CONSULTANT REPORT

LAKE TAHOE UNIFIED SCHOOL DISTRICT

South Tahoe High School*
South Lake Tahoe Middle School*
Tahoe Valley Elementary School

*portions of school were audited

Prepared for: California Energy Commission
Prepared by: Digital Energy, Inc.

.

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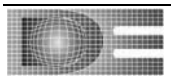
PREFACE

This study was prepared as a result of the Lake Tahoe Unified School District's request for assistance under the Bright Schools Program. This California Energy Commission program assists K through 12 schools in identifying measures that can cut energy use and cost in existing and planned facilities while concurrently enhancing building performance. Once the measures are identified, the program can provide additional assistance to help implement or finance the recommendations. The Commission's low interest loans provide competitive financing and are structured so that the estimated measure savings are the basis for the loan repayments. In addition, under Proposition 39, the California Clean Energy Jobs Act, local educational agencies can request money from the California Department of Education to fund identified energy efficiency measures.

This study was conducted for the Commission by Digital Energy, Inc., under the direction of Jairam Agaram, P.E. The contract assignment was directed and managed with the assistance of Monica Rudman, project manager for the Commission. Digital Energy, Inc. and the Commission appreciate the assistance offered by all Lake Tahoe Unified District personnel during the study.



ABSTRACT

This report presents the results of an energy audit that was conducted in April 2015 for the Lake Tahoe Unified School District under the Bright Schools Program. The audits include several district facilities: South Tahoe High School, South Lake Tahoe Middle School, and Tahoe Valley Elementary School. This report discusses the results of the energy audit and provides information on the next steps for project implementation.

The scope of work focused on energy efficiency measures associated with HVAC systems and controls, lighting systems and controls, solar photovoltaic systems and building envelope and fenestration to reduce energy costs and associated GHG emissions at these facilities. After performing a full day survey at the district facilities, savings calculations were developed using Excel spreadsheets.

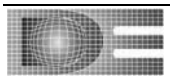
The recommended measures include:

- Re-lamping T8s to lower LED lamps;
- Installing occupancy sensors in various spaces;
- Installation of photocell adapter;
- Retrofitting high pressure sodium fixtures with LED;
- Implementation of Title 24 mandated exterior fixtures controls;
- Demand control ventilation;
- Implementation of occupancy based HVAC controls;
- Installing network thermostats;
- Implementation of snow melt controls;
- Installation of natural gas booster heater;
- Implementation of automatic door closers for walk in freezers and refrigerators;
- Installing electronically commutated fan motors; installing pre rinse spray valves;
- Installing anti-sweat heater controls;
- Retrofitting refrigerators with high efficiency refrigerators;
- Installing premium efficiency motors;
- Implementation of window films and weather stripping.

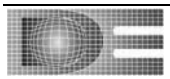
The savings to investment ratio for the recommended measures is 1.54 and simple payback is 9.8 years.

Other high capital measures were analyzed, but were not recommended due to the low savings to investment ratio. These measures include:

- Converting single pane to dual pane windows throughout;
- Installing new efficient condensing boilers;
- Installing solar panels for electricity generation;
- Installing combined heat and power generation system;



- Retrofitting existing high ballast factor electronic ballast linear fluorescent fixtures and T12 linear fluorescent fixtures with low ballast factor electronic ballasts and 28 watt linear fluorescent lamps; and
- Implementing the Title 24 mandated (associated with fixture retrofit) comprehensive smart interior lighting controls solutions.



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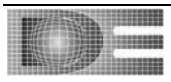

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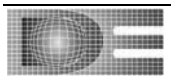


Executive Summary

A. Focus and Scope of the Audit

During April 2015, an energy audit was conducted for the Lake Tahoe Unified School District (District) under the Bright Schools Program. The detailed audit focused on identifying energy saving retrofit measures at the following facilities: South Tahoe High School, South Lake Tahoe Middle School, and Tahoe Valley Elementary School. This report presents the results of the energy audit and provides information on the next steps for measure implementation.

B. Annual Energy Use and Cost

During a recent 12 month period, the combined audited facilities used 1,259,350 kWh (6.83 kWh/square foot) of electricity and 281,679 therms (1.53 therms/square foot) of natural gas. During this period, the district spent $168,778 for electricity and $263,201 for natural gas. Cost of electricity and natural gas during this period averaged $0.134/kWh and $0.934/therm, respectively. Based on a combined audited facility area of 184,371 square feet and combined energy cost of $431,979 the average energy cost at the three facilities is $2.34/square foot per year. The site's energy use intensity (EUI) of 226.0 kBtu/square foot is much higher than the nationwide average EUI of 58.2 kBtu/square foot.[1]

C. Measure Recommendations

The report identifies several measures that can reduce the district's overall energy use and cost. If implemented, these measures can cut overall energy cost by 17.7 percent or an estimated $76,516 per year. These measures would require an investment of about $792,958 and could qualify for utility incentives of $46,290, resulting in net simple payback of 9.8 years which is a SIR of 1.54. **Table E.1** details the measure recommendations.[2] Included are measures which address specific items of interest such as re-lamping T8s to lower LED lamps; installing occupancy sensors in various spaces; installation of photocell adapter; retrofitting high pressure sodium fixtures with LED; implementation of Title 24 mandated exterior fixtures controls; demand control ventilation; implementation of occupancy based HVAC controls; installing network thermostats, implementation of snow melt controls; installation of natural gas booster heater; implementation of automatic door closers for walk in freezers and refrigerators; installing electronically commutated fan motors; installing pre rinse spray valves; installing anti-sweat heater controls; retrofitting refrigerators with high efficiency refrigerators; installing premium efficiency motors; and implementation of window films and weather stripping. **Table E.2** details measures that were evaluated but are only recommended as part of future

1. Nation-wide average, for K through 12 schools, according to Energy Star Portfolio Manager's technical reference on EUI by facility type. See : https://portfoliomanager.energystar.gov/pdf/reference/US%20National%20Median%20Table.pdf

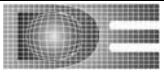
2. Projects are broken down by facility in **Tables E.3** through **E.5**.

modernization efforts due to their long payback periods. Detailed information on these and all other measures is contained in Section 4. Section 5 provides information on how some or all of these measures can be funded with a low interest loan from the Energy Commission and incentive offers from utility provider.

D. Greenhouse Gas Reduction

Greenhouse gas emissions are those greenhouse gases that allow sunlight to enter the atmosphere freely and contribute to the greenhouse effect, which many believe is the cause of global warming. One of the primary greenhouse gases thought to be a major contributor to global warming is carbon dioxide emissions (CO_2). Approximately 0.69 lbs. of CO_2 (greenhouse gas) are released in the production of 1 kilowatt (kWh) of electricity.[3] Also, about 11.7 pounds of CO_2 are released for each therm of natural gas consumed. Based on these indices, a total of 834,028 pounds of CO_2 greenhouse gas emissions can be saved if all recommended measures proposed in this study are implemented. This is equivalent to removing 80 passenger cars from the road for one year.

1. Source: http://www.epa.gov/cleanenergy/energy-resources/calculator.html.



Measure Summary Tables (District wide Totals)

Table E.1 Recommended Energy Efficiency Measures (EEMs)

Measure #	Measure Description	Peak Demand Savings (kW)	Annual Electricity Savings (kWh)	Annual Gas Savings (Therms)	Annual CO2 Savings / Mitigation (Pounds)	Measure Cost Estimate ($)	Annual Cost Savings ($)	Payback Period without Incentive (years)	Estimated Incentive ($)	Measure Costs w/ Incentive ($)	Payback Period with Incentive (years)	Saving to Investment Ratio (SIR)
L-1	Replacing 32-Watt fluorescentT8 lamps with 19-Watt LED lamps	57.1	96,035	0	66,264	$278,440	$10,801	25.8	$23,427	$255,013	23.6	0.25
L-2	Install Occupancy Sensors for Interior Lighting Controls	0.0	36,844	0	25,422	$71,944	$2,938	24.5	$7,890	$64,054	21.8	0.52
L-3	Photocell Adapter	0.0	1,266	0	873	$514	$96	5.3	$63	$451	4.7	0.94
L-4A	Replace 150 Watt HPS with 66-Watt LEDs	4.6	18,564	0	12,809	$30,305	$2,052	14.8	$956	$29,349	14.3	1.24
L-4B	Install Exterior Smart Controls	0.0	4,933	0	3,404	$3,133	$413	7.6	$247	$2,886	7.0	1.27
M-1	Demand Controlled Ventilation	0.0	0	4,755	55,633	$32,172	$4,195	7.7	$1,161	$31,011	7.4	1.49
M-2	Occupancy Sensor Controls	0.0	43,254	11,242	161,372	$65,757	$13,195	5.0	$2,163	$63,594	4.8	3.18
M-3	Networked Thermostats	0.0	4,620	401	7,881	$18,492	$901	20.5	$231	$18,261	20.3	0.71
M-5	Snow Melt Controls	0	6,998	17,321	207,479	$108,873	$14,820	7.3	$350	$108,523	7.3	2.17
K-1	Natural gas booster heaters	0.0	13,500	542	15,657	$44,504	$1,162	38.3	$675	$43,829	37.7	0.80
K-2	Automatic door closers on walk-in freezers and refrigerators	0	482	0	333	$861	$37	23.5	$24	$837	22.8	0.25
K-3	Electronically commutated fan motors	0.0	10,497	0	7,243	$10,884	$800	13.6	$525	$10,359	13.0	1.35
K-4	Pre-rinse spray valve	0.0	0	1,096	12,828	$1,265	$979	1.3	$0	$1,265	1.3	4.41
K-5	Anti-Sweat Heater (ASH) Controls	0.0	20,150	0	13,904	$11,391	$1,535	7.4	$1,008	$10,383	6.8	0.67
K-6	High-Efficiency Refrigerators	0.0	1,865	0	1,287	$3,500	$167	21.0	$0	$3,500	21.0	0.75
E-1	Premium Efficiency Motors	0.0	1,487	0	1,026	$5,616	$161	34.9	$1,645	$3,971	24.7	0.94
ENV-1	Window films and weatherstripping	0.0	67,248	16,599	240,614	$105,308	$22,263	4.7	$5,926	$99,382	4.5	4.45
Total (All Recommended Measures):		**61.7**	**327,742**	**51,956**	**834,028**	**$792,958**	**$76,516**	**10.4**	**$46,290**	**$746,668**	**9.8**	**1.54**

Table E.2 EEMs Recommended During Future Modernization (Long Payback Periods)

Measure #	Measure Description	Peak Demand Savings (kW)	Annual Electricity Savings (kWh)	Annual Gas Savings (Therms)	Annual CO2 Savings / Mitigation (Pounds)	Measure Cost Estimate ($)	Annual Cost Savings ($)	Payback Period without Incentive (years)	Estimated Incentive ($)	Measure Costs w/ Incentive ($)	Payback Period with Incentive (years)	Saving to Investment Ratio (SIR)
L-5A	LED Retrofit of fluorescent T8 fixtures with new LED fixtures	65.5	112,965	0	77,946	$799,473	$12,518	63.9	$14,752	$784,721	62.7	0.48
L-5B	Comprehensive smart controls for Interior Lighting as per mandated Title 24 Standards	0.0	77,854	0	53,720	$654,392	$6,571	99.6	$3,893	$650,500	99.0	0.22
M-4	New Condensing Boilers	0.0	0	5,850	68,448	$391,799	$5,143	76.2	$7,625	$384,174	74.7	0.56
ENV-2	New dual pane, low emmissivity windows	0.0	32,278	9,338	131,532	$1,797,621	$10,908	164.8	$1,614	$1,796,007	164.7	0.42
PV-1	Install Solar Panels	183.9	293,374	0	202,428	$864,035	$23,431	36.9	$0	$864,035	36.9	0.26
CHP-1	Clean combined heat and power generation	75.0	473,040	20,121	561,809	$267,608	$2,313	115.7	$0	$267,608	115.7	-0.19
Total (All Recommended Measures):		**324.4**	**989,511**	**35,309**	**1,095,881**	**$4,774,928**	**$60,885**	**78.4**	**$27,883**	**$4,747,045**	**78.0**	**0.34**

Measure Summary Tables (By Facility)

Table E.3 Recommended EEMs – South Lake Tahoe High School

Measure #	Measure Description	Peak Demand Savings (kW)	Annual Electricity Savings (kWh)	Annual Gas Savings (Therms)	Annual CO2 Savings / Mitigation (Pounds)	Measure Cost Estimate ($)	Annual Cost Savings ($)	Payback Period without Incentive (years)	Estimated Incentive ($)	Measure Costs w/ Incentive ($)	Payback Period with Incentive (years)	Saving to Investment Ratio (SIR)
L-1	Replacing 32-Watt T8 lamps with 19-Watt LEDs	24.1	42,845	0	29,563	$122,047	$4,542	26.9	$10,269	$111,778	24.6	0.25
L-2	Install Occupancy Sensors for Interior Lighting Controls	0.0	16,891	0.0	11,655	$30,290	$1,284	23.6	$3,390	$26,900	21.0	0.54
L-4A	Replace 150 Watt HPS with 66-Watt LEDs	3.6	14,920	0	10,295	$21,030	$1,582	13.3	$746	$20,284	12.8	1.36
L-4B	Install Exterior Smart Controls	0.0	3,776	0	2,606	$2,014	$287	7.0	$189	$1,825	6.4	2.50
M-1	Demand Controlled Ventilation	0.0	0.0	1,479	17,307	$9,856	$1,220	8.1	$361	$9,494	7.8	1.42
M-2	Occupancy Sensor Controls	0.0	19,447	5,329	75,766	$29,745	$5,874	5.1	$972	$28,772	4.9	3.13
M-5	Snow Melt Controls	0.0	6,998	17,321	207,479	$108,873	$14,820	7.3	$350	$108,523	7.3	2.17
K-1	Natural gas booster heaters	0.0	2,700	108	3,131	$14,835	$205	72.3	$135	$14,700	71.6	0.57
K-2	Automatic door closers on walk-in freezers and refrigerators	0.0	482	-	333	$861	$37	23.5	$24	$837	22.8	0.25
K-3	Electronically commutated fan motors	0.0	5,079	0	3,505	$5,971	$386	15.5	$254	$5,718	14.8	1.21
K-4	Pre-rinse spray valve	0.0	0	548	6,414	$633	$452	1.4	$0	$633	1.4	4.31
K-5	Anti-Sweat Heater (ASH) Controls	0.0	9,653	-	6,660	$6,249	$734	8.5	$483	$5,767	7.9	0.59
K-6	High-Efficiency Refrigerators	0.0	851	-	587	$1,750	$65	27.1	$0	$1,750	27.1	0.63
ENV-1	Window films and weatherstripping	0.0	31,972	9,265	130,458	$26,045	$10,073	2.6	$970	$25,074	2.5	7.70
Total (All Recommended Measures):		**27.7**	**155,614**	**34,050**	**505,759**	**$380,197**	**$41,560**	**9.1**	**$18,143**	**$362,054**	**8.7**	**1.71**

Table E.4 Recommended EEMs – South Lake Tahoe Middle School

Measure #	Measure Description	Peak Demand Savings (kW)	Annual Electricity Savings (kWh)	Annual Gas Savings (Therms)	Annual CO2 Savings / Mitigation (Pounds)	Measure Cost Estimate ($)	Annual Cost Savings ($)	Payback Period without Incentive (years)	Estimated Incentive ($)	Measure Costs w/ Incentive ($)	Payback Period with Incentive (years)	Saving to Investment Ratio (SIR)
L-1	Replacing 32-Watt T8 lamps with 19-Watt LEDs	17.6	28,661	0	19,776	$84,176	$3,095	27.2	$7,082	$77,094	24.9	0.24
L-2	Install Occupancy Sensors for Interior Lighting Controls	0.0	15,768	0	10,880	$29,508	$1,198	24.6	$3,120	$26,388	22.0	0.52
L-3	Photocell Adapter	0.0	1,266	0	873	$514	$96	5.3	$63	$451	4.7	1.84
M-1	Demand Controlled Ventilation	0.0	0	1,740	20,361	$9,147	$1,500	6.1	$425	$8,722	5.8	1.84
M-2	Occupancy Sensor Controls	0.0	14,014	4,219	59,029	$19,724	$4,705	4.2	$701	$19,023	4.0	3.75
M-3	Networked Thermostats	--	2,215	239	4,321	$9,035	$445	20.3	$111	$8,925	20.1	0.72
K-1	Natural gas booster heaters	0.0	5,400	217	6,263	$14,835	$412	36.0	$270	$14,565	35.3	0.83
K-3	Electronically commutated fan motors	0.0	5,418	0	3,738	$4,913	$414	11.9	$271	$4,642	11.2	1.52
K-5	Anti-Sweat Heater (ASH) Controls	0.0	10,498	0	7,243	$5,141	$801	6.4	$525	$4,616	5.8	0.78
E-1	Premium Efficiency Motors	0.0	1,487	0	1,026	$5,616	$161	34.9	$1,645	$3,971	24.7	0.94
ENV-1	Window films and weatherstripping	0.0	21,154	7,335	100,412	$54,531	$7,936	6.9	$3,389	$51,142	6.4	3.19
Total (All Recommended Measures):		**17.6**	**105,880**	**13,749**	**233,922**	**$237,140**	**$20,764**	**11.4**	**$17,602**	**$219,538**	**10.6**	**1.47**

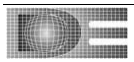
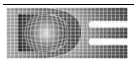


Table E.5 Recommended EEMs – Tahoe Valley Elementary School

Measure #	Measure Description	Peak Demand Savings (kW)	Annual Electricity Savings (kWh)	Annual Gas Savings (Therms)	Annual CO2 Savings / Mitigation (Pounds)	Measure Cost Estimate ($)	Annual Cost Savings ($)	Payback Period without Incentive (years)	Estimated Incentive ($)	Measure Costs w/ Incentive ($)	Payback Period with Incentive (years)	Saving to Investment Ratio (SIR)
L-1	Replacing 32-Watt T8 lamps with 19-Watt LED lamps	15.4	24,529	0	16,925	$72,217	$3,164	22.8	$6,076	$66,141	20.9	0.27
L-2	Install Occupancy Sensors for Interior Lighting Controls	0.0	4,185	0	2,888	$12,146	$456	26.6	$1,380	$10,766	23.6	0.50
L-4A	Replace 150 Watt HPS with 66-Watt LED fixtures	1.0	3,644	0	2,514	$9,275	$470	19.7	$210	$9,065	19.3	0.98
L-4B	Install Exterior Smart Controls	0.0	1,156	0	798	$1,119	$126	8.9	$58	$1,061	8.4	1.94
M-1	Demand Controlled Ventilation	0.0	0.0	1,536	17,965	$13,169	$1,475	8.9	$375	$12,794	8.7	1.29
M-2	Occupancy Sensor Controls	0.0	9,793	1,694	26,577	$16,288	$2,616	6.2	$490	$15,799	6.0	2.59
M-3	Networked Thermostats	--	2,405	162	3,560	$9,456	$456	20.7	$120	$9,336	20.5	0.71
K-1	Natural gas booster heaters	0.0	5,400	217	6,263	$14,835	$545	27.2	$270	$14,565	26.7	1.00
K-4	Pre-rinse spray valve	0.0	0	548	6,414	$633	$527	1.2	$0	$633	1.2	4.50
K-6	High-Efficiency Refrigerators	0.0	1,014	-	700	$1,750	$102	17.1	$0	$1,750	17.1	0.87
ENV-1	Window films and weatherstripping	0.0	14,122	0	9,744	$24,733	$4,255	5.8	$1,567	$23,166	5.4	3.71
Total (All Recommended Measures):		**16.4**	**66,248**	**4,157**	**94,347**	**$175,621**	**$14,192**	**12.4**	**$10,545**	**$165,075**	**11.6**	**1.23**

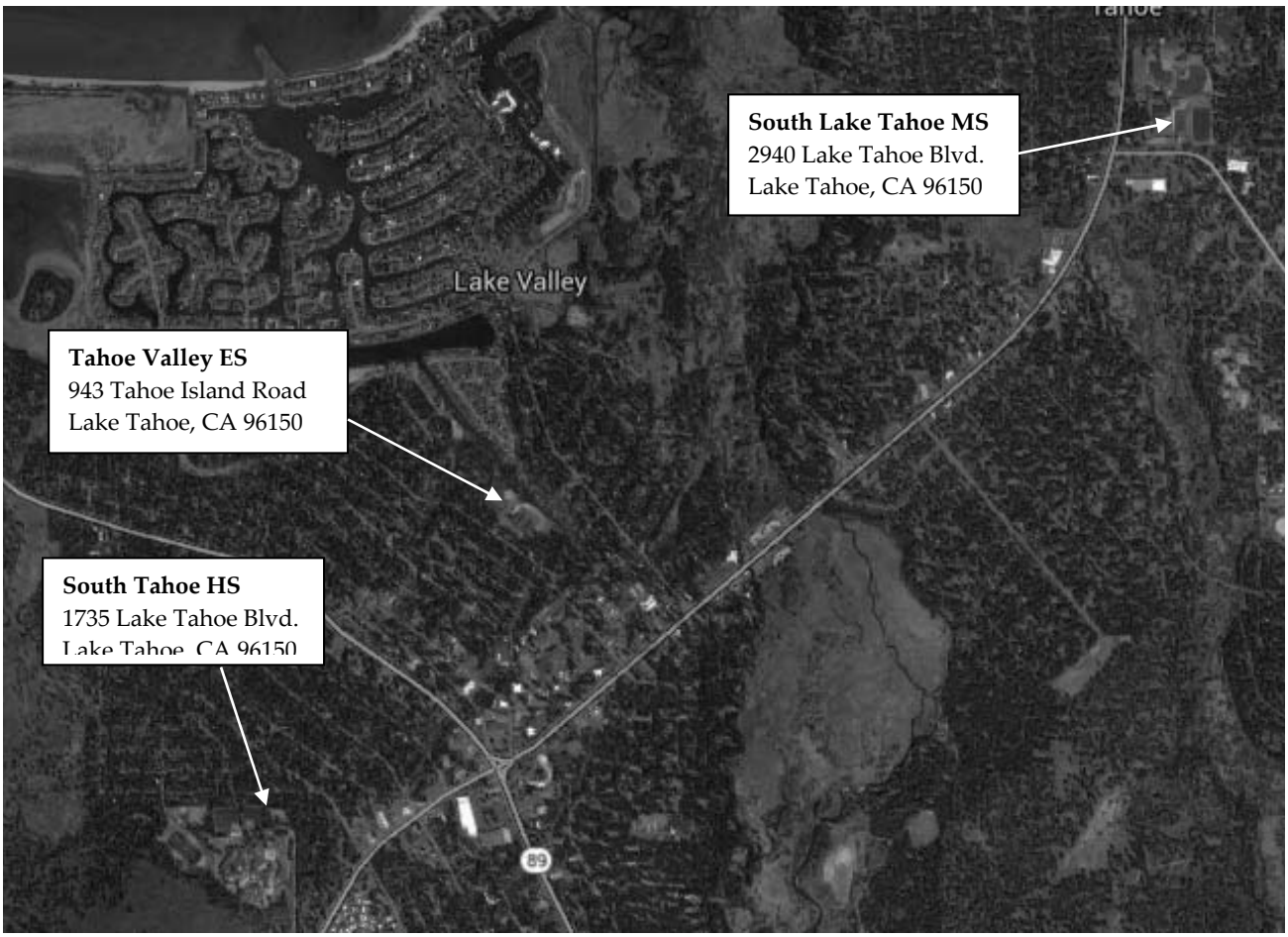


1 Facility Description

1.1 Background

The Lake Tahoe Unified School District is located in El Dorado County, California. The District provides services to approximately 3,050 students in eight schools. This study specifically focuses on three of those schools: (1) portions of South Tahoe High School (HS) (2) portions of South Lake Tahoe Middle School (MS), and (3) Tahoe Valley Elementary School (ES). These schools serve about 2,300 students. **Figure 1.1** is a map of the audited facilities.

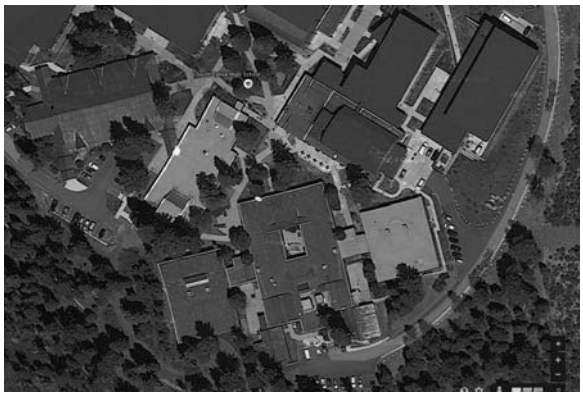
Figure 1.1 General vicinity map of subject District facilities



1.2 Site Description

South Tahoe High School (HS)

South Tahoe HS serves all Lake Tahoe USD students in grades 9 through 12, with an enrollment of 1,001. The HS was built starting in 1966 with additions over the years. The school has a total area of 200,000 sq. ft., but only a portion of the school containing 73,170 sq. ft. is included in this audit. The audited facilities consist of:

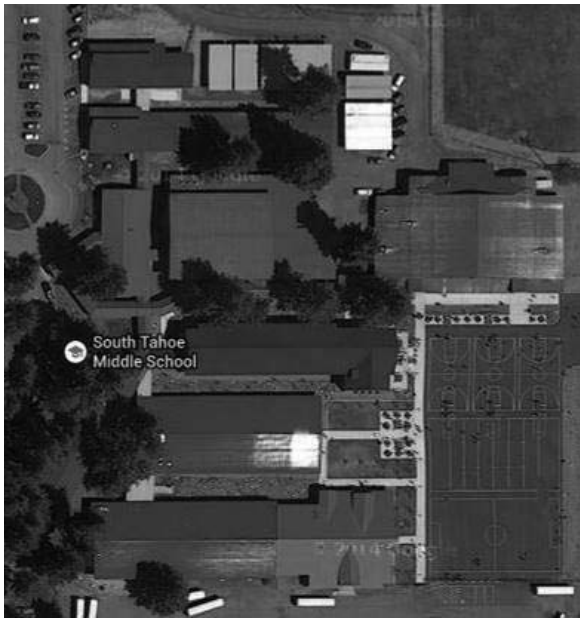


- Buildings A, B, and C are classrooms built in 1966, connected by enclosed stairways.
- Main Office (MO) contains administrative offices and the library.
- Science and Technology (ST) contains science and technology classrooms.

All of the audited areas are one story buildings. Buildings A, B, and C have interior hallways, while ST has a central workroom connected to the classrooms, with a covered walkway on the outside of the classrooms.

South Lake Tahoe Middle School (MS)

South Lake Tahoe MS serves students in grades 6 through 8, with an enrollment of 820. The MS was built in 1954 with several additions and renovations since then. The school has an area of 120,000 sq. ft., but only 67,827 sq. ft. is included in this audit. The audited areas consist of:



- Buildings Angora, Rubicon, and Freel are classrooms and mostly built in 1954 are connected by enclosed breezeways. Portions of Angora were recently remodeled with new windows and lighting, and Rubicon was extended.
- Office area adjoins the main breezeway and has been recently remodeled.
- Gym has locker and activity rooms.
- Kitchen (included in audit) is attached to the multi-purpose room (not included).
- Eight portable (relocatable) classrooms are owned by the district.

All the audited areas are one story buildings. Rubicon has a central hallway while Angora has an enclosed breezeway on one side. The Gym is

connected to the central breezeway on the west, and has a covered walkway on its south side. The portable classrooms have no covered walkway.

