INVESTMENT GRADE AUDIT
Total Project

Presented By:

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November 4, 2009

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1.0 Executive Summary

Earlier this year, the Town of Oro Valley (TOV) selected APS Energy Services as an energy partner to promote fiscal responsibility, environmental stewardship and TOV employee well-being. APS Energy Services has been tasked to deliver a 100% Investment Grade Audit Report on November 4, 2009.

The Town of Oro Valley has identified 12 facilities along with multiple well and pumping stations, totaling over 83,071 square feet to be included as part of this Audit. The purpose of the Investment Grade Audit is to ensure a fundamentally sound project. Through detailed technical evaluation and analysis, the audit identifies energy, water and operational efficiency cost reduction opportunities, as well as renewable energy alternatives, and determines the potential value thereof to maximize facility infrastructure improvements. The team worked with TOV to reconcile any long term plans for use of the facilities with the proposed retrofit projects, other planned projects, compliance with local, State and Federal requirements, as well as, minimizing disruption to occupants during data collection and facility monitoring.

The Investment Grade Audit was designed to accomplish the following:

- Evaluate facility energy using equipment at 12 locations.
- Provide recommendations to substantially reduce electric, natural gas and water use.
- Replace old and obsolete equipment with the most cost effective, long term solution.
- Standardize energy efficient products across all facilities.
- Make improvements to the environment that positively effect comfort, lighting levels and the health of staff, visitors and residents.
- Locate alternative funding sources to help pay for the improvements.

APS Energy Services has reviewed all savings opportunities for the Town of Oro Valley. The total project has been divided into three separate projects depending on the source of funding for the project. Project details can be found below:

Table 1-0. Project Overview

Project	Locations	Funding Source
Project #1	Town Hall Complex, Library and Main PD	ARRA Stimulus Funds
Project #2	Public Works/Operations & Parks and Rec, Public Works/Maintenance and Warehouse, Rancho Vistoso MOC, Riverfront Park, JDK Park, Reclaimed Water Plant, Street Lights, Pump Stations and Well Sites	Municipal Tax Exempt Lease Purchase Agreement
Project #3 (Solar PV)	Town Hall Complex Parking Area	CREBs Program

1.1. Key Milestones

The preliminary findings from the audit process indicate there is significant energy, water and operational efficiency cost reduction opportunities, and subsequent pages will outline the findings to-date. To ensure success, the following Table 1-1 lists key milestones for the Investment Grade Audit process.

Table 1-1. Investment Grade Audit Key Milestones

Key Milestones	Date
Audit Contract Approved	08.19.09
30% Review Report Submitted	09.08.09
60% Review Report Submitted	10.01.09
90% Review Report Submitted	10.21.09
Final Report Submitted	11.04.09
Town Council Meeting	11.18.09
Finalize Contract Negotiations	TBD
Finalize Financing	TBD

1.2. Environmental Benefits

TOV will realize a carbon footprint reduction by implementing projects that reduce fossil fuel consumption. Electrical generation uses fossil fuel and fossil fuels are also used directly for heating processes. Less energy consumed translates into less power plant production and pollution into the air. The energy cost avoidances for electricity, natural gas and water for the proposed project have been calculated and their environmental benefit recorded in Section 4.0 Environmental Benefits.

- Electricity Reduction: **1,364,064** kWh/yr (**17%** Reduction)
- Natural Gas Reduction: **16,406** therms/yr (**25%** Reduction)
- Water Reduction: **782** thousands of gallons/yr (**4%** Reduction)

These annual cost avoidances, once achieved, will produce the following environmental benefits.

Table 1-2. Environmental Benefits

Type of Polution	Pollutants Reduced
Carbon Dioxide (CO_2) Eliminated:	**2,465,329** Pounds (lbs)
Sulfur Dioxide (SO_2) Eliminated:	**1,306** Pounds (lbs)
Nitric Oxide (NO_X) Eliminated:	**2,307** Pounds (lbs)

2.0 Financial Summary

The results of the Investment Grade Audit and the resulting recommended program, indicate that TOV will realize a total annual cost avoidance of **$235,485**. The total cost of all improvements is **$4,243,170**, providing an attractive **12.5 year payback**. The total project is divided into three separate projects depending on the source of funding. Project details are as follows:

Please see Table 2-0 for the costs and savings summary of the overall project.

Table 2-0. Proposed Energy Conservation Measures Costs and Cost Avoidances

Energy Conservation Measure	Annual Electrical Consumption Savings (kWh)	Annual Electricity Savings $	Annual Natural Gas Savings (Therms)	Annual Natural Gas Savings $	Annual Water Savings (Thousand Gallons)	Annual Water Savings $	Annual Labor Operations Savings $	Rebates $	Total Annual Savings $	Total Project Cost $	Simple Payback with Energy, Water, Rebates and O&M Savings
Town of Oro Valley Library	94,633	$ 10,346	7,277	$ 9,533	77	$ 597	$ 183	$ 7,954	$ 20,659	$ 145,475	6.66
Town Hall Complex (4 Buildings)	106,254	$ 13,191	1,636	$ 2,142	409	$ 3,121	$ 461	$ 7,417	$ 18,915	$ 473,161	24.62
Oro Valley PD Main Station	105,408	$ 13,086	3,955	$ 5,181	59	$ 488	$ 533	$ 5,563	$ 19,288	$ 155,714	7.78
Public Works/Operations & Parks and Recreation	32,715	$ 4,209	-	-	-	$ -	$ 26	$ 330	$ 4,236	$ 40,265	9.43
Public Works/Maintenance and Warehouse	5,627	$ 775	-	-	-	$ -	$ 79	$ 430	$ 854	$ 12,068	13.62
Rancho Vistoso Municipal Operations Center	7,281	$ 1,167	-	-	8	$ 77	$ 14	$ 246	$ 1,258	$ 21,691	17.04
Riverfront Park	39,141	$ 4,907	-	-	52	$ 393	$ 51	$ 4,675	$ 5,352	$ 82,069	14.46
JDK Park and Pool	45,462	$ 5,823	3,538	$ 4,635	176	$ 1,384	$ 3,123	$ 4,305	$ 14,965	$ 177,229	11.56
Reclaimed Water Plant	13,730	$ 11,883	-	-	-	$ -	$ 45	$ -	$ 11,928	$ 118,219	9.91
Street Lights	177,924	$ 12,690	-	-	-	$ -	$ 221	$ 26,900	$ 12,911	$ 301,449	21.27
Data Energy Management (Citywide)	27,113	$ 3,254	-	-	-	$ -	$ -	$ -	$ 3,254	$ 13,290	4.08
Low E Window Film (Select Sites)	5,754	$ 574	-	-	-	$ -	$ -	$ -	$ 574	$ 22,661	39.49
Pump Stations and Well Sites	149,631	$ 50,461	-	-	-	$ -	$ 26	$ 36	$ 50,487	$ 285,592	5.66
Solar Photovoltiac at Town Hall Complex Parking	553,392	$ 70,805	-	-	-	$ -	$ -	$ 1,241,604	$ 70,805	$ 2,394,288	16.28
TOTALS:	1,364,064	$ 203,171	16,406	$ 21,491	782	$ 6,060	$ 4,762	$1,299,461	$ 235,485	$4,243,170	12.50

2.1 Financial Highlights

2.1.1. Financial Summary

APS Energy Services is currently in the 100% Review Phase of the Investment Grade Audit designed to develop operational cost savings measures for TOV.

