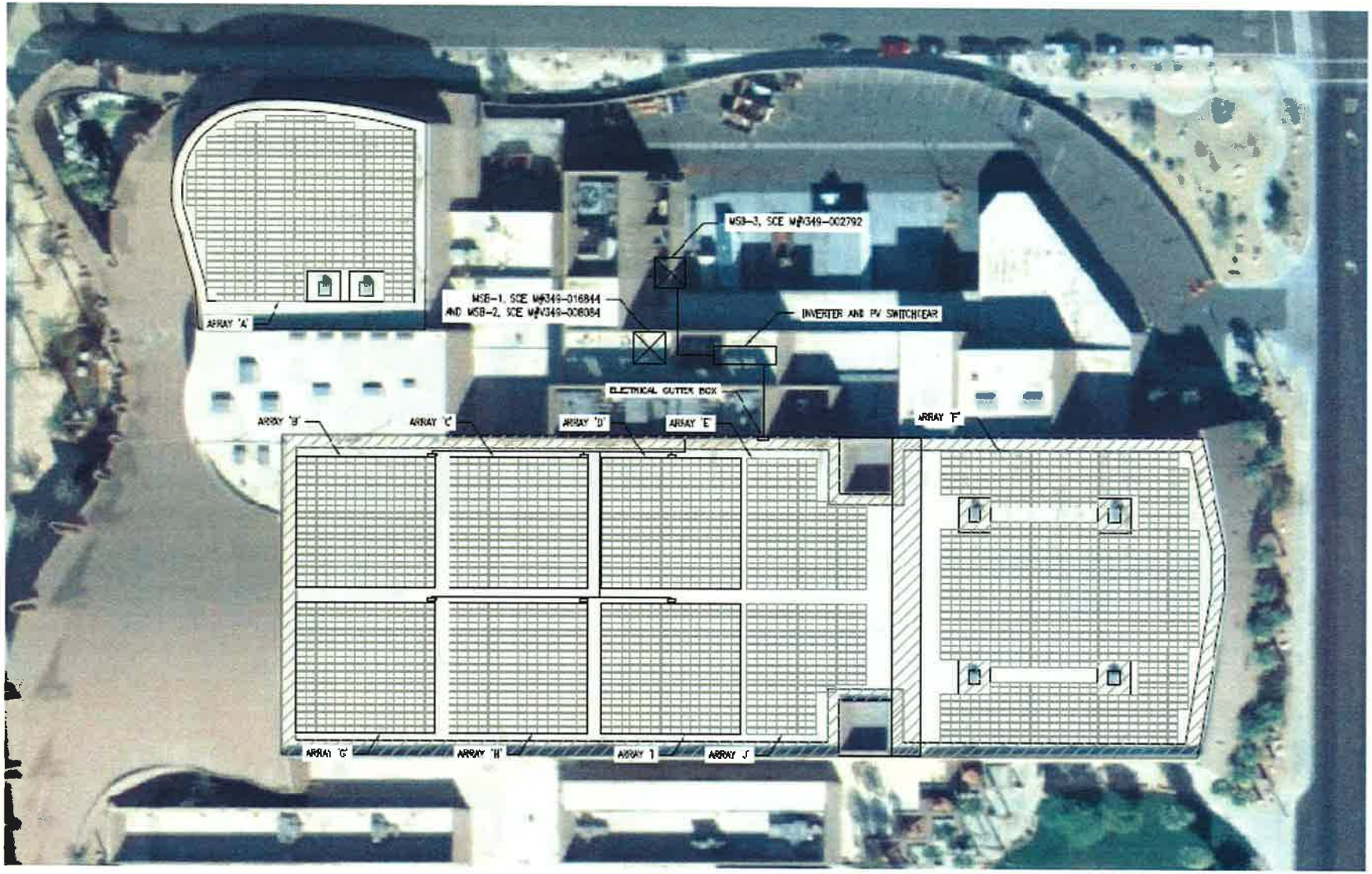
County Administration Potential Solar Layout