Tahoe Valley Elementary School (ES)

Tahoe Valley ES serves students in grades K through 5, with an enrollment of 458. It was built in 1958, and most areas are original construction with modernization and remodels over the years. The school has a total area of 43,374 sq. ft. and all of the permanent and portable (relocatable) buildings are included in this audit. The school consists of:

- Wings A and B are classrooms with wing A being larger for kindergarten classrooms.
- Multi-purpose room, kitchen, and library occupy a third wing.
- Central breezeway connects all three wings.
- Office area adjoins central breezeway.
- Pump room is small free-standing building used for storage (pump is no longer used).
- Nine portables classrooms are owned by the district.

All the school buildings are one story.

1.3 Operating Schedules

All schools operate on a traditional academic calendar (**Appendix F**). The first day of school is in the last week of August and the last day is in mid-June. Total school days in a year are 180, with breaks for Thanksgiving, winter holidays, President's holiday, spring break, plus snow days.

Table 1.1 summarizes the bell schedules for each school. Note that building operating hours are not necessarily representative of actual room usage. Usage hours by space type are presented in **Appendix F**.

Table 1.1 Facility Bell Schedules

Facility	Operating Schedule [1]	School Days per Year [2]
South Tahoe HS	7:05 a.m. to 2:40 p.m.	180
South Lake Tahoe MS	7:45 a.m. to 3:10 p.m.	180
Tahoe Valley ES	9:10 a.m. to 3:20 p.m.	180

1.4 Local Weather Statistics

Weather data statistics for Lake Tahoe, California, indicate that the region has 25 annual cooling degree days and 7,936 annual heating degree days, with respect to a base temperature of 65 °F

Extremes recorded at the weather station show that temperatures have reached as high as 94 °F in the summer and as low as -16 °F in the winter. The average maximum temperature is 69.8 °F, and the average minimum temperature in January is 19.1 °F

More weather statistics for the region are shown in Appendix D [3]

1. Representative of bell schedules. Note that additional hours before and after are probable for teachers and administrative staff.

2. Data gathered from the District's 2014-2015 Work Calendars (see Appendix F).

3. Cooling Degree Day units are computed as the difference between the daily average temperature and the base temperature. (Daily Avg. Temp. - Base Temp.) One unit is accumulated for each degree Fahrenheit the average temperature is above the base temperature. Negative numbers are discarded. Example: If the day's high temperature was 95 and the low temperature was 51, the base 60 heating degree day units is ((95 + 51) / 2) - 60 = 13. This is done for each day of the month and summed. Heating Degree Day units are computed as the difference between the base temperature and the daily average temperature. (Base Temp. - Daily Avg. Temp.) One unit is accumulated for each degree Fahrenheit the average temperature is below the base temperature. Negative numbers are discarded. Example: If the day's high temperature was 65 and the low temperature was 31, the base 50 heating degree day units is 50 - ((65 + 31) / 2) = 2. This is done for each day of the month and summed.

2 Existing Energy Use

2.1 Site Energy Usage

Energy records for the district show that during a recent 12 month period (May 2014 through April 2015) the three schools used 1,259,350 kWh of electricity and 281,679 therms of natural gas. Cost of electricity and natural gas during this period averaged $0.134 per kWh and $0.934 per therm, respectively. The combined energy cost of $431,979 is equivalent to a unit cost index of $2.34 per sq. ft. Electricity and natural gas are purchased from Liberty Utilities and Southwest Gas Company, respectively. Existing electricity rate schedules include A1, A2, and A3 with Time-of-Use (TOU) and non-TOU options. The overall energy costs and usage are summarized below in **Tables 2.1** and **2. 2**. Refer to **Appendix A** for detailed historical energy use data.

Table 2.1 Electricity Use Summary: Entire Schools

School	GSF	Rate Schedule	Electricity (kWh)	Cost ($)	kWh/ GSF	$/GSF	Site kBtu/GSF	Rate ($/kWh)
South Lake Tahoe HS	73,170	A1/A3	553,079	$74,840	7.56	$1.023	81.0	$0.135
South Lake Tahoe MS	67,827	A1/A3	408,612	$53,095	6.02	$0.783	64.6	$0.130
Tahoe Valley ES	43,374	A1/A2	297,659	$40,842	6.86	$0.942	73.5	$0.137
Total	**184,371**	**-**	**1,259,350**	**$168,778**	**6.83**	**$0.915**	**73.2**	**$0.134**

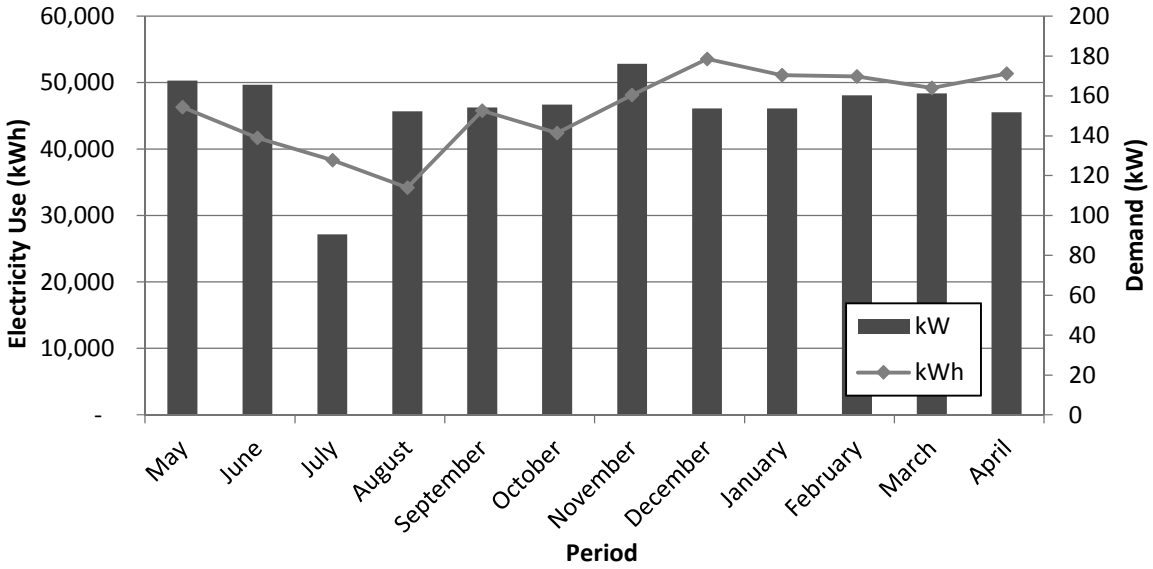
Table 2.2 Natural Gas Use Summary: Entire Schools

School	GSF	Rate Schedule	Natural Gas (Therms)	Cost ($)	Therm/ GSF	$/GSF	Site kBtu/GSF	Rate ($/Therm)
South Lake Tahoe HS	73,170	SLT-40	208,092	$191,659	2.84	$2.619	284.4	$0.921
South Lake Tahoe MS	67,827	SLT-40	55,964	$53,119	0.83	$0.783	82.51	$0.949
Tahoe Valley ES	43,374	SLT-40	17,623	$18,423	0.41	$0.425	40.63	$1.045
Total	**184,371**	**-**	**281,679**	**$263,201**	**1.53**	**$1.428**	**152.78**	**$0.934**

2.2 Energy Use Patterns

Figures 2.1A, **2.1B**, and **2.1C** illustrate the seasonal variation in the use of electricity for South Tahoe HS, South Lake Tahoe MS, and Tahoe Valley ES. **Figures 2.2A**, **2.2B**, and **2.2C** illustrate the seasonal variation in the use of natural gas for the facilities. Notes are provided on observations made.

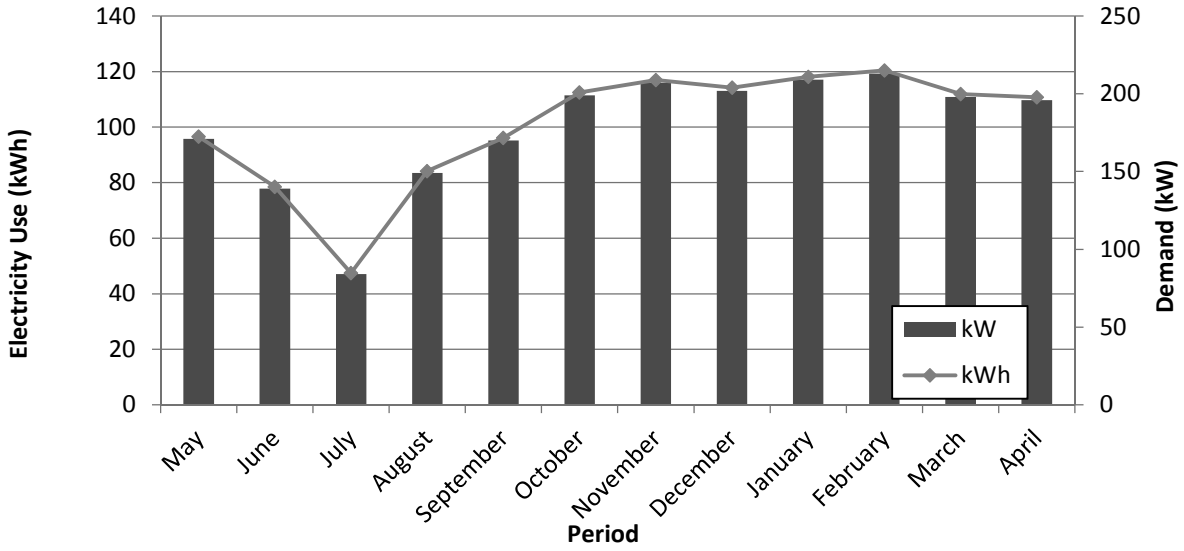
Figure 2.1A South Lake Tahoe High School Electricity Use



Trends and Observations

- Electricity use drops slightly in the summer when school is not in session; however, usage is still significant. This indicates that ventilation, lighting, and other equipment may be operating unnecessarily in summer.
- Usage peaks in December when it is the coldest and a higher use of space heaters.
- Usage spikes in August when normal school activities resume.

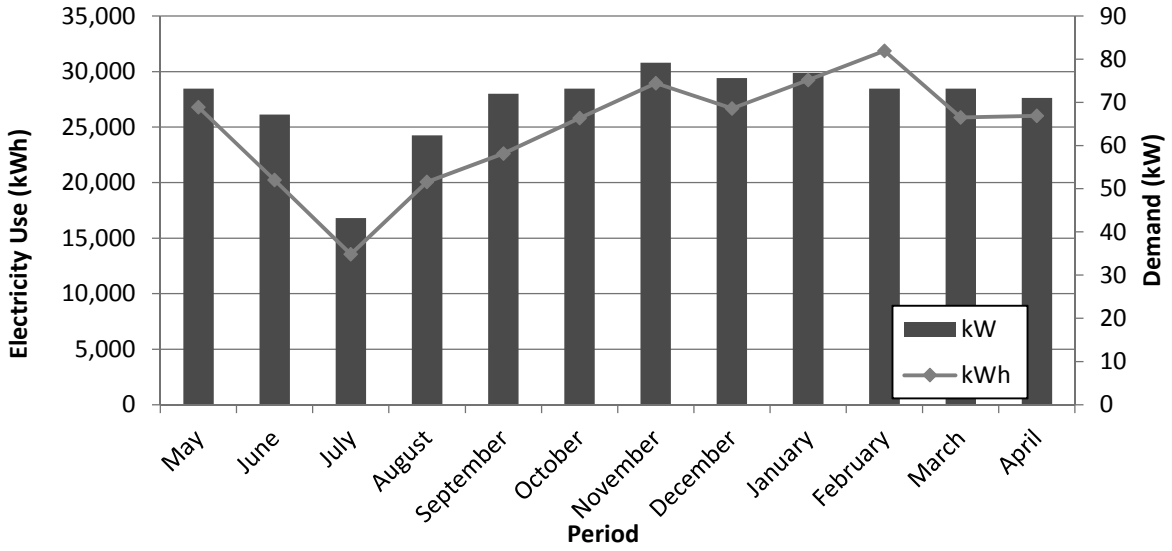
Figure 2.1B South Lake Tahoe MS Electricity Use



Trends and Observations

- Electricity use dips in July when school is not in session; however, usage is still significant. This indicates that ventilation, lighting, and other equipment may be operating unnecessarily in summer.
- Spike in August signifies start of school operations.
- Usage peaks in winter months and early spring when it is the coldest and a higher use of space heaters.

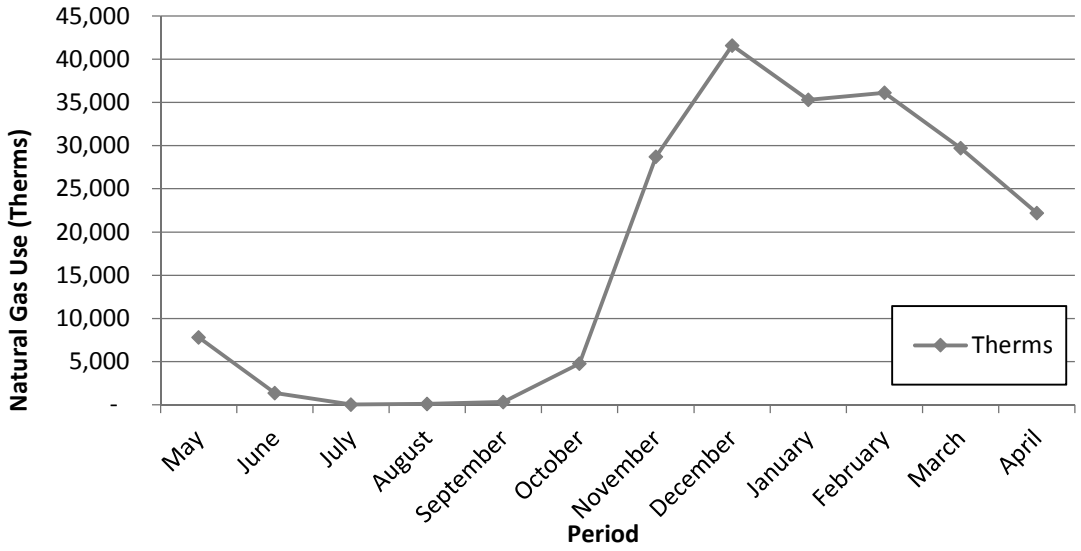
Figure 2.1C Tahoe Valley ES Electricity Use



Trends and Observations

- Electricity use dips in July when school is not in session; however, usage is still significant. Further investigation into understanding the exact source(s) of this usage may be warranted.
- Electricity use spikes in August when school begins normal operations.
- Usage peaks in winter months and early spring when it is the coldest and a higher use of space heaters.

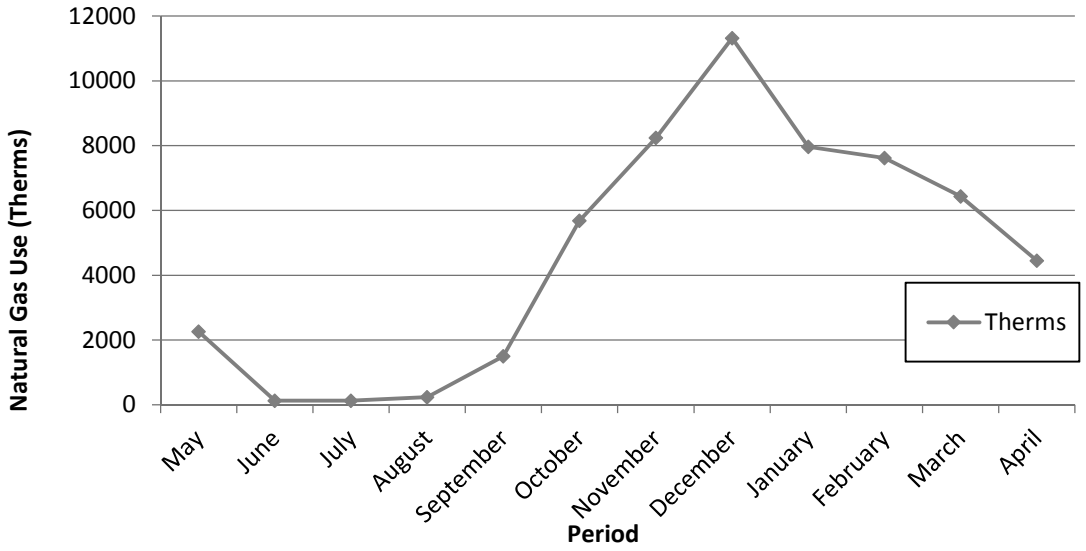
Figure 2.2A South Lake Tahoe High School Natural Gas Use



Trends and Observations

- Use peaks in December when demand for heating is at a maximum.
- Gas use drops dramatically in spring and summer when heating is no longer needed.
- Use begins to rise in fall when temperatures cool and heating is necessary.

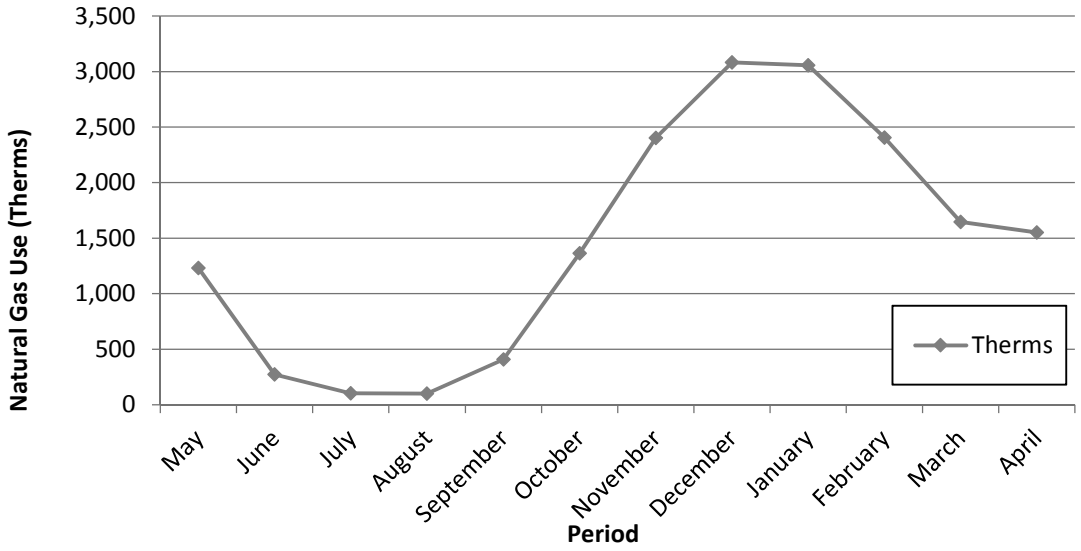
Figure 2.2B South Lake Tahoe MS Natural Gas Use



Trends and Observations

- Use peaks in December when demand for heating is at a maximum.
- Gas use drops dramatically in spring and summer when heating is no longer needed.
- Use begins to rise in fall when temperatures cool and heating is necessary.

Figure 2.2C Tahoe Valley ES Natural Gas Use



Trends and Observations

- Use peaks in December when demand for heating is at a maximum.
- Gas use drops dramatically in spring and summer when heating is no longer needed.
- Use begins to rise in fall when temperatures cool and heating is necessary.

2.3 Energy Balance

Based on the inventory of lighting and HVAC equipment, and the best estimate of operating hours and efficiency ratings of the various systems, a breakdown of energy use was calculated and is presented in **Appendix B**. A summary of the electricity and natural gas balances for the audited portions of the three schools are shown in **Tables 2.3** and **2.4**, respectively. The energy using equipment (fans, pumps, HVAC, lighting, and other uses) is described in Section 3. Graphical representations of the breakdown of energy use for electricity and natural gas are shown in **Figures 2.3** and **2.4**.

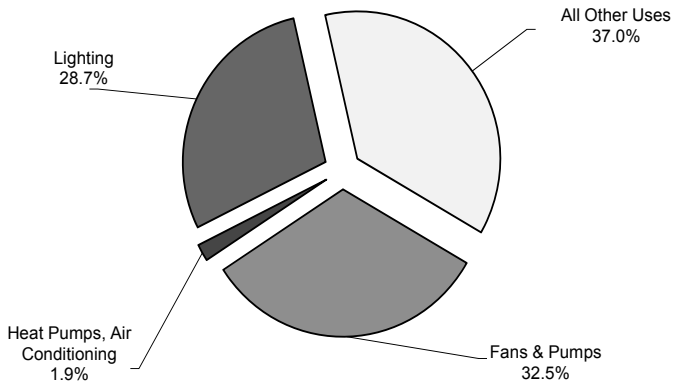
Electricity

Table 2.3 Electricity Energy Balance Summary: Audited Areas Only

End Use	Fans & Pumps	Heat Pumps, Air Conditioning	Lighting	All Other Uses	TOTAL kWh
South Lake Tahoe HS	194,468	0	152,710	205,901	**553,079**
% of Total	*35.2%*	*0.0%*	*27.6%*	*37.2%*	***100%***
South Lake Tahoe MS	128,668	11,474	127,879	140,591	**408,612**
% of Total	*31.5%*	*2.8%*	*31.3%*	*34.4%*	***100%***
Tahoe Valley ES	85,896	12,034	80,788	118,940	**297,659**
% of Total	*28.9%*	*4.0%*	*27.1%*	*40.0%*	***100%***
TOTAL	**409,032**	**23,509**	**361,377**	**465,432**	**1,259,350**
% of Total	*32.5%*	*1.9%*	*28.7%*	*37.0%*	***100%***

[1] "All Others" includes office equipment (e.g., computers, printers, and copiers), domestic water heaters, kitchen appliances, plug loads, and other miscellaneous equipment not accounted for.

Figure 2.3 Electricity Usage Breakdown: All Audited Facilities



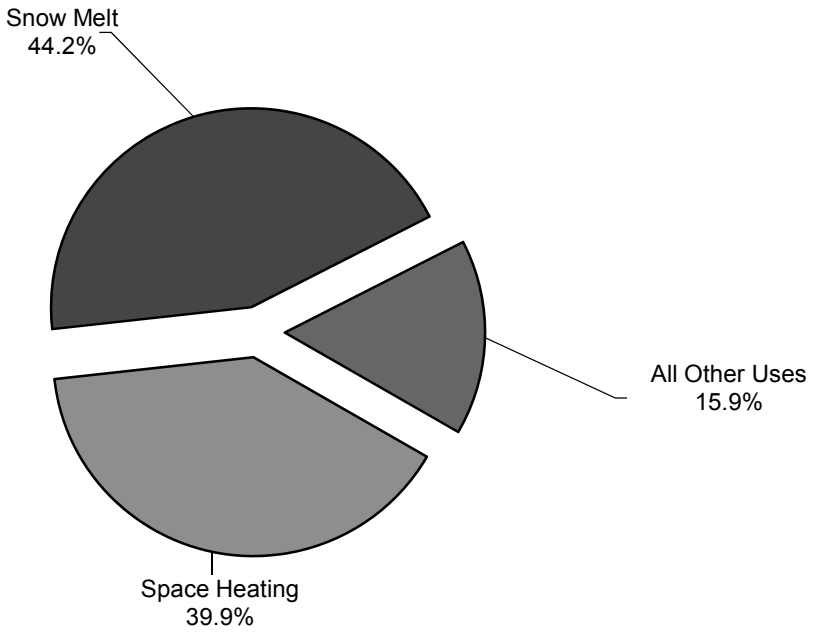
Natural Gas

Table 2.4 Natural Gas Fuel Energy Balance Summary: Audited Areas Only

End Use	Space Heating	Snow Melt	All Other Uses	TOTAL Therms
South Lake Tahoe HS	53,289	120,121	34,682	**208,092**
% of Total	*25.6%*	*57.7%*	*16.7%*	***100%***
South Lake Tahoe MS	42,187	4,449	9,327	**55,964**
% of Total	*75.4%*	*8.0%*	*16.7%*	***100%***
Tahoe Valley ES	16,940	0	683	**17,623**
% of Total	*96.1%*	*0.0%*	*3.9%*	***100%***
TOTAL	**112,416**	**124,570**	**44,693**	**281,679**
% of Total	*39.9%*	*44.2%*	*15.9%*	***100%***

[1] "All Others" includes domestic hot water and kitchen equipment (where applicable).

Figure 2.4 Natural Gas Usage Breakdown: All Audited Facilities



3 Energy Using Systems

3.1 Lighting Systems

District facility lighting includes T8 linear fluorescent fixtures and compact fluorescents powered by electronic ballasts as well as high intensity discharge (HID) fixtures. Lighting controls are by wall switches, occupancy sensors, and lighting control panels with photocell sensors and programmable time clocks. The District recently retrofitted its lighting with high efficiency lamps, ballasts, and lighting controls.

The following are additional notes and observations with respect to lighting systems at each facility:

South Tahoe High School - Audited Areas

Lighting includes linear fluorescent fixtures with four foot T8 lamps and electronic ballasts in the classrooms, as well as compact fluorescents powered by electronic ballasts in hallways. Light fixtures in classrooms in buildings A, B, and C are 1960's era equipment that was designed for HO or VHO fluorescent lamps and has been converted to four foot and two foot T8 lamps on electronic ballasts. Exterior lighting includes recessed downlights with compact fluorescent lamps on electronic ballasts and low wattage metal halide and high pressure sodium wall packs and downlights.

The interior lighting is controlled by wall switches plus some occupancy sensors. In buildings A, B, and C the typical lighting control in classrooms is a single wall switch without an occupancy sensor; occupancy sensors were found only in a few rooms including lounges and teacher work rooms. In the Main Office (MO) and Science and Technology (ST) buildings, lighting is controlled by multiple switches for each room, without any occupancy sensors.

All of the rooms have large windows that can provide daylight. Most of the windows are dual pane, but some are still the single pane that was installed during the 1966 construction.

South Lake Tahoe Middle School - Audited Areas

Most of the audited areas are lit with linear fluorescent fixtures with four foot T8 lamps and electronic ballasts. Exterior lighting includes surface mount fixtures with compact fluorescent lamps and pole mount fixtures with metal halide lamps.

The indoor lighting is controlled by wall switches and some occupancy sensors. The typical lighting control in classrooms is a single wall switch without an occupancy sensor, but some classrooms have been remodeled and occupancy sensors have been installed.

All of the rooms have large windows that can provide some daylight. There are large areas of single pane glass, especially on corridors and older classrooms.

Tahoe Valley Elementary School

Most areas in the permanent buildings are lit by fluorescent fixtures with four foot T8 lamps and electronic ballasts. Based on a sample of fixtures that were opened during the site visit, the electronic ballasts are rapid start type. There are also some compact fluorescent lamps in downlights and surface mount fixtures. Most of the relocatable classrooms have fluorescent fixtures with four foot T8 lamps and electronic ballasts, but the remainder have fixtures with T12 lamps and magnetic ballasts.

Exterior lighting includes surface mount fixtures with compact fluorescent lamps and pole mount fixtures with metal halide lamps.

The indoor lighting in the permanent buildings is controlled by occupancy sensors and wall switches connected to a lighting control panel. Indoor lighting in relocatable classrooms is controlled by wall switches with occupancy sensors in some of the classrooms.

All of the classrooms in the permanent buildings have large windows that can provide daylight. The portable classrooms have smaller windows.

3.2 Heating, Ventilation, and Air Conditioning (HVAC)

South Tahoe High School - Audited Areas

A central boiler plant outside the audited areas provides low pressure steam for space heat throughout the school. The boiler plant is natural gas fired and is about 80 percent efficient. The steam distribution system appears to be in good repair; no evidence of leaks was seen and the system is reported to require little make-up water. The steam from the central plant is used in heat exchangers to generate heating hot water. The heating hot water is distributed from mechanical rooms to unit ventilators in most of the classrooms and air handlers in the MO and ST building.