During the course of the audit, many potential measures were identified and their economics evaluated. APS Energy Services is recommending a package of operating cost saving measures that produce a program that requires no capital in order to implement. Based upon the audit and current utility rates, the identified measures will produce a total first year cost avoidance of **$235,485.** This annual savings stream creates the funding source that pays for the recommended upgrades and efficiency improvements for TOV. Highlights of the program are summarized below:

- First Year Project Savings **$ 235,485**
- 15 Year Project Savings (with escalations) **$ 5,470,256**
- Project Principal Amount **$ 4,243,170**
- Annual Lease Payment **$ 336,753**
- 15 Year Net Project Savings* **$ 631,876**
- Energy Efficiency Estimated Rebates **$ 57,857**
- Solar Energy Performance Based Rebates** **$ 1,634,028**
- Financing Term Length **15 Years**
- Estimated Annual Financing Rate*** **5.75% & 1.00%**

** Net project savings is based on projected utility rate increases of 2-3% annually.*
*** This is over a 20 year term*
**** 5.75% for lease purchase project and 1.00% for solar CREBs project*

2.1.2. Financial Structure

The construction cost to implement the recommended project is **$4,243,170.** The fixed price and the current tax rate are included as part of the Investment Grade Audit submitted on November 4, 2009.

TOV will be responsible for payment of applicable taxes in connection with the fixed price amount of the Agreement for any adjustments of the tax rate for work performed under this Agreement.

The Program also provides:

- Assistance in obtaining all available utility incentives.
- Assistance in obtaining Federal ARRA Funding and Clean Renewable Energy Bonds (CREBs)
- All work to be performed at a not-to-exceed price.

Based on the accepted Rate Forecast, the following Table found in Section 5.0 summarizes the savings potential of these recommendations. The Existing Annual Utility costs are total city-wide costs.

Table 2-1. Proposed Annual Energy and O&M Savings

Fuel Type	Existing Annual Cost	Proposed Annual Cost Avoidances	Reduction (%)
Electricity	$ 1,193,304	$ 203,171	17.03%
Natural Gas	$ 87,233	$ 21,491	24.64%
Water	$ 144,405	$ 6,060	4.20%
Total Annual Utility Cost Avoidance:		**$ 230,722**	
Annual O&M Cost Avoidance		$ 4,763	
Total Annual Cost Avoidance:		**$ 235,485**	

3.0 Utility Analysis

A utility billing analysis provides an evaluation of opportunities for energy savings. Utility rate issues, utility costs for each of TOV's facilities and overall benchmarking have been utilized in an effort to identify Energy Conservation Measure opportunities.

Base Year for Utility Costs and Usage
The utility base year utilized for this audit is the fiscal year for TOV, July 2008 through June 2009. While the billing for utility services is not exactly contained within those dates, TOV attributes the billing as closely to those days as possible to ensure reconciliation of expenditures during the fiscal year.

3.1. Rate Analysis

The first step of any billing analysis is an assessment of the billing rate and TOV's energy requirements. This ensures that TOV is being billed using the most appropriate tariff for their usage pattern. Depending on the Energy Conservation Measures selected for implementation, additional analysis may be required to determine if a better rate schedule can be applied after the measures are implemented.

Electric service to TOV Facilities is provided by Tucson Electric Power (TEP). The rate structure for specific accounts can be broken down as follows:

- GS-10 is the rate schedule for all facilities with the exception of pumping loads for water utilities.
- PS-43 is the pumping rate schedule for facilities where pumping is the primary load.

Natural gas delivery service for all TOV facilities is supplied by Southwest Gas (SWG). Some facilities use electric heat and do not have natural gas service. A variety of rate schedules apply to the Town of Oro Valley accounts depending on how much gas service is utilized. Specific tariffs include:

- GS-25 Large, Medium, and Small service
- GS-55S Small compressed gas service

The Town of Oro Valley provides potable and reclaimed water service to customers. The reclaimed water service is provided to four (4) golf courses. Potable water is supplied within the service territory to residential and commercial customers.

3.2. Utility Costs

The FY 2008 annual energy expenditures (electricity, gas and water) for the facilities included as part of this audit are approximately $1.4 million. These energy expenditures do not include the anticipated rate increases forecasted in 2009 or any additional rate increases on a go-forward basis. For the purpose of calculating energy savings, the FY2008 data has been used to establish the Baseline Year.

3.3. Annual Summary by Usage and Cost

Table 3-0 provides a summary of the annual usage and cost for TOV. Usage and cost data represents the annual totals for FY 2008.

Table 3-0. Summary of Annual Usage

Utility Type	Electricity Usage (kWh)	Natural Gas Usage (therms)	Water Usage (gallons)	Annual Cost ($)	Cost/ Unit
Electricity	2,541,971			$ 315,552	$ 0.12
Natural Gas		62,216		$ 87,233	$ 1.40
Water/Sewer			18,905,700	$ 144,405	$ 0.01
			TOTALS:	**$ 547,190**	

3.4. Monthly Electricity Cost, Usage and Demand Analysis

Analysis of the monthly billing usage and cost data provides an assessment of the load pattern for the facility. Monthly analysis is a method of identifying anomalies that are not accounted for based upon expected patterns. A typical usage and cost analysis will identify any particular months with unusual costs in order to focus on either the rate application or equipment consumption during the audit.

The following table summarizes the electric accounts for the facilities included in this IGA with the exception of the water utility

Table 3-1. Summary Electric Utility Information

Building	Address	Sq. Footage	Account No.	Meter No.	Rate	Annual KWH	Annual $
Calle Concordia	680 W Calle Concordia	4,000	4957679151	TR9-7482	GS-10	181,676	$ 21,128
Pool Building	23 W Calle Concordia	-	4957674128	TR9-7804	GS-10	377,849	$ 43,150
Park -- Not Verified	N/A	-	4957674944	TR9-7804	GS-10	253,222	$ 32,937
Police Rancho Vistoso	1171 E Rancho Vistoso Blvd	1,000	4957674276	SC16-3857	GS-10	30,534	$ 4,060
Library	1305 W Naranja Dr	25,000	4957674267	TR9-8733	GS-10	550,851	$ 69,200
Administration	11000 N La Canada Dr	18,722	4957674982	TR9-3929	GS-10	543,076	$ 68,311
Police	11000 N La Canada Dr #3	6,875	4957674020	TR9-7456	GS-10	503,409	$ 63,416
MOC	23 W Calle Concordia	4,320	4957674089	XH-344528	GS-10	34,129	$ 4,474
Calle Con A	23 W Calle Concordia	1,334	4957674950	TR9-7482	GS-10	67,225	$ 8,876
TOTALS:						**2,541,971**	**$ 315,552**
Average $/kWh	**$**	**0.12414**					

Some items of interest for the previous table include:

- The metering for the Administration building includes the Administration facility, the Water Utility management facility, the Court facility, and Development Services. The square footage shown for this complex includes all the buildings listed.

The following table summarizes these facilities on a cost per square foot basis:

Table 3-2. Summary of Electric Utility Information - Cost Per Square Foot					
Building	**Address**	**Sq. Footage**	**Annual kWh**	**Annual $**	**$/Sq. Ft.**
Calle Concordia	680 W Calle Concordia	4,000	181,676	$ 21,128	$ 5.2821
Police Rancho Vistoso	1171 E Rancho Vistoso Blvd	1,000	30,534	$ 4,060	$ 4.0603
Library	1305 W Naranja Dr	25,000	550,851	$ 69,200	$ 2.7680
Administration	11000 N La Canada Dr	18,722	543,076	$ 68,311	$ 3.6487
Police	11000 N La Canada Dr #3	6,875	503,409	$ 63,416	$ 9.2241
MOC	23 W Calle Concordia	4,320	34,129	$ 4,474	$ 1.0356
Calle Con A	23 W Calle Concordia	1,334	67,225	$ 8,876	$ 6.6538

As this table indicates, the highest cost is incurred at the leased facility for the Police Department on Rancho Vistoso, and the lowest cost per square foot is incurred at the main operations center, and there is only a small difference in total cost per square foot for the main facilities included.