North Lot Carports

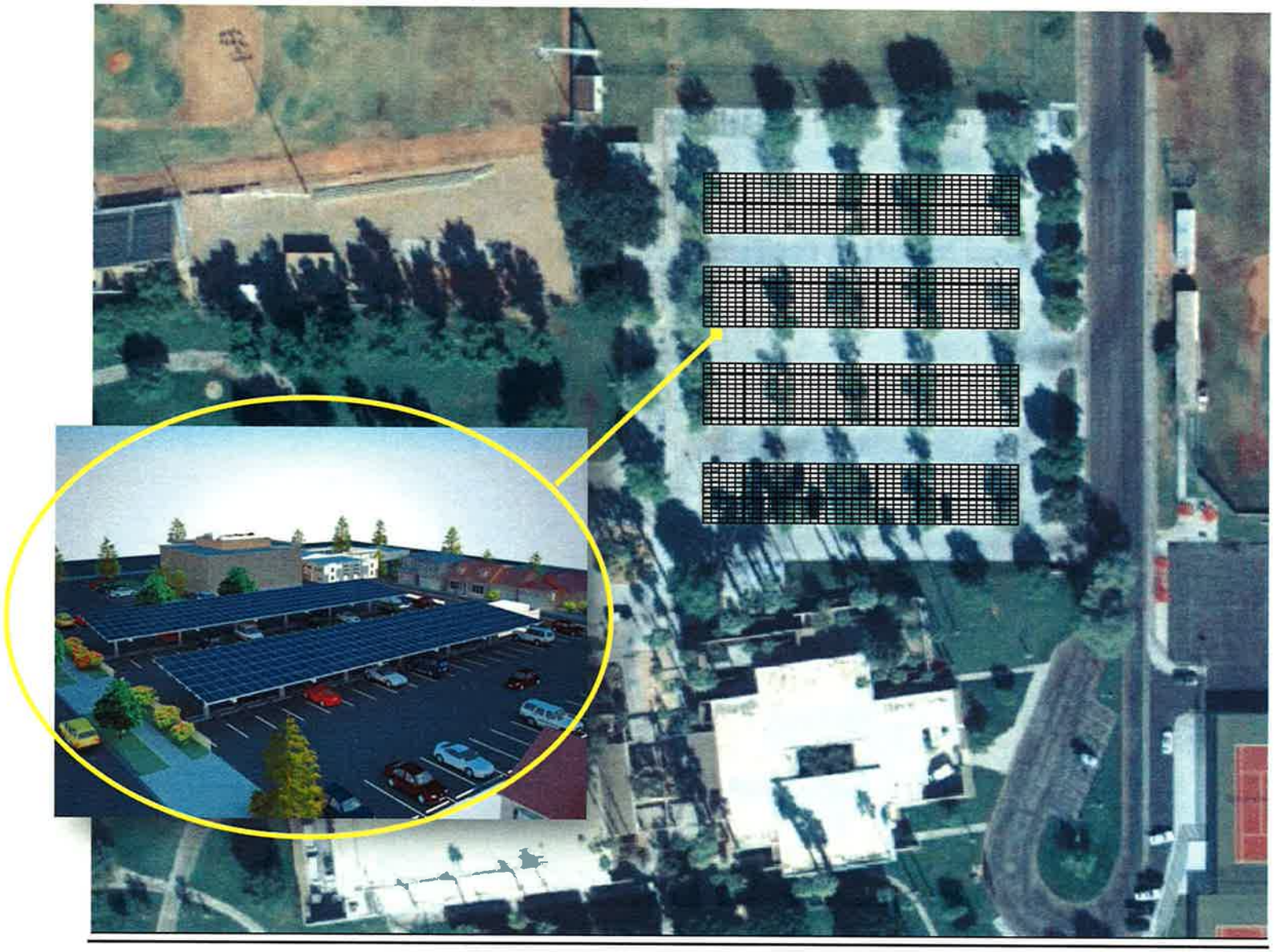
South Lot Carports

Airport Potential Solar Layout

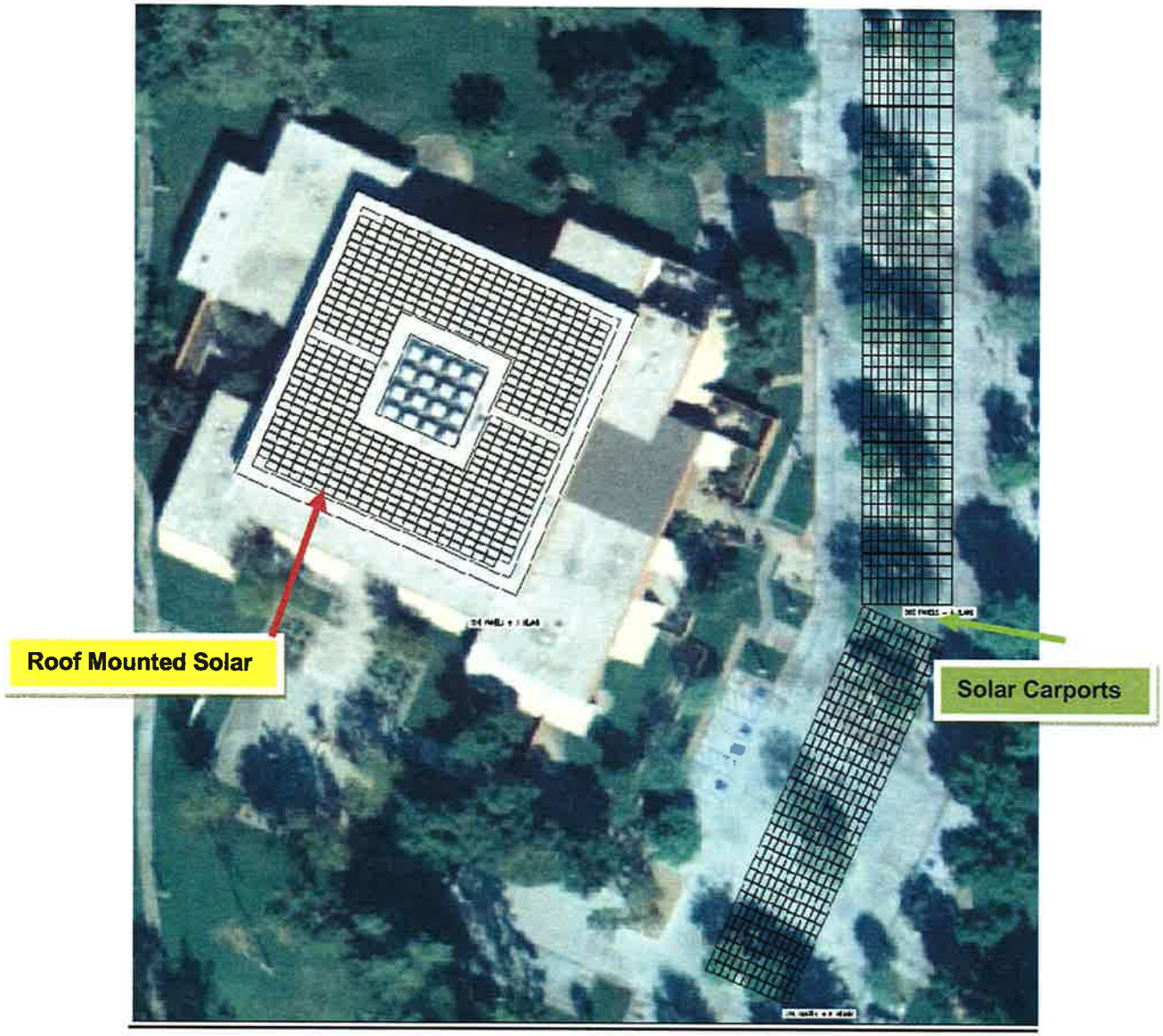
Convention Center Potential Solar Layout



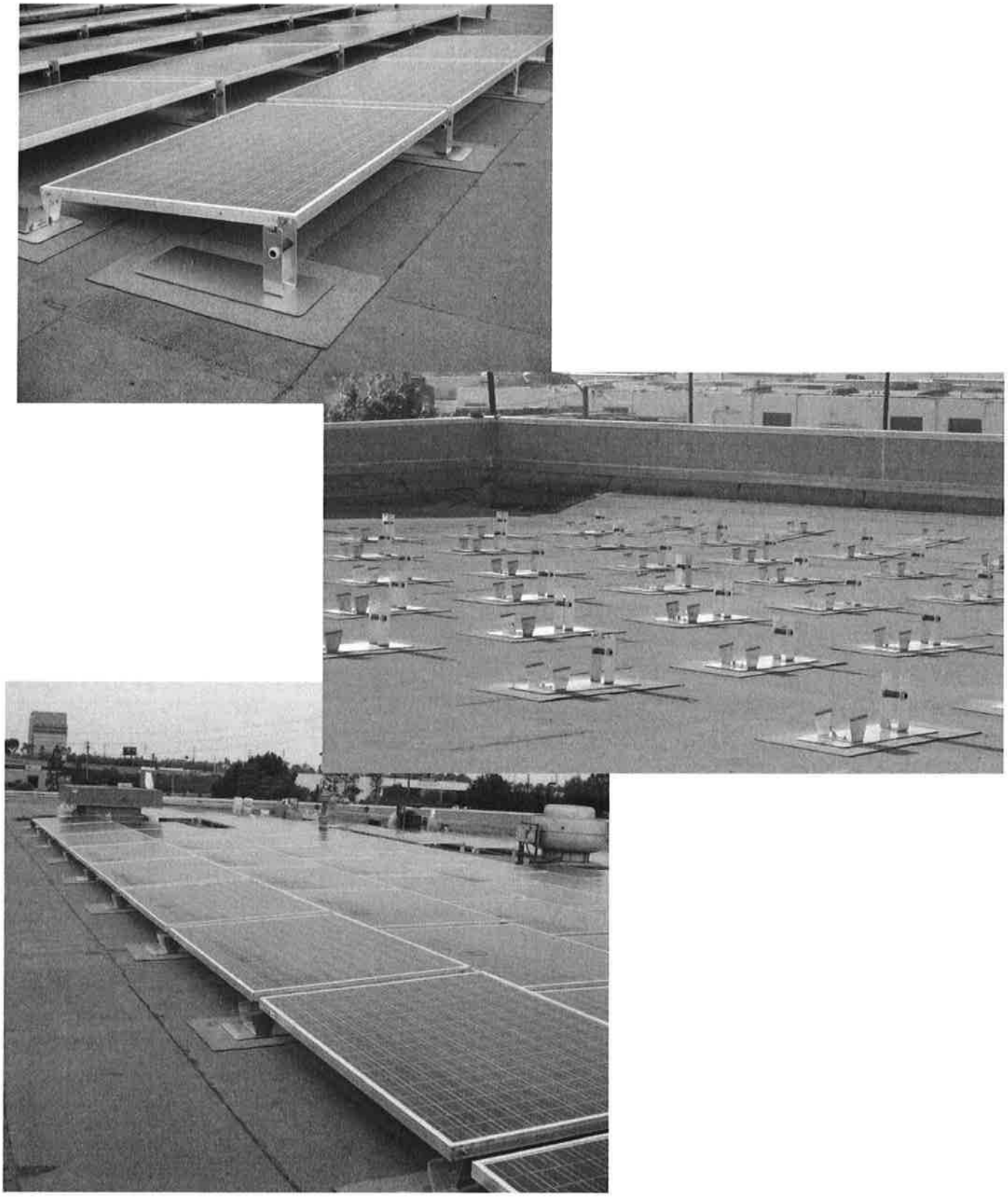
Pavilion Parking (Sunrise Parke) Lot Potential Solar Layout



Library Potential Solar Layout



Rooftop Mounting Systems (Similar in Type)



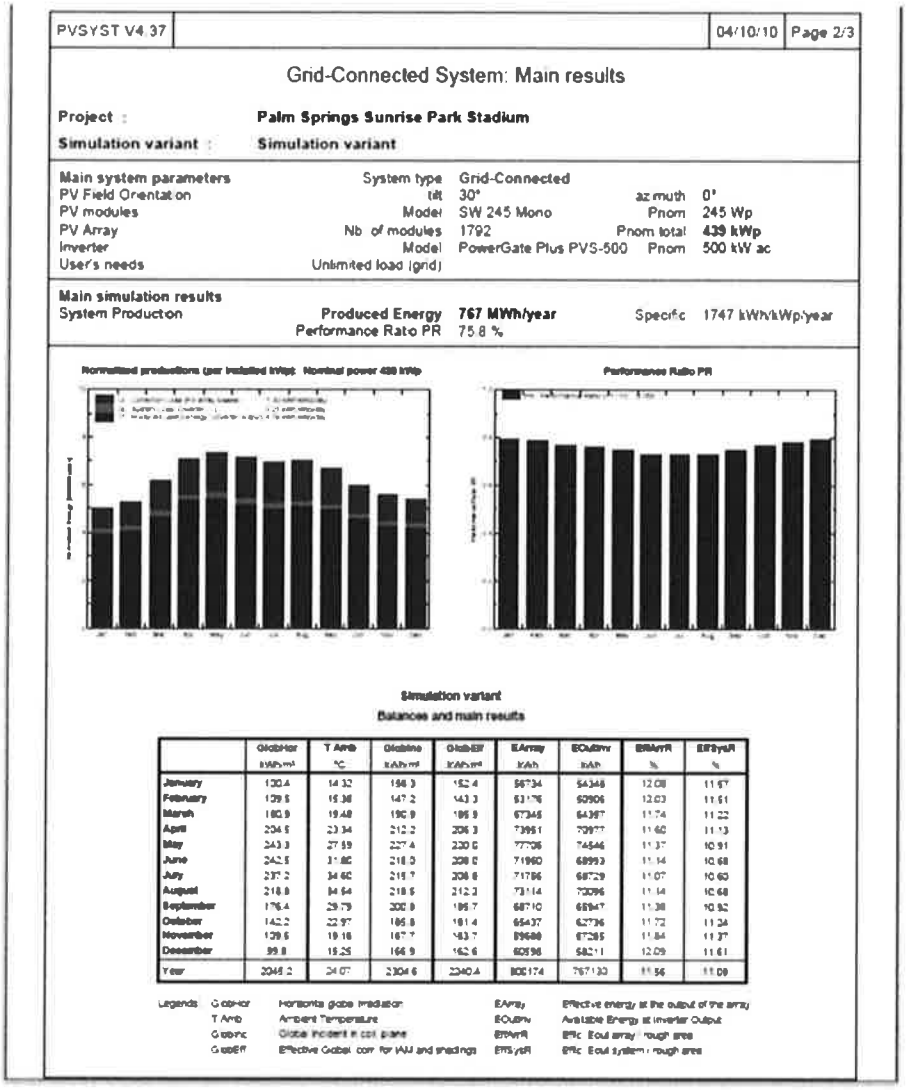
Carport Structures (Similar in Type)

Performance Modeling and Annual Production Analysis

Chevron ES uses a recognized software program called PVSYST to assist in estimating the power production output of the proposed solar PV systems. This software was developed *by the Institute of Environmental Sciences' (ISE) Energy Group/FOREL, part of the University of Geneva, Switzerland.*

PVSYST allows the user to upload site specific weather conditions and data to more accurately estimate the output of the proposed solar PV systems. Information about the location of the system, the size of the system, the type of system components, and other factors are all inputted into the program in order to calculate the approximate energy production data. A PVSYST model was generated for all options presented in this proposal to determine the annual electricity generated by the PV systems and presented in the table at the top of this section. The following is an example of the PVSYST output generated for Sunrise park / Pavilion parking lot.