All of the classrooms have operable sections in their windows to provide fresh air. In addition, most of the classrooms have an exhaust fan built into their windows to remove warm air during hot weather. The fans have gravity operated dampers. During the audit, many of the dampers were observed to be failing to close completely, which will allow warm air to escape during cold weather.

The heating and ventilating systems are controlled by a Johnson Controls energy management system (EMS).

South Lake Tahoe Middle School - Audited Areas

Two boiler rooms supply heating hot water to the audited areas. The boilers are natural gas fired. Two in the Gym were installed in 2000 and are about 80 percent efficient, and two in the Echo building were installed in 2013 and are 88 percent efficient. The heating hot water is distributed to unit ventilators in most of the classrooms and fan coils serving the gym and some classrooms in the audited areas.

Portable classrooms have individual wall mounted heat pumps or gas furnace/electric air conditioning units. These are controlled by programmable thermostats.

All of the classrooms have operable sections in their windows to provide fresh air.

The heating and ventilating systems in the permanent buildings are controlled by a Johnson Controls energy management system (EMS).

Tahoe Valley Elementary School

One boiler room supplies heating hot water to all of the school's permanent buildings. The boilers are natural gas fired. They were installed about 1998 and are about 78 percent efficient. The heating hot water is distributed to unit ventilators in most of the classrooms and offices and to fan coils serving the Multi-purpose room and library.

Portable classrooms have individual wall mounted heat pumps or gas furnace/electric air conditioning units. These are controlled by programmable thermostats.

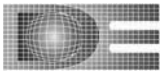
All of the classrooms have operable sections in their windows to provide additional fresh air.

The heating and ventilating systems for the permanent buildings are controlled by a Johnson Controls EMS.

3.3 Other District Energy Using Systems

Snow Melt

The audited area at South Tahoe HS includes a snow melt system that circulates a heated glycol solution through pipes buried in the pavement when it is snowing. The South Lake Tahoe area gets an average of 15 feet of snowfall each year, and the snow melt systems get rid of snow and ice that has not been removed by plowing and snow blowing. The snow melt system has an automatic control that switches on the pump based on sensor readings. The sensors include outside air temperature, pavement temperature, and snow/ice/moisture sensors. The District has set the controls to activate the pump and circulate hot glycol solution based on the pavement temperature sensors, because they felt the snow/ice/sensors were not properly activating the systems.



Office Equipment

Other types of equipment that use electricity include computers, printers, and copiers. Almost every classroom has at least one computer, as do all offices. All of the offices in the audited areas have printers and copiers. According to the IT staff interviewed during the audit, almost all of the computers have automatic shutdown software. Very few were seen idle with the monitor on during the audit. Printers and copiers appeared to be new and Energy Star compliant.

Domestic Water Heaters

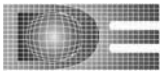
Domestic hot water (DHW) for the audited facilities is provided by electric or natural gas fired tank-type water heaters. The largest of these was a 98 gallon gas water heater for the gym at South Lake Tahoe MS.

Kitchen

All of the audited facilities have kitchens.

The audited areas at South Tahoe HS include a kitchen in building B. This kitchen was formerly used for the school's meal program, and it is still used for some food preparation even though there is a new central kitchen and cafeteria outside the audited areas. Its equipment includes gas ranges and ovens, walk-in refrigerator and walk-in freezer, reach-in refrigerators, dishwasher, and garbage disposal.

The kitchen in the audited areas at South Lake Tahoe MS provides all the meal service for the school. Its equipment includes gas ranges and ovens, walk-in refrigerator and walk-in freezer, reach-in and display refrigerators, heated serving line, dishwasher, and garbage disposal.



4 Energy Project Summaries

4.1 Lighting

The District has converted its fluorescent light fixtures to energy efficient T8 lamps powered by electronic ballasts, and installed occupancy sensor based controls to shut off lights when areas are vacant. There are opportunities to further increase the energy efficiency of the lighting in the areas that were audited. These opportunities have been evaluated in light of the new regulations that govern measures to modify existing lighting systems and their controls.

The 2013 Building Energy Efficiency Standards (Standards) has a significant impact on the way lighting and controls are used in California buildings. The most important change to the Standards (specifically Title 24, Part 6, effective July 2014), in terms of energy savings, is that many more (compared to 2008 Standards) retrofit measures (where the number of fixtures retrofitted exceeds the compliance threshold) will be required to meet the new construction standards for lighting. Spaces in which less than 10 percent of the lighting is being changed out, or buildings in which fewer than 40 luminaires are being altered (lamps and ballasts replaced or rewiring) are exempt, but otherwise all new lighting must meet not only the lighting power density (LPD) requirements, but also most of the controls requirements (including dimming). The following discussion elaborates on which measures can be treated as Alterations.
Lighting system alterations include alterations where an existing lighting system is modified, luminaires are replaced, or luminaires are disconnected from the circuit, removed, and reinstalled, whether in the same location or elsewhere.

Luminaire modification in place is not considered a lighting system alteration provided the following conditions are met:

1. Replacing lamps and ballasts with like type or quantity in a manner that preserves the original luminaire listing.
2. Changing the number or type of light source in a luminaire including: socket renewal, removal, or relocation of sockets or lamp holders, and/or related wiring internal to the luminaire, including the addition of safety disconnection devices.
3. Changing the optical system of a luminaire in part or in whole.
4. Replacing whole luminaires one for one in which the only electrical modification involves disconnecting the existing luminaire and reconnecting the replacement luminaire.
5. Luminaire modifications in place shall not be part of, or the result of, any general remodeling or renovation of the enclosed space in which they are located.
6. Luminaire modifications in place shall not cause, be the result of, or involve any changes to the panel board or branch circuit wiring, including line voltage switches, relays, contactors, dimmers, and other control devices providing power to the lighting system.

Exception: Circuit modifications strictly limited to the addition of occupancy or vacancy sensors and class two lighting controls are permitted for luminaire modifications in place.

Note: The following indoor lighting alterations are not required to comply with the lighting requirements in Title 24, Part 6:

1. Replacement in kind of parts of an existing luminaire that include new lamps, lamp holders, or lenses.
2. Lighting alterations directly caused by the disturbance of asbestos.

The salient features of the 2013 Standards applicable to this study (specifically, general zones with areas greater than 100 sq. ft. and any size classrooms) are discussed below:

1. **Area Lighting Controls**: Each area enclosed by ceiling-height partitions must have an independent, manual switching, or control device that is readily accessible to occupants and is located in the space. The switching or control device must provide ON and OFF functionality. **Applicable to all interior lighting retrofits.**
2. **Multilevel Switching Controls:** This is applicable to all enclosed spaces with areas 100 sq. ft. or larger with a connected load LPD exceeding 0.5 watts per sq. ft. The multi-level lighting control requirements allow a room to be occupied with all of the lights turned on, part of the lights turned on, and none of the lights turned on, whether the room is occupied or not. The number of required lighting control steps varies, depending on the type of lighting technology in each installed luminaire, in accordance with Table 130.1-A of Title 24, Part 6. For example, the linear fluorescent fixtures must have at least four steps of control (one in each range) in the range of 100 percent, 80 to 85 percent, 50 to 70 percent, and 20 to 40 percent. The step switching can be done by one of the following methods: manual dimming, continuous dimming, or switching alternate lamps in each luminaire, having a minimum of four lamps per luminaire, illuminating the same area in the same manner.

Exceptions: Only one step switching (30 to 70 percent) is allowed for the zones less than 100 sq. ft. and with LPD equal or lower than 0.5 watts per sq. ft.; for the classrooms with LPD equal to or lower than 0.7 watts per sq. ft.; and enclosed spaces with LPD equal to or lower than 85 percent of the allowed LPD (per Area Category Method).

3. **Automatic Shut-off Controls:** All interior lighting zones shall be able to turn OFF lighting either completely or partially depending upon the space type when the space is typically unoccupied. **Complete shut off is applicable for all offices 250 sq. ft. or less, multipurpose rooms of less than 1,000 sq. ft., and classrooms or conference rooms of any size. Lighting shall be controlled with occupancy sensing controls to automatically shut of all of the lighting when the room is unoccupied. Partial shut off (reduce lighting power by at least 50 percent) is applicable to library book stack aisles, warehouse aisles, corridors, and stairwells. Exception: In corridors, stairwells, and warehouse aisles where the calculated lighting power density is 80 percent or less of the value allowed under the area category method, occupant sensing controls shall reduce the lighting power by at least 40 percent.**
4. **Automatic Daylight Controls:** This is applicable for spaces exceeding allowed LPD (per Area Category Method) by 85 percent. Luminaires providing general lighting that are in or are partially in the skylit/daylit zones or primary sidelit/daylit zones shall be controlled

by fully functional automatic day lighting controls. The lighting must be continuously dimmable or meet the required number of controls steps from Table 130.1-A of the Title 24, Part 6. The combined luminance from controlled lighting and daylight shall not be less than controlled lighting with no daylight. In the daylight controlled areas, when the illuminance received from the daylight is greater than 150 percent of the designed illuminance received from the general lighting system at full power, the general lighting power in that daylight zone shall be reduced by a minimum of 65 percent.

Exceptions: Not applicable for spaces using less than 0.3 watts per sq. ft.; rooms where the total lighting power in the daylight zones is less than 120 watts; and rooms with a total glazing area less than 24 sq. ft.

5. **Demand Response Controls:** Lighting power in buildings larger than 10,000 sq. ft. shall be capable of being automatically reduced in response to a demand response signal, so that the building's lighting power can be lowered by a minimum of 15 percent below the total installed lighting power.

Exception: Spaces that are non-habitable and spaces with an LPD of less than 0.5 watts per sq. ft. shall not be counted toward the building's total power density. Also, not applicable for building retrofits that do not increase lighting power in the enclosed space above the pre-retrofit levels.

Lighting Measure L-1: Retrofit existing standard 32 watt T8 fluorescent fixtures with 19 watt LED tubes

Measure *Description*

This measure aims to change out the T8 lamps and install LED tubes that are designed to work with the existing ballasts inside the existing fixtures.

The advantages of the LED tubes over the 32 watt fluorescent lamps include:

1. Longer life. The T8 tubes can last about 20,000 hours, depending on how many times they are switched on and off, while the LED tubes may last about 50,000 hours (with some loss of light output, based on testing that attempts to duplicate aging effects within a shorter period than the estimated lifetime).
2. Potentially less light absorbed inside the fixture and in the ceiling. While fluorescent lamps emit light evenly in all directions - up, down, and sideways—the LED lamps are designed to emit light downward only.
3. Less electricity used. The LED tubes are typically 19 watts. They're about as efficient as a 32 watt fluorescent lamp, and they draw less electricity (so they produce less light).
4. Higher quality light. The LED's can provide better color rendition than 32 watt lamps.

The disadvantages of the LED tubes are as follows:

1. Higher, but declining costs. 32 watt fluorescent lamps typically cost about $2.00 in quantities of around 1,000, while LED tubes are being offered at $10.00 apiece in similar quantities. Prices are falling as worldwide production increases.
2. Incompatibility with some fixtures. Parabolic reflector fixtures often have one or more lamps placed above an opaque plastic bar which will block most of the light from an LED tube.
3. Internal electronics. LED tubes are compatible with existing ballasts because the LED tube has an electronic circuit to convert the ballast's high voltage, high frequency alternating current (AC) output to the low voltage, direct current (DC) required by LED's. The electronic circuit represents an additional point of failure, and must be disposed of properly at the end of the LED tube's life.

Implementation Scope of Work

1. Remove existing lamps. Follow local, state, federal, and industry recommended guidelines associated with storage, transport, and waste disposal of lamps.
2. Clean the existing fixtures, including all reflective surfaces inside the fixture and lens. Use an approved cleansing agent that is non-toxic. Replace any broken or defective fixture hardware such as broken lamp holders and any yellowed or damaged lenses. Any damaged or clouded old lenses shall be replaced with new lenses that are a direct replacement for size, material, and thickness.
3. Install new LED tubes that are compatible with existing ballasts and fixtures.

4. Prior to a full scale retrofit measure, a pilot measure should be performed in a selected area to ascertain the performance of the new T8 system. The desired results are low glare, high efficiency, and uniform distribution with footcandle levels as recommended by IES.

Analysis Summary

Refer to **Table 4.1** for analysis summary.

Table 4.1 Analysis summary of proposed Lighting Measure L-1

Facility	# of Fixtures	kW Saved	kWh Saved	Rate ($/kWh)	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Tahoe HS	2,633	24.1	42,845	$0.106	$122,047	$4,542	26.9	$10,269	$111,778	24.6
South Lake Tahoe MS	1,816	17.6	28,661	$0.108	$84,176	$3,095	27.2	$7,082	$77,094	24.9
Tahoe Valley ES	1,558	15.4	24,529	$0.125	$72,217	$3,164	22.8	$6,076	$66,141	20.9
Total:	**6,007**	**57.1**	**96,035**	**-**	**$278,440**	**$10,801**	**25.8**	**$23,427**	**$255,013**	**23.6**

Lighting Measure L-2: Provide occupancy sensors for control of interior lighting in various zones District wide

Measure Description

Occupancy sensors allow lights to be automatically turned off when no motion is detected in a given space. These controls are ideal for areas such as activity rooms, break rooms, meeting rooms, public restrooms, and large public use areas which have variable occupancy throughout the day and where lights may be inadvertently left on. Occupancy sensors are nonexistent in most areas of the audited facilities. The only locations where occupancy sensors were found during the audit in building B at South Tahoe HS, a few classrooms at South Lake Tahoe MS, and buildings A and B at Tahoe Valley ES.

As an efficiency enhancement option, this measure proposes the installation of occupancy sensors in most areas. Measure analysis assumes that the lamp retrofit proposed in Lighting Measure L-1 is in place and operational. The analysis also assumes 20 percent savings in lighting operational hours. Refer to **Appendix F** for proposed controls locations.

Note: Per Title 24, Part 6, the circuit modifications must be strictly limited to the addition of occupancy or vacancy sensors and class two lighting controls to treat the measure as luminaire modifications in place. Any other modification with respect to wiring or control will be treated as an alteration and will trigger the mandated Title 24 controls and lighting power density requirements.

Implementation Scope of Work

1. Two types of sensors are available: wall mount and ceiling mount. Wall mounts are recommended where the sensor has a clear line of sight to the occupants in that area. For larger zones, ceiling mount sensors are more appropriate.
2. Select a dual technology (DT) sensor that is designed based on both ultrasonic (US) and passive infrared (PIR) technology. PIR sensors respond to movement of infrared sources such as human bodies in motion. As the name suggests, they are passive, meaning that they do not send out a signal (i.e., they must have a direct line-of-sight to the motion). In contrast, ultrasonic sensors emit high frequency sound waves and trigger lights depending on shifts in the frequency of the reflected sound. Unlike PIR sensors, US occupancy sensors are sensitive to motion of inanimate objects such as moving curtains. These sensors do not need a clear line-of-sight and are preferred for spaces with partitions, tall cabinets, or other obstacles. **Appendix E** includes catalog cut sheets of sensors to be considered.
3. Locate the circuit or the switch leg that energizes the lights in a given area.
4. Install a switch pack(s) (relay) in the circuit. This relay will be connected to the occupancy sensor.
5. Install the sensor such that it has a line of sight with the area being controlled.

6. Connect low voltage wiring between the sensor and the switch pack. For large areas, two sensors can be used to monitor the entire zone. Both sensors can be connected to the same switch pack.
7. Where multiple switch legs exist, use multiple switch packs.
8. Adjust sensor timing to a minimum of 20 minutes. Lower time duration should be avoided since it could affect lamp life, due to frequent switching.

Analysis Summary

Refer to **Table 4.2** for analysis summary.

Table 4.2 Analysis summary of proposed Lighting Measure L-2

Facility	# of Sensors	kW Saved	kWh Saved	Rate ($/kWh)	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Tahoe HS	113	0	16,891	$0.076	$30,290	$1,284	23.6	$3,390	$26,900	21.0
South Lake Tahoe MS	104	0	15,768	$0.076	$29,508	$1,198	24.6	$3,120	$26,388	22.0
Tahoe Valley ES	46	0	4,185	$0.101	$12,146	$456	26.6	$1,380	$10,766	23.6
Total:	**263**	**0**	**36,844**	**-**	**$71,944**	**$2,938**	**24.5**	**$7,890**	**$64,054**	**21.8**

Lighting Measure L-3: Add Photocell Adapters to all exterior light fixtures in the South Lake Tahoe MS

Measure Description

It was observed during the site audit that the 17 building exterior fixtures are controlled only by a wall mount switch. The subject fixtures are compact fluorescent lighting fixture, and cutting down the inadvertent use of these fixtures can lead to substantial savings. To avoid the inadvertent use of exterior light during the day, this measure proposes to add a simple plug-and-play screw in photocell sensor to the fixture.

For savings analysis, it is assumed that all of the existing light fixtures remain on for 50 percent of the normal school operating hours. Typically, the teacher or custodian will turn on the exterior light prior to exiting the room at the end of the day, which means the light is on while daylight is still present, and remains on until it is manually turned off the next morning, hours after sunrise. It is estimated that these unnecessary operating hours will be eliminated by photocell controls. An estimated 40 percent savings could be realized.

Note: The success of this measure hinges on (1) whether the existing fixtures have sufficient room to accommodate the photocell adapter, and (2) whether the existing fixtures have screw in sockets. The photocell adapter recommended for this measure is only compatible with screw type fixtures. If the fixture is not compatible with the adapter, an alternative is to install a standalone photocell that is mounted on the fixture and wired directly to the circuit. Due to the labor involved, the cost of such a measure may reach $100 per fixture, with a payback of 10 to 15 years. Also, since the wattage of the compact fluorescent luminaires is less than 30 watts, there is no requirement to install a motion sensor along with the photocell.

Implementation Scope of Work

1. Identify all exterior lighting fixtures where a photocell adapter is desired.
2. Verify that there is sufficient room to accommodate the photocell adapter control.
3. Verify that the fixture has a screw in type lamp and socket.
4. Unscrew the existing lamp, screw the photocell adapter into the socket, and install the lamp into the photocell adapter.
5. The photocell adapter sensor shall be positioned correctly and not exposed to bright light sources.
6. Installation shall be in compliance with the latest NEC and all applicable regulations.
7. **Appendix E** of this study provides samples of screw in photocell adapters.

Analysis Summary

Refer to **Table 4.3** for analysis summary.

Table 4.3 Analysis summary of proposed Lighting Measure L-3

Facility	# of Sensors	kW Saved	kWh Saved	Rate ($/kWh)	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Lake Tahoe MS	17	n/a	1,266	$0.076	$514	$96	5.3	$63	$451	4.7
Total:	**17**	**-**	**1,266**	**$0.076**	**$514**	**$96**	**5.3**	**$63**	**$451**	**4.7**

Lighting Measure L-4: A. Retrofit existing High Pressure Sodium (HPS) exterior lighting fixtures with LED lamps
B. Install photocell and vacancy controls.

Measure Description

The building exteriors and parking lots at both audited school sites are illuminated mainly by HPS fixtures; the wattages for these ranges from 70 to 400 watts. One energy efficiency option for such fixtures is LED lamps. **Table 4.4** summarizes exterior fixture type alongside the proposed LED fixture option. Also shown are the estimated savings per fixture.

Title 24 mandates that all outdoor lighting must be controlled with either a photocell or an astronomical time clock that automatically turns off the lights as daylight becomes available. Additionally, the luminaires, with some exceptions, mounted at 24 feet or less from the ground must comply with the following requirements:

1. Must have motion sensors or other controls that automatically reduce lighting power by 40 to 80 percent when the area is vacant.
2. The controls must provide auto-on when area is occupied.
3. No more than 1,500 watts of lighting power shall be controlled together.
4. Includes wall packs as well as pole mounted fixtures.

Exceptions: Pole mounted fixtures with lighting power less than or equal to 75 watts, non-pole mounted fixtures with lighting power less than or equal to 30 watts, and linear lighting fixtures with power less than or equal to 4 watts.

Early activation or delayed activation of exterior lights through use of time clocks can be corrected by using photocell controls. In outdoor lighting applications, this methodology can reduce electricity usage by 5 to 20 percent (i.e., 20 percent for the exterior fixtures controlled by switches and 5 percent for the fixtures controlled by a time clock). Also, the motion sensor based light dimming can further reduce electricity usage by another 30 percent. For analysis purposes, this measure assumes following overall 50 percent savings in the exterior lighting operation hours.

For enhanced energy savings and to meet Title 24's mandated controls compliance, we are proposing LED fixtures by *Cree BetaLED* along with multi-level lighting controls. The multilevel lighting control system generally consists of smart sensors at each fixture. Each luminaire with embedded control technology is designed with an intelligent, pre-tested microprocessor integrated into the fixture's driver. This design eliminates the need for additional interfaces, enabling the fixture and controls to interface for instantaneous and seamless interoperability. The control system offers occupancy and vacancy sensing, daylight harvesting, light level scheduling, and demand response controls.

Table 4.4 Summary of Proposed LED Fixtures to Replace HPS Fixtures

Baseline Fixture	Baseline Watts	Proposed Fixture	Proposed Watts	Watts Saved (per Fixtures)
HPS-70W	94	LED-42W	42	52
HPS-150W	170	LED-66W	66	104

Implementation Scope of Work

1. Prior to initiating service, follow all safety precautions associated with working on HPS fixtures.
2. Remove old lamps and ballasts (all fixtures).
3. Replace with new LED lamps and provide line voltage directly bypassing starter/ ballast/transformer.
4. Installation shall be conducted by a certified electrician based on the manufacturer's recommendations.
5. The photocell control probe shall be positioned correctly and not exposed to bright light sources.
6. Installation shall be in compliance with the latest NEC and all applicable regulations.
7. Take lighting measurements before and after to confirm that the new lighting system meets or exceeds original lighting levels.

Analysis Summary

Refer to **Tables 4.5A** and **4.5B** for analysis summary.

Table 4.5A Analysis summary of proposed Lighting Retrofit Measure L-4 (A)

Facility	# of Fixtures	kW Saved	kWh Saved	Rate ($/kWh)	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Tahoe HS	25	3.6	14,920	$0.106	$21,030	$1,582	13.3	$746	$20,284	12.8
Tahoe Valley ES	10	1.0	3,644	$0.125	$9,275	$470	19.7	$210	$9,065	19.3
Total:	**35**	**5**	**18,564**	**-**	**$30,305**	**$2,052**	**14.8**	**$956**	**$29,349**	**14.3**

Table 4.5B Analysis summary of proposed Lighting Controls Measure L-4 (B)

Facility	# of Sensors	kW Saved	kWh Saved	Rate ($/kWh)	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Tahoe HS	18	n/a	3,776	$0.076	$2,014	$287	7.0	$189	$1,825	6.4
Tahoe Valley ES	10	n/a	1,156	$0.101	$1,119	$126	8.9	$58	$1,061	8.4
Total:	**28**	**-**	**4,933**	**-**	**$3,133**	**$413**	**7.6**	**$247**	**$2,886**	**7.0**

Lighting Measure L-5: Modernize lighting systems (Alternate Option to Lighting Measure L-1 and L-2)

Measure Description

This measure is presented to illustrate the potential measure cost and savings associated with the lighting modernization effort at the audited facilities. The modernization effort will entail the following:

1. For all of the zones in all three audited facilities: Retrofit existing 32 watt T8 fluorescent linear and U-bend fixtures with new energy efficient LED fixtures.
2. Implement interior lighting controls as mandated by 2013 Standards.

Refer **Table 4.6** for a comparative summary of baseline and proposed fixtures. The baseline fixture has two 32 watt T8 (one inch diameter) fluorescent lamps, while the proposed fixture has a 45 watt (input) LED light engine. The T8 lamps are rated to provide 2800 lumens apiece, but their actual output is less for two reasons. First, the electronic ballast has a ballast factor (ratio of actual lamp lumen output to rated lumen output) of 88 percent, so the initial output per lamp is only 2464 lumens. Second, the lamps' output declines as they age; after the lamps have been on for 40 percent of their rated 20,000 hour lifetime the output is 95 percent of the initial output, or 2341 lumens per lamp. The LED light engine's is driven at a 1.00 ballast factor, and its light output does not decline with age. Both the baseline fixture and the proposed fixture are 90 percent efficient (ratio of lamp lumen output to lumens emitted by the fixture). Taking the fixture efficiency into account along with ballast factor and lamp aging, the baseline fixture provides 4213 lumens, while the LED fixture provides 5850 lumens. The baseline fixture consumes 55 watts, while the LED fixture consumes 45 watts.

It is strongly emphasized that prior to a full scale retrofit, pilot installations be done in representative areas to determine if light levels are adequate.

Table 4.6 Comparison of baseline fluorescent fixtures and proposed LED fixtures*

	Baseline (1st Generation T8)	**Proposed** (Reduced-Wattage LED Fixture) w.r.t. Baseline
	2-lamp fixture with 32-watt T8 lamps and normal ballast factor electronic ballast	2X4 45-watt LED Fixture
LAMP DATA [1]		
Lamp Watts	32	45
Initial Lamp Output (Lumens)	2,800	5,000
Design Lamp Output (Lumens) [2]	2,660	5,000
Lamp Lumen Maintenance (%)	95%	100%
Lamp Life (Hours)	20,000	75,000
CRI	78	80
SYSTEM DATA		
Lamps per Fixture	2	1
Ballast Factor	0.88	1.00
Fixture Efficiency [3]	90%	90%
Work Surface Illuminance Factor [4]	1.00	1.30
Initial System Lumens	4,435	5,850
Mean System Lumens	4,213	5,850
Lumen Reduction (%)	-	-39%
Fixture Input Power (Watts)	55	45
Watt Savings	-	18%
Design Lamp Efficacy (Lumens/Watt)	97	111

[1] Data gathered from lamp and ballast manufacturers including Sylvania, General Electric, and CREE

[2] At 40% Rated Life

[3] Fixture efficiency is an estimate based on typical values. Efficiency varies by fixture design, condition, etc.

[4] Based on empirical measurements

*Fixture wattages and ballast factors are from the manufacturer's literature

Retrofitting the existing lamps and ballasts district wide is considered an alteration per Title 24. Because the number of subject luminaires exceeds the compliance threshold, the proposed retrofit will trigger the Title 24 mandated compliance requirement of enhanced lighting controls and LPD. Therefore, the retrofit options discussed are dependent on the implementation of recommended lighting controls.

The calculated LPD in the subject enclosed spaces is less than 85 percent of the allowed lighting power area category method and two audited schools have total gross area above 10,000 sq. ft. which triggers the following control requirements:

1. Area Controls: All luminaires need manually switched On and Off lighting controls, and each area enclosed by ceiling height partitions shall be independently controlled.
2. Automatic Shut-Off Requirements: Lighting fixtures in any size classrooms, conference rooms, private offices (250 square feet or less), restrooms, and multipurpose rooms (1,000 sq. ft. or less) shall be turned off completely during typical non-occupancy periods. In all other spaces lighting power shall be reduced to 50 percent during non-occupancy periods.
3. Multilevel Lighting Controls: All spaces with areas 100 sq. ft. or larger shall have at least four steps of control, or continuous dimming.
4. Automatic Daylight Controls: All luminaires providing general lighting that are in or are partially in the skylit/daylit zones or primary sidelit/daylit zones shall be controlled by fully functional automatic day lighting controls. The lighting must be continuously dimmable or meet the required number of controls steps from Table 130.1-A of Title 24, Part 6.
5. Demand Response Controls: Applies to all buildings with enclosed space area larger than 10,000 sq. ft. This is applicable to both audited schools. The buildings shall have automatic lighting controls that uniformly reduce lighting power consumption by a minimum of 15 percent below total installed lighting power upon receipt of a demand response signal.