3.5. Monthly Natural Gas Cost and Usage Analysis

The following table summarizes the natural gas usage by facility for the Town of Oro Valley:

Table 3-3. Summary of Natural Gas Utility Information

Building	Address	Sq. Footage	Account No.	Rate	Annual Therms	Annual $
Library	1305 W Naranja	25,000	361-3677205-002	G-25L Large	10,071	$ 14,314
Maintenance Rear Bldg	680 W Calle Concordia	1,334	361-0756999-021	G-25M Medium	988	$ 1,509
Court	11000 N La Canada Dr 2	4,212	361-0780575-021	G-25S Small	251	$ 399
Town Hall/Admin	11000 N La Canada Dr 1	18,722	361-0780561-021	G-25S Small	844	$ 1,309
Water	11000 N La Canada Dr 4	2,192	361-3525688-002	G-25S Small	732	$ 1,157
Maintenance	680 W Calle Concordia	4,000	361-3609779-002	G-55S Compressed Small	5	$ 3
Police Department	11000 N La Canada Dr PD	6,875	361-316652-002	G-25M Medium	5,521	$ 7,426
Community Development	11000 N La Canada Dr 3	10,000	361-0780580-021	G-25S Small	88	$ 147
TOTALS:					**18,500**	**$ 26,263**
Average $/Therm	**$**	**1.4196**				

The library uses the most gas followed by the police department. The remaining facilities use small amounts for space heating.

3.6. Water Usage Analysis

The following tables summarize the well and pumping system costs:

Table 3-4. Summary of Well System Utility Information

Name	Address	Identifier	Zone	Number	Account No.	Meter No.	Rate	Annual KWH	Annual $	Gallons Pumped	Notes	$/KWH
C8	107910 N Highlands	Well	C	8	4957674644	3HC-401	PS-43	215,830	$ 22,434	91,839,000		$ 0.10394
CS1	9054 N Bald Eagle	Well	CS	1	4957674250	TR9-264	PS-43	570,080	$ 50,897	139,551,000		$ 0.08928
D5	10798 N Lacanada	Well	D	5	4957674686	SC16-11850	PS-43	190,256	$ 17,581	50,657,000		$ 0.09240
CS2	8922 N Hartman	Well	CS	2	4957674139	TR9-652	PS-43	294,240	$ 26,250	116,950,000		$ 0.08921
D4	11111 N Stallard Pl	Well	D	4	4957674475	N/A	PS-43	26,220	$ 2,480	35,812,000		$ 0.09460
D7	1331 W Lambert Ln	Well	D	7	4957674369	TR9-8690	PS-43	338,780	$ 30,830	79,707,000		$ 0.09100
D6	1565 W Canada Hills Dr	Well	D	6	4957674512	3AC-692	PS-43	250,560	$ 22,940	68,252,000		$ 0.09155
C4	1545 E Pusch Wilderness	Well	C	4	4957674942	TR9-6563	PS-43	106,680	$ 9,973	31,305,000		$ 0.09348
D8	10440 N Starsearcher	Well	D	8	4957674445	N/A	PS-43	94,242	$ 9,926	-		$ 0.10532
C5	222 E Naranja Dr	Well	C	5	4957674983	TR9-9278	**GS-10**	620,960	$ 70,794	178,231,000		$ 0.11401
E4	12151 N Oracle	Well	E	4	4957674607	TR9-3192	PS-43	1,420,960	$ 128,150	-		$ 0.09019
E3	1770 E. Rancho Vistoso	Well	E	3	4957674770	SC16-5878	PS-43	199,803	$ 18,412	65,700,000		$ 0.09215
F1	12522 E Rancho Vistoso	Well	F	1	4957674177	SC16-12298	PS-43	385,845	$ 34,995	97,690,000		$ 0.09070
E2	1201 E Tangerine	Well	E	2	4957674129	N/A	PS-43	515,440	$ 46,822	180,240,000		$ 0.09084
C6	701 E Lambert	Well	C	6	4957674585	TR9-2607	**GS-10**	634,560	$ 71,339	297,111,000		$ 0.11242
C7	1201 W Linda Vista	Well	C	7	4957674542	TR9-2688	PS-43	302,960	$ 27,548	95,779,000	Well and Pump	$ 0.09093
E5B	1717 E Tangerine Rd	Well	E	5B	4957674533	TR9-3703	PS-43	452,200	$ 41,009	294,115,000		$ 0.09069
D1	1835 Innovation Park Dr.	Well	D	1	4957674501	TR9-5399	**GS-10**	354,080	$ 40,986	183,090,000	Well and Pump	$ 0.11575
E7B	11823 N Oracle Rd	Well	E	7B	4957674015	TR9-6547	PS-43	298,960	$ 27,303	115,929,000		$ 0.09133
D9	3530W Meadowbrook Dr	Well	D	9	4957674740	TR9-6563	PS-43	859,440	$ 75,181	242,376,000		$ 0.08748
C9	420 Pusch View Ln	Well	C	9	4957674206	N/A	**GS-10**	60,800	$ 7,474	37,630,000		$ 0.12293
E6B	11500 N Oracle Rd	Well	E	6B	4957674206	TR9-3192	PS-43	-	$ -	201,064,000		N/A

Table 3-5. Pump Station Utility Information

Name	Address	Identifier	Account No.	Meter No.	Rate	Annual KWH	Annual $	Cost Per KWH
Crimson Canyon	9810 N La Reserve Pl	Pump	4957674917	N/A	PS-43	4,760	$ 451	$ 0.0948
Deer Run	10290 N la Reserve Drive	Pump	9145398017	N/A	PS-43	34,928	$ 3,373	$ 0.0966
El Con	1313 E Linda Vista Blvd	Pump	6878924017	TR9-6530	PS-43	121,760	$ 11,431	$ 0.0939
High Mesa	1650 E Rancho Vistoso	Pump	4957674125	3AC-1205	PS-43	352,000	$ 31,790	$ 0.0903
Sun City	14698 N Del Webb blvd	Pump	4957674496	N/A	PS-43	22,840	$ 2,190	$ 0.0959
Rancho Vistoso	901 E Rancho Vistoso	Pump	4957674360	N/A	PS-43	14,603	$ 1,383	$ 0.0947
Woodburne	12101 N Woodburne Ave	Pump	4957674880	3CC-86	PS-43	175,840	$ 16,392	$ 0.0932
Woodshade	13368 N. Rancho Vistoso	Pump	4957674614	SC16-5291	PS-43	134,714	$ 12,942	$ 0.0961
Rancho Del Oro	12064 N Sliding Rock Pl	Pump	4957674231	SC16-1192	**GS-10**	101,443	$ 12,150	$ 0.1198
Canyon Del Oro	256 W Calle Concordia	Pump	4957674420	N/A	PS-43	34,900	$ 3,314	$ 0.0949
Big View	2568 E Big View Drive	Pump	4957674674	N/A	**GS-10**	10,160	$ 1,367	$ 0.1345
Water Plant 14	13891 N Rancho Vistoso	Pump	4945764288	N/A	**GS-10**	16,560	$ 2,185	$ 0.1319
Reclaimed Plant	13358 N Rancho Vistoso	Pump	4957674622	TR9-6632	**GS-10**	538,000	$ 60,777	$ 0.1130

The items where the rate is listed as a GS-10 in red are likely accounts where the cost per kWh indicates that the location may be on the wrong electric rate. Refer to the section detailing the rate analysis for the savings that were identified based on appropriate rate allocation. As these tables indicate, a substantial amount of cost is incurred by the water system, and the actual average rate reflects the PS-43 rate currently in effect for most sites.