PVSYST Output for 439kW Solar at Sunrise Park / Pavilion Parking Lot



PVSYST V4.37 | 04/10/10 | Page 2/3

Grid-Connected System: Main results

Project : **Palm Springs Sunrise Park Stadium**

Simulation variant : **Simulation variant**

Main system parameters	System type	Grid-Connected			
PV Field Orientation	tilt	30°	azimuth	0°	
PV modules	Model	SW 245 Mono	Pnom	245 Wp	
PV Array	Nb. of modules	1792	Pnom total	**439 kWp**	
Inverter	Model	PowerGate Plus PVS-500	Pnom	500 kW ac	
User's needs	Unlimited load (grid)				

Main simulation results

System Production — **Produced Energy** **767 MWh/year** — Specific 1747 kWh/kWp/year

Performance Ratio PR 75.8 %

Simulation variant

Balances and main results

	GlobHor kWh/m²	T Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray kWh	EOutInv kWh	EffArrR %	EffSysR %
January	120.4	14.32	156.3	152.4	56734	54348	12.08	11.57
February	139.5	15.38	147.2	143.3	53176	50906	12.03	11.51
March	180.9	19.48	190.9	186.9	67345	64367	11.74	11.22
April	204.5	23.34	212.2	206.3	73951	70977	11.60	11.13
May	243.3	27.59	227.4	220.6	77706	74546	11.37	10.91
June	242.5	31.80	218.0	208.6	71960	68993	11.14	10.68
July	237.2	34.60	215.7	208.6	71786	68729	11.07	10.60
August	218.8	34.64	218.5	212.3	73114	70096	11.14	10.68
September	176.4	29.79	200.9	196.7	68710	65947	11.38	10.92
October	142.2	22.97	186.8	181.4	65437	62736	11.72	11.24
November	139.6	19.16	167.7	163.7	59688	57285	11.84	11.37
December	99.8	15.25	166.9	162.6	60596	58211	12.09	11.61
Year	2048.2	24.07	2304.6	2240.4	805174	767193	11.56	11.09

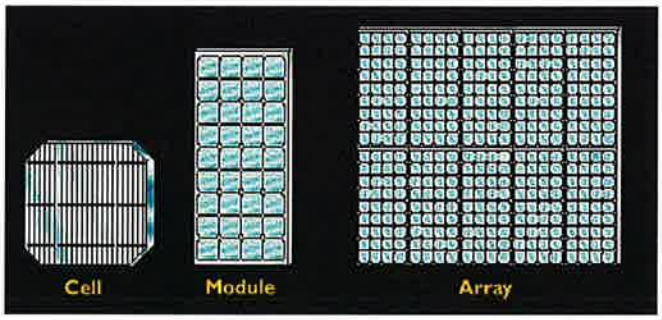
Legends: GlobHor Horizontal global irradiation; T Amb Ambient Temperature; GlobInc Global incident in coll. plane; GlobEff Effective Global, corr. for IAM and shadings; EArray Effective energy at the output of the array; EOutInv Available Energy at Inverter Output; EffArrR Effic. Eout array / rough area; EffSysR Effic. Eout system / rough area

Operation and Maintenance
All solar systems require routine maintenance to keep the system operating as effectively as possible. The project financials include the ongoing annual maintenance which are described in Monitoring & Verification - Section VI of this report.

The California Solar Initiative
There are still incentives available for solar within the SCE territory although the reserves are limited. The project financials include the estimated solar incentives which are described in Incentives - Section V of this report.

Turning Sunlight into Electricity
The "photovoltaic effect" is the basic physical process through which a PV cell converts sunlight into electricity. Sunlight is composed of photons, or particles of solar energy. These photons contain various amounts of energy corresponding to the different wavelengths of the solar spectrum. When photons strike a PV cell, they may be reflected, absorbed, or they may pass right through. Only the absorbed photons generate electricity. When this happens, the energy of the photon is transferred to an electron in an atom of the cell (which is actually a semiconductor). With its newfound energy, the electron is able to escape from its normal position associated with that atom to become part of the current in an electrical circuit.

From Cells to Arrays
The PV cell is the basic unit in a PV system. An individual PV cell typically produces between 1 and 2 watts, hardly enough power for the great majority of applications. But we can increase the power by connecting cells together to form larger units called modules. Modules, in turn, can be connected to form even larger units known as arrays, which can be interconnected for more power, and so on. Because of this modularity, PV systems may be designed to meet any electrical requirement, no matter how large or how small.



Balance of System
Modules or arrays, by themselves, do not constitute a PV system. We must also have structures on which to put them and point them toward the sun, and components that take the direct-current (dc) electricity produced by the modules or arrays and condition the electricity so it can be used in the specific application.
We may think of a complete PV system as comprising of three subsystems. On one side, we have the PV devices (cells, modules, arrays, etc.) that convert sunlight into direct-current (dc) electricity. On the other side, we have the load, or the application for which the PV electricity is intended. Between these, we need a third subsystem to enable the PV electricity to be properly applied to the load. This third subsystem is generally referred to as the "balance of system" (BOS).

The BOS typically consists of structures for mounting the PV arrays or modules, combiners and switchgear that combine the power from the array, and the power-conditioning (inverters and transformers) equipment that adjusts and converts the dc electricity to the proper form and magnitude required by an alternating-current (ac) load. If required, the BOS also includes storage devices, such as batteries, for storing PV-generated electricity to be used during cloudy days or at night.

Utility Connection
On-grid the PV is connected to the local utility grid; excess solar power generated and not consumed by the facility is "exported" to the utility grid. The facility gets a credit from the local utility company for the power fed into the utility grid. Off-grid the PV system is not interconnected with the local utility agency's power grid. The solar power generated is sized so that it supplies to the site facility only. To enhance system reliability and economics, Chevron ES recommends a grid-interconnected (on-grid) PV system when possible.

Solar Benefits
Installation of customer-sited renewable energy systems continues to increase on both a small and large scale across the country. These technologies reduce dependence on existing conventional electric generation sources that often create greenhouse gas emissions. Implementation of photovoltaic systems for on-site energy generation reduce the reliance on the utility companies and offer the City a hedge against fluctuating energy prices.

There are many benefits associated with the implementation of a solar PV program with Chevron ES as a partner:

- Economic leadership – reduces energy costs, promotes financial stability and budget predictability by eliminating uncertainty related to future electricity costs.
- Environmental stewardship – provides clean energy resulting in reduced greenhouse gases. They burn no fuel and have no moving parts, they are clean and silent.
- Positive public recognition and community outreach – communicating the City's leadership to the community.
- Low operating costs - PV arrays use the energy from sunlight to produce electricity—the fuel is free. There are no moving parts and the arrays require little upkeep.
- Press releases, award applications, jointly coordinated media coverage and ribbon cutting ceremony.
- Provides a cushion against future price increases in traditional energy sources, offering a hedge against future price volatility.
- PV systems operate reliably over their expected lifetime of 20 to 25 years (PV cells were originally developed for use in space, where repair is extremely expensive, if not impossible. PV still powers nearly every satellite circling the earth because it operates reliably for long periods of time with virtually no maintenance.)

Renewable Rate "Option R" Utility Tariff Schedule

As a result of SCE filing a new rate settlement with the California Public Utilities Commission (CPUC), electricity rates for SCE's medium and large sized customers increased as of October 1, 2009. However, the new rate settlement filing also included special rate schedules, known as Option R, for customers who install renewable distributed generation technologies, including solar PV systems.

These renewable rate schedules are advantageous for customers that are planning self generation with PV because Option R has no demand charge associated with the tariff rate structure.

Of the three components of a SCE electric bill, including the demand charge, the energy charge, and the customer charge, the demand charge is typically the largest percentage of the bill. Another feature of the Option R tariff rate structure is that it has high on-peak energy charges. However, since most of the electricity generated by the solar PV system occurs during on-peak hours, very little of that high cost electricity will have to be purchased from SCE.

Option R rates will only be available for the first 150 MW of renewable distributed generation technologies installed. After the 150 MW limit has been reached, the remaining customers will be charged using the standard rate schedule, even if a renewable distributed generation technology is installed onsite. Thus, it would be in the customer's best interest to commit and install a solar PV system as soon as possible.

Customers in the current tariffs TOU-GS2, TOU-GS3, and TOU-8 schedules are eligible to switch to the corresponding Option R rate schedules. Many of the City facilities including the Convention Center and the Sunrise park are currently on a "TOU" tariff schedule and can be switched to the Option R rate schedule following the installation of the solar PV system.