In order to meet all of the mandated lighting control requirements, this measure proposes the implementation of an intelligent lighting control system for all of the lighting fixtures (existing and retrofitted) in the audited facilities. Intelligent lighting control systems are an innovative approach to lighting controls that utilize the feedback from actual measurable conditions at a zone to control the lighting fixtures serving that zone. It is a simple yet innovative control approach that is greatly suited for this measure.

For this measure, the use of a control system made by Enlighted is proposed. The Enlighted intelligent lighting control system generally consists of smart sensors at each lighting fixture. All sensors are linked through a wireless network through gateways which are connected through Ethernet to a main server, or Energy Manager. Smart sensors can sense occupancy, ambient light, and temperature. Feedback is collected by the server for intelligent control of zones. For optimized control, this measure also proposes the use of dimming ballasts for all fluorescent lighting systems that are controlled by the system. Accordingly, all existing instant-start

electronic ballasts shall be removed and replaced with new dimmable ballasts.

Key features of the intelligent control system are highlighted below:

- Easy installation
- Wireless
- Independent fixture control
- Built-in daylight harvesting
- Multiple zone profile programming
- User friendly software makes reprograming settings convenient
- Built-in energy monitoring to react to demand response signal
- Data from the smart sensor can be interlocked with demand response or HVAC controls
- Dimming capability allows lighting levels to be adjusted based on activity
- Meets Title 24 mandated control requirements.

Table 4.7 summarizes and highlights the potential energy saving opportunities listed above.

Table 4.7 Measures Resolved by Smart Controls

Control Requirement Function	Control Requirement Satisfied by Smart Controls?	Estimated Overall Associated Energy Savings, where applicable (percent)	Notes
Automatic Shut Off	Yes	20 percent	Wireless configuration eliminates wiring costs and complexity, when compared to standard occupancy/vacancy sensors. None of the audited facilities use occupancy sensors even though various rooms go unoccupied for long periods with lights on.
Multilevel Lighting Controls	Yes	25 percent	With dimming capability, the output of any fixture can be set to match the light level required by the zone. For example, classroom lighting can be dimmed when computers are in use or when visuals are shown. This can reduce glare and eye fatigue as well as generate energy savings. Also, during non-teaching hours (e.g., custodian cleaning hours) lighting levels can be effectively dimmed to 50 percent or lower level. Lamp Lumen Maintenance: All lamps exhibit some reduction in light output over time. Manufacturers report light output at 40 percent of rated life as an indicator of maintained light output. This value is close to the average light output over the life of the lamp and is called mean light output, mean lumens, or design lumens. For the specific application, lighting systems are designed with respect to mean light output, not initial lumens. Therefore, the lighting fixtures are tend to provide higher lumens (foot-candles) during the initial hours of operations; consequently, leading to inefficient operations first few hundred hours operations.
Automatic Daylight Controls	Yes	20 percent	Smart controls can dim lighting fixtures during primary daylight areas. It is estimated that during 30 percent of the usage hours (after accounting for automatic shut off and dimming), lighting levels can be dimmed to at least 35.
Demand Response Controls	Yes	Not Accounted	

Smart controls are recommended for most enclosed spaces except for those custodian and storage rooms that already have vacancy sensors. For analysis, this measure assumes the following 40 percent savings in lighting operation hours.

Implementation Scope of Work

1. Select a suitable location for the mock-up installation.
2. Identify all the lighting fixtures being controlled.
3. Replace existing ballasts with new dimmable ballasts. Removed ballasts can be stored and reused.
4. Install a sensor at each existing lighting fixture being controlled.
5. Install a power pack per manufacturer's instructions.
6. Install the gateway and energy manager in a suitable location as recommended by the manufacturer.
7. Program the system to provide the desired modes of operation.

Proposed Equipment

1. Intelligent Lighting Control System
   The selected intelligent lighting control system is made by Enlighted and has the following hardware:
   a) Enlighted Sensor – Sensor installed at each lighting fixture; integrated with occupancy, daylight, and temperature sensors.
   b) Gateways – Gateways are intermediary devices that wirelessly connect all sensors with the server. One gateway should be adequate for the mock-up.
   c) Energy Manager – The energy manager acts as the server. Control sequences including occupancy, scheduling, and energy use are programmed and viewed through the energy manager.
2. Fixtures/Ballasts/Lamps
   a) CREE – ZR24 & ZR22 - 5,203 lumens fixture.

Analysis Summary

Refer to **Table 4.8A** and **4.8B** for analysis summary.

Table 4.8A Analysis summary of proposed Lighting Retrofit Measure L-5(A)

Facility	# of Fixtures	kW Saved	kWh Saved	Rate ($/kWh)	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Tahoe HS	1,057	25.4	45,463	$0.106	$326,530	$4,819	67.8	$6,025	$320,505	66.5
South Lake Tahoe MS	822	28.1	48,025	$0.108	$254,273	$5,187	49.0	$4,685	$249,587	48.1
Tahoe Valley ES	709	12.0	19,477	$0.125	$218,670	$2,512	87.0	$4,041	$214,629	85.4
Total:	**2,588**	**66**	**112,965**	**-**	**$799,473**	**$12,518**	**63.9**	**$14,752**	**$784,721**	**62.7**

Table 4.8B Analysis summary of proposed Lighting Controls Measure L-5(B)

Facility	# of Sensors	kW Saved	kWh Saved	Rate ($/kWh)	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Tahoe HS	1,057	n/a	33,555	$0.076	$267,269	$2,550	104.8	$1,678	$265,592	104.1
South Lake Tahoe MS	822	n/a	24,472	$0.076	$207,848	$1,860	111.8	$1,224	$206,624	111.1
Tahoe Valley ES	709	n/a	19,827	$0.101	$179,275	$2,161	83.0	$991	$178,284	82.5
Total:	**2,588**	**0.0**	**77,854**	**-**	**$654,392**	**$6,571**	**99.6**	**$3,893**	**$650,500**	**99.0**

4.2 Electrical

Electrical Measure E-1: Premium efficiency motors

Measure Description

This measure would replace old standard efficiency motors in the audited areas with new premium efficiency motors. Because motor cost per horsepower (hp) decreases with size, only motors 5 hp and larger were considered. And because savings increase with annual usage hours, only motors that operate more than 2,000 hours a year were examined.

The motors that were considered drive heating hot water pumps at South Tahoe HS and South Lake Tahoe MS. Tahoe Valley ES also has pumps, but the motors are smaller. Because of the climate, the pumps are heavily used, operating both during school hours and when the school is closed, to keep the interiors above freezing. Average annual heating pump operation was estimated based on Typical Meteorological Year data**. Table 4.9** lists the motors that were considered, the existing motor efficiencies, and the efficiencies available in premium efficiency motors.

Table 4.9 Pump Motor Summaries

School	Location	Service	Number Motors	HP each	Existing Efficiency	Premium Efficiency
South Tahoe HS	B mechanical room	Heating Hot Water	2	5	90.2%	90.8%
South Lake Tahoe MS	Gym boiler room	Heating Hot Water	2	10	88.5%	92.5%

The motors at the HS are nearly as efficient as the best available premium efficiency units. Only the motors in the MS gym boiler room appeared to have a potential for substantial savings from replacement with premium efficiency units.

Implementation Scope

1. Replace old motors with new (matching capacity) premium efficiency motors.
2. Installation should conform to the National Electric Code as well as local codes and practices.
3. Motor shall be installed in locations that are compatible with motor enclosure and ambient conditions. Improper selection of the motor enclosure and ambient conditions can lead to reduced operating life of the motor. Proper ventilation for the motor must be provided. Obstructed airflow can lead to reduction of motor life. Provide Open Drip-Proof/WPI motor for use indoors where atmosphere is relatively clean, dry, well

ventilated and non-corrosive. Provide Totally Enclosed and WPII motors where dirt, moisture or dust are present and in outdoor locations.

4. The motor must be securely installed to a rigid foundation or mounting surface to minimize vibration and maintain alignment between the motor and shaft load. Failure to provide a proper mounting surface may cause vibration, misalignment and bearing damage.
5. Provide proper motor alignment of the motor with the driven equipment using a method recommended by the motor manufacturer.
6. Provide wiring, conduits, disconnects, power connections, and associated components and accessories. Motor and control wiring, overload protection, disconnects, accessories and grounding shall conform to the National Electric Code and local codes and practices.
7. Electrical requirements including Voltage, Phase, Frequency, and RPM and frame size requirements shall match those on existing motors.
8. Provide start-up.

Analysis Summary

The savings from this measure were estimated with a spreadsheet calculation which is included in **Appendix C**, using the efficiencies of the existing and proposed motors, the estimated motor loading (fraction of rated horsepower that is actually used to drive the pump), and the estimated annual hours of operation. The motor loading was estimated at 80 percent based on typical practice for sizing motors for pumps. The annual hours of operation were estimated based on the annual number of hours when the outside air temperature is below 65 ° F during school hours, or 50 ° F during the rest of the year. Those hours were divided by two since there are two pumps that are alternated to provide 100 percent standby.

The cost of the measure was estimated using materials costs from web sources and estimated hours for the motor replacements. Refer to **Table 4.10** for analysis summary.

Table 4.10 Analysis summary of proposed Electrical Measure E-1

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Energy Cost Savings ($)	Payback Period (Years)	Estimated Incentive ($)	Project Cost with Incentive ($)	Simple Payback Period with Incentive (Years)
South Lake Tahoe MS	--	1,487	$0.076	0	$0.862	$5,616	$161	34.9	$1,645	$3,971	24.7
Total:	**0**	**1,487**	**$0.076**	**0**	**-**	**$5,616**	**$161**	**34.9**	**$1,645**	**$3,971**	**24.7**

4.3 Building Envelope

Building Envelope Measure ENV-1: Adding window films and weather stripping to increase envelope efficiency.

Measure Description

All of the audited facilities have some older areas with windows, doors, and dampers that leak air due to age and wear. This measure would reduce the space heating loads by applying window film and weather stripping to the areas with air leaks.

Implementation Scope of Work

1. Inspect windows, doors, and dampers and identify deficient components. This should be done in advance by a weatherization consultant prior to bidding the work.
2. Clean windows and apply window film over single pane windows with leaks around panes.
3. Clean, repair, and lubricate hinges and latches on operable windows and exterior doors, and install seals and weather stripping where needed.
4. Clean, repair, and lubricate dampers including those on unit ventilators, gravity relief vents, and window mounted exhaust fans.
5. Lubrication shall be used in accordance with instructions from component manufacturers and applicable health and safety codes.
6. Cleaning materials shall be used in accordance with manufacturer's instructions and applicable health and safety codes.

Analysis Summary

Savings from this measure were analyzed using eQUEST building energy simulation software. From a simple model with dimensions, envelope, and mechanical systems similar to that of a typical District classroom, month-by-month energy use was simulated. Baseline case included a high level of air infiltration consistent with the condition of the windows, doors, and dampers seen during the site visit. Proposed case was modeled exactly the same, but with the infiltration rate reduced by half.

The cost of the measure was estimated based on the costs of weather stripping materials, labor, and equipment. The materials include window film, gaskets and weather strip for the operable windows, exterior doors, and replacement dampers. Quantities of materials were estimated based on construction drawings for the buildings and observations made during the site visits. Quantities of labor were estimated based on assumed productivity for inspection, cleaning, repairs, and installation of materials. Equipment costs were estimated for trucks and lifts for high windows. Refer to **Table 4.11** for analysis summary.

Table 4.11 Analysis summary of proposed Building Envelope Measure ENV-1

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Energy Cost Savings ($)	Payback Period (Years)	Estimated Incentive ($)	Project Cost with Incentive ($)	Simple Payback Period with Incentive (Years)
South Tahoe HS	0	31,972	$0.076	9,265	$0.825	$26,045	$10,073	2.6	$970	$25,074	2.5
South Lake Tahoe MS	0	21,154	$0.076	7,335	$0.862	$54,531	$7,936	6.9	$3,389	$51,142	6.4
Tahoe Valley ES	0	14,122	$0.101	2,945	$0.961	$24,733	$4,255	5.8	$1,567	$23,166	5.4
Total:	**0**	**67,248**		**19,545**		**$105,308**	**$22,263**	**4.7**	**$5,926**	**$99,382**	**4.5**

Building Envelope Measure ENV-2: New dual pane, Low emissivity windows.

Measure Description

All of the audited facilities have some old single pane windows as well as newer dual pane windows. This measure would replace the old single pane windows in order to reduce the space heating loads in the schools.

Windows are rated by R-value (resistance to heat flow) and/or U-value (ability to transfer heat). The higher the R-value, the more efficient the window (U-values are the direct inverse). An ordinary well sealed dual pane window for instance has a typical R-value of 3.0 compared to a single pane window which has typical R-value of 1.0. See table below for comparison of various window types including estimated install costs**. Table 4.12** notes other glazing properties such as Solar Heat Gain Coefficient (SHGC) and Visual Light Transmittance (VLT) which should be considered when selecting a new window. SHGC is a measure of a glazing system's net solar gain. VLT is a measure of the proportion of visible light that passes through a glazing system.

Table 4.12 Comparison of various window types[1]

Glazing Type	R-value	U-value	SHGC	VLT
Single-pane, Clear	0.9	1.1	0.8	0.9
Single-pane, Selective Tint	0.9	1.1	0.6	0.6
Double-pane, Clear	3.3	0.3	0.4	0.8
Double-pane, Selective Tint	3.3	0.3	0.3	0.5
Double-pane, Low-e	3.3	0.3	0.4	0.4

During the site visit, the single pane windows were measured, giving a total area of 11,851 sq. ft**. Table 4.13** shows the breakdown of area by school.

Table 4.13 Square feet of single pane glasses

School	Square feet of single pane glass
Tahoe Valley Elementary	3133
South Lake Tahoe Middle School	6778
South Tahoe High School	1940
Total	11851

1.Glazing properties are for general comparisons only. Actual values will vary by manufacturer, thickness of glass, thickness of air gap, gas type fill, color of tint, coating type, etc.

Analysis Summary

Savings from this measure were analyzed using eQUEST building energy simulation software. From a simple model with dimensions, envelope, and mechanical systems similar to that of a typical District classroom, month-by-month energy use was simulated. Baseline case included 190 sq. ft. of single pane windows on the typical 1,000 sq. ft. classroom. Proposed case was modeled exactly the same, but with the same area of new reflective dual pane windows.

The difference in the consumption of natural gas and electricity between the baseline and proposed cases, divided by the area of the windows, gave estimated annual savings of 0.1 Therms and 5.3 kWh per sq. ft. of windows replaced

The cost of the measure was estimated based on the district's cost for its most recent window replacement measure, in which about 900 sq. ft. of window were replaced for a total contractor cost of $121,072, equivalent to $134.52 per sq. ft. of glazing.

This measure is not recommended. The results of the analysis of measure costs and savings, shown in the table below, indicate the simple payback is longer than the expected life of the new windows. Refer to **Table 4.14** for analysis summary.

Table 4.14 Analysis summary of proposed Building Envelope Measure ENV-2

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Energy Cost Savings ($)	Payback Period (Years)	Estimated Incentive ($)	Project Cost with Incentive ($)	Simple Payback Period with Incentive (Years)
South Tahoe HS	0	5,284	$0.076	1,529	$0.825	$339,021	$1,663	203.9	$264	$338,756	203.7
South Lake Tahoe MS	0	18,461	$0.076	5,341	$0.862	$965,192	$6,012	160.5	$923	$964,269	160.4
Tahoe Valley ES	0	8,533	$0.101	2,469	$0.961	$493,408	$3,233	152.6	$427	$492,982	152.5
Total:	**0**	**32,278**		**9,338**		**$1,797,621**	**$10,908**	**164.8**	**$1,614**	**$1,796,007**	**164.7**

4.4 Kitchen

Kitchen Measure K-1: Natural gas booster heaters for dishwashers

Measure Description

All of the audited facilities have electric booster heaters to supply 180 °F rinse water to their dishwashing equipment. These booster heaters are each rated at 15,000 watts electrical demand, which is more than the ratings of most other equipment at the schools. This measure would replace the booster heaters with natural gas fired booster heaters.

Implementation Scope of Work

1. The work should be performed by a licensed contractor experienced in installation of commercial kitchen equipment.
2. Observe all safety precautions and applicable codes related to working with electric and natural gas appliances.
3. Remove the existing electric booster heaters and dispose of in accordance with applicable regulations.
4. Install natural gas piping to connect to the existing services, with piping sized to code. All of the kitchens have natural gas appliances.
5. Install exhaust flue to proper location for venting of combustion products from natural gas booster heater. All of the kitchens have dishwasher exhaust hoods in close proximity to the booster heater location.
6. Install new natural gas booster heater sized to meet hot water flow and temperature needed in the dishwashing area. Booster heater with input rating of 60,000 Btu/hr appears to provide a direct replacement for existing units.
7. Install 120V power as needed for new booster heater and provide interlock with exhaust hood fan as needed to meet code requirements.

Analysis Summary

Savings for the new booster heaters were estimated using a spreadsheet calculation. Existing booster heater operation was assumed to be one hour per school day at South Tahoe HS, since the kitchen in building B is no longer used for the main food service, and 2 hours per day at South Lake Tahoe MS and Tahoe Valley ES. Booster heater operation was assumed to be at 100 percent of input rating when on, with 100 percent efficiency. The new booster heaters were assumed to provide the same Btu's as the existing electric units, but with natural gas as fuel and 85 percent efficiency. Electricity and natural gas were valued at the effective utility rates for the schools in order to provide the dollar value of the savings.

Costs for the new booster heaters were estimated using prices determined from web sources for the new natural gas booster heaters, and prices for installation materials and labor determined from cost estimating guides.
Refer to **Table 4.1**5 for analysis summary.

Table 4.15 Analysis summary of proposed Kitchen Measure K-1

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Energy Cost Savings ($)	Payback Period (Years)	Estimated Incentive ($)	Project Cost with Incentive ($)	Simple Payback Period with Incentive (Years)
South Tahoe HS	0	2,700	$0.076	108	$0.825	$14,835	$205	72.3	$135	$14,700	71.6
South Lake Tahoe MS	0	5,400	$0.076	217	$0.862	$14,835	$412	36.0	$270	$14,565	35.3
Tahoe Valley ES	0	5,400	$0.101	217	$0.961	$14,835	$545	27.2	$270	$14,565	26.7
Total:	**0**	**13,500**		**542**		**$44,504**	**$1,162**	**38.3**	**$675**	**$43,829**	**37.7**

Kitchen Measure K-2: Automatic door closers on walk-in refrigerators and walk-in freezers

Measure Description

All of the audited facilities have walk-in refrigerators and walk-in freezers with doors that are equipped with automatic door closers. The automatic door closers are spring loaded devices that will close the door firmly once the door is within an inch of its fully closed position. The door closers in the kitchen in building B at South Tahoe HS are damaged and no longer hold the doors shut, allowing the door to remain slightly ajar.

Implementation Scope of Work

1. Remove and dispose of existing door closer.
2. Install new door closer, drilling new holes as needed.

Analysis Summary

Savings for the door closers were estimated using a spreadsheet calculation. Air flow into the walk-in refrigerator and freezer was estimated based on the door dimensions and estimated air velocity and door gap size. Electricity consumption due to the air flow was calculated based on the temperatures inside and outside the refrigeration equipment, using the estimated performance of the condensing units.

Costs for the new door closers were estimated using prices determined from a web source for the new closers, and prices for installation materials and labor determined from cost estimating guides. Refer to **Table 4.16** for analysis summary.

Table 4.16 Analysis summary of proposed Kitchen Measure K-2

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Energy Cost Savings ($)	Payback Period (Years)	Estimated Incentive ($)	Project Cost with Incentive ($)	Simple Payback Period with Incentive (Years)
South Tahoe HS	0	482	$0.076	0	0	861	37	23.5	$24	$837	22.8
Total:	**0**	**482**	**$0.076**	**0**	**-**	**$861**	**$37**	**23.5**	**$24**	**$837**	**22.8**

Kitchen Measure K-3: Electronically commutated fan motors and speed controls for walk-in refrigerators and walk-in freezers

Measure Description

The walk-in refrigerators and walk-in freezers for the kitchens at South Tahoe HS and South Lake Tahoe MS each have two small fan motors that operate continuously to blow air over the evaporator coils in order to keep the walk-ins cold. These fan motors create some heat due to their inefficiency, and that heat must be removed by the condensing units that serve the walk-ins.

This measure proposes to replace the fan motors with more efficient motors, called electronically commutated motors, which have been proven as an economical and reliable replacement for existing fan motors on evaporators. In addition the measure will install controls that will slow the fans when the evaporator coils are not receiving refrigerant. Tahoe Valley ES has new walk-ins that already have this type of motor and control.

Implementation Scope of Work

1. Engage the services of a refrigeration contractor that specializes in the installation of electronically commutated motors to replace existing evaporator fan motors.
2. Remove existing motors.
3. Install new motor and check for proper fan speed and air flow.

Analysis Summary

Savings from this measure were estimated with a spreadsheet calculation, based on the results of an electric load monitoring study by the Pacific Gas and Electric Company's Food Service Technology Center which measured the electric load created by conventional motors on evaporator fans and by electronically commutated motors.

Costs were determined based on web sources for the electronically commutated motors and speed controls, with installation materials and labor determined from cost estimating guides. Refer to **Table 4.17** for analysis summary.

Table 4.17 Analysis summary of proposed Kitchen Measure K-3

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Energy Cost Savings ($)	Payback Period (Years)	Estimated Incentive ($)	Project Cost with Incentive ($)	Simple Payback Period with Incentive (Years)
South Tahoe HS	0	5,079	$0.076	0	0	$5,971	$386	15.5	$254	$5,718	14.8
South Lake Tahoe MS	0	5,418	$0.076	0	0	$4,913	$414	11.9	$271	$4,642	11.2
Total:	**0**	**10,497**		**0**		**$10,884**	**$800**	**13.6**	**$525**	**$10,359**	**13.0**

Kitchen Measure K-4: Pre-rinse spray valve

Measure Description

This measure proposes to replace standard pre-rinse spray valves with low flow spray valves, in order to save energy required to heat the water for the pre-rinse spray.

Background and Existing Situation

The kitchens at South Tahoe HS and Tahoe Valley ES have pre-rinse sprays for their dishwashing areas that appear to be standard design. The pre-rinse sprays are used to remove food waste from cooking utensils and dishes prior to placing them in the dishwasher. A low cost energy efficiency measure that can be easily implemented in such areas is low flow rinse valve. Low flow rinse valves offer energy saving opportunity through (1) reduction in gallons of water consumption, and (2) consequent reduction in therms of natural gas for hot water heating. Standard pre-rinse water spray valves have flow rates as high as five gallons per minute. New low flow valves are readily available that perform as well as standard valves using only 1.25 gallons per minute.

Note that not all low flow designs exhibit comparable cleaning performance. Products with high velocity spray patterns will show substantially better cleaning performance than those which simply use a flow restrictor to achieve the recommended gallon per minute flow. It is recommended to purchase only those models that have been tested in accordance with ASTM F2323-03: Standard Test Method for Pre-rinse Spray Valves and meet this efficiency recommendation.

All pre-rinse valves are generally inexpensive and easily interchangeable with different manufacturers' assemblies. A typical pre-rinse valve last about five years unless it is of substandard manufacture, improperly installed, or used in a facility with poor water quality. It is also recommended to check with the utility company as they may be able to finance part (if not all) of the measure costs.

Analysis Summary

Natural gas savings were estimated using a spreadsheet calculation based on flow rates in standard and low flow spray valves, estimated usage per school day, and water heater efficiency. Dollar value of savings was determined based on the effective natural gas rate for the schools.

Note: Costs were determined from web sources for the spray valves and hoses; and installation labor cost was determined based on cost estimating guides. Refer to **Table 4.18** for analysis summary.

Table 4.18 Analysis summary of proposed Kitchen Measure K-4

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Energy Cost Savings ($)	Payback Period (Years)	Estimated Incentive ($)	Project Cost with Incentive ($)	Simple Payback Period with Incentive (Years)
South Tahoe HS	0	0	0	548	$0.825	633	$452	1.4	$0	$633	1.4
Tahoe Valley ES	0	0	0	548	$0.961	633	$527	1.2	$0	$633	1.2
Total:	**0**	**0**		**1096**		**$1,265**	**$979**	**1.3**	**$0**	**$1,265**	**1.3**

Kitchen Measure K-5: Anti-Sweat Heater (ASH) Controls

Measure Description

This measure proposes to install controls on existing refrigerators that have windows with electric heating elements that run constantly to prevent formation of condensation (sweat) that would obscure the windows. The new controls will operate the heaters only when the kitchens are humid enough that condensation can form.

Background and Existing Situation

The kitchens at South Tahoe HS and South Lake Tahoe MS appear to have refrigerators with uncontrolled anti-sweat heaters on windows. Tahoe Valley ES has new walk-ins that appear to have heater controls.

Anti-sweat heater controls can be retrofitted fairly easily to existing refrigerators by an electrician. The controls must be properly placed to accurately sense conditions in the room.

Implementation Scope of Work

1. Hire a refrigeration contractor who has experience installing anti-sweat heater controls. The contractor shall first verify that the controls can be installed without harm to the refrigerators, then proceed on installation.
2. The contractor will install the controller on or inside the refrigerator, in a position where its humidity sensor can accurately gage conditions in the room. The controller will be wired into the electrical circuit that energizes the refrigerator's anti-sweat heater.
3. The contractor shall verify that the completed installation turns off the anti-sweat heater when the air in the room is dry, and turns the heater on when the air is humid (for example, spraying hot water near sensor).
4. Installation shall comply with all federal, state, and local regulations including the California Mechanical Code, National Electric Code, and any refrigeration related regulations.

Analysis summary

The wattage of the existing heaters was estimated based on nameplate data obtained during the site visit and the Energy Commission's database of refrigerator data. Savings were estimated based on the difference between the current constant operation and the assumed 1500 hours per year operation with the controls.

Costs for the measure were determined based on a web source for the price of the new controller and cost estimating guides for installation labor. Refer to **Table 4.19** for analysis summary.

Table 4.19 Analysis summary of proposed Kitchen Measure K-5

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Energy Cost Savings ($)	Payback Period (Years)	Estimated Incentive ($)	Project Cost with Incentive ($)	Simple Payback Period with Incentive (Years)
South Tahoe HS	0	9,653	$0.076	0	0	$6,249	$734	8.5	$483	$5,767	7.9
South Lake Tahoe MS	0	10,498	$0.076	0	0	$5,141	$801	6.4	$525	$4,616	5.8
Total:	**0**	**20,150**		**0**		**$11,391**	**$1,535**	**7.4**	**$1,008**	**$10,383**	**6.8**

Kitchen Measure K-6: High Efficiency Refrigerators

Measure Description

This measure proposes to replace existing low efficiency refrigerators with new high efficiency units.

Background and Existing Situation

Most of the refrigerators seen during the site visit have efficiencies high enough that it would not be cost effective to purchase replacement units based on electricity savings alone. However, two units were found to be extremely inefficient.

Refrigerators in schools are often donated by well-meaning teachers and parents, to provide food storage for staff kitchens and culinary classrooms. Some of these units date to a time when manufacturers skimped on insulation to maximize internal volume within given outside dimensions, and added anti-sweat heaters that ran constantly so their poorly insulated products wouldn't drip onto kitchen floors.