The total cost and the production is shown in the following table:

Table 3-6. Summary of Water Usage		
Total kWh		**9,755,404**
Total $	**$**	**943,067**
Gallons		**2,603,028,000**
Cost per 1000 Gallons	**$**	**0.3623**

This analysis only includes the direct energy costs to produce the water, not the overall costs that the Town of Oro Valley incurs for asset, operations, and maintenance of facilities needed to provide water service.

3.7. Disaggregation Into End Use

The billing data can be broken into expected end use components for both electric and natural gas consumption. For this report, several Equest® models were developed which is an excellent approximation for the end use or disaggregation of the utility billing. For the main administrative complex, four buildings were modeled as one to reflect the utility meter locations. They are as follows:

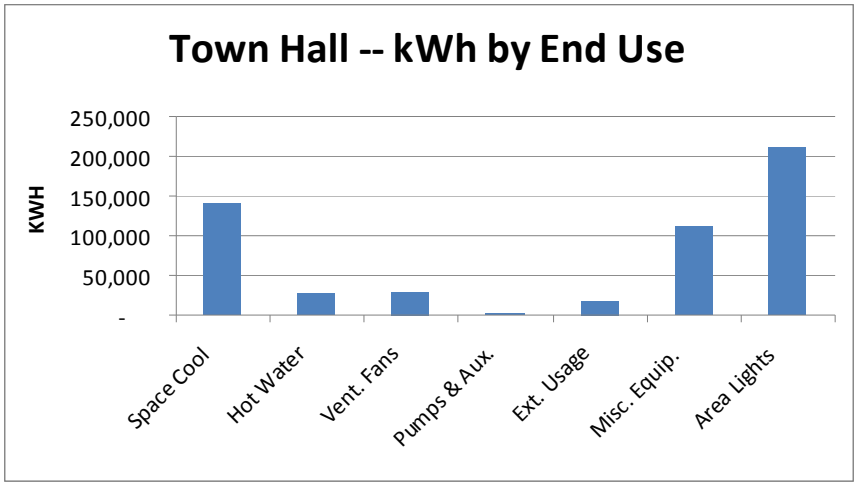
- Administration Building
- Development Services Building
- Water Utility Building
- Magistrate Court Building

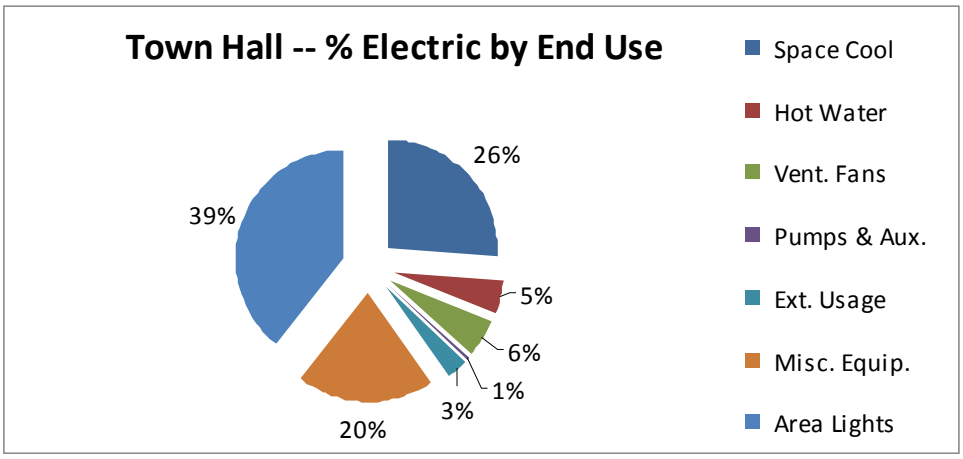
The other two structures in the main complex (Library and Police) had separate meters which were disaggregated based on the individual model results. For remaining buildings assessment of the overall function and comparison to energy models and savings results were used to establish the overall disaggregation.

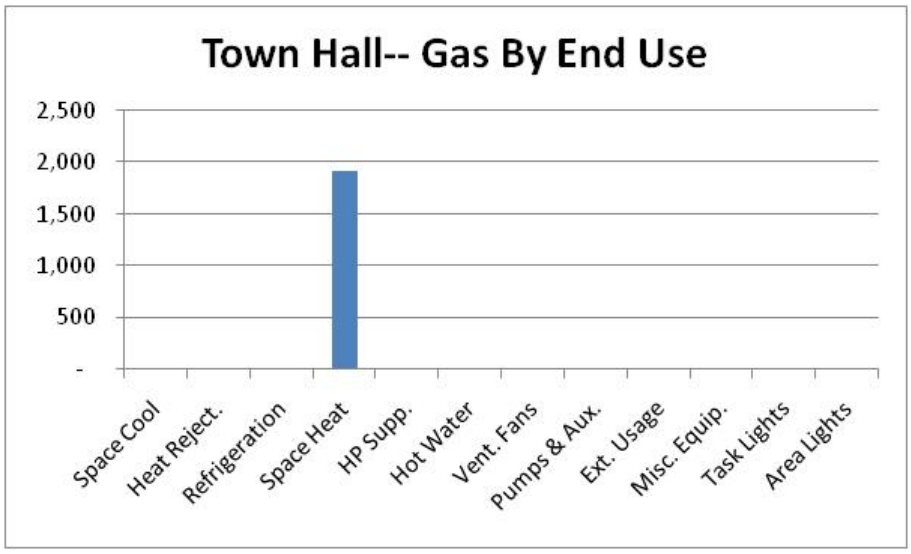
The following sections detail the overall end use analysis by building and energy type.

3.7.1. Town Hall Complex

The town hall complex consists of the Administration Building, Development Services Building, Water Utility Building and Magistrate Court Building. The following charts detail the overall end use analysis for this complex.