See attached Option R rate schedule.

EDISON

Southern California Edison
Rosemead, California (U 338-E)

Revised Cal. PUC Sheet No. 46881-E
Cancelling Revised Cal. PUC Sheet No. 46647-E

Schedule TOU-8 Sheet 13
TIME-OF-USE - GENERAL SERVICE - LARGE

(Continued)

RATES (Continued)

SERVICE METERED AND DELIVERED AT VOLTAGES FROM 2 KV TO 50 KV

Option R	Delivery Service								Generation[8]	
	Trans[1]	Distrbtn[2]	NSGC[3]	NDC[4]	PPPC[5]	DWRBC[6]	PUCRF[7]	Total[8]	URG[9]	DWR
Energy Charge - $/kWh/Meter/Month										
Summer Season - On-Peak	(0.00023) (R)	0.01565 (I)	0.00107	0.00064	0.00908 (R)	0.00615	0.00034	0.03160 (R)	0.39077	0.03763
Mid-Peak	(0.00023) (R)	0.01565 (I)	0.00107	0.00064	0.00908 (R)	0.00615	0.00034	0.03160 (R)	0.12820	0.03763
Off-Peak	(0.00023) (R)	0.01565 (I)	0.00107	0.00064	0.00908 (R)	0.00615	0.00034	0.03160 (R)	0.04798	0.03763
Winter Season - Mid-Peak	(0.00023) (R)	0.01565 (I)	0.00107	0.00064	0.00908 (R)	0.00615	0.00034	0.03160 (R)	0.07175	0.03763
Off-Peak	(0.00023) (R)	0.01565 (I)	0.00107	0.00064	0.00908 (R)	0.00615	0.00034	0.03160 (R)	0.04314	0.03763
Customer Charge - $/Meter/Month		307.72						307.72		
Demand Charge - $/kW of Billing Demand/Meter/Month										
Facilities Related	2.64 (I)	3.05 (R)						5.69 (I)		
Power Factor Adjustment - $/kVAR		0.27						0.27		

* The ongoing Competition Transition Charge (CTC) of $0.00377 per kWh is recovered in the URG component of Generation.

1 Trans = Transmission and the Transmission Owners Tariff Charge Adjustments (TOTCA) which are FERC approved. The TOTCA represents the Transmission Revenue Balancing Account Adjustment (TRBAA) of $0.00056 per kWh, Reliability Services Balancing Account Adjustment (RSBAA) of $0.00004 per kWh, and Transmission Access Charge Balancing Account Adjustment (TACBAA) of $0.00036 per kWh. (R)

2 Distrbtn = Distribution

3 NSGC = New System Generation Charge

4 NDC = Nuclear Decommissioning Charge

5 PPPC = Public Purpose Programs Charge (Includes California Alternate Rates for Energy Surcharge where applicable.)

6 DWRBC = Department of Water Resources (DWR) Bond Charge. The DWR Bond Charge is not applicable to exempt Bundled Service and Direct Access Customers, as defined in and pursuant to D.02-10-063, D.02-02-051, and D.02-12-082.

7 PUCRF = The PUC Reimbursement Fee is described in Schedule RF-E.

8 Total = Total Delivery Service rates that are applicable to both Bundled Service, Direct Access (DA) and Community Choice Aggregation Service (CCA Service) Customers, except DA and CCA Service Customers are not subject to the DWRBC rate component of this Schedule but instead pay the DWRBC as provided by Schedule DA-CRS or Schedule CCA-CRS.

9 Gen = Generation – The Gen rates are applicable only to Bundled Service Customers. When calculating the Energy Charge, the Gen portion is calculated as described in the Billing Calculation Special Condition of this Schedule.

(Continued)

(To be inserted by utility)
Advice 2435-E-A
Decision

Issued by
Akbar Jazayeri
Vice President

(To be inserted by Cal. PUC)
Date Filed Mar 30, 2010
Effective Jun 1, 2010
Resolution E-3930

13C9

EDISON

Southern California Edison
Rosemead, California (U 338-E)

Original Cal. PUC Sheet No. 45718-E
Cancelling Cal. PUC Sheet No.

Schedule TOU-8 Sheet 2
TIME-OF-USE - GENERAL SERVICE - LARGE

(Continued)

APPLICABILITY (Continued)

Option A

Option A of this Schedule is available to customers who participate in Permanent Load Shifting (PLS) or Cold Ironing pollution mitigation programs. PLS is defined as moving electrical energy usage from SCE's on-peak period to another time period on an ongoing (permanent) basis. Examples of PLS technologies include thermal energy storage, solar batteries, the pumping and storage of water, or any other technology as determined by SCE. The application of PLS involves the installation of load shifting equipment to permanently shift a prescribed amount of electrical demand away from the on-peak period. Eligible systems must account for at least 15 percent of the customer's annual peak demand, as recorded over the previous 12 months. Cold-Ironing refers to pollution mitigation programs that reduce emissions of nitrogen oxides (NO_x), sulfur oxides (SO_x), particulate matter (PM), carbon monoxide, or hydrocarbons by replacing electricity generated on-board mobile sources with electricity supplied through SCE's distribution grid, where the on-board electricity generation is produced by fossil fueled internal combustion engines that supply power for general use such as lighting, cooling, and machinery. Eligible Cold-Ironing applications include vessels hotelling at the Port of Long Beach and the Port of Hueneme, and long-haul trucks hotelling at truck stops. Eligibility for Cold-Ironing shall be in accordance with SCE's Rule 18.

Option R

Option R of this Schedule is available to customers with demands not exceeding annual peak demands of four (4) MW and who install, own, or operate solar, wind, fuel cells, or other eligible onsite Renewable Distributed Generation Technologies as defined by the California Solar Initiative (CSI) or the Self-Generation Incentive Program (SGIP). Eligible systems must have a net renewable generating capacity equal to or greater than 15 percent of the customer's annual peak demand, as recorded over the previous 12-months. For generating systems that have received incentives through either CSI or the SGIP, the renewable generating capacity shall be the net generator output value, net of inverter losses, established in the customer's Generating Facility Interconnection Agreement required in Rule 21. All other applicants must provide net generator output values, net of inverter losses based on the methodology for establishing such values described in the CSI or if applicable the SGIP handbooks. Participation on this rate option is limited to a cumulative installed distributed generation output capacity of 150 MW for all eligible rate groups.

(Continued)

(To be inserted by utility)
Advice 2386-E
Decision 09-08-028
2C27

Issued by
Akbar Jazayeri
Vice President

(To be inserted by Cal. PUC)
Date Filed Sep 30, 2009
Effective Oct 1, 2009
Resolution

Energy Conservation Measures Not Incorporated into Overall Program

Below is a list of energy conservation measure projects that were evaluated or considered, but later found not to fit within the program scope. While these projects may offer some energy savings, they typically would have to be funded through an additional capital outlay and/or through excess savings from other projects.

- **Measure:** **Day Lighting with Skylights**
- **Measure:** **Demand Control Lighting**
- **Measure:** **Conversion of Air Handling Units to Variable Air Volume**
- **Measure:** **Isolated Cooling System for Admin Space–Convention Center**
- **Measure:** **Hot Water Boiler Replacement - Convention Center**
- **Measure:** **Domestic Water Upgrades (Toilets, Urinals, Sinks, Showers)**
- **Measure:** **Reclaimed Water for Irrigation – Sunrise Park (Purple Pipe)**
- **Measure:** **Solar Domestic Hot Water**
- **Measure:** **Waste Water Treatment Plant Biogas at Municipal plant**

V. Incentives

Incentive, Grants and Rebates

Chevron ES will apply for all utility incentives eligible for the project on behalf of the City. We will develop all supporting documentation, respond to all utility questions and act as a host for all surveys necessary to receiving the utility incentive payment. We will also attend any post incentive payment equipment inspections required by the utility. The following are a couple of incentive programs that apply for the City for this project. For each of these programs the eligible incentive has been calculated per Energy Conservation Measure and is included in *Table 1.1 of Executive Summary- Section I.*

This section is only provided to give more detail about each of the incentive programs.

California Solar Initiative

The California Solar Initiative (CSI) provides a performance based incentive, paid out over 5 years to the project owner based on actual, measured and documented performance. The CSI Program requires that a pre-approved 3rd party monitoring and reporting service company be secured to document the actual solar system performance and that all required metering equipment and software comply with the programs requirements. Chevron ES will identify and secure these services and ensure the appropriate equipment is installed.