The two inefficient units seen during the site visit were located in a culinary classroom at South Lake Tahoe MS and the staff kitchen at Tahoe Valley ES.

Analysis summary

Savings for the replacements were based on data for annual electricity consumption from the Energy Commission's database of refrigerator data.

Costs for the measure were determined based on a web source for the price of the new refrigerators and cost estimating guides for installation labor. Refer to **Table 4.20** for analysis summary.

Table 4.20 Analysis summary of proposed Kitchen Measure K-6

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Energy Cost Savings ($)	Payback Period (Years)	Estimated Incentive ($)	Project Cost with Incentive ($)	Simple Payback Period with Incentive (Years)
South Tahoe HS	0	851	$0.076	0	0	$1,750	$65	27.1	$0	$1,750	27.1
Tahoe Valley ES	0	1,014	$0.101	0	0	$1,750	$102	17.1	$0	$1,750	17.1
Total:	**0**	**1,865**		**0**		**$3,500**	**$167**	**21.0**	**$0**	**$3,500**	**21.0**

4.5 Mechanical

Mechanical Measure M-1: Demand controlled ventilation

Measure Description and Objectives

This measure would consist of installing, programming and commissioning a system to control the fresh air intake into the heating and ventilation systems serving large spaces. The control would be based on measured carbon dioxide levels to control ventilation based on demand from occupants. It would use the existing energy management system that is already controlling the heating and ventilation systems. This measure would add a carbon dioxide sensor for each space, modifications to the heating and ventilation units, and programming for the energy management system.

Existing System and Background

Each of the audited facilities has at least one large space that is heated and ventilated by constant volume systems. These large spaces consist of the library at South Tahoe HS, the gym at South Lake Tahoe MS, and the multipurpose room at Tahoe Valley ES. The systems consist of unit ventilators or air handlers, which are controlled by existing energy management systems. All of the unit ventilators and air handlers have fresh air intakes to admit outside air. These are typically adjusted to provide a minimum setting of 25 percent outside air in order to provide enough outside air when the spaces are fully occupied. The systems also typically have actuators to provide some cooling, when the space is warm and outside air is cooler, by opening the outside air dampers completely and shutting off the recirculation of return air, so that the spaces receive 100 percent outside air.

Proposed New Equipment and Implementation Scope

The proposed new equipment consists of sensors to measure carbon dioxide in the room.

The unit ventilators and air handlers would be modified or adjusted so that their outside air dampers can be modulated from fully closed to 100 percent open.

The energy management systems would be programmed to control the outside air dampers based on the carbon dioxide sensor readings.

Analysis Summary

Savings from this measure were analyzed using the eQUEST building simulation model. A prototypical 6,000 sq. ft. space was modeled, first using the current conditions of 25 percent minimum outside air, then under the proposed operation with the outside air controlled based

on space occupancy. The savings per sq. ft. of floor space were then applied to the estimated floor space for each of the large spaces.

Costs were estimated based on web sources for the cost of the new sensors, and cost estimating guides for installation materials and labor. Refer to **Table 4.21** for analysis summary.

Table 4.21 Analysis summary of proposed Mechanical Measure M-1

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Energy Cost Savings ($)	Payback Period (Years)	Estimated Incentive ($)	Project Cost with Incentive ($)	Simple Payback Period with Incentive (Years)
South Tahoe HS	0	0	0	1,479	$0.825	$9,856	$1,220	8.1	$361	$9,494	7.8
South Lake Tahoe MS	0	0	0	1,740	$0.862	$9,147	$1,500	6.1	$425	$8,722	5.8
Tahoe Valley ES	0	0	0	1,536	$0.961	$13,169	$1,475	8.9	$375	$12,794	8.7
Total:	**0**	**0**	**0**	**4,755**		**$32,172**	**$4,195**	**7.7**	**$1,161**	**$31,011**	**7.4**

Mechanical Measure M-2: Occupancy sensor control of HVAC

Measure Description and Objectives

This measure would consist of controlling existing HVAC systems on the basis of room occupancy, in order to save electricity and gas by shutting off fans and setting back thermostat settings.

Existing System and Background

Currently, the HVAC systems in the audited facilities are controlled based on preset operating schedules and room temperature. The HVAC systems are primarily heating and ventilating only, except in the portable classrooms that have air conditioning. Systems in the permanent buildings are controlled by energy management systems, and those in the portable classrooms are controlled by programmable thermostats. Replacement of the programmable thermostats with networked thermostats is proposed as a separate mechanical measure. The controls typically operate the systems in occupied mode 6:00 a.m. to 4:00 p.m. on schooldays, with the fans operating constantly for ventilation and the room maintained between 68 °F and 72 °F, adjustable by the occupant with a slider. The rest of the time, the fans operate only as needed for temperature control, and the room is maintained above 50 °F to prevent damage to the room contents.

All of the audited facilities have at least some occupancy sensors for lighting control, and more sensors have been proposed as lighting controls measures in this report. The occupancy sensors typically have spare outputs that can be used to control HVAC. If there are no spare outputs, a low voltage slave relay can be added to provide a control output.

Proposed New Equipment and Implementation Scope

The proposed new equipment consists of low voltage wiring and slave relays.

The energy management systems would be programmed to put a room's HVAC system into unoccupied mode if the room has been vacant for 30 minutes or more, and then to return to occupied mode when the room is re-occupied.

Analysis Summary

Savings from this measure were analyzed using a spreadsheet model that applied the estimated 10 percent savings from occupancy sensor control to the estimated HVAC energy from **Appendix B**.

Costs were estimated based on cost estimating guides for installation materials and labor. Quantities of wiring and other materials were based on the numbers of existing HVAC units

determined from building construction drawings and the site visits. Refer to **Table 4.22** for analysis summary.

Table 4.22 Analysis summary of proposed Mechanical Measure M-2

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Energy Cost Savings ($)	Payback Period (Years)	Estimated Incentive ($)	Project Cost with Incentive ($)	Simple Payback Period with Incentive (Years)
South Tahoe HS	0	19,447	$0.076	5,329	$0.825	$29,745	$5,874	5.1	$972	$28,772	4.9
South Lake Tahoe MS	0	14,014	$0.076	4,219	$0.862	$19,724	$4,705	4.2	$701	$19,023	4.0
Tahoe Valley ES	0	9,793	$0.101	1,694	$0.961	$16,288	$2,616	6.2	$490	$15,799	6.0
Total:	**0**	**43,254**		**11,242**		**$65,757**	**$13,195**	**5.0**	**$2,163**	**$63,594**	**4.8**

Mechanical Measure M-3: Networked thermostats

Measure Description and Objectives

This measure would consist of replacing the existing programmable thermostats with networked thermostats for control of existing HVAC systems in the portable classrooms.

Existing System and Background

South Lake Tahoe MS and Tahoe Valley ES both have portable classrooms with HVAC systems that are controlled by programmable thermostats. The controls typically operate the systems in occupied mode 6:00 a.m. to 4:00 p.m. on schooldays, with the fans operating constantly for ventilation and the room maintained between 68 °F and 72 °F. The rest of the time, the fans operate only as needed for temperature control, and the room is maintained between 50 °F and 85 °F to prevent damage to the room contents.

The programmable thermostats are only capable of following a fixed schedule. They must be manually adjusted to reduce HVAC operation for holidays, snow days, minimum days, and school session breaks. In addition, many of the portable classrooms are only used for special classes or as offices and storage, and their HVAC needs don't follow a fixed schedule.

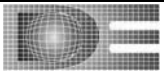
Energy costs could be further reduced by installing energy management systems (EMS) like the ones that serve the permanent buildings at the schools. However, this is expensive. Estimates indicate an average of $2,200 to $2,500 per controlled zone.

An alternative lower cost option is network thermostats. These controls have recently gained popularity given their ability to do many of the same functions at a lower cost. Accordingly, network thermostats are often referred to as technology that helps bridge the gap between conventional thermostats and expensive building control systems.

Network thermostats can be connected via a secure wired Ethernet to a facility's data network. Through an IP address, each thermostat is able to serve up its own web pages to allow the user to configure and monitor the thermostat using a standard web-browser. Remote HVAC zone monitoring and control are also available over secure and authorized broadband internet connections. This feature allows for maintenance staff or other service providers to monitor, diagnose, and control HVAC systems from a remote central location.

Network thermostats typically feature:

- Automatic Heat/Cool Changeover
- Dual Occupied and Unoccupied Setpoints for Heat and Cool
- Remote Sensor Capability (indoor, duct, and outdoor)
- Outdoor Temperature Display (if applicable)
- Keyboard Lockout (prevents users from tampering with setpoints)
- Push Button Override with temperature adjustment



Software to manage the networked thermostats is available to provide a clean and simple interface. This software allows maintenance staff to administer common changes to multiple thermostats, save predefined common or specific device settings, and restrict user access privileges. Some software also has the ability to send visual alarm notifications and e-mails or text messages.

Major network thermostat manufacturers are listed below. These examples are for illustration purposes only; no endorsement of the products is implied. Refer to **Appendix E** or the manufacturer's web-site for additional product information including product data sheets and various case studies.

Proliphix (www.proliphix.com)
Net/X Network Thermostats (www.networkthermostat.com)
XCI Controls (www.xcicontrols.com)

While there are functions that network thermostats lack when compared to EMS/DDC systems (economizing, trending, etc.), the features that contribute to energy savings remain. These include 365 day scheduling (including weekday, weekends, and holidays), upper and lower bounds on temperature setpoints, user lockouts, and remote monitoring and control. Cost estimates of network thermostats are in the range of $800 to $850 per zone. For this analysis, it is estimated that network thermostats will be able to capture approximately 70 percent of the 15 percent energy savings estimate for a typical EMS/DDC measure (or 10 percent of overall HVAC energy use). Overall, the savings break-down is as follows: four percent - improved scheduling; three percent improved zone temperature controls; and three percent- optimized start/stop.

Proposed New Equipment and Implementation Scope

1. Assess the capabilities of the existing communication (Ethernet) network. Verify that the proposed network thermostats are suitable for the application. Contact network thermostat dealer.
2. Provide new network thermostats in each controlled zone. This may also be a good time to identify thermostats presently in unsuitable locations, such as near windows and doors, where they may be exposed to sunlight and draft winds.
3. To minimize installation cost, use existing conduits for drawing communication wiring. Use new conduits where required.
4. Programming will require specification of logic and sequence of operation for all equipment. This component of the measure will require a careful design process. The logic must address key areas germane to the operation of the units under the conditions encountered at the facility.

5. Provide training for the operators. Training shall include all operational, programming, control, and maintenance aspects of the system.

Note: Effective use of the control system critically hinges upon proper training and programming. Therefore, the district must plan for training during system installation. Success of the system is critically dependent on the district's ability to assign a dedicated staff resource to remain knowledgeable and maintain such controls.

6. An important factor to consider in selection of a control system is the local support available. Limited support in the area may result in long down times in cases of system failures.
7. If the district wishes to pursue this measure, they could issue an RFP to interested vendors and seek competitive installation prices for the same.

Analysis Summary

Savings from this measure were analyzed using a spreadsheet model that applied the estimated 10 percent savings from networked thermostat control to the estimated HVAC energy for the portable classrooms from **Appendix B**.

Costs were estimated based on cost estimating guides for installation materials and labor. Quantities of wiring and other materials were based on the numbers of existing HVAC units determined from the site visits. Refer to **Table 4.23** for analysis summary.

Table 4.23 Analysis summary of proposed Mechanical Measure M-3

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Energy Cost Savings ($)	Payback Period (Years)	Estimated Incentive ($)	Project Cost with Incentive ($)	Simple Payback Period with Incentive (Years)
South Lake Tahoe MS	--	2,215	$0.108	239	$0.862	$9,035	$445	20.3	$111	$8,925	20.1
Tahoe Valley ES	--	2,405	$0.125	162	$0.961	$9,456	$456	20.7	$120	$9,336	20.5
Total:	**0**	**4,620**		**401**		**$18,492**	**$901**	**20.5**	**$231**	**$18,261**	**20.3**

Mechanical Measure M-4: New High Efficiency Boilers

Measure Description

This measure proposes the replacement of four existing, older boilers with four new boilers of equal capacity and higher efficiency. Efficiency of the new boiler shall be at least 85 percent (higher heating value basis) with NOx emissions less than 20 ppm. See **Appendix E** for manufacturer's data of boilers with these specifications.

Because equipment is near its expected service life, the payback period associated with this recommendation may be an irrelevant issue. We propose that this measure be seriously considered along with any future modernization plans.

Background and Exist*in*g Situation

There are two locations in the audited facilities which have boilers near the end of their service lifetimes. South Lake Tahoe MS has 1995 vintage boilers in the boiler room located in the gym, and Tahoe Valley ES has 1997 vintage boilers. These boilers have nameplate efficiencies of 80 percent, and are probably less efficient now due to the effects of age on their heat transfer surfaces and combustion controls that cleaning and tune-ups cannot fully rejuvenate.

New boilers are available with efficiencies of 85 percent or better. However, new boilers are expensive items and the energy savings may not be sufficient to justify the cost.

Implementation Scope of Work

1. Seek services of an engineer to specify the new boiler with a thermal efficiency rating of at least 85 percent with NOx levels not to exceed 20 ppm.
2. Remove existing old boiler. Ensure that demolition of all elements is in accordance with local regulations.
3. Assess whether load conditions in the served areas have changed significantly since the existing boiler was originally installed.
4. Verify all required minimum clearances from combustible construction materials. Clearances should allow for servicing.
5. Verify which of the existing boiler components can be reused (if any). Existing gas piping for example can typically be reused. Refer to manufacturer's installation instructions for proper ventilation and flue exhaust requirements.
6. Install new boiler as per boiler manufacturer's written instructions. The boiler should be mounted on a level, structurally sound surface. Mount the new boiler in the same location after removing the old boiler. Ensure that new boiler is anchored as per boiler manufacturer's written recommendations and California Building Code requirements.
7. Proceed with equipment start-up as instructed by boiler manufacturer.

8. Installation of all new equipment shall comply with all federal regulations including but not limited to the California Mechanical Code, National Electric Code, California Fire Code, and gas service related regulations.

Analysis Summary

Savings were estimated with a spreadsheet calculation that used the efficiencies of the existing and proposed boilers together with the annual space heating natural gas consumption estimated in **Appendix B** for the schools. Dollar value of the savings was estimated using the effective natural gas rate for the schools as determined in **Appendix F**.

Costs for the new boilers and materials and labor for installation were estimated using cost estimating guides. Refer to **Table 4.24** for analysis summary.

Table 4.24 Analysis summary of proposed Mechanical Measure M-4

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Energy Cost Savings ($)	Payback Period (Years)	Estimated Incentive ($)	Project Cost with Incentive ($)	Simple Payback Period with Incentive (Years)
South Lake Tahoe MS	--	0	--	4,822	$0.862	$238,278	$4,155	57.3	$5,000	$233,278	56.1
Tahoe Valley ES	--	0	--	1,028	$0.961	$153,521	$988	155.4	$2,625	$150,896	152.7
Total:	**0**	**0**		**5850**		**$391,799**	**$5,143**	**76.2**	**$7,625**	**$384,174**	**74.7**

Mechanical Measure M-5: Snow Melt System Controls

Measure Description and Objectives

This measure would consist of installing, programming and commissioning upgrades to controls for existing snow melt systems.

The objectives of the measure are as follows:

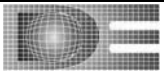
1. Minimize operation of the snow melt system in idling mode
2. Provide an easy means for school district staff to turn on the melt mode of the snow melt systems in anticipation of a snow storm, with automatic shut-off after the storm is over
3. Correct all problems with the existing snow melt system such as improperly located snow and ice sensors, active snow melt piping under pavement that no longer needs to be kept clear of snow, etc.
4. Train district staff in operation and maintenance of the snow melt systems
5. Provide trending and reporting on the snow melt systems' operation through the existing energy management systems

Existing System and Background

Both South Tahoe HS and South Lake Tahoe MS have extensive snow melt systems. The HS system is the largest, with snow melt piping embedded in about 58,000 sq. ft. of pavement. The MS system has snow melt piping in about 12,000 sq. ft. of pavement. However the audited areas for this study include only a portion of the snow melt piping, all of which is at the HS and is connected to mechanical rooms in building B, MO, and ST. There is an estimated 21,000 sq. ft. of pavement with snow melt piping connected to mechanical rooms in the audited areas.

The snow melt systems function by pumping heated propylene glycol solution through the piping embedded in the pavement. The glycol solution is heated in a heat exchanger, using steam from the HS's boiler plant, or heating hot water from the MS's boilers. The temperature of the glycol solution is controlled by varying the amount of steam or heating hot water fed into the heat exchanger.

The existing controls for the snow melt systems are connected to sensors for the outdoor air temperature, the temperature of the pavement, and the presence of snow, ice, or water on top of the pavement. The systems will operate in idling mode if no snow, ice, or water is present, but the outdoor air temperature is below freezing and the pavement is a preset temperature setpoint such as 25 °F or 30 °F. When snow or ice is detected, the systems will ramp up to melt mode, raising the temperature of the pavement above freezing to melt the snow or ice and evaporate the water from the pavement.



The snow melt systems can consume a large amount of energy, particularly if they are set for a relatively high idling setpoint. This has reportedly happened. District staff have raised the idling setpoints on the controls because the snow and ice sensors did not seem to be activating the melt mode of the snow melt systems. The result is that the pavement is being warmed whenever the temperature is below freezing, which occurs about 1600 hours a year in South Lake Tahoe.

The amount of energy consumed by the snow melt systems was estimated using figures from the 2011 ASHRAE Handbook of HVAC Applications for the closest location, which is Ely, Nevada. This source provides the annual thermal energy consumption for a snow melting system operated in both melt and idling mode to keep pavement snow free. The ASHRAE figures were adjusted as follows:

- The melt mode energy consumption was multiplied by 3.64, the ratio of South Lake Tahoe average annual snowfall to that in Ely, Nevada.
- The idling mode energy consumption was multiplied by 0.57, the ratio of South Lake Tahoe annual hours with outside air dry bulb temperatures less than 32 °F to those in Ely, Nevada.

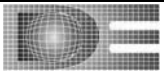
Including ground conduction heat losses of 30 percent and a boiler efficiency of 82 percent, the estimated annual natural gas consumption for the existing system is 1.7 Therms per sq. ft. per year. This is for operation in both idling and melt mode. If it were only operated in melt mode, the system would consume 0.4 Therms per sq. ft. per year. In addition to the natural gas, the systems use electricity to pump the glycol solution. Based on the pump horsepower and the number of hours per year with outside air temperatures below freezing, the estimated annual electricity consumption for the existing system is 0.7 kWh per sq. ft. per year, which would be reduced to 0.2 kWh per sq. ft. per year if the system were only operated in melt mode without any idling.

Implementation Scope

The new system should be designed by a mechanical engineer with controls and snow melt system consultants.

The basic scope for construction of the measure is as follows:

1. Provide a complete assessment of the existing system and identify any deficiencies that would interfere with its proper operation, and any areas that no longer need to be served with snow melting.
2. Prepare a design including new controllers, sensors, interfaces to the existing energy management system, remote operator stations, and other equipment and replacement parts as needed.
3. Install the system in accordance with manufacturer's instructions and applicable building codes.



4. Program EMS to provide trending reports showing the systems' operation, energy consumption, and temperatures including outside air and glycol.
5. Commission system and demonstrate proper operation over a period of at least a week, including continuous monitoring of operation and temperatures.
6. Provide training to district staff as well as bound instruction manuals, covering routine operations, periodic maintenance, and troubleshooting.

Analysis Summary

Savings from this measure was analyzed using a spreadsheet that is included in **Appendix C**. Savings were conservatively estimated as 50 percent of the difference between estimated current natural gas and electricity consumption for snow melting, operating in both melt and idling modes, and the estimated consumption if the systems only operated in melt mode.

The dollar value of the energy savings was calculated using the current utility tariffs for natural gas and electricity service. The electricity price that was used includes only energy charges, based on the assumption that the snow melt system will not operate when demand charges are incurred, so that the measure will not significantly affect electrical demand. Refer to **Table 4.25** for analysis summary.

Table 4.25 Analysis summary of proposed Mechanical Measure M-5

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Energy Cost Savings ($)	Payback Period (Years)	Estimated Incentive ($)	Project Cost with Incentive ($)	Simple Payback Period with Incentive (Years)
South Tahoe HS	--	6,998	$0.076	17,321	$0.825	$108,873	$14,820	7.3	$350	$108,523	7.3
Total:	**n/a**	**6,998**	**$0.076**	**17,321**	**$0.825**	**$108,873**	**$14,820**	**7.3**	**$350**	**$108,523**	**7.3**

4.6 Clean Generation

Solar PV Measure PV-1: Solar PV (rack or parking shade mount)

Measure Description and Objectives

Because of the district's interest in exploring clean generation, solar PV was analyzed as part of this energy audit. However, it is not recommended because of poor economics that result from:

- Lack of incentives that would offset part of the cost.
- Relatively low electricity prices compared to other areas and customer classes.
- High maintenance costs due to climate.
- Relatively low output due to cloud cover, especially in winter.

The following locations were identified as possible locations for grid-tied solar PV systems:

1. On new parking space canopies at South Tahoe HS
2. On new parking space canopies at South Lake Tahoe MS
3. On new parking space canopies at Tahoe Valley ES
4. On new ground mounted racks at Tahoe Valley ES

Installing these solar PV systems would allow the district to generate electricity on-site, thereby offsetting electricity that is currently purchased from the utility.

Solar PV locations

The solar PV systems would be installed on parking canopies or ground mount racks to avoid mounting on the roofs. In heavy snowfall years, the district has to clear snow from the roofs when it accumulates to a level that is near the ratings of the roofs. Roof mounted panels would add a small amount of weight to the roofs, and could create an impediment to snow removal. Parking canopies and ground mount racks would not require any structural re-evaluation of the existing roofs, and can be designed to successfully cope with the weight of snowfall even in heavy snowfall years.

South Tahoe HS: The audited area of South Tahoe HS includes one small parking area, just south of building B, that could be suitable for solar PV. It should be noted that outside the audited area, there are larger parking areas where the installed cost could be lower because of economies of scale in the wiring and foundation excavation. There is also open space on the hillside and adjoining the playing fields. These locations may be problematic because of planning issues and potential damage to solar PV modules from baseballs.

South Lake Tahoe MS: Solar PV could be installed on new canopies in the parking lot, away from the trees west of the parking lot that shade the lot in the late afternoon, which will reduce

afternoon power output. Outside the audited area there is open space that may be suitable for solar PV on ground mount racks.

Tahoe Valley ES: Solar PV could be installed on new canopies in the parking lot, away from the trees on the southwest side of the lot. It should be noted that the home plate of the school's baseball field is 325 feet from the closest parking space.

Solar PV could also be installed on ground mount racks on the southeast portion of the school property where there is open space adjoining existing residences. It should be noted that this may not be acceptable to the planning authorities.

Implementation Scope

There are many ways this measure could be implemented, which include:

1. Traditional design-bid-own, in which the district would hire a solar PV design firm to create bid documents, select a contractor to construct the measure, then own and maintain the equipment.
2. Power purchase agreement (PPA), in which the district would select a solar PV provider who would lease space from the district and sell the district the electricity from the equipment.

Whichever way the measure is implemented, it needs to be designed by an experienced solar PV design firm with structural and electrical consultants. Key parts of the design process include:

1. Permitting issues related to construction in open spaces and parking lots
2. Parking lot traffic analysis, including assessment of parking canopy placement relative to school bus lanes and consideration of possible restriping.
3. Structural analysis of proposed canopies and ground mount racks, including foundation design and snow load analysis.
4. Analyzing the possible tie-in points for the electric power on the schools' electrical distribution systems.
5. System sizing relative to the schools' electrical needs, which should long term monitoring of instantaneous or 15 minute interval electrical load during both school sessions and break periods.
6. String, combiner, and inverter layout.

In addition, if the solar PV measure is financed with Prop. 39 funds, a performance guarantee will be required for the systems that are expected to produce over 1500 kWh of electricity per kW of system size. This guarantee will require metering as well as responsibility for ongoing monitoring.

Analysis Summary

The annual production of power from the systems was estimated using the online PVWatts Version 2 calculator from the National Renewable Energy Laboratory. The output from the PVWatts calculator is included in **Appendix C**. In estimating power output, weather data specific to South Lake Tahoe was used in the software. Each system was modeled based on orientations that appear suitable for the installations of parking canopies or a ground-mount system. The PV modules and inverters were specified as standard efficiency units in the inputs to the PVWatts calculator, corresponding to a typical 310 Watt DC monocrystalline panel and a 96% efficient inverter. Refer to **Table 4.26** for the inputs, approximate numbers of panels, and results of the PVWatts calculation.

Table 4.26 PV Module Calculator Input

	SLT HS Building B Parking	SLT MS Parking	TV ES Parking	TV ES Ground Mount
Number Parking Spaces	8	76	12	na
Row Orientation	E-W	N-S	SE-NW	E-W
Panel Azimuth	S	E	SW	S
Tilt	10	10	10	40
Solar PV module capacity, kW DC	12.8	121.6	19.2	40
kWh/yr AC per kW DC	1,572	1,456	1,501	1,684
Number of Panels	41	392	62	129
Watts per Panel DC at STC	310	310	310	310
Inverter Capacity, kW AC	12	111	17	36
Inverter Efficiency	96%	96%	96%	96%
Estimated Annual Production-School Year	12,980	110,249	18,891	47,058
Estimated Annual Production-Breaks	7,139	66,838	9,935	20,283

A key output from the PVWatts calculator is the annual electricity output divided by the total generating capacity of the solar panels (kWh/yr AC per kW DC). This number directly affects the economics of solar PV and is fairly low for most of the systems that were analyzed, in comparison to systems with more favorable climate and orientation.

The dollar value of the power output from the systems was estimated based on two rates from the rate simulation (see **Appendix F**). The dollar value of the power output during the school year was estimated using the total energy price including demand charges. The dollar value of

the power output during the winter and summer break year was estimated using the energy price not including demand charges. The prices for the schools are relatively low compared to those for schools in other areas of the state.

The estimated installed unit cost (labor and materials included) for the parking canopy mounted PV systems is $4,700 per kW DC. This cost was based on recent average costs for typical roof mounted systems for public sector measures in California, plus a $1,000 per kW DC adder for the installed cost of the parking canopies, including foundations, additional wiring, etc. The estimated installed cost of the ground mounted system is $4,200 per kW DC, again based on recent average costs of for typical roof mounted systems for public sector measures in California, plus a $500 per kW DC adder for the installed cost of the parking canopies, including foundations, additional wiring, etc. This cost would not include the cost of a 25-year warranty on all system components.

Maintenance costs were included in the analysis and were estimated at $67 per kW DC per year, based on a recent proposal for panel cleaning and annual inspections of wiring, inverters, and switchgear for another public facility. The solar PV systems at the schools would be exposed to extreme weather conditions as well as airborne dust, and regular cleaning and electrical inspections would be essential for longevity.

Financial incentives were not included in the cost analysis presented in this report; the CSI program concluded in summer 2015 and there is no replacement program under development and the state and federal tax credits are not applicable for government owned facilities. Refer to **Table 4.27** for analysis summary. The measure is not recommended because the systems fail to pay for themselves within a 20 year expected lifetime for the solar panels and a 10 year expected lifetime for the inverters. The CEC's savings to investment ratio (SIR) calculator estimates a 0.26 SIR for the solar PV systems. Please refer to Appendix G for the detailed PV system concept schematic.