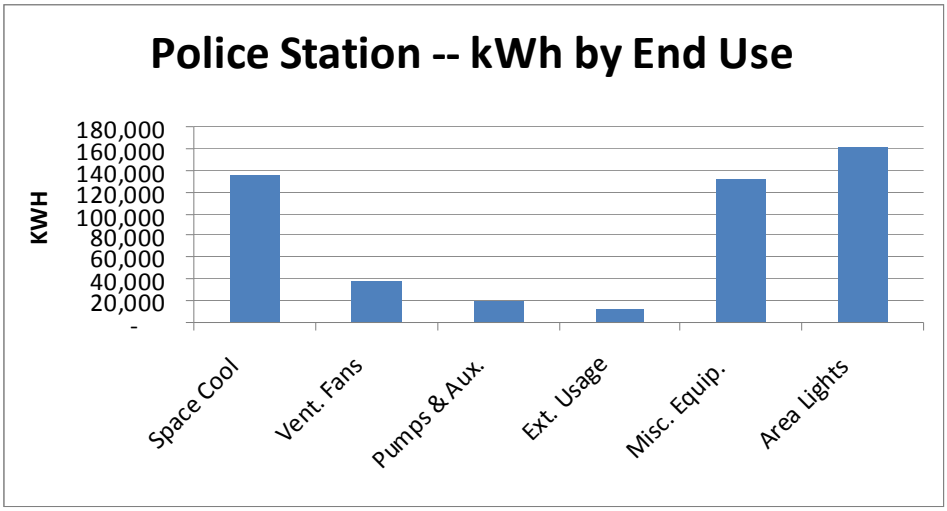


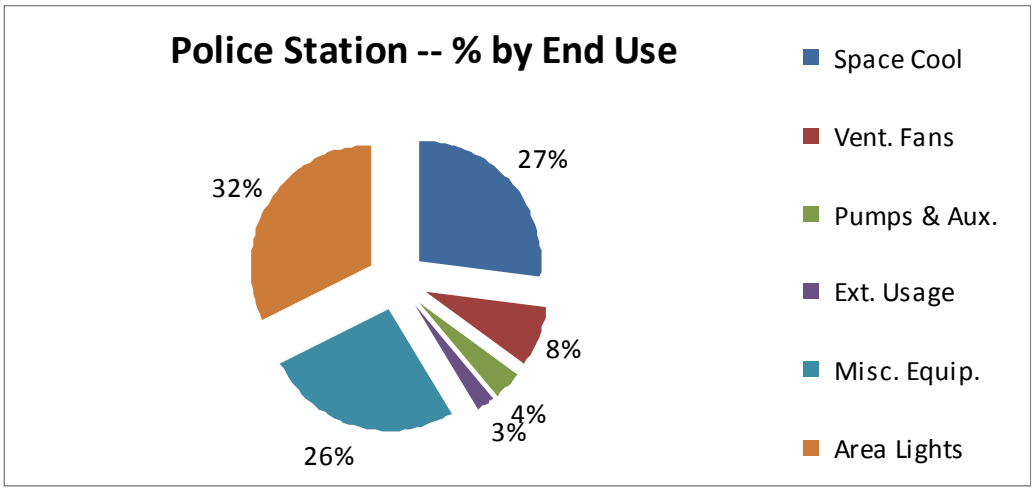


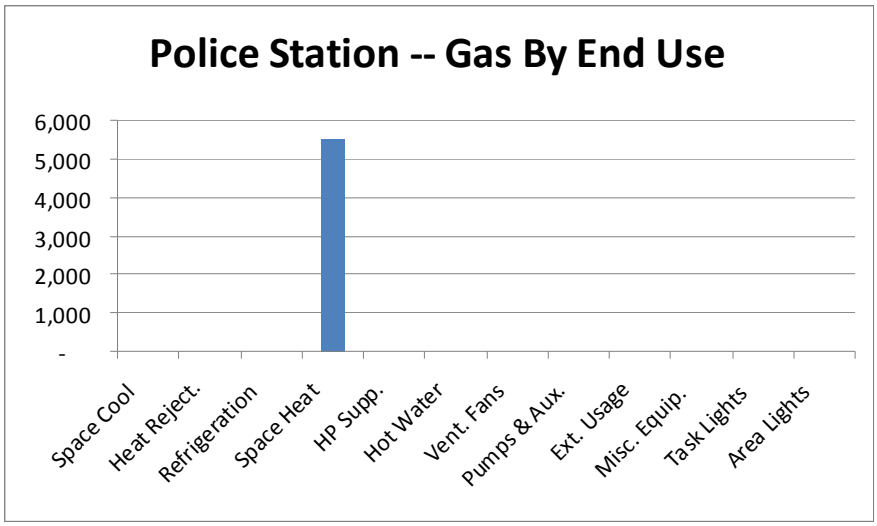


3.7.2. Police Station

The following charts show the breakdown into end use for the Main Police Department facility:

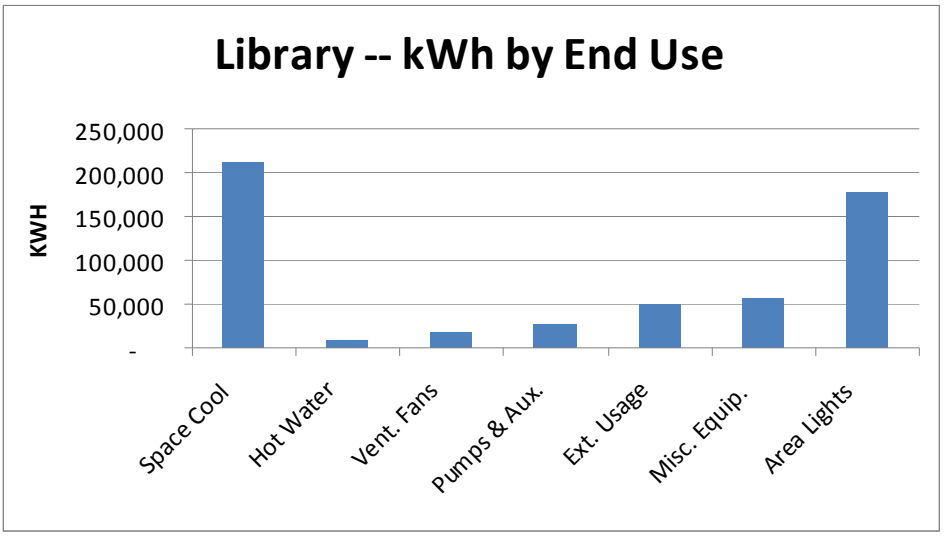


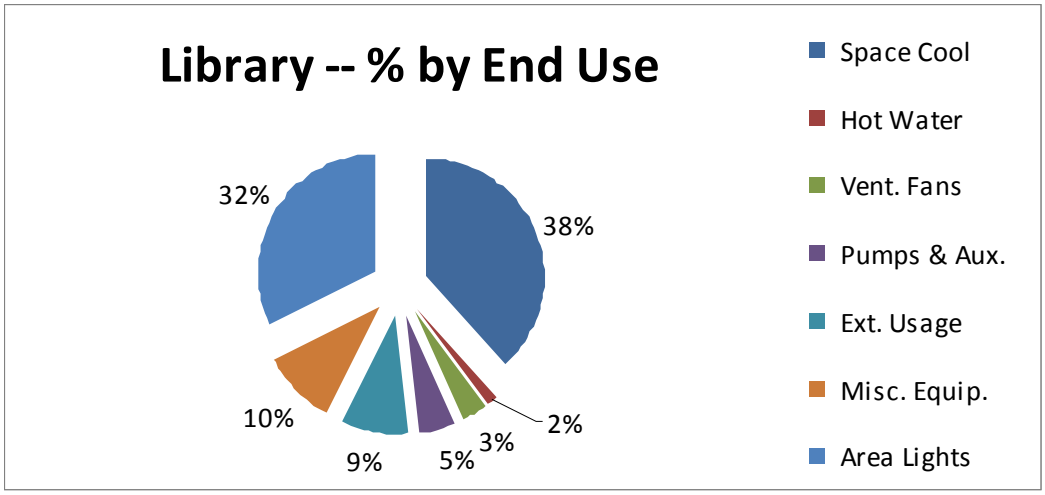


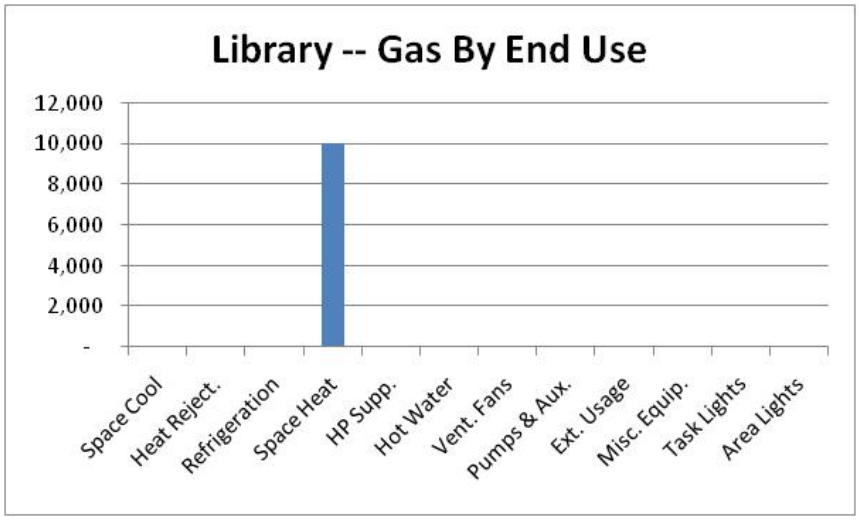


3.7.3. Library

The following charts show the breakdown by end use for the library:

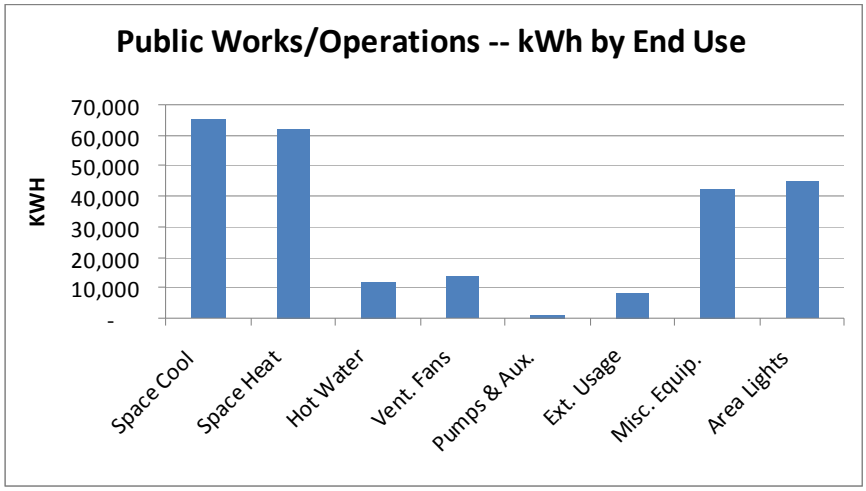


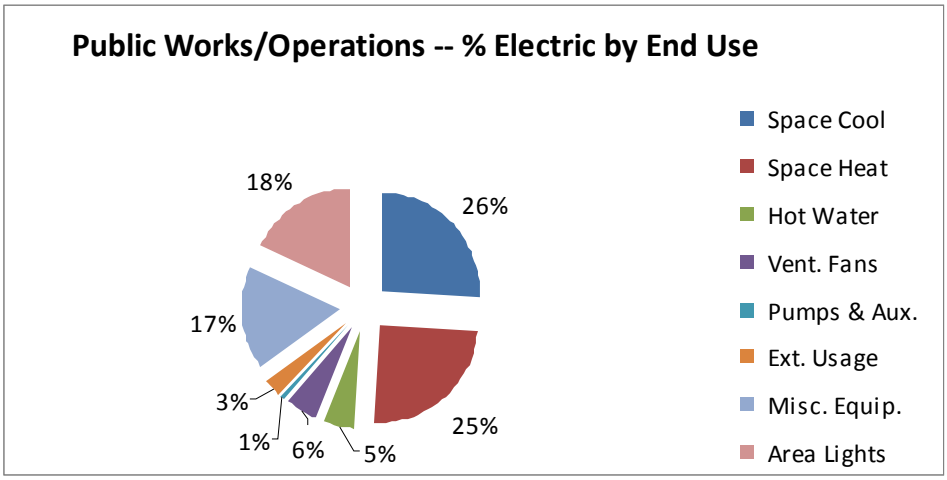


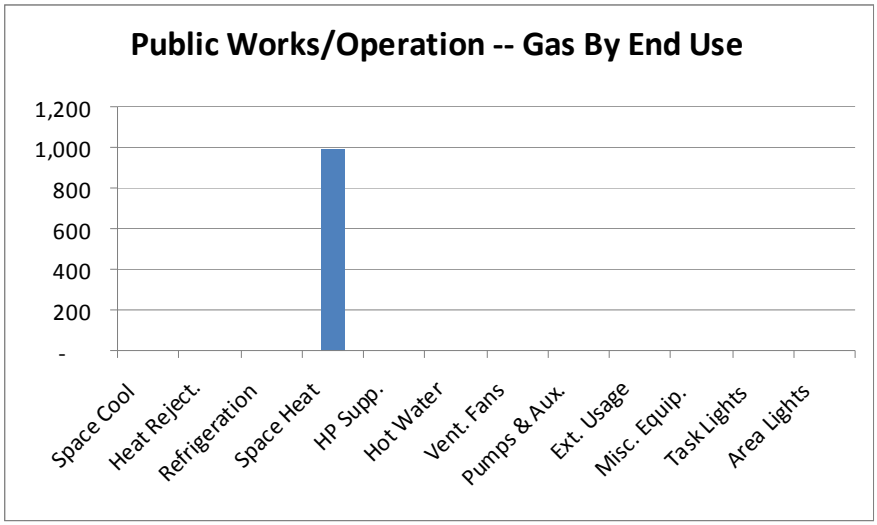


3.7.4. Public Works/Operations & Parks and Recreation

The following charts show the breakdown by end use for the Public Works/Operations & Parks and Recreation:

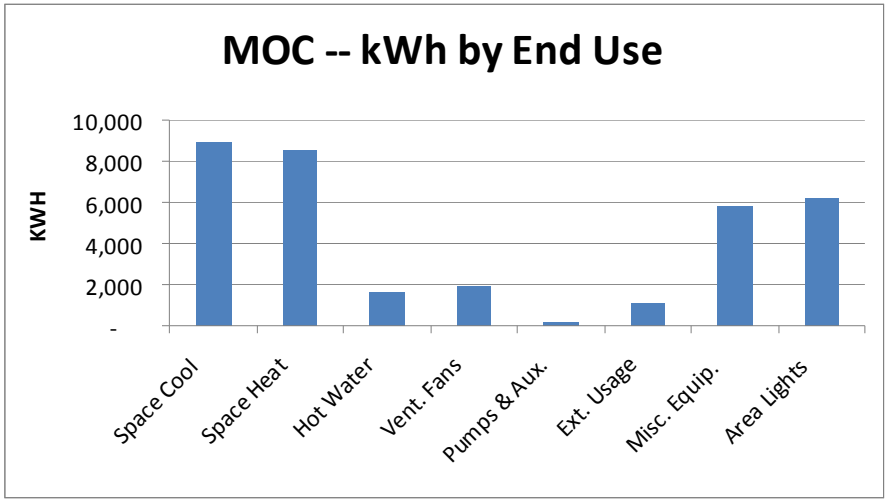


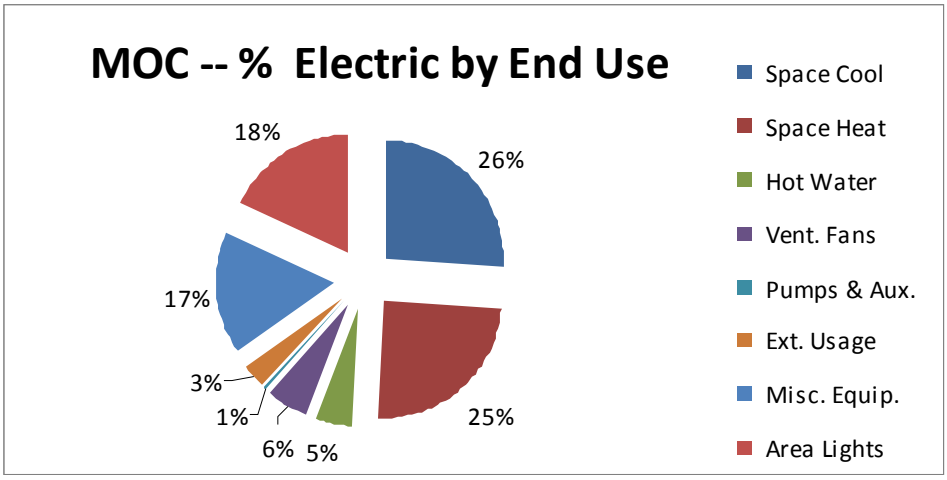




3.7.5. Municipal Operations Center (MOC)

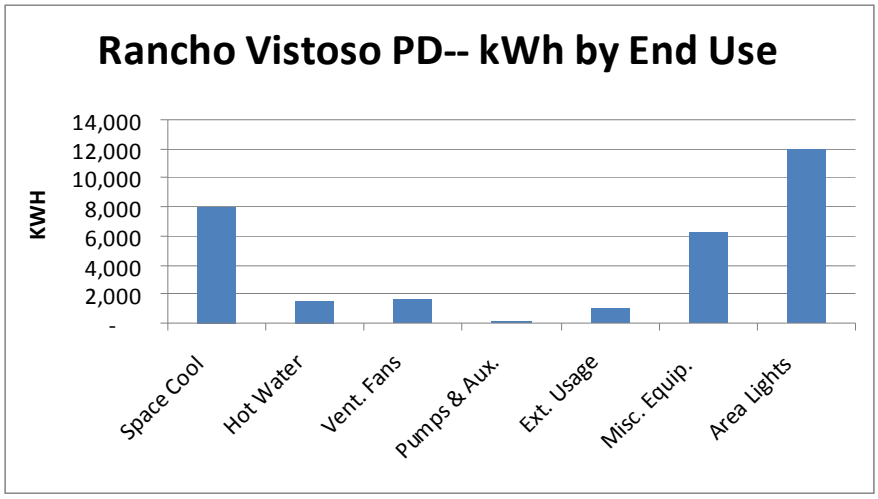
The following charts show the Municipal Operations Center (MOC) breakdown by end use:

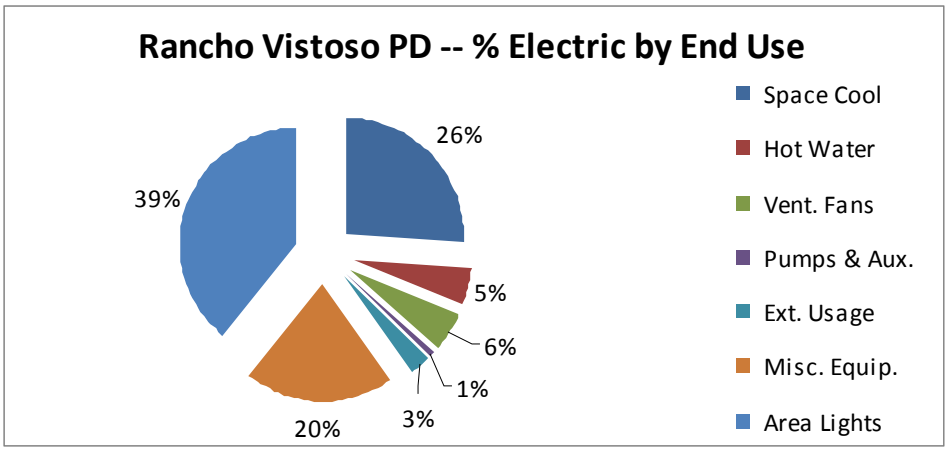




3.7.6. Police – Rancho Vistoso

The following charts show the end use breakdown for the Police Facility on Rancho Vistoso:





3.7.7. Other Facilities

Other facilities not included herein are not broken down due to lack of any available utility data or are included in other separate reports.

4.0 Environmental Benefits

The Town of Oro Valley will realize a carbon footprint reduction by implementing projects that reduce fossil fuel consumption. Electrical generation uses fossil fuel and fossil fuels are also used directly for heating processes. Below is an example of what will be used to document the environmental benefits associated with each building's recommended improvements.

Table 4-0. Environmental Benefits

By reducing your energy use it indirectly lowers energy production at the source. A great deal of the energy, which is consumed your facility(s), is produced by power plants burning fossil fuels. The burning of these fuels contributes to environmental contamination.

According to the United States Environmental Protection Agency, and other groups it can be calculated just how much of the pollutants can be reduced or eliminated based on the amount of energy that is saved. This information differs by area based on sev

Annual kWh saved through project implementation: 1,364,064

Annual therms saved through project implementation: 16,406

Type Of Pollution	Health Effect	Environmental Effect	Reduction / kWh	Reduction / Therm	Pollutants Reduced
Greenhouse Gasses (CO_2)	Can cause respiratory and other health problems, particularly in children and the elderly.	Climate change on a global scale has been attributed to increased emissions of carbon dioxide (CO_2)	1.657 pounds / kWh	12.5 pounds / therm	2,465,329 lbs (CO_2) reduced
Volatile Organic Compounds (VOC)	Ozone (smog) effects, cancer and other serious health problems	Ozone (smog) effects plants life included vegetation damage.	0.000061 pounds / kWh	.0005 pounds / therm	91 lbs (VOC) reduced
Nitrogen Oxides (Nox)	Lung damage, respiratory illness, ozone (smog) effects.	Acid rain also causes buildings, statues and monuments to deteriorate.	0.001523 pounds / kWh	.014 pounds / therm	2,307 lbs (NOx) reduced
Carbon Monoxide (CO)	Reduces ability of blood to bring oxygen to body cells and tissues.	One of the six "criteria pollutants" the US EPA tracks related to power production reduces environmental quality	0.00041 pounds / kWh	.0019 pounds / therm	590 lbs (CO) reduced
Sulfur Dioxide (SO_2)	Respiratory illness, breathing problems, may cause permanent damage to lungs.	Precursor of acid rain, which can damage trees, lakes, and soil; aerosols can reduce visibility.	0.000956 pounds / kWh	.0001 pounds / therm	1,306 lbs (SO_2) reduced
Particulates (PM10)	Eye, nose, and throat irritation; lung damage; bronchitis, cancer, early death	Source of haze which reduced visibility. Ashes, smoke, soot and dust can dirty and discolor structures	0.00002 pounds / kWh	.0004 pounds / therm	34 lbs (PM10) reduced
Mercury (Hg)	Liver, kidney, and brain damage; neurological and development damage	Accumulates in the food chain.	0.003404 milligrams / kWh	0 or negligible pounds / therm	4,643 Mg of (Hg) reduced

Saving 10,000 kWh is equivalent to the CO_2 emissions avoided by taking 1.3 cars off the road for a year, not burning 808 gallons of gas, emissions from .94 of a typical home, sequestered from planting 182 tree seedlings and letting them grow 10 years, or	Removing	258	cars from the road / year
	Or Not Burning	149,057	Gallons of gas / year
	Or saving enough energy to power	184	typical american homes for a year
	Or the annual environmental benefit of this project is equivalent to planting and growing for 10 years	36,895	trees / year
	Or Avoiding the greenhouse gas emmissions by not landfilling	461	tons of waste / year

Sources: www.cleanerandgreener.org
http://www.epa.gov/cleanenergy/energy-resources/calculator.html

Table 4-1. Environmental Impact		
Type of Pollution	Pollutants Reduced	
Carbon Dioxide (CO_2) Eliminated:	**2,465,329**	Pounds (lbs)
Sulfur Dioxide (SO_2) Eliminated:	**1,306**	Pounds (lbs)
Nitric Oxide (NO_x) Eliminated:	**2,307**	Pounds (lbs)

Table 4-2. Reduction Equivalents
Reduction is Equivalent to the...
annual greenhouse gas emissions from **258** passenger cars, *or*
CO_2 emissions from **149,057** gallons of gasoline consumed, *or*
CO_2 emissions from the electricity use of **184** homes for one year, *or*
planting and growing for 10 years **36,895** trees/year, *or*
greenhouse gas emissions avoided by recycling **461** tons of waste instead of sending it to the landfill.