The incentives are disbursed based on the rate provided in the CSI Trigger Point Tracker schedule. The incentive will be reduced to the next step as soon as the allocated MW demand from the previous step has been allocated. Currently the CSI is in Step 8 of the non-residential incentive. Chevron ES strongly recommends the City move forward with all solar reservations applications as soon as possible to reserve the available incentive at the highest rate and before all the funds are allocated. There is a reservation fee required when submitting applications for incentives that is reimbursable when the project moves forward. Upon City's direction and approval Chevron ES shall submit an application to SCE's CSI program for incentive funding for the solar projects

Below is the CSI Trigger Point Tracker from the SCE website

Trigger Point Tracker

		EPBB Payments (per Watt)			PBI Payments (per kWh)		
Step	Statewide MW in Step	Residential	Non-Residential		Residential	Non-Residential	
			Commercial	Government/ Non-Profit		Commercial	Government/ Non-Profit
~~1~~	~~50~~	~~n/a~~	~~n/a~~	~~n/a~~	~~n/a~~	~~n/a~~	~~n/a~~
~~2~~	~~70~~	~~$2.50~~	~~$2.50~~	~~$3.25~~	~~$0.39~~	~~$0.39~~	~~$0.50~~
~~3~~	~~100~~	~~$2.20~~	~~$2.20~~	~~$2.95~~	~~$0.34~~	~~$0.34~~	~~$0.46~~
~~4~~	~~130~~	~~$1.90~~	~~$1.90~~	~~$2.65~~	~~$0.26~~	~~$0.26~~	~~$0.37~~
~~5~~	~~160~~	~~$1.55~~	~~$1.55~~	~~$2.30~~	~~$0.22~~	~~$0.22~~	~~$0.32~~
~~6~~	~~190~~	~~$1.10~~	~~$1.10~~	~~$1.85~~	~~$0.15~~	~~$0.15~~	~~$0.26~~
~~7~~	215	$0.65	$0.65	$1.40	$0.09	$0.09	$0.19
8	250	$0.35	$0.35	$1.10	$0.05	$0.05	$0.15
9	285	$0.25	$0.25	$0.90	$0.03	$0.03	$0.12
10	350	$0.20	$0.20	$0.70	$0.03	$0.03	$0.10

Anything over a 10kW system automatically follows the performance based incentive (PBI) payment schedule. The PBI payments are paid out monthly based on the actual energy produced over a 5 year period. Based on a module degradation factor of 0.7% and trigger step 8 of the PBI payment schedule the total incentive for each of the systems is provided in *Table 1.1 of Executive Summary – Section I.* The incentive amount is calculated using $0.15/kwh generated

Express Solutions Program[8]

The Express Solutions Program is another SCE offered rebate potential for the City. By improving some of the current HVAC and lighting the City will realize savings in both energy and money. Express Solutions program offers SCE business customers cash rebates to offset the cost of replacing or upgrading to high-efficiency equipment that can improve their facilities' energy efficiency Incentives are paid on a first-come, first-serve basis until the Express Solutions Program expires or until funds are exhausted, whichever occurs first.

Desert Partnership Program

The City is also involved in the Desert Partnership Program in which it receives additional incentives from the utility for implementing energy efficiency programs. Currently the City is in the silver level of the Desert Partnership Program and receives an additional $0.06/kwh for all measures that qualify under the Express Solutions Program. Implementing the energy measures recommended will satisfy the City's requirements to move into the next incentive level; the City now needs it residents and business owners to do their part to push the City into the Gold level under this program.

Chevron ES is also investigating potential incentives with Southern CA Gas Company as well as Desert Water Authority.

[8] References SCE - http://www.sce.com/business/ems/express_solutions.htm

VI. Monitoring & Verification

The heart of any performance contract is the guarantees with which it is associated. Not only the guaranteed price of the installation but the guaranteed savings generated from the installation of the energy conservation measures. While the installation guarantee is easy to track and verify, the savings guarantee is more complex, can be done in different ways, can be costly, and can be left open to interpretation. However, when done correctly, not only can the savings be measured and verified, but the customer can achieve many additional benefits from the equipment installed, over and above the guaranteed savings.

The following section introduces Chevron Energy Solutions' Energy Management Group (EMG), and outlines some of the services it can provide. Specifically, these topics will address:

- EMG overview – Including its staff, experience and capabilities.
- Measurement and verification (M&V) of savings – What are the options, when should they be applied, and what are the benefits of each.
- Recommended M&V program – Based on the parameters of this analysis, these are our recommendations for a workable M&V plan that gives the greatest ongoing benefit, and ongoing monitoring services. These are included in the base Monitoring fee.
- Monitoring Services – The scope of Standard Services included by the EMG.

Energy Management Group Overview

Chevron Energy Solutions has one of the largest; most experienced M&V departments in the industry. A professional engineer with 22 years in performance contracting leads a team of 24 full-time dedicated staff, with an average tenure in energy services of over 10 years each. EMG has overseen hundreds of guarantees and currently has about 100 clients with ongoing guarantees that total over 650 million dollars.

The depth and diversity of the personnel prepares them to handle a variety of ongoing services, as detailed in this report. In general, these tasks are overseen by three divisions, each with its own area of expertise.

Energy Accounting:
Headed by a manager who has overseen M&V of performance contracts for the last 15 years, this team oversees the guarantee potion of the monitoring contracts. They are responsible for analyzing the utility consumption, generating the monitoring reports, tracking changes to the facilities and maximizing the energy savings. This team includes on-site dedicated Energy Resource Managers (ERM) for some of our larger contracts.

Electronic Monitoring:
The electronic monitoring division has extensive experience in monitoring, commissioning, and troubleshooting over 25 different types of Building Automation Systems (BAS) aka EMS. This group has daily responsibility for tracking the performance of the building automation systems installed or upgraded as part of virtually all Chevron ES contracts. BAS installation/improvements often account for 25% of the energy savings on a project, but their effectiveness can be diminished over time by building occupants through "unmanaged equipment -overrides".

Through continuous periodic monitoring of these systems, unintentional overrides and control component failures are detected and reported back to our customers before substantial energy savings are lost.

Support Services:

This team of professionals handles most of the extended services detailed below including UtilityVision[SM], Chevron Energy Solutions' suite of services centered around an Internet based real-time energy information system. UtilityVision integrates seamlessly throughout the monitoring program, allowing the EMG to offer a greater level of service to our clients at a lower ongoing cost.

Most importantly, the EMG works as a team to deliver a program specifically designed to meet the needs of each client.

Measurement & Verification of Savings

One key to successfully achieving the predicted savings of any project is the accuracy measurement techniques employed, and the validity of the energy baselines. To assure confidence in these processes, Chevron Energy Solutions will follow the International Performance Measurement and Verification Protocol (IPMVP). This protocol is recognized by the National Association of Energy Service Companies (NAESCO) as the standard guideline of how savings resulting from energy conservation projects should be measured.

The IPMVP defines four broad options for measurement and verification of energy savings. Each option is applicable to specific situations; and, oftentimes, more than one option is possible. Multiple options are often implemented on a single project. The broad categories of the IPMVP lay out as follows:

- Option A – Partially Measured Retrofit Isolation – End-use measurements, some stipulations.
- Option B – Retrofit Isolation – Complete end-use measurements.
- Option C – Whole Building – Energy use analysis on multiple systems.
- Option D – Calibrated Simulation– Computer modeled building savings.

Often overlooked is the necessity of identifying the M&V plan coincidently with the project development. In some cases, it is necessary to drop or ignore a portion of savings associated with a specific retrofit for the simple reason that that portion is unreasonably expensive to measure.

Implementation of a verification plan for the diverse types of ECM's typically involved in a performance contract usually requires a combination of methods to successfully measure savings. Even for a given ECM, verification categories may be crossed by combining a stipulated and an end-use measurement component into the savings calculation. Factors that guide the selection of an M&V method for each ECM include:

- Cost of measurement vs. savings
- Timing of measure installation
- Likelihood of future ECM's at the same facility
- Degree of sub-metering within the facility
- Likelihood of future construction at the facility
- Complexity of ECM's to be installed
- Level of interaction between ECM's
- Likelihood of sustainable savings from the measures
- Dynamics of the facility's energy baselines

Due to the variables and dynamics that are unique to each performance contract, and often to each facility within a performance contract, an individual measurement and verification plan must be developed for each situation. While the specifics may vary, the general method employed will always follow one of the methods outlined in the IPMVP.

The following paragraphs detail the four potential M&V methods:

Option A – Partially Measured Retrofit Isolation
This option allows for the energy savings to be calculated using a sampling of field measurements combined with stipulated parameters. The savings, once calculated, are usually stipulated to for the life of the project. Ongoing actual measurements may or may not be used in this verification technique depending on whether the predicted savings and/or volatility of the measures implemented warrant the expenditure on additional field measurements.

A possible application for using this option would be for lighting efficiency improvements whose performance may be relatively stable and not interdependent with other measures. The savings for the lighting upgrade would be quantified by measuring before and after power consumption for a representative sample of lighting circuits and by stipulating or agreeing to the hours of operation of each circuit.

Option B – Retrofit Isolation
Energy savings performance of energy conservation measures are measured and verified at the-end use site. Option B techniques are designed for projects where long-term continuous measurement of performance is desired and warranted. Under Option B, individual loads are continuously monitored to determine performance; and this measured performance is compared with a baseline to determine savings.

A possible application for Option B measurement would be for the installation of a solar area. In this case the energy savings boundary is the entire array and the baseline is zero. Energy usage of the area would be negative, as the array is producing energy and adding it to the grid or for use by the facility. Total monthly savings would be equal to the energy produced that month and measured through utility grade meters on an on-going basis.

This type of measurement can be expensive and complex, but may be implemented as an alternative to Option C to ensure the long-term success of the energy conservation measures.

Option C – Whole Building
Option C verification techniques measure savings by comparing the post-retrofit overall energy use in a building or facility with pre-retrofit energy baselines. Implicit in this measurement option is the necessity of identifying and accounting for the effects of changes to the facilities during the measurement period that are beyond the scope of the measures installed. The impact of building additions, changes in operating hours, remodeling projects, etc., that are implemented by the customer during the measurement period must have their energy impact accounted for if the true savings from the energy conservation measures is to be assessed. This process can be time consuming and expensive in facilities that are very dynamic.