Table 4.27 Analysis summary of proposed Solar PV Measure PV-1

Facility	kW DC	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Maintenance Costs	Energy Cost Savings ($)	Payback Period (Years)	Estimated Incentive ($)	Project Cost with Incentive ($)	Simple Payback Period with Incentive (Years)
South Tahoe HS	12.8	20,119	$0.116	0	0	$58,410	$858	$1,479	39.5	$0	$58,410	39.5
South Lake Tahoe MS	121.6	177,088	$0.116	0	0	$554,896	$8,147	$12,318	45.0	$0	$554,896	45.0
Tahoe Valley ES-Parking	19.2	28,825	$0.141	0	0	$87,615	$1,286	$2,790	31.4	$0	$87,615	31.4
Tahoe Valley ES-Ground Mount	40.0	67,341	$0.141	0	0	$163,113	$2,680	$6,844	23.8	$0	$163,113	23.8
Total:	**193.6**	**293,374**	**$0.129**	**0**		**$864,035**	**$12,971**	**$23,431**	**36.9**	**$0**	**$864,035**	**36.9**

Clean Generation CHP-1: Install natural gas fueled clean combined heat and power generation at South Tahoe HS

Measure Description and Objectives

This measure would consist of installing a low emission combined heat and power (CHP) system at South Tahoe HS. This would allow the district to generate both useful heat and electricity on-site, thereby offsetting electricity that is currently purchased from the utility as well as natural gas that is currently used in the school's boilers.

CHP location

CHP seldom makes sense for facilities with small, intermittent heat and power loads. It generally works best in facilities that require significant amounts of both heat and power around the clock, seven days a week, and throughout the year. The audited area of South Tahoe HS is not large enough to support a CHP system, but a location that might be feasible is the boiler house between the gym and student union. The heat output from a CHP system could be connected to the domestic hot water, snow melt, and space heating hot water systems that originate from the boiler house. (The boilers in the boiler house produce steam for distribution, and it is very inefficient to produce steam from a small CHP system because of the higher temperature of steam compared to domestic hot water or space heating hot water.)

CHP Technology

There are three types of clean, natural gas fueled CHP systems that offer clean generation in sizes that might be appropriate for the South Tahoe HS:

1. Internal combustion reciprocating engines, like the Tecogen module.
2. Recuperated gas turbine engines, like the Capstone module.
3. Fuel cells with heat recovery, like the Fuel Cell Energy module.

All of these technologies offer low emissions as well as high efficiency and demonstrated reliability. All are modules designed to facilitate connection to fuel, electric distribution, domestic hot water, and space heating hot water.

Maintenance

Maintenance is an important consideration for all CHP technologies. All types of systems require periodic attention to perform reliably. Internal combustion reciprocating engines require oil changes and other scheduled engine maintenance. Gas turbine based systems require periodic overhauls at longer intervals, but the expense of the overhaul is much higher. Fuel cells require periodic stack replacements. All of the types of systems require frequent attention to the pumps, motors, fans, and controls that are essential to applying the power and

heat output to the school. Any shortcoming in maintenance will result in system downtime and loss of economic value from the system.

Implementation Scope

There are many ways this measure could be implemented, which include:

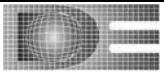
1. Traditional design-bid-own, in which the district would hire a design firm to create bid documents, select a contractor to construct the measure, then own and maintain the equipment.
2. Power purchase agreement (PPA), in which the district would select a CHP system provider who would lease space from the district and sell the district the electricity and useful heat from the equipment.

Whichever way the measure is implemented, it needs to be designed by an experienced CHP design firm with structural, mechanical, and electrical consultants. Key parts of the design process include:

1. Permitting issues related to air pollution permits and construction
2. Utility issues including interconnection agreements, metering, and protective relaying
3. Analyzing the possible tie-in points for the electric power on the schools' electrical distribution systems, and for the heat output to connect to the school's domestic hot water and (possibly) snow melt and space heating hot water systems
4. System sizing relative to the schools' electrical and heat needs, which should include long term monitoring of electrical and heat loads during both school sessions and break periods.
5. Structural, mechanical, and electrical design of the interface between the module and the school's electrical and heating systems.

Analysis Summary

The annual production of heat and power from the systems was estimated using manufacturer's data for the systems plus assumptions about the loads in the school. These assumptions would have to be refined by load monitoring before any investment is considered. The smaller systems (reciprocating engine and gas turbine) were assumed to run 75 percent of the time with 100 percent of their electric output used and with 80 percent of their thermal output used. These assumptions reflect the absence of natural gas usage by the school during the summer months. With no thermal load, the smaller systems would not be economic to run at current electricity prices. The fuel cell was assumed to run 98 percent of the time, with the same useful thermal output as the smaller systems. The fuel cell is more efficient than the smaller systems and it is eligible for net metering which under Liberty Utilities' current tariff seems to provide the same price for exported power as for imported power. This tariff may be interpreted to exclude payment of the demand charges for the kW exported to the grid, which would reduce the value of power exports.



The dollar value of the power output from the systems was estimated based on the total energy price including demand charges. Installed cost and maintenance costs were estimated based on data provided by the manufacturers for other measures with similar scope.

Financial incentives were not included in the cost analysis presented in this report; the Self-Generation Incentive Program does not apply since the district is not a customer of one of California's three large investor-owned utilities. Refer to **Table 4.28** for analysis summary.

Table 4.28 Analysis summary of proposed CHP Measure CHP-1

Facility	kW AC	kWh/yr Output	Rate ($/kWh)	Th/yr Boiler Gas Savings	Rate ($/Th)	Th/yr Fuel Consumption	Rate ($/Th)	Maint-enance Cost	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Tahoe High School	75	473,040	$0.106	$20,121	$0.825	62,122	$0.809	$14,191	$267,608	$2,313	115.7	$0	$267,608	115.7
Total		**473,040**	**$0.106**	**$20,121**	**$0.825**	**62,122**	**$0.809**	**$14,191**	**$267,608**	**$2,313**	**115.7**	**$0**	**$267,608**	**115.7**

5 Grants, Incentives, and Rebates

5.1 The California Clean Energy Jobs Act (Proposition 39)

Under Proposition 39, the California Clean Energy Jobs Act, local educational agencies (LEAs) can request money from the California Department of Education to fund identified energy efficiency measures. Eligible recipients include county offices of education, school districts, charter schools, and state special schools. Annual award amounts are contingent upon funds allocated annually in the State budget and approved by the Legislature. Lake Tahoe Unified School District's 2013 through 2014 award was about $175,000 and the 2014 through 2015 award exceeded $150,000.
Applications are submitted to the Energy Commission and, in conjunction with the Department of Education, funds are allocated upon application approval. These funds are allocated over a five-year implementation cycle and are based on identified energy conservation measures submitted via an Energy Expenditure Plan to the Energy Commission. For more information on Proposition 39, please refer to the following website:

http://www.energy.ca.gov/efficiency/proposition39/
http://www.cde.ca.gov/ls/fa/ce/.

5.2 Liberty Utilities Standard Commercial Incentives

Liberty Utilities' and Southwest Gas' Customized Retrofit – Demand Response Programs provide customers cash incentive payments for energy efficiency measures involving the installation of new, high efficiency equipment or systems. The program entails an itemized approach whereby the incentive is based on a list of eligible equipment as well as a calculated approach whereby the incentive is based on the amount of energy savings produced annually. The district is encouraged to investigate itemized rebates as they may result in higher incentives.

The Municipal Program is designed for municipal customers of any size on a commercial account to help with the purchase of energy efficient equipment as part of a new construction or renovation measure, replacement of equipment that has reached its end of useful life or to replace less efficient existing equipment. Prescriptive incentives, new and retrofit, include chillers (new only), compressed air, heating, cooling and water heating, HVAC (new only), lighting, motors, and variable frequency drives. Technical assistance by an outside engineering firm may be offered to any municipal customer when it is necessary to quantify the energy savings potential of a proposed measure, and Liberty Utilities will typically fund 50 percent of the cost.

Incentives for retrofit measures generally cover up to 35 percent of the measure cost (50 percent for lighting).
Incentives for new equipment and construction cover up to 75 percent of the incremental cost for the most efficient options. For efficient options utilized in school construction, expansion or major renovation, incentives for new equipment and construction cover up to 100 percent of the incremental cost.

All incentives are subject to funding availability. Certain caps and restrictions apply. Once the district receives an incentive approval, the incentive is fixed and the money is reserved for the measure.

The standard incentive payment amount is based on a flat incentive rate (per kW, per kWh or per Therms) applied to one year of energy savings. As is indicated in **Table 5.1**, incentive rates vary with the type of measure implemented:

Table 5.1 Standard retrofit program rebates by category

Measure Category	Incentive Rate
Lighting (Fluorescent, Other Lighting, or Controls)	LED - $0.25 – $40 per lamp RW T8 - $1.00 per lamp Occupancy Sensors - $12 – $30 per sensor Daylighting Controls - $0.10 per watts controlled
Kitchen	Refrigerators - $50 – $125 per refrigerator Freezers - $60 – $200 per freezer Anti-Sweat Heater Controls - $40 per door
HVAC	VSD on HVAC fans and pumps - $45 per Hp Window Film - $0.50 per Sq. Foot HVAC Occupancy Sensors - $55 per room Programmable Thermostat - $25 per thermostat

It is important to note that if any of the measure measures are included in applications to any other California end user energy efficiency rebate program, the measure may be ineligible for participation. Other California end user energy efficiency programs include, but are not limited to, any end user program offered by or through Southern California Gas Company, Southern California Edison, PG&E, San Diego Gas and Electric, the Energy Commission, Liberty Utilities, Southwest Gas, and the CPUC, including local programs funded by the Public Goods Charge. For additional details including measure applicability, funding availability, and important dates and deadlines, the district is strongly encouraged to speak with a utility representative.

5.3 Liberty Utilities Custom Retrofit Incentives

Less common installations, not included on the prescriptive applications, may also qualify for incentives as Custom measures. Measure cost and potential energy savings are quantified and evaluated through a benefit/cost model to determine eligibility for incentives.

On-peak and non on-peak time periods apply under the Liberty Utility incentives program as well. On-peak is in July to September, from 1:00 p.m. to 6:00 p.m. on weekdays, and October to June, from 5:00 p.m. to 9:00 p.m., seven days per week. Non on-peak is in the summer from July to September, from 6:00 p.m. to 1:00 p.m. on weekdays, from midnight to midnight on Saturdays and Sundays, and in the winter from October to June, from 9:00 p.m. to 5:00 p.m., seven days per week.

The custom incentive payment amount is based on a flat incentive rate (per kW or per kWh) applied to one year of energy savings. As is indicated in **Table 5.2**, incentive rates apply to the type of custom measure implemented:

Table 5.2 Custom retrofit program rebates

Category	Incentive Rate
Custom Incentive Amount	On-Peak - $0.10 per kWh Non On-Peak - $0.05 per kWh

5.4 Liberty Utilities Rebates

Liberty Utilities offers standard rebates for specific measures as well as the customized retrofit incentives based on estimated savings. The rebates are for specific types of equipment that must retrofit, replace, or upgrade old equipment with new technologies with energy efficiencies that exceed applicable government and/or industry minimum efficiency standards. The types of equipment for which K through 12 schools often can receive standard rebates include:

- Reduced Wattage T8 Lamps
- CFL Fixtures
- Occupancy Sensors
- Daylighting Controls
- LED Lamps
- Ventilation Controls
- Anti-Sweat Heater Controls

- EC Motors: Walk-In
- Evaporator Fan Control
- Vending Machine Controls
- Programmable Thermostats
- Window Film
- VSD on HVAC Fans and Pumps
- DCV – Interior
- Air Side Economizers
- Solid and Glass Door Refrigerators and Freezers

The standard rebates apply only to specific applications. The customized retrofit incentives are an alternative to the standard rebate program, and can provide a larger dollar amount in some instances. In this study, incentive amounts for energy efficiency measures were calculated by selecting the larger of the applicable standard rebate or customized retrofit incentive.

5.5 Southwest Gas Standard Commercial Incentives

According to ENERGY STAR®, a typical commercial building's energy use accounts for 30 percent of operating costs, the largest single category of controllable costs. By using natural gas, energy bills can be lowered. By improving facilities with high-efficiency natural gas equipment, businesses can be more energy efficient and environmentally responsible while maximizing business potential. Southwest Gas, Smarter Greener Better rebates are available for upgrades to commercial equipment.

Rebates are available for purchases made on or after January 1, 2015, through December 31, 2015, or until program funds are no longer available, whichever comes first. Due to limited funding, rebate applications should be submitted as soon as possible after purchase and installation. Equipment must be installed before submitting a rebate application. Rebate applications will be processed on a first-come, first-served basis and must be postmarked or submitted online by January 31, 2016, to be eligible for rebate.

Program participation dates are subject to funding availability and may change without notice. For updated program submission deadline dates, and for details on program eligibility and requirements, visit www.swgasliving.com/efficiency/ca.

The standard incentive payment amount is based on a flat incentive rate (per therm) applied to one year of energy savings. As is indicated in **Table 5.3**, incentive rates vary with the type of measure implemented:

Table 5.3 Standard retrofit program rebates by category

Measure Category	Incentive Rate
Gas	Natural Gas Non-Condensing Boiler - $1.00 per MBtuh Natural Gas Condensing Boiler - $1.25 per MBtuh Tank less Water Heater - $200 per heater Convection Oven - $500 per oven Combination Oven - $750 per oven Conveyer Oven - $750 per oven

5.6 Southwest **Gas Rebates**

Southwest Gas offers standard rebates for specific measures based on estimated savings. The rebates are for specific types of equipment that must retrofit, replace, or upgrade old equipment with new technologies with energy efficiencies that exceed applicable government and/or industry minimum efficiency standards. The types of equipment for which K through 12 schools often can receive standard rebates include:

- Tank less Water Heaters
- Smart Low-Flow Showerheads
- Furnaces
- Convection Ovens
- Conveyer Ovens
- Combination Ovens
- Griddles
- Fryers
- Natural Gas Non-Condensing Boilers
- Natural Gas Condensing Boilers
- Modulating Burners
- O_2 Trim Controls
- Steam Traps

The standard rebates apply only to specific applications. In this study, incentive amounts for energy efficiency measures were calculated by selecting the larger of the applicable standard rebate.

Appendix A

Baseline Energy Use &
Utility Company Rate Schedules

Electricity Use Summary-Entire Schools (Audited Areas) - Estim

School	GSF	Rate Schedule	Electricity (kWh)	Cost ($)	kWh/ GSF	$/GSF	Site kBtu/GSF	Rate ($/kWh)
South Lake Tahoe HS	73,170	A1/A3	553,079	$74,840	7.56	$1.023	81.0	$0.135
South Lake Tahoe MS	67,827	A1/A3	408,612	$53,095	6.02	$0.783	64.6	$0.130
Tahoe Valley ES	43,374	A1/A2	297,659	$40,842	6.86	$0.942	73.5	$0.137
Total	**184,371**	**-**	**1,259,350**	**$168,778**	**6.83**	**$0.915**	**73.2**	**$0.134**

Natural Gas Use Summary-Audited Zones (Audited Areas) - Estimate

School	GSF	Rate Schedule	Natural Gas (Therms)	Cost ($)	Therm/ GSF	$/GSF	Site kBtu/GSF	Rate ($/Therm)
South Lake Tahoe HS	73,170	SLT-40	208,092	$191,659	2.84	$2.619	284.4	$0.921
South Lake Tahoe MS	67,827	SLT-40	55,964	$53,119	0.83	$0.783	82.51	$0.949
Tahoe Valley ES	43,374	SLT-40	17,623	$18,423	0.41	$0.425	40.63	$1.045
Total	**184,371**	**-**	**281,679**	**$263,201**	**1.53**	**$1.428**	**152.78**	**$0.934**

Total Energy Use Summary (Audited Areas) - Estimate

School	GSF	Total Energy (MMBTU)	Total Energy Cost	Total Energy Cost per GSF	kBTU/ GSF
South Lake Tahoe HS	73,170	26,736	$266,500	$3.64	365.40
South Lake Tahoe MS	67,827	9,975	$106,214	$1.57	147.07
Tahoe Valley ES	43,374	4,952	$59,265	$1.37	114.17
Total	**184,371**	41,663	**$431,979**	**$2.34**	**225.97**

Electricity Use Summary-Entire Schools

School	GSF	Rate Schedule	Electricity (kWh)	Cost ($)	kWh/ GSF	$/GSF	Site kBtu/GSF	Rate ($/kWh)
South Lake Tahoe HS	200,000	A1/A3	1,997,338	$270,271	9.99	$1.351	107.0	$0.135
South Lake Tahoe MS	120,000	A1/A3	797,728	$103,657	6.65	$0.864	71.2	$0.130
Tahoe Valley ES	43,374	A1/A2	297,659	$40,842	6.86	$0.942	73.5	$0.137
Total	**363,374**	**-**	**3,092,725**	**$414,770**	**8.51**	**$1.141**	**91.2**	**$0.134**

Natural Gas Use Summary-Audited Zones

School	GSF	Rate Schedule	Natural Gas (Therms)	Cost ($)	Therm/ GSF	$/GSF	Site kBtu/GSF	Rate ($/Therm)
South Lake Tahoe HS	200,000	SLT-40	300,820	$277,065	1.50	$1.385	150.41	$0.921
South Lake Tahoe MS	120,000	SLT-40	75,011	$71,197	0.63	$0.593	62.51	$0.949
Tahoe Valley ES	43,374	SLT-40	17,623	$18,423	0.41	$0.425	40.63	$1.045
Total	**363,374**	**-**	**393,454**	**$366,686**	**1.08**	**$1.009**	**108.28**	**$0.932**

Total Energy Use Summary

School	GSF	Total Energy (MMBTU)	Total Energy Cost	Total Energy Cost per GSF	kBTU/ GSF
South Lake Tahoe HS	200,000	51,485	$547,337	$2.74	257.43
South Lake Tahoe MS	120,000	16,050	$174,854	$1.46	133.75
Tahoe Valley ES	43,374	4,952	$59,265	$1.37	114.17
Total	**363,374**	72,487	**$781,456**	**$2.15**	**199.48**

Historical Energy Use

Site Name: South Tahoe HS
Service Address: 1735 Lake Tahoe Blvd.
Buildings: All except CTE, Scoreboard, Snack Shack, and outdoor lights
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule: A3
Service Agreement ID:
Account ID: 88543852
Meter #: 197686

					Winter Energy			*Summer Energy*		*Max Demand*	*Winter Demand*			*Summer Demand*		*Total Charges*	
No.	Month	Date Read	Days Billed	Total Usage	On Peak	Partial Peak	Off Peak	Partial Peak	Off Peak		On Peak	Part Peak	Off Peak	On Peak	Part Peak	Electric Charges	Ave. Rate
				kWh	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kW*	*kW*	*kW*	*kW*	*kW*	*kW*	*$*	*$/kWh*
1	May	5/29/14	30	109,280	19680	55040	34560	0	0	264	180	264	190	0	0	$ 13,095	$ 0.120
2	June	6/27/14	29	95,440	1,920	4,400	2,480	44,560	42,080	258	0	0	0	258	245	$ 10,901	$ 0.114
3	July	7/30/14	33	86,320	0	0	0	43,200	43,120	146	0	0	0	146	144	$ 11,902	$ 0.138
4	August	8/28/14	29	80,480	0	0	0	41,840	38,640	237	0	0	0	237	230	$ 14,141	$ 0.176
5	September	9/29/14	32	107,840	0	0	0	57,920	49,920	239	0	0	0	239	238	$ 12,018	$ 0.111
6	October	10/28/14	29	98,800	15,040	48,800	29,200	3,760	2,000	249	158	249	178	238	231	$ 13,475	$ 0.136
7	November	11/26/14	29	113,200	20,000	56,080	37,120	0	0	272	179	272	200	0	0	$ 13,475	$ 0.119
8	December	12/29/14	33	132,720	24,480	62,560	45,680	0	0	290	230	290	216	0	0	$ 15,472	$ 0.117
9	January	1/28/15	30	126,000	22,720	61,440	41,840	0	0	284	190	284	222	0	0	$ 14,553	$ 0.116
10	February	2/27/15	30	124,000	22,160	60,560	41,280	0	0	289	231	289	220	0	0	$ 14,701	$ 0.119
11	March	3/27/15	28	119,120	20,000	60,160	38,960	0	0	288	231	288	220	0	0	$ 14,312	$ 0.120
12	April	4/28/15	32	123,200	21,120	60,000	42,080	0	0	277	169	277	220	0	0	$ 13,626	$ 0.111
TOTAL			364	1,316,400	147,440	414,000	278,640	191,280	175,760	-	-			-	-	$ 161,671	$ 0.123

Site Name: South Tahoe HS
Service Address: 1735 Lake Tahoe Blvd.
Buildings: CTE Building
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule: A2 and A1
Service Agreement ID:
Account ID: 88549534
Meter #: 208631 and 193353

					Summer Energy	*Winter Energy*	*Max Demand*	*Summer Demand*	*Winter Demand*	*Total Charges*	
No.	Month	Date Read	Days Billed	Total Usage	all	all	all	Summer Max Demand	Winter Demand	Electric Charges	Ave. Rate
				kWh	*kWh*	*kWh*	*kW*	*kW*	*kW*	*$*	*$/kWh*
1	May	5/29/14	31	57,160			194			$9,323.56	$ 0.163
2	June	6/27/14	29	54,000			194			$8,640.92	$ 0.160
3	July	7/30/14	33	50,880			101			$7,898.54	$ 0.155
4	August	8/28/14	29	41,760			180			$6,796.40	$ 0.163
5	September	9/29/14	32	56,160			182			$8,975.96	$ 0.160
6	October	10/28/14	29	53,040			177			$8,490.48	$ 0.160
7	November	11/26/14	29	59,680			210			$9,594.25	$ 0.161
8	December	12/29/14	33	59,920			130			$9,281.56	$ 0.155
9	January	1/28/15	30	57,720			136			$8,918.63	$ 0.155
10	February	2/27/15	30	59,040			149			$9,118.02	$ 0.154
11	March	3/27/15	28	57,640			153			$8,902.00	$ 0.154
12	April	4/28/15	32	61,440			138			$9,214.89	$ 0.150
TOTAL			365	668,440	0	0	-	-	-	$105,155.21	$ 0.157

Site Name: South Tahoe HS
Service Address: 1735 Lake Tahoe Blvd.
Buildings: STHS Scoreboard
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule: A1
Service Agreement ID:
Account ID: 88528370
Meter #: 2141315

					Summer Energy	*Winter Energy*	*Max Demand*	*Summer Demand*	*Winter Demand*	*Total Charges*	
No.	Month	Date Read	Days Billed	Total Usage	all	all	all	Summer Max Demand	Winter Demand	Electric Charges	Ave. Rate
				kWh	*kWh*	*kWh*	*kW*	*kW*	*kW*	*$*	*$/kWh*
1	May	5/29/14	31	1						$15.68	$ 15.680
2	June	6/27/14	29	16						$67.17	$ 4.198
3	July	7/30/14	33	1						$82.28	$ 82.280
4	August	8/28/14	29	0						$75.86	#DIV/0!
5	September	9/29/14	32	26						$96.10	$ 3.696
6	October	10/28/14	29	26						$83.73	$ 3.220
7	November	11/26/14	29	20						$37.63	$ 1.882
8	December	12/29/14	33	0						$19.90	#DIV/0!
9	January	1/28/15	30	0						$19.08	#DIV/0!
10	February	2/27/15	30	0						$25.61	#DIV/0!
11	March	3/27/15	28	0						$28.50	#DIV/0!
12	April	4/28/15	30	0						$28.73	#DIV/0!
TOTAL			363	90	0	0	-	-	-	$580.27	$ 6.447

Site Name: South Tahoe HS
Service Address: 1735 Lake Tahoe Blvd.
Buildings: Snack Shack
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule: A1
Service Agreement ID:
Account ID: 88528371
Meter #: 1107740

					Summer Energy	*Winter Energy*	*Max Demand*	*Summer Demand*	*Winter Demand*	*Total Charges*	
No.	Month	Date Read	Days Billed	Total Usage	all	all	all	Summer Max Demand	Winter Demand	Electric Charges	Ave. Rate
				kWh	*kWh*	*kWh*	*kW*	*kW*	*kW*	*$*	*$/kWh*
1	May	5/29/14	31	16						$13.48	$ 0.843
2	June	6/27/14	29	370						$15.68	$ 0.042
3	July	7/30/14	33	474						$13.48	$ 0.028
4	August	8/28/14	29	430						$13.35	$ 0.031
5	September	9/29/14	32	569						$17.15	$ 0.030
6	October	10/28/14	29	484						$17.15	$ 0.035
7	November	11/26/14	29	167						$16.26	$ 0.097
8	December	12/29/14	33	45						$13.35	$ 0.297
9	January	1/28/15	30	39						$13.43	$ 0.344
10	February	2/27/15	30	84						$13.44	$ 0.160
11	March	3/27/15	28	104						$13.44	$ 0.129
12	April	4/28/15	32	113						$28.73	$ 0.254
TOTAL			365	2,895	0	0	-	-	-	$188.94	$ 0.065

Site Name: South Tahoe HS
Service Address: 1735 Lake Tahoe Blvd.
Buildings: Outdoor Lights
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule: SL/OL
Service Agreement ID:
Account ID: 88543852
Meter #: OLG06-1276 and OLG-11-1250

					Summer Energy	*Winter Energy*	*Max Demand*	*Summer Demand*	*Winter Demand*	*Total Charges*	
No.	Month	Date Read	Days Billed	Total Usage	all	all	all	Summer Max Demand	Winter Demand	Electric Charges	Ave. Rate
				kWh	*kWh*	*kWh*	*kW*	*kW*	*kW*	*$*	*$/kWh*
1	May	6/10/14	31	216						$49.31	$ 0.228
2	June	7/9/14	29	202						$46.13	$ 0.228
3	July	8/7/14	29	202						$46.13	$ 0.228
4	August	9/8/14	32	223						$50.90	$ 0.228
5	September	10/8/14	30	209						$47.72	$ 0.228
6	October	11/6/14	29	202						$46.13	$ 0.228
7	November	12/8/14	32	223						$50.90	$ 0.228
8	December	1/7/15	30	209						$47.72	$ 0.228
9	January	2/5/15	29	202						$46.13	$ 0.228
10	February	3/9/15	32	223						$50.90	$ 0.228
11	March	4/8/15	30	209						$47.72	$ 0.228
12	April	5/8/15	30	209						$47.72	$ 0.228
TOTAL			363	2,529	0	0	-	-	-	$577.40	$ 0.228

Site Name: South Tahoe HS
Service Address: 1735 Lake Tahoe Blvd.
Buildings: Streetlights
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule: SL/OL
Service Agreement ID:
Account ID: 88543990
Meter #: SLG06-1276

					Summer Energy	*Winter Energy*	*Max Demand*	*Summer Demand*	*Winter Demand*	*Total Charges*	
No.	Month	Date Read	Days Billed	Total Usage	all	all	all	Summer Max Demand	Winter Demand	Electric Charges	Ave. Rate
				kWh	*kWh*	*kWh*	*kW*	*kW*	*kW*	*$*	*$/kWh*
1	May	6/10/14	33	631						$184.94	$ 0.293
2	June	7/9/14	29	555						$163.93	$ 0.295
3	July	8/7/14	29	555						$159.73	$ 0.288
4	August	9/8/14	32	612						$180.73	$ 0.295
5	September	10/8/14	30	574						$172.33	$ 0.300
6	October	11/6/14	29	555						$163.93	$ 0.295
7	November	12/8/14	32	612						$180.73	$ 0.295
8	December	1/7/15	30	574						$169.68	$ 0.296
9	January	2/5/15	29	555						$170.38	$ 0.307
10	February	3/9/15	32	612						$200.97	$ 0.328
11	March	4/8/15	30	574						$174.01	$ 0.303
12	April	5/8/15	30	574						$177.00	$ 0.308
TOTAL			365	6,984	0	0	-	-	-	$2,098.36	$ 0.300