5.0 Technical Report

APS Energy Services is submitting the following Investment Grade Audit of Energy Conservation Measures to TOV. The objective of this report is to identify Energy Conservation Measures that will improve operations and reduce operating and maintenance (O&M) costs through energy saving technologies and practices.

The results of the Audit reveal total electric, gas, operational and maintenance savings opportunities of **$235,485** per year. To achieve these savings, APS Energy Services has identified and recommended a number of Energy Conservation Measures (ECMs).

The recommended Energy Conservation Measures (ECMs) can be found in the following matrix, Table 5-0 ECM Matrix.

Table 5-0. Energy Conservation Measures

Facility	Square Footage	ECM 1 Interior Lighting And Controls	ECM 4 Water Conservation	ECM 6 Solar Water Heating	ECM 7 Rate Analysis	ECM 8 Low E Window Film	ECM 9 Ceiling Fans	ECM 10 Direct Digital Controls	ECM 13 HVAC Zone Control	ECM 14 High Efficiency Packaged Units	ECM 15 Variable Frequency Drives	ECM 17 Demand Controlled Ventilation	ECM 18 Pump/Well Piping Modifications	ECM 19 Premium Efficiency Motor	ECM 20 Data Energy Management	Solar Photovoltaic System
Town of Oro Valley Library	25,000	X	X					X				X		X	X	X
Administration Building	18,722	X	X			X	X	X	X	X					X	X
Oro Valley Water Utility Building	2,192	X	X			X		X		X					X	X
Magistrate Court Building	4,212	X	X			X		X		X					X	X
Development Services Building	10,000	X	X			X	X	X	X						X	X
Oro Valley Police Dept. Main Station	6,875	X	X	X		X		X							X	X
Public Works/Operations & Parks and Recreation	4,000	X	X							X					X	
Public Works Maintenance/Warehouse	780	X	X													
Rancho Vistoso Municipal Operations Center	4,320	X	X												X	
Riverfront Park		X	X													
JDK Park and Pool		X	X	X												
Pump Stations and Well Sites		X			X						X		X	X		
Reclaimed Water Plant		X			X						X				X	

Savings calculations for mechanical projects (HVAC and controls) Energy Conservation Measures are dependent on the schedule and temperature settings of the associated equipment. These settings are determined based on the site survey and interviews with facility personnel.

"Existing Conditions" summarizes the schedules and temperature set points identified during the site survey, while "Proposed Conditions" summarizes the schedules and temperature set points proposed by APS Energy Services. Both existing and proposed schedules and temperature set points have been input to the calculation tools used to determine savings for the HVAC and Energy Management Controls System measures.

Table 4-1. Standards of Operation								
			Existing			Proposed		
ITEM #	BLDG #	Building Name	Average HVAC Schedule	Average Heating Occupied Unoccupied Temperatures	Average Cooling Occupied Unoccupied Temperatures	HVAC Schedule	Heating Occupied Unoccupied Temperatures	Cooling Occupied Unoccupied Temperatures
1	1	Town of Oro Valley Library (AHU-1)	06:00 - 22:00 7 Days/Week	74/60	74/85	08:00 - 18:00 M,W,F,S 10:00 - 23:00 T, Th	68/55	75/85
2	1	Town of Oro Valley Library (AHU-2)	06:45 - 22:00 7 Days/Week	74/60	74/80	08:00 - 18:00 M,W,F,S 10:00 - 23:00 T, Th	68/55	75/85
3	2	Administration Building (Manual Thermostats)	24/7	71/71	71/71	07:00 - 18:00 M-F	68/55	75/85
4	2	Administration Building (Programmable)	07:00 - 18:00 M-F	71/67	75/81	07:00 - 18:00 M-F	68/55	75/85
5	3	Oro Valley Water Utility Building	24/7	75/75	75/75	07:00 - 18:00 M-F	68/55	75/85
6	4	Magistrate Court Building	06:00 - 19:00 7 Days/Week	72/69	75/77	07:00 - 1800 M-F	68/55	75/85
7	5	Development Services Building	24/7	73/73	73/73	07:00 - 1800 M-F	68/55	75/85
8	6	Oro Valley Police Dept. Main Station	24/7	74/74	75/75	24/7	68/68	75/75

Note

1 Libray and Police Station are average of all VAV zones from DDC systems.

2 All programmable thermostats located at MOC were found to be in the occupied hold position.

3 Six of seven thermostats located in Development Services are manual Thermostats.

4 Rancho Visoto Police Station programmable thermostat was behind locked cover, could not read program.

5 The Public Works/Operations & Parks and Recreation programmable thermostat did not respond to program commands.

Savings calculations for the lighting measure are dependent upon the operating hours of the lighting systems.

Table 5-2. Lighting Hours of Operation

Hour Code	Area Description	Existing Weekly Winter On-Peak Hours	Existing Weekly Winter Off-Peak Hours	Existing Weekly Summer On-Peak Hours	Existing Weekly Summer Off-Peak Hours	Total Existing Annual Hours of Operation	Total Projected Annual Hours of Operation
CELL	Jail Cells	40	86	40	86	6,577	6577
CF	Conf. Room	20	6	20	6	1,344	1344
CF-OS	Conf. Room, add new sensor	20	6	20	6	1,344	854
C-OS	Classrooms- add new sensor	30	10	30	10	2,088	1670
G-OS	Gyms, add new sensor	40	34	40	34	3,863	2588
H	Halls & common areas	40	57	40	57	5,074	5074
H-OS	Hallways, add new sensor	40	57	40	57	5,074	2604
L	Cafeteria	30	10	30	10	2,088	2088
L-OS	Cafeteria, add new sensor	30	10	30	10	2,088	1399
M	Maintenance Areas	40	34	40	34	3,863	3863
O	Offices	30	10	30	10	2,088	2088
OO	Open Office	40	27	40	28	3,515	3515
OO-OS	Open Offices, add new sensor	40	27	40	28	3,515	1977
O-OS	Offices, add new sensor	30	10	30	10	2,088	1121
O-PD	Offices Police Department	40	27	40	28	3,515	3515
O-PD-OS	Offices Police Department, add new sensor	40	27	40	28	3,515	1898
PD	Police Station La Canada	40	103.75	40	103.51	7,500	7500
PDO-OS	Police Station La Canada-Offices, add new sensors	40	103.75	40	103.51	7,500	4125
PDRR-OS	Police Station La Canada-Restrooms, add new sensors	40	103.75	40	103.51	7,500	1875
RR	Restrooms	32	20	33	20	2,738	2738
RR-OS	Restrooms, add new sensor	32	20	33	20	2,738	673
S	Storage Areas	5	5	5	5	522	522
VEND	Vending Machine, add new sensor	40	128	40	128	8,760	4818
W	Warehouse	40	34	40	34	3,863	3863
X	Outside Areas	0	84	0	84	4,385	4385
Z	24 Hour Areas	40	128	40	128	8,760	8760