However, there are many benefits to an Option C measurement. When significant interactions between energy consuming systems and energy conservation measures are present, and for assessing savings for measures that are not easily measured directly, Option C may be the only viable method. Option C savings calculations also most closely emulate the bills from the utility company, and the calculations are easy to understand and explain.

Entirely Stipulated Savings

While not directly defined as an IPMVP option, the protocol recognizes that there are instances when measurement and verification of the savings is not warranted. In cases where the cost of measurement is too high as compared to the savings, where the parameters preclude accurate measurements, or where the confidence of the savings projections is high, the Client and Chevron Energy Solutions may agree to stipulate to those projected savings for the term of the project without any additional measurement and verification of the savings.

Recommended Measurement & Verification Program

The table below represents a proposed M&V approach which balances M&V cost with the value of savings associated with each component. The UtilityVision® service will be employed throughout the city to minimize M&V cost and to maximize energy savings.

M&V of the cogeneration plant savings will be suspended during periods of unscheduled maintenance. During such time periods, it will be assumed that plant performance is the same as measured just prior to the unscheduled down time.

In certain situations, changes in the relative cost of natural gas versus electricity can result in relatively short periods when on-site generation is more expensive than purchasing electricity from the utility. If this situation occurs during the energy savings term, and the City elects to shut down electric generation, it will be assumed that plant performance is the same as measured during the same time period when co-generation was operating.

Table 6.1 Measurement & Verification Method per Energy Measure

ECM#	ECM Descriptions	Savings Component	M&V Method
L1	Lighting Upgrades - Interior and Exterior Citywide	Electricity, (kWh)	Option A
L1-A	Lighting Upgrades - Interior and Exterior Municipal	Electricity, (kWh)	Option C
L1-B	Lighting Upgrades - Interior and Exterior Sunrise	Electricity, (kWh)	Option A
M1-A	Central Plant Cogeneration Upgrade - Municipal	Electricity and Natural Gas, (kWh, Therms)	Option C
M2-A	Energy Management Control System - Municipal	Electricity and Natural Gas, (kWh, Therms)	Option C
M1-B	Central Plant Upgrade (No Cogeneration) - Sunrise	Electricity and Natural Gas, (kWh, Therms)	Stipulated
M2-B	Energy Management Control System - Sunrise	Electricity and Natural Gas, (kWh, Therms)	Stipulated
W1	Irrigation / Water Management	Water (ccf)	Stipulated
PV1-A	Solar Photovoltaic - 103 kW at Convention Center	Electricity, (kWh)	Option B
PV1-B	Solar Photovoltaic - 439 kW City Wide Connected to Sunrise Plant	Electricity, (kWh)	Option B

CES is proposing a five (5) year energy savings and production guarantee term for this program, if CES does not meet the energy guarantee at any time during the 5 years the customer has the option to extend the guarantee on an annual basis or in 5 year increments. However, the City must elect to do so by 6 months into year 4 guarantee.

Additionally, for all years which the City chooses to extend the guarantee period to, the City will agree to pay the annual M&V amount as provided in the proforma at year 5 escalated at 3% for every year thereafter. In the event that CES and the City agree that the guaranteed savings cannot be achieved, CES will pay annually to the City the amount of the non-achieved for the term of the project finance. CES will have the option to make annual payments or the NPV of those payments to the City.

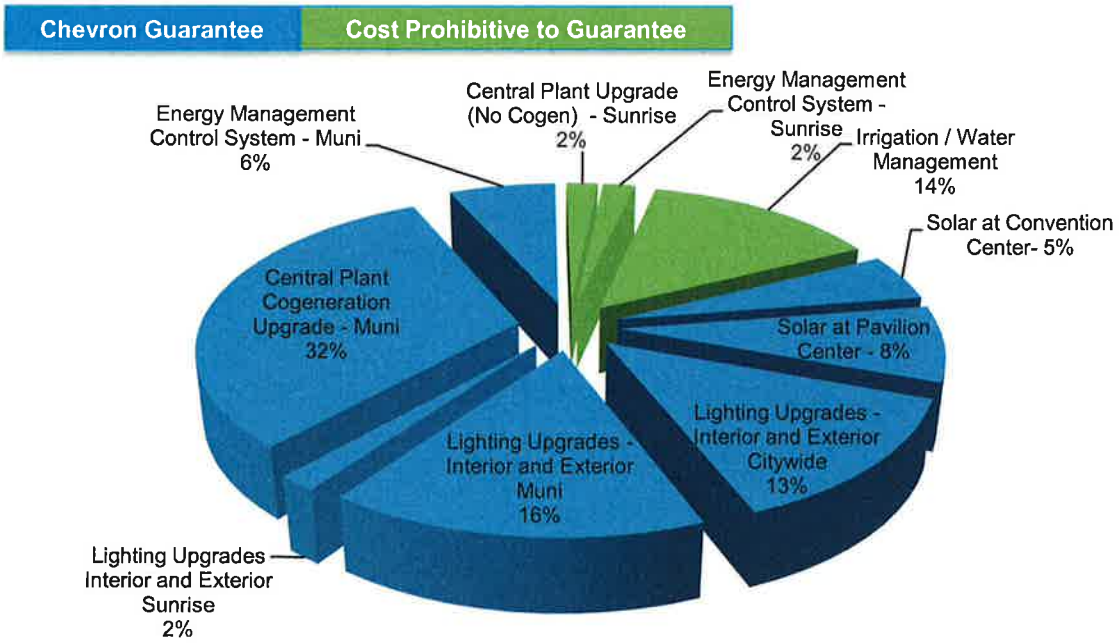


Figure 6.1 – What's My Risk

Monitoring Services

The long-term success of any performance contract relies on the continued efforts of the Owner and the Energy Service Company. To this end, Chevron Energy Solutions offers a monitoring service as part of the energy guarantee that focuses on the measurement, verification, and the maintenance of the energy savings. This section describes the services offered by Chevron ES for the recommended program scope. However, it is understood that the needs of our clients vary, and every effort will be made to meet any additional needs that may arise.

Proposed Services

- UtilityVision – Brings the greatest level of value with a reduced ongoing Monitoring cost.
- Energy Savings Reports.
- Energy Baselines Maintenance.
- Energy Resource Manager (Part Time) – On-site dedicated Energy Professional whose responsibilities are outlined below.
- Solar Systems Operation and Maintenance

UtilityVisionSM ®

Chevron Energy Solutions has developed our own comprehensive, web-based system called UtilityVision® to allow customers to track energy usage and solar system production. It is easily accessible from www.utilityvision.com. Using a valid password, the client can view near real-time energy information as well as view 15-minute load profile data and graphs for each meter.

UtilityVision® allows customers to access custom reports at their desktop. The Web interface allows customers to obtain summarized and interval data for their organization. Customers view usage data as well as other applicable properties. For electricity, UtilityVision® shows consumption, demand, volts, amps and power factor for individual meters. For natural gas, BTU, and other meters, 15 minute interval consumption data is collected. In addition to presentation via the UtilityVision® website, data can be delivered to informational display.

The primary electric and gas load profiles can be used to spot energy demand peaks as they occur, and the electric sub-meter load profiles will assist the City in determining exactly where and when those peaks occur. Once known, it is possible to program the building automated control system to reduce the peak demand at these critical times. The net effect should be a reduction in the average equivalent energy rate.

Chevron Energy Solutions gathers production data every 15-minutes, yielding 35,000 records for each data point over the course of a year. In addition to the performance monitoring, Chevron Energy Solutions uses this level of detail to ensure that the City is in compliance with California Solar Initiative (CSI) standards in order to receive the monthly incentive check based on kWh production. Chevron Energy Solutions is also a registered performance and monitoring service (PMRS), recognized by the California Energy Commission as an official PMRS provider.

With UtilityVision® installed, energy consumption information is read automatically at each site and is uploaded to our internet servers on a daily basis. Monthly energy generation monitoring reports are available within a few days of the end of the calendar month. Energy generation is measured in the same way as with paper bills, but the information is available much sooner. web -based reports are also available on a daily, weekly and monthly basis. Please see the sample of a weekly report in Figure 6.2 below:

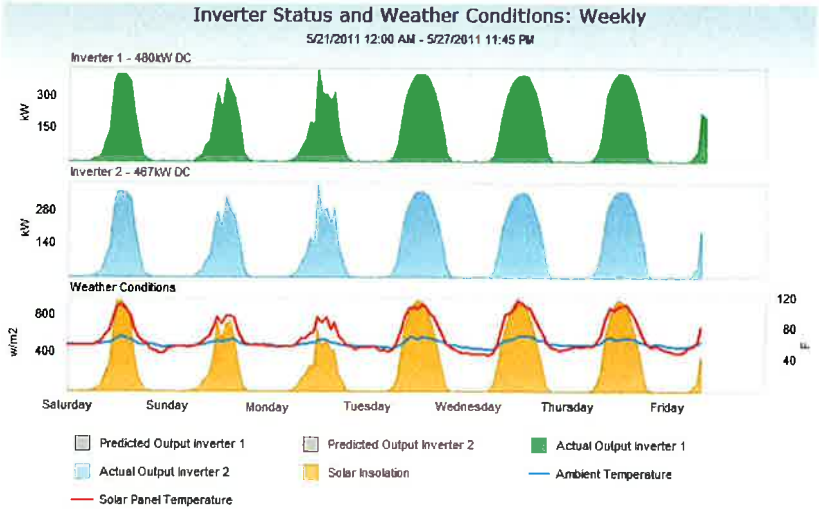


Figure 6.2: Sample UtilityVision® Report

Solar production and other project performance information is often presented on flat panel informational displays at council meetings, public relations and media events. Chevron ES has included a total of two informational displays to be located at the Convention Center for the 103kW system and at City Hall for the 439kW system.