TOTAL

Site Name: South Tahoe HS
Service Address: 1735 Lake Tahoe Blvd.
Buildings: ALL SERVICES
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule: A1, A3, OL/SL
Service Agreement ID:
Account ID: ALL ACCOUNTS
Meter #: ALL METERS

					Winter Energy			*Summer Energy*		*Max Demand*	*Summer Demand*		*Winter Demand*			*Total Charges*	
No.	Month	Date Read	Days Billed	Total Usage	On Peak	Partial Peak	Off Peak	Partial Peak	Off Peak		On Peak	Part Peak	On Peak	Part Peak	Off Peak	Electric Charges	Ave. Rate
				kWh	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kW*	*kW*	*kW*	*kW*	*kW*	*kW*	*$*	*$/kWh*
1	May			167,304						458						$ 22,682	$ 0.136
2	June			150,583						452						$ 19,835	$ 0.132
3	July			138,432						248						$ 20,102	$ 0.145
4	August			123,505						416						$ 21,258	$ 0.172
5	September			165,378						422						$ 21,327	$ 0.129
6	October			153,107						426						$ 22,276	$ 0.145
7	November			173,902						482						$ 23,355	$ 0.134
8	December			193,468						420						$ 25,005	$ 0.129
9	January			184,516						420						$ 23,721	$ 0.129
10	February			183,959						438						$ 24,110	$ 0.131
11	March			177,647						441						$ 23,478	$ 0.132
12	April			185,536						415						$ 23,123	$ 0.125
TOTAL			0	1,997,338	0	0	0	0	0	-	-	-	-			$ 270,271	$ 0.135

Historical Energy Use

Site Name: South Lake Tahoe MS
Service Address: 2950 Lake Tahoe Blvd
Buildings: All except pump and outdoor lights
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule: A3
Service Agreement ID:
Account ID: 88543902
Meter #: 200744

					Winter Energy			*Summer Energy*		*Max Demand*	*Winter Demand*			*Summer Demand*		*Total Charges*	
No.	Month	Date Read	Days Billed	Total Usage	On Peak	Partial Peak	Off Peak	Partial Peak	Off Peak		On Peak	Part Peak	Off Peak	On Peak	Part Peak	Electric Charges	Ave. Rate
				kWh	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kW*	*kW*	*kW*	*kW*	*kW*	*kW*	*$*	*$/kWh*
1	May	6/9/14	31	71,600	10,300	26,700	16,400	9,300	8,900	171	119	171	130	154	166	$ 8,393	$ 0.117
2	June	7/9/14	30	48,200	0	0	0	24,700	23,500	139	0	0	0	138	139	$ 6,917	$ 0.144
3	July	8/7/14	29	39,400	0	0	0	20,000	19,400	84	0	0	0	84	76	$ 5,865	$ 0.149
4	August	9/8/14	32	47,900	0	0	0	25,600	22,300	149	0	0	0	141	149	$ 7,487	$ 0.156
5	September	10/7/14	29	53,300	1,900	6,700	3,600	23,300	17,800	170	91	170	109	157	159	$ 7,976	$ 0.150
6	October	11/6/14	30	67,500	11,900	36,100	19,500	0	0	199	114	199	139	0	0	$ 8,716	$ 0.129
7	November	12/8/14	32	76,500	14,400	38,200	23,900	0	0	207	121	207	154	0	0	$ 9,529	$ 0.125
8	December	1/7/15	30	74,100	14,300	35,000	24,800	0	0	202	125	202	154	0	0	$ 9,274	$ 0.125
9	January	2/5/15	29	82,200	15,500	41,700	25,000	0	0	209	137	209	161	0	0	$ 10,027	$ 0.122
10	February	3/9/15	32	82,900	15,900	40,500	26,500	0	0	213	135	213	158	0	0	$ 10,086	$ 0.122
11	March	4/8/15	30	76,100	13,900	39,000	23,200	0	0	198	129	198	156	0	0	$ 9,334	$ 0.123
12	April	5/7/15	30	70,300	12,600	36,300	21,400	0	0	196	136	196	147	0	0	$ 8,753	$ 0.125
TOTAL			364	790,000	110,700	300,200	184,300	102,900	91,900	-	-			-	-	$ 102,356	$ 0.130

Site Name: South Lake Tahoe MS
Service Address: 2950 Lake Tahoe Blvd
Buildings: Pump
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule: A1
Service Agreement ID:
Account ID: 88535894
Meter #: 124565

					Summer Energy	*Winter Energy*	*Max Demand*	*Summer Demand*	*Winter Demand*	*Total Charges*	
No.	Month	Date Read	Days Billed	Total Usage	all	all	all	Summer Max Demand	Winter Demand	Electric Charges	Ave. Rate
				kWh	*kWh*	*kWh*	*kW*	*kW*	*kW*	*$*	*$/kWh*
1	May	6/10/14	31	1,050						$166.05	$ 0.158
2	June	7/9/14	29	988						$157.04	$ 0.159
3	July	8/7/14	29	807						$130.71	$ 0.162
4	August	9/8/14	32	978						$155.56	$ 0.159
5	September	10/7/14	29	655						$108.61	$ 0.166
6	October	11/6/14	30	282						$54.36	$ 0.193
7	November	12/8/14	32	178						$39.22	$ 0.220
8	December	1/7/15	30	470						$81.68	$ 0.174
9	January	2/5/15	29	465						$80.81	$ 0.174
10	February	3/9/15	32	228						$46.47	$ 0.204
11	March	4/8/15	30	212						$43.55	$ 0.205
12	April	5/8/15	30	621						$98.51	$ 0.159
TOTAL			363	6,934	0	0	-	-	-	$1,162.57	$ 0.168

Site Name: South Lake Tahoe MS
Service Address: 2950 Lake Tahoe Blvd
Buildings: Outdoor Lights
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule: OL/SL
Service Agreement ID:
Account ID: 88543902
Meter #: OLG11-1256

					Summer Energy	*Winter Energy*	*Max Demand*	*Summer Demand*	*Winter Demand*	*Total Charges*	
No.	Month	Date Read	Days Billed	Total Usage	all	all	all	Summer Max Demand	Winter Demand	Electric Charges	Ave. Rate
				kWh	*kWh*	*kWh*	*kW*	*kW*	*kW*	*$*	*$/kWh*
1	May	6/9/14	31	70						$11.75	$ 0.168
2	June	7/9/14	30	66						$11.37	$ 0.172
3	July	8/7/14	29	63						$10.99	$ 0.174
4	August	9/8/14	32	70						$12.13	$ 0.173
5	September	10/7/14	29	64						$10.99	$ 0.172
6	October	11/6/14	30	65						$11.37	$ 0.175
7	November	12/8/14	32	71						$12.13	$ 0.171
8	December	1/7/15	30	65						$11.37	$ 0.175
9	January	2/5/15	29	64						$10.99	$ 0.172
10	February	3/9/15	32	67						$12.13	$ 0.181
11	March	4/8/15	30	65						$11.37	$ 0.175
12	April	5/7/15	30	64						$11.37	$ 0.178
	TOTAL		364	794	0	0	-	-	-	$137.97	$ 0.174

TOTAL

Site Name: South Lake Tahoe MS
Service Address: 2950 Lake Tahoe Blvd
Buildings: ALL SERVICES
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule: A3, A1, OL/SL
Service Agreement ID:
Account ID: ALL ACCOUNTS
Meter #: ALL METERS

					Winter Energy			*Summer Energy*		*Max Demand*	*Summer Demand*		*Winter Demand*			*Total Charges*	
No.	Month	Date Read	Days Billed	Total Usage	On Peak	Partial Peak	Off Peak	Partial Peak	Off Peak		On Peak	Part Peak	On Peak	Part Peak	Off Peak	Electric Charges	Ave. Rate
				kWh	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kW*	*kW*	*kW*	*kW*	*kW*	*kW*	*$*	*$/kWh*
1	May			72,720						171						$ 8,570	$ 0.118
2	June			49,254						139						$ 7,086	$ 0.144
3	July			40,270						84						$ 6,006	$ 0.149
4	August			48,948						149						$ 7,654	$ 0.156
5	September			54,019						170						$ 8,095	$ 0.150
6	October			67,847						199						$ 8,782	$ 0.129
7	November			76,749						207						$ 9,580	$ 0.125
8	December			74,635						202						$ 9,367	$ 0.126
9	January			82,729						209						$ 10,118	$ 0.122
10	February			83,195						213						$ 10,145	$ 0.122
11	March			76,377						198						$ 9,389	$ 0.123
12	April			70,985						196						$ 8,863	$ 0.125
TOTAL			0	797,728	0	0	0	0	0	-	-	-	-			$ 103,657	$ 0.130

Site Name: Tahoe Valley ES
Service Address: 943 Tahoe Island Drive
Buildings: Main
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule: A2
Service Agreement ID:
Account ID: 88543857
Meter #: 117239

					Summer Energy	*Winter Energy*	*Max Demand*	*Summer Demand*	*Winter Demand*	*Total Charges*	
No.	Month	Date Read	Days Billed	Total Usage	all	all	all	Summer Max Demand	Winter Demand	Electric Charges	Ave. Rate
				kWh	*kWh*	*kWh*	*kW*	*kW*	*kW*	*$*	*$/kWh*
1	May	6/3/14	31	22,680			73			$2,854.58	$ 0.126
2	June	7/2/14	29	17,520			67			$2,804.33	$ 0.160
3	July	8/1/14	30	12,000			43			$1,935.87	$ 0.161
4	August	9/2/14	32	16,920			62			$2,699.82	$ 0.160
5	September	10/1/14	29	19,200			72			$3,035.71	$ 0.158
6	October	10/31/14	30	21,600			73			$2,682.07	$ 0.124
7	November	12/2/14	32	23,280			79			$2,886.90	$ 0.124
8	December	12/31/14	29	21,000			76			$2,644.02	$ 0.126
9	January	1/29/15	29	23,040			77			$2,829.75	$ 0.123
10	February	3/3/15	33	25,320			73			$3,014.61	$ 0.119
11	March	3/31/15	28	21,480			73			$2,656.39	$ 0.124
12	April	4/30/15	30	21,000			71			$2,504.40	$ 0.119
TOTAL			362	245,040	0	0	-	-	-	$32,548.45	$ 0.133

Site Name: Tahoe Valley ES
Service Address: 943 Tahoe Island Drive
Buildings: Portables
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule: A1
Service Agreement ID:
Account ID: 88525742
Meter #: 191037

					Summer Energy	*Winter Energy*	*Max Demand*	*Summer Demand*	*Winter Demand*	*Total Charges*	
No.	Month	Date Read	Days Billed	Total Usage	all	all	all	Summer Max Demand	Winter Demand	Electric Charges	Ave. Rate
				kWh	*kWh*	*kWh*	*kW*	*kW*	*kW*	*$*	*$/kWh*
1	May	6/3/14	31	4,080			21			$638.12	$ 0.156
2	June	7/2/14	29	2,660			23			$420.67	$ 0.158
3	July	8/1/14	30	1,520			10			$246.10	$ 0.162
4	August	9/2/14	32	3,100			20			$488.05	$ 0.157
5	September	10/1/14	29	3,380			23			$530.93	$ 0.157
6	October	10/31/14	30	4,180			19			$653.43	$ 0.156
7	November	12/2/14	32	5,620			21			$873.94	$ 0.156
8	December	12/31/14	29	5,640			20			$877.02	$ 0.156
9	January	1/29/15	29	6,160			22			$953.40	$ 0.155
10	February	3/3/15	33	6,480			28			$1,002.24	$ 0.155
11	March	3/31/15	28	4,360			20			$678.72	$ 0.156
12	April	4/30/15	30	4,960			22			$745.43	$ 0.150
TOTAL			362	52,140	0	0	-	-	-	$8,108.05	$ 0.156

Site Name: Tahoe Valley ES
Service Address: 943 Tahoe Island Drive
Buildings: Outdoor Lights
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule: SL/OL
Service Agreement ID:
Account ID: 88543857
Meter #: OLG06-1252

					Summer Energy	*Winter Energy*	*Max Demand*	*Summer Demand*	*Winter Demand*	*Total Charges*	
No.	Month	Date Read	Days Billed	Total Usage	all	all	all	Summer Max Demand	Winter Demand	Electric Charges	Ave. Rate
				kWh	*kWh*	*kWh*	*kW*	*kW*	*kW*	*$*	*$/kWh*
1	May	6/3/14	31	41						$15.91	$ 0.388
2	June	7/2/14	29	38						$14.88	$ 0.388
3	July	8/1/14	30	40						$15.40	$ 0.388
4	August	9/2/14	32	42						$16.42	$ 0.388
5	September	10/1/14	29	38						$14.88	$ 0.388
6	October	10/31/14	30	40						$15.40	$ 0.388
7	November	12/2/14	32	42						$16.42	$ 0.388
8	December	12/31/14	29	38						$14.88	$ 0.388
9	January	1/29/15	29	38						$14.88	$ 0.388
10	February	3/3/15	33	44						$16.94	$ 0.388
11	March	3/31/15	28	37						$14.37	$ 0.388
12	April	4/30/15	30	40						$15.40	$ 0.388
TOTAL			362	479	0	0	-	-	-	$185.79	$ 0.388

TOTAL

Site Name: Tahoe Valley ES
Service Address: 943 Tahoe Island Drive
Buildings:
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule:
Service Agreement ID:
Account ID: 88543857
Meter #:

No.	Month	Date Read	Days Billed	Total Usage	*Summer Energy* all	*Winter Energy* all	*Max Demand* all	*Summer Demand* Summer Max Demand	*Winter Demand* Winter Demand	*Total Charges* Electric Charges	Ave. Rate
				kWh	*kWh*	*kWh*	*kW*	*kW*	*kW*	*$*	*$/kWh*
1	May			26,801			73			$3,508.61	$ 0.131
2	June			20,218			67			$3,239.88	$ 0.160
3	July			13,560			43			$2,197.37	$ 0.162
4	August			20,062			62			$3,204.29	$ 0.160
5	September			22,618			72			$3,581.52	$ 0.158
6	October			25,820			73			$3,350.90	$ 0.130
7	November			28,942			79			$3,777.26	$ 0.131
8	December			26,678			76			$3,535.92	$ 0.133
9	January			29,238			77			$3,798.03	$ 0.130
10	February			31,844			73			$4,033.79	$ 0.127
11	March			25,877			73			$3,349.48	$ 0.129
12	April			26,000			71			$3,265.23	$ 0.126
TOTAL			0	297,659	0	0	-	-	-	$40,842.29	$ 0.137

Historical Energy Use

Site Name: South Tahoe High School
Service Address: 1735 Lake Tahoe Blvd.
Service Type: **Natural Gas**
Service Provider: Southwest Gas Co
Rate Schedule: SLT-40
Service Account ID:
Account ID: 141-1233003-002
Meter #:

No.	Month	Date Read	Days Billed	First Tier	Second Tier	Third Tier	Fourth Tier	Total Therms	Gas Cost	Ave. Rate
									$	*$/Therms*
1	May	6/3/14	29	100	500	2,400	8,259	11,259	$10,434.04	*$0.93*
2	June	7/3/14	30	100	500	1,361	0	1,961	$1,975.85	*$1.01*
3	July	8/4/14	32	57	0	0	0	57	$114.89	*$2.02*
4	August	9/3/14	30	100	63	0	0	163	$190.68	*$1.17*
5	September	10/2/14	29	100	361	0	0	461	$496.25	*$1.08*
6	October	10/31/14	29	100	500	2,400	3,906	6,906	$6,460.77	*$0.94*
7	November	12/4/14	34	100	500	2,400	38,516	41,516	$37,037.43	*$0.89*
8	December	1/6/15	33	100	500	2,400	57,116	60,116	$53,182.52	*$0.88*
9	January	2/4/15	29	100	500	2,400	48,046	51,046	$50,365.93	*$0.99*
10	February	3/6/15	30	100	500	2,400	49,229	52,229	$49,858.81	*$0.95*
11	March	4/6/15	31	100	500	2,400	39,984	42,984	$39,767.08	*$0.93*
12	April	5/5/15	29	100	500	2,400	29,122	32,122	$27,180.91	*$0.85*
	Total		**365**	1,157	4,924	20,561	274,178	300,820	$277,065.16	*$0.92*

Site Name: South Lake Tahoe Middle School
Service Address: 2940 Lake Tahoe Blvd.
Service Type: **Natural Gas**
Service Provider: Southwest Gas Co
Rate Schedule: SLT-40
Service Account ID:
Account ID: 141-1072205-001
Meter #:

No.	Month	Date Read	Days Billed	First Tier	Second Tier	Third Tier	Fourth Tier	Total Therms	Gas Cost	Ave. Rate
									$	*$/Therms*
1	May	6/18/14	29	100	500	2,400	26	3,026	$2,830.33	*$0.94*
2	June	7/18/14	30	100	74	0	0	174	$212.40	*$1.22*
3	July	8/18/14	31	100	70	0	0	170	$202.90	*$1.19*
4	August	9/17/14	30	100	218	0	0	318	$351.39	*$1.11*
5	September	10/16/14	29	100	500	1,405	0	2,005	$2,031.48	*$1.01*
6	October	11/17/14	32	100	500	2,400	4,621	7,621	$7,118.29	*$0.93*
7	November	12/17/14	30	100	500	2,400	8,046	11,046	$9,985.72	*$0.90*
8	December	1/20/15	34	100	500	2,400	12,168	15,168	$14,559.98	*$0.96*
9	January	2/19/15	30	100	500	2,400	7,676	10,676	$10,676.21	*$1.00*
10	February	3/20/15	29	100	500	2,400	7,217	10,217	$9,999.89	*$0.98*
11	March	4/20/15	31	100	500	2,400	5,619	8,619	$7,920.86	*$0.92*
12	April	5/19/15	31	100	500	2,400	2,971	5,971	$5,307.99	*$0.89*
	Total		**366**	1,200	4,862	20,605	48,344	75,011	$71,197.44	*$0.95*

Historical Energy Use

Site Name: Tahoe Valley Elementary School
Service Address: 2940 Lake Tahoe Blvd.
Service Type: **Natural Gas**
Service Provider: Southwest Gas Co
Rate Schedule: SLT-40
Service Account ID:
Account ID: 141-1072205-001
Meter #:

No.	Month	Date Read	Days Billed	First Tier	Second Tier	Third Tier	Fourth Tier	Total Therms	Gas Cost	Ave. Rate
									$	*$/Therms*
1	May	6/2/14	30	100	500	631	0	1,231	$1,183.51	*$0.96*
2	June	7/1/14	29	100	173	0	0	273	$292.19	*$1.07*
3	July	7/31/14	30	100	4	0	0	104	$134.31	*$1.29*
4	August	8/29/14	29	100	0	0	0	100	$123.86	*$1.24*
5	September	9/30/14	32	100	309	0	0	409	$442.55	*$1.08*
6	October	10/29/14	29	100	500	764	0	1,364	$1,408.05	*$1.03*
7	November	12/2/14	34	100	500	1,802	0	2,402	$2,456.72	*$1.02*
8	December	1/2/15	31	100	500	2,482	0	3,082	$3,060.37	*$0.99*
9	January	2/2/15	31	100	500	2,456	0	3,056	$3,401.90	*$1.11*
10	February	3/4/15	30	100	500	1,805	0	2,405	$2,613.82	*$1.09*
11	March	4/2/15	29	100	500	1,045	0	1,645	$1,771.81	*$1.08*
12	April	5/1/15	29	100	500	952	0	1,552	$1,533.95	*$0.99*
	Total		**363**	1,200	4,486	11,937	0	17,623	$18,423.04	*$1.05*

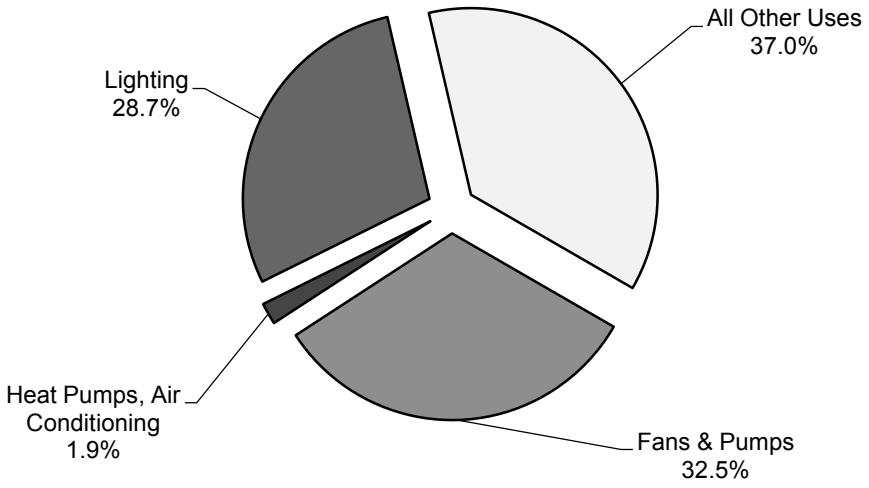
Appendix B

Energy Balance

Electricity Energy Balance Summary - *kWh (Audited Areas)*

End Use	Fans & Pumps	Heat Pumps, Air Conditioning	Lighting	All Other Uses	TOTAL kWh
South Lake Tahoe HS	194,468	0	152,710	205,901	**553,079**
% of Total	*35.2%*	*0.0%*	*27.6%*	*37.2%*	***100%***
South Lake Tahoe MS	128,668	11,474	127,879	140,591	**408,612**
% of Total	*31.5%*	*2.8%*	*31.3%*	*34.4%*	***100%***
Tahoe Valley ES	85,896	12,034	80,788	118,940	**297,659**
% of Total	*28.9%*	*4.0%*	*27.1%*	*40.0%*	***100%***
TOTAL	**409,032**	**23,509**	**361,377**	**465,432**	**1,259,350**
% of Total	*32.5%*	*1.9%*	*28.7%*	*37.0%*	***100%***

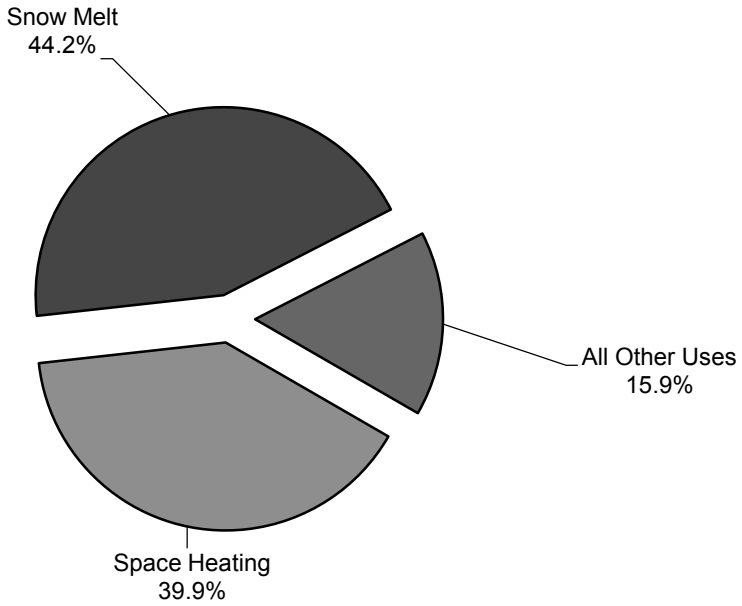
"All Others" includes office equipment (e.g., computers, printers, copiers), domestic water heaters, kitchen appliances, plug loads, and other miscellaneous equipment not accounted for



Natural Gas Energy Balance Summary - *Therms (Audited Area)*

End Use	Space Heating	Snow Melt	All Other Uses	TOTAL Therms
South Lake Tahoe HS	53,289	120,121	34,682	**208,092**
% of Total	*25.6%*	*57.7%*	*16.7%*	***100%***
South Lake Tahoe MS	42,187	4,449	9,327	**55,964**
% of Total	*75.4%*	*8.0%*	*16.7%*	***100%***
Tahoe Valley ES	16,940	0	683	**17,623**
% of Total	*96.1%*	*0.0%*	*3.9%*	***100%***
TOTAL	**112,416**	**124,570**	**44,693**	**281,679**
% of Total	*39.9%*	*44.2%*	*15.9%*	***100%***

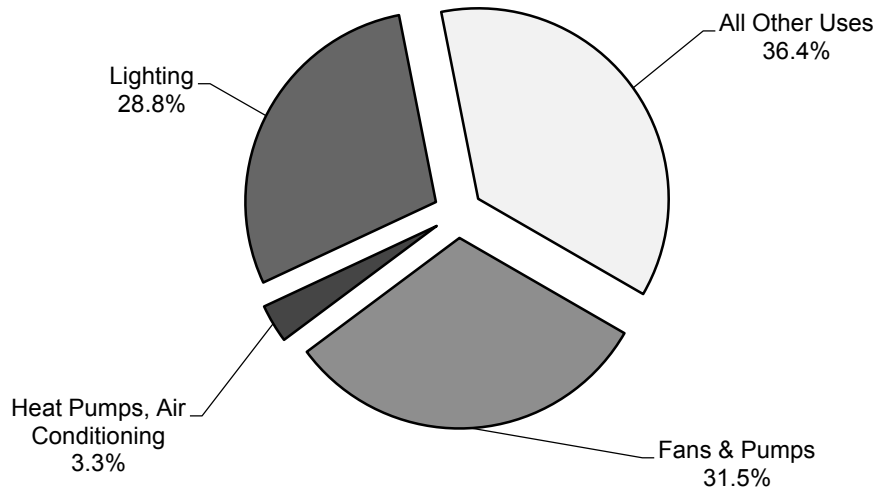
"All Others" includes domestic hot water and kitchen equipment



Electricity Energy Balance Summary - *kWh (Entire Schools)*

End Use	Fans & Pumps	Heat Pumps, Air Conditioning	Lighting	All Other Uses	TOTAL kWh
South Lake Tahoe HS	648,523	77,143	528,100	743,572	**1,997,338**
% of Total	*32.5%*	*3.9%*	*26.4%*	*37.2%*	***100%***
South Lake Tahoe MS	238,720	11,474	273,060	274,474	**797,728**
% of Total	*29.9%*	*1.4%*	*34.2%*	*34.4%*	***100%***
Tahoe Valley ES	85,896	12,034	90,782	108,947	**297,659**
% of Total	*28.9%*	*4.0%*	*30.5%*	*36.6%*	***100%***
TOTAL	**973,139**	**100,651**	**891,942**	**1,126,993**	**3,092,725**
% of Total	*31.5%*	*3.3%*	*28.8%*	*36.4%*	***100%***