In addition to the performance monitoring requirements, UtilityVision® offers a great educational benefit by incorporating hands-on learning labs with real-time solar data. This system allows the City staff to educate on energy efficiency and solar systems right at their facilities. The data can be used as a tool to provide information on strategies for efficient use of energy on City facilities.

Figure 6.3 and 6.4 show examples of screens from one of the solar system installations for the informational display system and web-based system.

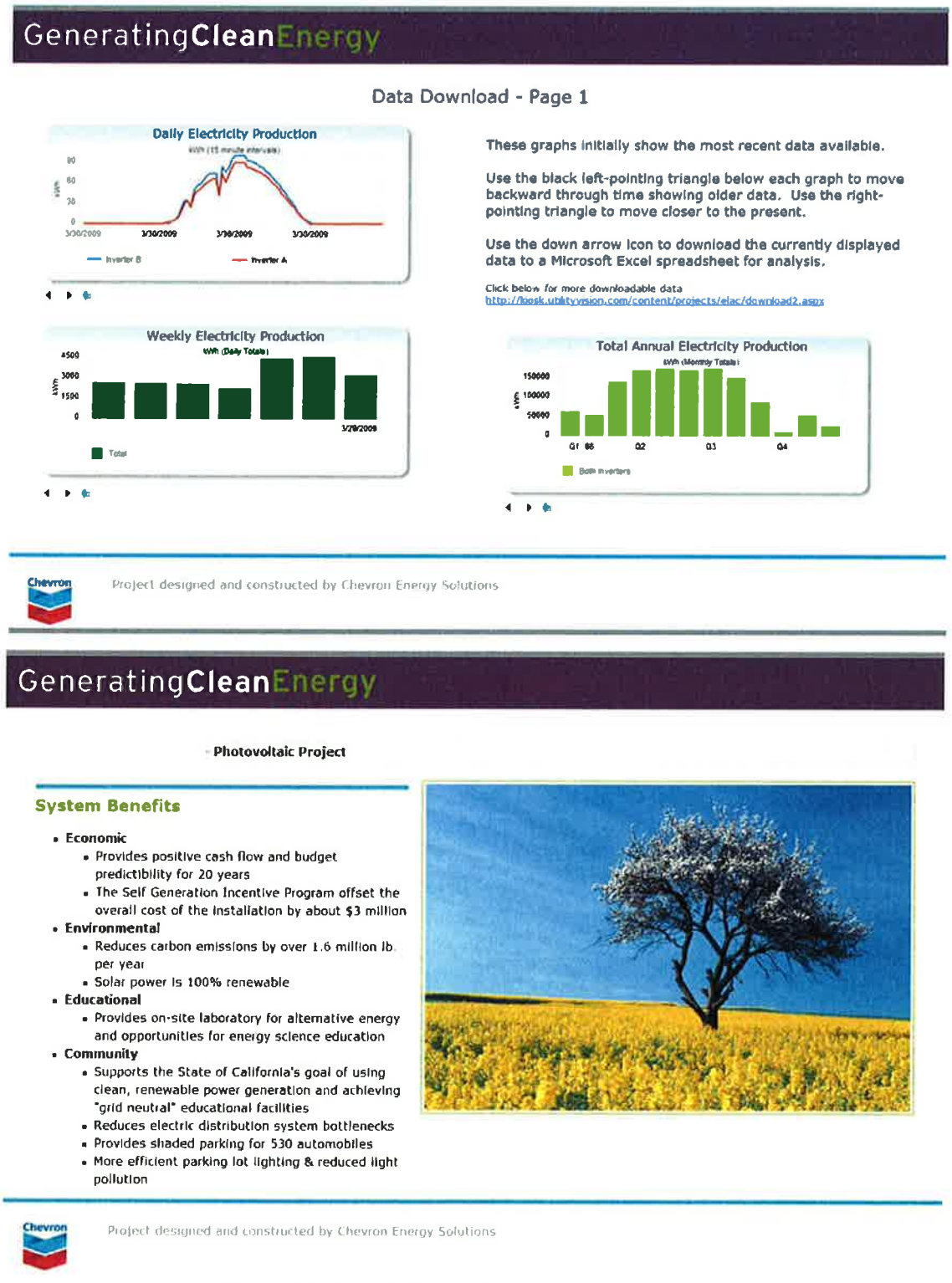


Figure 6.3: Sample Output Pages from UtilityVision®

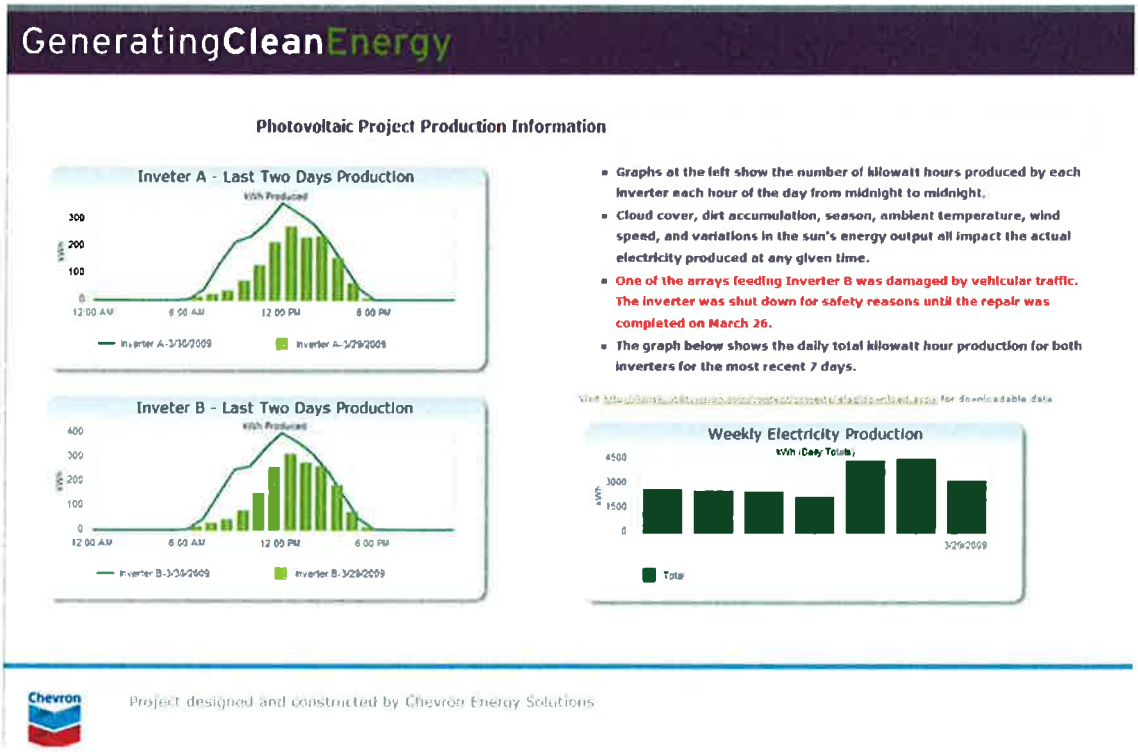


Figure 6.4: Sample UtilityVision® Webpage Showing Solar PV Production

Additional benefits associated with UtilityVision® are the ability for the Energy Management Group and the Customer to analyze building or equipment load profiles on 15-minute intervals. Building load profiles have proven extremely valuable in maximizing energy savings at many customer sites. Real time demand and consumption rates can also be viewed, as well as user-defined aggregations of multiple facilities.

Customers find UtilityVision's load profiling and aggregation tools to be invaluable when negotiating for the most attractive rate structure in both regulated and de-regulated energy environments. UtilityVision® also provides for a simple but powerful interface through which manual energy curtailment initiatives can be managed without having to be fluent with multiple building automated control systems.

UtilityVision® is an Internet-based platform that requires hardware to get the information out to the Internet. Information is passed between this local hardware, the UtilityVision® web server, and users who access the information.

UtilityVision® buildings and meters included in Option C M&V plan (electric and gas unless otherwise mentioned).

* Municipal Plant – Main electric meter
* Municipal Plant- (2) Main gas meters
* City Hall – Main gas meter
* Airport – Main gas meter
* Airport Fire Station– Main gas meter
* Police Dept & Training– Main gas meter
* Convention Center – Main electric
* Sunrise Park – Main electric meter
* All BTU Sub-meters for Municipal Plant
* All kwh Sub-meters for Municipal Plant

Energy Savings Reports

Subtracting the actual energy consumption from the historical energy baseline, and multiplying by the contractual energy rates typically accomplish the calculation of energy savings. This calculation is done monthly for each building on a monitoring report supplied to the Client. Other savings calculation methodologies, as identified in the program, will also appear on these reports. The total savings for the month and year-to-date are summarized and compared against a prorated portion of the guarantee so the progress of the program can be tracked.

At year-end, the annual energy savings, including any adjustments, are compiled and Chevron ES will issue a final year-end report for acceptance by the Client. The savings as reported will be used to fulfill the requirements under the guarantee. Any changes to the baseline or savings adjustments will be included, in detail, with the final monitoring reports, as well as being reflected on the customer's UtilityVision® site.

Daily activity includes:

- Receiving and compiling energy consumption data from UtilityVision® hardware.
- Exception alarming for sites whose consumption exceeds expected values.

Monthly activity includes:

- Analyzing savings reports for errors or irregularities with any recommended actions being submitted to the client in letter format.
- Receiving and compiling energy bills or other data needed for the M&V process.
- Analyzing utility bills for errors or irregularities.
- Creating and printing report.
- Analyzing monthly performance and summarizing in letter format.

Year-end reports include:

- Final savings calculations and adjustments, if any, printed for Client review and approval.
- Overall analysis of facility energy performance.
- Printed graphs comparing current usage versus baseline usage, on a facility-by-facility basis.

Reports can be modified to meet the needs of the Client, often without additional expense.

Baseline Maintenance

One common reason that energy savings can appear to decrease over time is due to a dynamic facility. Adjustments must be made to the baseline if the true savings derived from the ECM's are to be accounted for when a facility is modified for reasons outside the scope of the performance contract. Typical changes to facilities include (but are not limited to):

* Occupancy Schedule Changes
* HVAC Schedule Changes
* Additional Miscellaneous Equipment
* New HVAC Equipment (cooling)
* Additions to Buildings`
* Remodeled Buildings

As the Client informs Chevron ES of any changes to the facility that may affect energy use, the Energy Management Group will quantify the effects of the changes on the overall energy use of the facility. The additional calculated monthly usage will be presented to the Client for review and approval, and then added to the baselines for use in the savings calculations.

If excess time is required to calculate the effect of large scale changes, the Client may be asked to pay for the time involved, or alternatively, agree to another form of savings calculations for the areas affected by the change.

Energy Resource Manager

As part of the ongoing commitment to our customers, Chevron Energy Solutions assists in reducing energy costs by actively monitoring the installed ECM's along with facilities operations and energy consumption. We can maximize this goal by adding an on-site Energy Resource Manager (ERM), dedicated to this program.

The ERM will work in conjunction with Chevron Energy Solutions' Energy Management Group to ensure that the buildings are operating properly and that energy savings are realized. While facility staff is usually focused on occupant comfort, the ERM will also focus on ensuring that equipment is turned off when not needed, and will work with the City to investigate and resolve heating and cooling problems.

In addition, the ERM will have the time, opportunity, and in-depth knowledge of the buildings and systems that will facilitate ongoing recommendation for energy savings opportunities.

The ERM for this project will have the following duties and responsibilities:

Municipal Cogeneration and Sunrise Central Plants

- Review, implement, and adjust control strategies of the plant on a monthly basis.
- On a weekly basis, monitor and analyze the performance of the equipment including: cogeneration engines, chillers, and other balance of plant equipment for Optimization of operating sequences for energy savings.
- Assist the City in coordinating and managing system maintenance, storage of spare parts, and proper site safety procedures and programs.
- Troubleshoot and assess unplanned outages.
- Manage the City maintenance contract at Municipal central plant to ensure proper and timely maintenance is being performed.

Solar System

- Analyze system performance on a weekly basis.
- Manage and oversee regularly scheduled operation and maintenance activity and keep updated logs and records.
- As needed, respond to system alarms and dispatch the appropriate personnel in the event of any type of system failure or warranty issues.

Energy Management System

- Schedule all applicable city buildings on a weekly basis; review temperatures settings, digital inputs, weekly schedules, holiday and daylight savings time changes.
- Provide response and support for alarms that are reported by the system.
- Assist the City with System Re-commissioning, Software Patches, Software Version Upgrades, and Workstation Support on an annual basis.

Water Irrigation Control System

- Spot check, review, implement, and adjust control strategies of the irrigation control on a monthly basis.
- Notify customer of any alarms or manual overrides.

Sub-Metering / Billing Support

- On a monthly basis will provide analysis and recommendations, generate reports, and reconcile with Southern California Edison billing.

Chevron Energy Solutions ERM will be onsite regularly 20 hours per week. This will ensure the proper interface with the administrative, maintenance, and custodial staff face-to-face to see first-hand how the energy program is operating.

Operation & Maintenance for Solar Systems

With few moving parts and no fuel costs, solar PV systems require little operations and maintenance as compared to other sources of generation. Since the modules are passive elements and inverters are equipped with automatic controls, day-to-day operation does not require extensive user input. However, regular maintenance consisting of periodic inspections of the arrays, mounting, wiring, and inverters is recommended to look out for and respond to faults that may trip the unit offline. Monitoring is also necessary to look out for suboptimal performance which might suggest a need for cleaning or further trouble-shooting.

There are five basic elements to solar PV system Operations and Maintenance:

- Module cleaning
- Inverter care
- String wiring maintenance
- Mounting structure maintenance
- Monitoring

Most maintenance activities involve routine inspections and cleanings, although comprehensive annual system inspections are encouraged to identify possible problems before they affect the operation of the systems.

In conjunction with our commitment to quality and long-term relationship with our customers, Chevron Energy Solutions has included as part of this project a maintenance program to support the CSI incentive requirements. Our maintenance program includes the following:

Table 6.2: Operation and Maintenance Summary Table

Operation and Maintenance			
Service Element	**Frequency per Year**	**Number of Staff**	**Contract Included**
Solar PV Panel Cleaning	2	3	5 years
Combiner Testing	1	2	5 years
DC Disconnect Testing	1	2	
Inverter Testing	1	2	
Electrical Travel to Sites	1	2	
Re-torque DC Connections	1	2	

As part of our inspection services, Chevron Energy Solutions will inspect the solar PV modules, combiner boxes, inverters, isolation transformers, PV service penetrations, and support structure on an annual basis. Additionally, the voltage and current output at each PV string will be measured annually. This data will be compared to the measurements of isolation and temperature readings to verify that no problems exist. Electrical connections at the array combiner boxes, main combiner boxes, and inverters will also be inspected on an annual basis.

Solar Carport Installation

Chevron Energy Solutions Operations and Maintenance services will also include removing the dust, dirt, and debris from the outside cabinets of inverters and transformers. The DAS will monitor and log system performance on a daily basis which can be reviewed by site personnel to establish an operational baseline for performance. If a gradual decrease in AC power output is detected, it may indicate a need for array cleaning. Semi-annual washings have been assumed and included as part of this report.

City Responsibilities for Performance Monitoring and Requirements for UtilityVision®

UtilityVision® will consist of computer hardware located on the City's premises, and user-authenticated software executed by technicians using a standard Web browser over the Internet. The computer hardware is required in order to get the information out to the Internet. Information is passed among three entities including:

- The local hardware
- The UtilityVision® Web Server
- The users who access the information

The key hardware component of each UtilityVision® installation is the Obvius A8812 Acquisuite Data Acquisition Server (DAS). The DAS collects data from all of the onsite monitoring equipment, translates the data to useful information and uploads the information to our central servers. This information will be formatted and displayed, for the solar systems, on a flat screen at the Convention Center and City Hall. The DAS and informational display can be installed on the City's existing network or DSL connection. There are also wireless options not covered in this document.

Table 6.3: Informational Display Network Architecture Information 6.3 identifies the network architecture for the informational display and DAS.

Table 6.3: Informational Display Network Architecture Information

Port	Direction	Transport Protocol	Communication Protocol	Description
80	Outbound	TCP	HTTP	Downloads web content to local drive
3389	Inbound	TCP	Terminal Client	Allows remote desktop connection for maintenance purposes

Table 6.4: AcquiSuite Data Acquisition Server Network Architecture Information

Port	Direction	Transport Protocol	Communication Protocol	Description
80	Outbound	TCP	HTTP	Downloads web content to local drive
80	Inbound	TCP	Terminal Client	Allows remote desktop connection for maintenance purposes
23	Inbound	TCP	Telnet	Allows remote telnet connection. Used for troubleshooting the DAQ and updating firmware files
21	Inbound	TCP	FTP	Allows upload of configuration files for custom serial frameworks used to communicate with onsite equipment such as the Satcon Inverters and the weather stations

UtilityVision requires the following connectivity provisions:

- A 10BaseT Ethernet connection on the LAN for each UtilityVision panel.
- A static internal IP address (10 dot) for each UtilityVision® panel.
- A public IP address for each UtilityVision® panel.
- Default gateway IP address and the network mask size.

The City's responsibilities include the following:

- The City must preserve the installation of all the energy measures/systems in their entirety and maintain them in good working order.
- The City shall not alter the system in any way that prevents the Chevron Energy Solutions team including contractors from performing monitoring or maintenance duties.
- The City must provide, free of charge, the Chevron Energy Solutions team including contractors access to reasonable amounts of water, electrical power, and other utilities at the sites in order for Chevron Energy Solutions to satisfy its solar Operations and Maintenance obligations.
- The City shall be responsible pursuant to applicable law for the remediation of any known hazardous substances encountered by the Chevron Energy Solutions team including contractors during the performance of O&M services.
- The City must maintain the landscaping and make an effort to keep surfaces that Chevron Energy Solutions constructs in good condition.

In the event that these conditions are not satisfied, Chevron Energy Solutions shall have no obligation to provide Operations and Maintenance services.