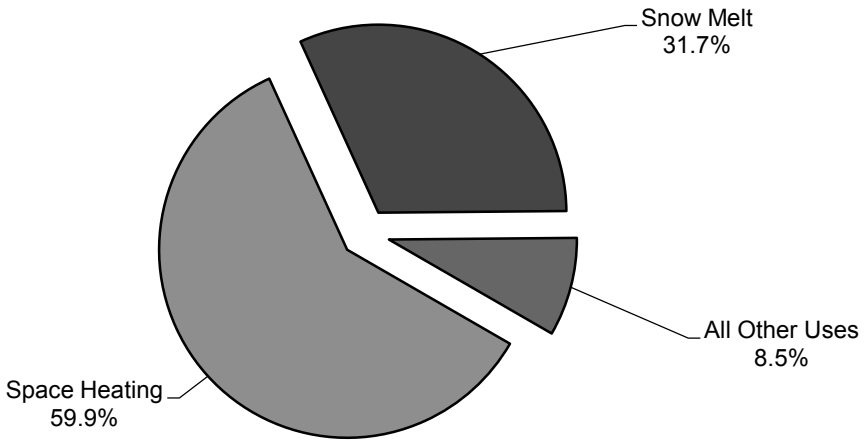
"All Others" includes office equipment (e.g., computers, printers, copiers), domestic water heaters, kitchen appliances, plug loads, and other miscellaneous equipment not accounted for



Natural Gas Energy Balance Summary - *Therms (Entire Schools)*

End Use	Space Heating	Snow Melt	All Other Uses	TOTAL Therms
South Lake Tahoe HS	151,111	120,121	29,588	**300,820**
% of Total	*50.2%*	*39.9%*	*9.8%*	***100%***
South Lake Tahoe MS	67,496	4,449	3,065	**75,011**
% of Total	*90.0%*	*5.9%*	*4.1%*	
Tahoe Valley ES	16,940	0	683	**17,623**
% of Total	*96.1%*	*0.0%*	*3.9%*	***100%***
TOTAL	**235,547**	**124,570**	**33,337**	**393,454**
% of Total	*59.9%*	*31.7%*	*8.5%*	***100%***

"All Others" includes domestic hot water and kitchen equipment



List of HVAC Systems - South Lake Tahoe HS

Fans and Pumps: Entire School

Fan Type	Facility	Area (Sq. Ft.)	HP / 1000 Sq. Ft.	Total HP	Motor Eff.	Ave. Load Factor	Ave. Use Hours	kWh/ Year [1]
Exhaust Fan	South Lake Tahoe HS	200,000	0.15	30.00	81%	80%	1,800	39,787
Supply and Return Fans	South Lake Tahoe HS	200,000	0.75	150.00	85%	80%	5,100	537,120
Heating Hot Water Pumps	South Lake Tahoe HS	200,000	0.10	20.00	85%	80%	5,100	71,616
Total		200,000	1.00	200.00				648,523

[1] Estimated kWh = [HP x 0.746 x LF / Eff] x Usage Hours

Space Heating: Entire School

Equipment Type	Facility	Area (Sq. Ft.)	MBtuh / 1000 Sq. Ft.	Total Mbtuh	AFUE	Ave. Load Factor	Ave. Use Hours	Th/ Year [1]
Heating Hot Water Coils	South Lake Tahoe HS	200,000	0.10	20.00	81%	12%	5,100	151,111
		200,000	0.10	20.00				151,111

Air Conditioning: Entire School

Equipment Type	Facility	Area (Sq. Ft.)	Tons /1000 Sq. Ft.	Total Tons	kW/ton	Ave. Load Factor	Ave. Use Hours	kWh/ Year [1]
Chiller	South Lake Tahoe HS	12,000	2.50	30.00	1.40	20%	1,800	77,143
		12,000	2.50	30.00				77,143

Note: the only air conditioning is in the theater

List of HVAC Systems - South Lake Tahoe HS

HVAC Energy Usage in Audited Areas

Exhaust Fans

Fan Type	Facility	Area	Fan HP /	Total	Motor	Ave.	Ave.	kWh/ Year
Exhaust Fan	South Lake Tahoe MS	67,827	0.10	6.78	85%	84%	8,760	43,803
-		**67,827**	**0.10**	**6.78**				**43,803**

			Fan/Pump Energy Use					*Natural Gas Heat Energy Use*				
Unit ID	**Area Served**	**# of Units**	**Motor HP**	**Motor Eff.**	**Ave. Load Factor**	**Annual Use Hours**	**kWh/ Year** [1]	**Max Input (MBH)**	**AFUE / Eff.**	**Ave. Load Factor**	**Annual Use Hours**	**Therms / Year**
Heating Hot Water Pumps	A, B, and C	2	5	89%	80%	2,550	17,196					
Heating Hot Water Pumps	MO	2	5	89%	80%	2,550	17,196					
Heating Hot Water Pumps	ST	1	2	80%	80%	5,100	7,609					
Heating and Ventilating Units	A, B, and C	36	1/4	76%	80%	5,100	36,044					
Fan-Coils	A, B, and C	15	1/4	76%	80%	5,100	15,018					
Heating and Ventilating Units	MO	22	1/4	76%	80%	5,100	22,027					
Fan-Coils	ST	12	3/4	77%	80%	5,100	35,575					
Space Heat Exchanger	A, B, and C	1						2300	82%	17%	5,100	24,318
Space Heat Exchanger	MO	1						1300	82%	17%	5,100	13,745
Space Heat Exchanger	ST	1						1440	82%	17%	5,100	15,225
TOTAL		**93**					**150,665**	**5,040**				**53,289**

[1] Estimated kWh = [HP x 0.746 x LF / Eff] x Usage Hours

[2] Equipment data based on as-built plans and site observations

List of HVAC Systems - South Lake Tahoe MS

Fans and Pumps: Entire School

Equipment Type	Facility	Area (Sq. Ft.)	HP / 1000 Sq. Ft.	Total HP	Motor Eff.	Ave. Load Factor	Ave. Use Hours	kWh/ Year [1]
Exhaust Fan	South Lake Tahoe MS	120,000	0.15	18.00	81%	80%	1,800	23,872
Supply and Return Fans	South Lake Tahoe MS	120,000	0.60	72.00	85%	60%	5,100	193,363
Heating Hot Water Pumps	South Lake Tahoe MS	120,000	0.10	12.00	85%	40%	5,100	21,485
Total		120,000	0.85	102.00				238,720

[1] Estimated kWh = [HP x 0.746 x LF / Eff] x Usage Hours

Space Heating

Equipment Type	Facility	Area (Sq. Ft.)	MBtuh / 1000 Sq. Ft.	Total Mbtuh	AFUE	Ave. Load Factor	Ave. Use Hours	Th/ Year [1]
Heating Hot Water Coils	South Lake Tahoe MS	120,000	0.11	13.40	81%	8%	5,100	67,496
		120,000	0.11	13.40				67,496

List of HVAC Systems - South Lake Tahoe MS

HVAC Energy Usage in Audited Areas

Exhaust Fans

Fan Type	Facility	Area (Sq. Ft.)	Fan HP / 1000	Total Fan	Motor Eff.	Ave. Load	Ave. Use	kWh/ Year [1]
Exhaust Fan	South Lake Tahoe MS	67,827	0.10	6.78	85%	84%	8,760	43,803
TOTAL		**67,827**	**0.10**	**6.78**				**43,803**

HVAC Systems

			Fan/Pump Energy Use					*Natural Gas Heat Energy Use*					*Heat Pump Heat Energy Use*					*Electric Air Conditioning*				
Unit ID	**Area Served**	**# of Units**	**Motor HP**	**Motor Eff.**	**Ave. Load Factor**	**Annual Use Hours**	**kWh/ Year [1]**	**Max Input (MBH)**	**AFUE / Eff.**	**Ave. Load Factor**	**Annual Use Hours**	**Therms / Year**	**Electric Heat MBH**	**HSPF Value**	**Ave Load Factor**	**Annual Use Hours**	**kWh/yr**	**Tons**	**kW/ton**	**Ave Load Factor**	**Annual Use Hours**	**kWh/yr**
Heating and Ventilating Units	Classrooms, halls, offices	34	1/8	75%	80%	5,100	17,248															
Fan Coils	Gym, Corridors, Kitchen, Rubicon remodel	8	3/4	81%	80%	5,100	22,546															
HHW Pumps in Gym Boiler	Angora, Gym, Office, Slant	2	10	89%	80%	2,550	34,392															
Gym Boilers	Angora, Gym, Office, Slant	2						4000	75%	8%	5,100	32,640										
H&V served by Echo Boilers	Rubicon	12						65	88%	16%	5,100	6,365										
Heat Pumps	Portables	2	1/3	76%	80%	5,100	2,670						48	7.0	10%	5,100	6,994	4	1.4	50%	200	1,120
Gas Furnace/Electric AC	Portables	6	1/3	76%	80%	5,100	8,010	65	78%	16%	5,100	3,182						4	1.4	50%	200	3,360
TOTAL		**66**	**33**				**84,865**					**42,187**					**6,994**					**4,480**

[1] Estimated kWh = [HP x 0.746 x LF / Eff] x Usage Hours
[2] Equipment data based on as-built plans and site observations

List of HVAC Systems - Tahoe Valley ES

(Audited Area is Entire School)

Exhaust Fans

Fan Type	Facility	Area (Sq. Ft.)	Fan HP / 1000 Sq. Ft.	Total Fan HP	Motor Eff.	Ave. Load Factor	Ave. Use Hours	kWh/ Year [1]
Exhaust Fan	Tahoe Valley ES	43,374	0.10	4.34	85%	84%	8,760	28,011
TOTAL		**43,374**	**0.10**	**4.34**				**28,011**

HVAC Systems

			Fan/Pump Energy Use					*Natural Gas Heat Energy Use*					*Heat Pump Heat Energy Use*					*Electric Air Conditioning*				
Unit ID	**Area Served**	**# of Units**	**Motor HP**	**Motor Eff.**	**Ave. Load Factor**	**Annual Use Hours**	**kWh/ Year [1]**	**Max Input (MBH)**	**AFUE / Eff.**	**Ave. Load Factor**	**Annual Use Hours**	**Therms/ Year**	**Electric Heat MBH**	**HSPF Value**	**Ave Load Factor**	**Annual Use Hours**	**kWh/yr**	**Tons**	**kW/ton**	**Ave Load Factor**	**Annual Use Hours**	**kWh/yr**
Heating and Ventilating Units	Classrooms, halls, offices	23	1/8	75%	80%	5,100	11,667															
Fan Coils	MP Room, Library, Kitchen	6	3/4	81%	80%	5,100	16,909															
HHW Pumps	all permanent	2	5	88%	80%	2,550	17,294															
Boilers	all permanent	2						2100	75%	7%	5,100	13,923										
Heat Pumps	Portables	2	1/3	76%	80%	5,100	2,670						48	7.0	10%	5,100	6,994	4	1.4	50%	200	1,120
Gas Furnace/Electric AC	Portables	7	1/3	76%	80%	5,100	9,345	65	78%	13%	5,100	3,017						4	1.4	50%	200	3,920
TOTAL		**42**					**57,885**					**16,940**					**6,994**					**5,040**

[1] Estimated kWh = [HP x 0.746 x LF / Eff] x Usage Hours

[2] Equipment data based on as-built plans and site observations

Summary of Lighting Systems

Estimates for Entire Schools

Facility	South Lake Tahoe HS	South Lake Tahoe MS	Tahoe Valley ES
GSF	200,000	120,000	43,374
Interior Lighting Estimate			
Basis for kWh Estimate	***Square Footage***	***Square Footage***	***Square Footage***
Watts/Sq. Ft.	1.2	1.2	1.2
Estimated Interior Lighting Load (kW)	240.0	144.0	52.0
Diversity Factor	0.8	0.8	0.8
Average Interior Lighting Load (kW)	192.0	115.2	41.6
Average Hours per Day	10	10	10
Typical Days per Year	180	180	180
Lighting Operational Hours per Year	1,800	1,800	1,800
Estimated Interior Lighting kWh	345,600	207,360	74,950
Exterior Lighting Estimate			
Basis for kWh Estimate	***Square Footage***	***Square Footage***	***Square Footage***
Estimated Exterior Lighting (W/Sq.Ft.)	0.25	0.15	0.10
Total Exterior Lighting Load (kW)	50.0	18.0	4.3
Average Hours per Day	10	10	10
Typical Days per Year	365	365	365
Average Exterior Lighting Hours	3,650	3,650	3,650
Estimated Exterior Lighting kWh	182,500	65,700	15,832
TOTAL LIGHTING kWh	**528,100**	**273,060**	**90,782**

Estimates for Audited Areas

Facility	South Lake Tahoe HS	South Lake Tahoe MS	Tahoe Valley ES
GSF	73,170	67,827	43,374
Interior Lighting Estimate			
Basis for kWh Estimate	***Square Footage***	***Square Footage***	***Square Footage***
Watts/Sq. Ft.	1.2	1.2	1.2
Estimated Interior Lighting Load (kW)	87.8	81.4	52.0
Diversity Factor	0.8	0.8	0.8
Average Interior Lighting Load (kW)	70.2	65.1	41.6
Average Hours per Day	10	10	10
Typical Days per Year	180	180	180
Lighting Operational Hours per Year	1,800	1,800	1,800
Estimated Interior Lighting kWh	126,438	117,205	74,950
Exterior Lighting Estimate			
Basis for kWh Estimate	***Square Footage***	***Square Footage***	***Square Footage***
Estimated Exterior Lighting (W/Sq.Ft.)	0.10	0.15	0.10
Total Exterior Lighting Load (kW)	7.3	10.2	4.3
Average Hours per Day	10	10	10
Typical Days per Year	365	365	365
Average Exterior Lighting Hours	3,650	3,650	3,650
Estimated Exterior Lighting kWh	26,707	37,135	15,832
TOTAL LIGHTING kWh	**153,145**	**154,340**	**90,782**

Appendix C

Energy Efficiency Measure Calculations

By Control Type Costs and Savings

Case: *Manufacturer Published Ballast Watts*

Control Type	*Associated Project #*	*Control Qty*	*Control Cost ($)*	*Control Savings ($)*	*Simple Payback (Years)*	*kWh Savings*
					.	
Exterior Smart Controls	L-4B	18	$2,013.90	$287.01	7	3,776
OS-1	L-2	25	$4,575.39	$64.44	71	848
OS-2	L-2	76	$20,634.58	$1,086.13	19	14,291
OS-3	L-2	2	$748.44	$66.97	11.2	881
OS-4	L-2	10	$4,331.81	$66.15	65.5	870
TOTAL		**138**	**$32,304.12**	**$1,570.70**	**20.6**	20,667

Conversion Type Energy and Cost Summary

Case: *Manufacturer Published Ballast Watts*

Convert From	*Convert To*	*Associated Project #*	*Fixture Retrofit Quantity*	*Demand Before (kW)*	*Demand After (kW)*	*Demand Savings (kW) with Diversity*	*Retrofit Energy Savings (kWh)*	*Retrofit Cost ($)*	*Retrofit Cost Savings ($)*	*Simple Payback (Years)*
1-F32T8	LED-19W-Linear	L-1	1	.	.	.	16.2	$46.36	$1.72	27
2-F17T8	NO CHANGE		6	0.2	0.2	.	.	$0.00	$0.00	.
2-F32T8	LED-19W-Linear	L-1	1488	40.6	26.8	13.8	24296.1	$68,972.73	$2,575.48	26.8
4-F17T8	NO CHANGE		20	1.1	1.1	.	.	$0.00	$0.00	.
4-F32T8	LED-19W-Linear	L-1	1144	30.9	20.6	10.3	18532.8	$53,027.46	$1,964.49	27
HPS-150W	LED-66W	L-4A	21	4.3	1.4	2.9	12544.3	$19,489.99	$1,329.70	14.7
HPS-70W	LED-42W	L-4A	4	0.8	0.2	0.7	2375.7	$1,540.17	$251.83	6.1
PL-13W	NO CHANGE		1	.	.	.	.	$0.00	$0.00	.
PL-2-13W	NO CHANGE		19	0.6	0.6	.	.	$0.00	$0.00	.
PL-26W	NO CHANGE		2	0.1	0.1	.	.	$0.00	$0.00	.
TOTAL			**2706**	**78.7**	**51**	**27.7**	**.**	**$143,076.72**	**$6,123.22**	**23.4**

By Control Type Costs and Savings

Case: *Manufacturer Published Ballast Watts*

Control Type	*Associated Project*	*Control Qty*	*Control Cost ($)*	*Control Savings ($)*	*Simple Payback (Years)*	*kWh Savings*
Interior Smart Controls	L-5B	1057	$267,269.28	$2,550.19	104.8	33,555
TOTAL		**1057**	**$267,269.28**	**$2,550.19**	**104.8**	**33,555**

Conversion Type Energy and Cost Summary

Case: *Manufacturer Published Ballast Watts*

Convert From	*Convert To*	*Associated Project #*	*Fixture Retrofit Quantity*	*Demand Before (kW)*	*Demand After (kW)*	*Demand Savings (kW) with Diversity*	*Retrofit Energy Savings (kWh)*	*Retrofit Cost ($)*	*Retrofit Cost Savings ($)*	*Simple Payback (Years)*
1-F32T8	LED-22W	L-5A	1	.	.	.	11.9	$331.49	$1.26	263.1
2-F17T8	LED-21W	L-5A	6	0.2	0.1	0.1	97.2	$1,658.14	$10.31	160.8
2-F32T8	LED-45W	L-5A	744	40.6	33.5	7.1	12525.5	$229,628.01	$1,327.74	172.9
4-F17T8	LED-45W	L-5A	20	1.1	0.9	0.2	396	$6,185.39	$41.96	147.4
4-F32T8	LED-45W	L-5A	286	30.9	12.9	18	32432.4	$88,727.07	$3,437.81	25.8
TOTAL			**1057**	**72.8**	**47.4**	**25.4**	**45463**	**326530.1**	**4819.08**	**67.8**

By Control Type Costs and Savings

Case: *Manufacturer Published Ballast Watts*

Control Type	*Associated Project #*	*Control Qty*	*Control Cost ($)*	*Control Savings ($)*	*Simple Payback (Years)*	*kWh Savings*
OS-2	L-2	104	$29,508.12	$1,198.34	24.6	15,768
Photocell-Adapter	L-3	17	$514.00	$96.20	5.3	1,266
TOTAL		**121**	**$30,022.13**	**$1,294.54**	**23.2**	**17,033**

Conversion Type Energy and Cost Summary

Case: *Manufacturer Published Ballast Watts*

Convert From	*Convert To*	*Associated Project #*	*Fixture Retrofit Quantity*	*Demand Before (kW)*	*Demand After (kW)*	*Demand Savings (kW) with Diversity*	*Retrofit Energy Savings (kWh)*	*Retrofit Cost ($)*	*Retrofit Cost Savings ($)*	*Simple Payback (Years)*
1-F17T8	NO CHANGE		4	0.1	0.1	.	.	$0.00	$0.00	.
1-F32T8	LED-19W-Linear	L-1	2	0.1	.	.	43.2	$92.71	$4.66	19.9
1-F40T12	NO CHANGE		1	.	.	.	.	$0.00	$0.00	.
2-F17T8	NO CHANGE		12	0.4	0.4	.	.	$0.00	$0.00	.
2-F32T8	LED-19W-Linear	L-1	762	20.8	13.7	7.1	11769	$35,320.68	$1,270.99	27.8
2-F40T12	NO CHANGE		25	1.8	1.8	.	.	$0.00	$0.00	.
3-F32T8	LED-19W-Linear	L-1	90	2.5	1.6	0.9	1566	$4,171.74	$169.13	24.7
3-F32T8-AB	LED-19W-Linear	L-1	306	9	5.5	3.5	5459	$14,183.92	$589.56	24.1
3-F40T12	NO CHANGE		53	6	6	.	.	$0.00	$0.00	.
3-F40T12-AB	NO CHANGE		26	3	3	.	.	$0.00	$0.00	.
4-F32T8	LED-19W-Linear	L-1	440	11.9	7.9	4	6868.8	$20,395.19	$741.82	27.5
4-F32T8-AB	LED-19W-Linear	L-1	216	5.9	3.9	2.1	2954.9	$10,012.16	$319.14	31.4
4-F40T12	NO CHANGE		22	3.2	3.2	.	.	$0.00	$0.00	.
6-F32T8-HO	NO CHANGE		36	8	8	.	.	$0.00	$0.00	.
PL-13W	NO CHANGE		13	0.2	0.2	.	.	$0.00	$0.00	.
PL-2-13W	NO CHANGE		38	1.3	1.3	.	.	$0.00	$0.00	.
PL-2-26W	NO CHANGE		1	0.1	0.1	.	.	$0.00	$0.00	.
TOTAL			**2047**	**74.2**	**56.7**	**17.5**	**28660.9**	**$84,176.41**	**$3,095.30**	**27.2**

By Control Type Costs and Savings

Case: *Manufacturer Published Ballast Watts*

Control Type	*Associated Project #*	*Control Qty*	*Control Cost ($)*	*Control Savings ($)*	*Simple Payback (Years)*	*kWh Savings*
Interior Smart Controls	L-5B	822	$207,848.05	$1,859.88	111.8	24,472
		822	**$207,848.05**	**$1,859.88**	**111.8**	**24,472**

Conversion Type Energy and Cost Summary

Case: *Manufacturer Published Ballast Watts*

Convert From	*Convert To*		*Fixture Retrofit Quantity*	*Demand Before (kW)*	*Demand After (kW)*	*Demand Savings (kW) with Diversity*	*Retrofit Energy Savings (kWh)*	*Retrofit Cost ($)*	*Retrofit Cost Savings ($)*	*Simple Payback (Years)*
1-F17T8	LED-21W	L-5A	4	0.1	0.1	.	-28.8	$1,104.46	($3.12)	-354
1-F32T8	LED-22W	L-5A	2	0.1	.	.	31.7	$662.97	$3.42	193.9
1-F40T12	LED-22W	L-5A	1	.	.	.	36	$331.36	$3.89	85.2
2-F17T8	LED-21W	L-5A	12	0.4	0.3	0.1	194.4	$3,316.27	$21.00	157.9
2-F32T8	LED-45W	L-5A	381	20.8	17.1	3.7	6091.2	$117,629.17	$657.78	178.8
2-F40T12	LED-44W	L-5A	14	1	0.6	0.4	564.5	$4,031.27	$60.96	66.1
2-F40T12	LED-45W	L-5A	11	0.8	0.5	0.3	379.1	$3,399.31	$40.95	83
3-F32T8	LED-45W	L-5A	30	2.5	1.4	1.1	2052	$9,292.55	$221.62	41.9
3-F32T8-AB	LED-45W	L-5A	102	9	4.6	4.4	6904.1	$31,902.58	$745.65	42.8
3-F40T12	LED-45W	L-5A	53	6	2.4	3.7	6582.6	$16,557.63	$710.92	23.3
3-F40T12-AB	LED-45W	L-5A	26	3	1.2	1.8	4222.8	$8,122.61	$456.07	17.8
4-F32T8	LED-45W	L-5A	110	11.9	5	6.9	12020.4	$34,125.79	$1,298.18	26.3
4-F32T8-AB	LED-45W	L-5A	54	5.9	2.4	3.5	5054.4	$16,915.68	$545.87	31
4-F40T12	LED-45W	L-5A	22	3.2	1	2.2	3920.4	$6,880.94	$423.41	16.3
TOTAL			**822**	**64.7**	**36.6**	**28.1**	**48024.8**	**$254,272.59**	**$5,186.60**	**49.0**

By Control Type Costs and Savings

Case: *Manufacturer Published Ballast Watts*

Control Type	*Associated Project #*	*Control Qty*	*Control Cost ($)*	*Control Savings ($)*	*Simple Payback (Years)*	*kWh Savings*
Exterior Smart Controls	L-4B	10	$1,118.83	$126.04	8.9	1,156
OS-2	L-2	46	$12,145.87	$456.19	26.6	4,185
TOTAL		**56**	**$13,264.71**	**$582.23**	**22.8**	

Conversion Type Energy and Cost Summary

Case: *Manufacturer Published Ballast Watts*

Convert From	*Convert To*	*Associated Project #*	*Fixture Retrofit Quantity*	*Demand Before (kW)*	*Demand After (kW)*	*Demand Savings (kW) with Diversity*	*Retrofit Energy Savings (kWh)*	*Retrofit Cost ($)*	*Retrofit Cost Savings ($)*	*Simple Payback (Years)*
2-F17T8	NO CHANGE		8	0.3	0.3	.	.	$0.00	$0.00	.
2-F32T8	LED-19W-Linear	L-1	1178	32.7	21.2	11.5	18005	$54,603.45	$2,322.65	23.5
3-F32T8	LED-19W-Linear	L-1	3	0.1	0.1	.	59.4	$139.06	$7.66	18.2
3-F32T8-AB	LED-19W-Linear	L-1	201	5.6	3.6	2	3106.1	$9,316.89	$400.69	23.3
4-F32T8	LED-19W-Linear	L-1	176	5.1	3.2	1.9	3358.1	$8,158.08	$433.19	18.8
HPS-150W	LED-66W	L-4A	10	1.7	0.7	1	3644.2	$9,275.20	$470.10	19.7
PL-13W	NO CHANGE		13	0.2	0.2	.	.	$0.00	$0.00	.
PL-2-13W	NO CHANGE		90	3.1	3.1	.	.	$0.00	$0.00	.
TOTAL			**1679**	**48.8**	**32.3**	**16.5**	**.**	**$81,492.66**	**$3,634.29**	**22.4**

By Control Type Costs and Savings

Case: *Manufacturer Published Ballast Watts*

Control Type	*Associated Project #*	*Control Qty*	*Control Cost ($)*	*Control Savings ($)*	*Simple Payback (Years)*	*kWh Savings*
Interior Smart Controls	L-5B	709	$179,275.15	$2,161.16	83	19,827
TOTAL		**709**	**$179,275.15**	**$2,161.16**	**83**	**19,827**

Conversion Type Energy and Cost Summary

Case: *Manufacturer Published Ballast Watts*

Convert From	*Convert To*	*Associated Project #*	*Fixture Retrofit Quantity*	*Demand Before (kW)*	*Demand After (kW)*	*Demand Savings (kW) with Diversity*	*Retrofit Energy Savings (kWh)*	*Retrofit Cost ($)*	*Retrofit Cost Savings ($)*	*Simple Payback (Years)*
2-F17T8	LED-21W	L-5A	8	0.3	0.2	0.1	187.2	$2,210.84	$24.15	91.5
2-F32T8	LED-45W	L-5A	589	32.7	26.5	6.2	9772.2	$181,676.20	$1,260.58	144.1
3-F32T8	LED-45W	L-5A	1	0.1	.	.	75.6	$309.75	$9.75	31.8
3-F32T8-AB	LED-45W	L-5A	67	5.6	3	2.6	4023	$20,822.79	$518.97	40.1
4-F32T8	LED-45W	L-5A	44	5.1	2	3.1	5418.7	$13,650.33	$699.02	19.5
TOTAL			**709**	**43.8**	**31.7**	**12**	**19476.7**	**218669.91**	**2512.47**	**87.0**

Project Cost Estimate

Project M-1 **Demand controlled ventilation**

Cost Factors

Tax Rate	8.0%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.117

South Tahoe High School

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
1	Carbon Dioxide Sensor	1	Ea.	$ 500.00	4	$ 55	$ 220	$ -	$ 720.00	$ 500	$ 220	$ -	$ 40	$ 849	$ 1,019
2	Damper Actuator, Repairs	6	Ea.	$ 250.00	4	$ 55	$ 220	$ -	$ 470.00	$ 1,500	$ 1,320	$ -	$ 120	$ 3,284	$ 3,941
3	Low Voltage Wiring	150	linear feet	$ 3	0	$ 55	$ 8	$ -	$ 11	$ 450	$ 1,238	$ -	$ 36	$ 1,925	$ 2,310
4	Programming	1	Ea.	$ -	4	$ 55	$ 220	$ -	$ 220	$ -	$ 220	$ -	$ -	$ 246	$ 295
	INSTALLING CONTRACTOR COST														$ 7,565
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 1,135
	Construction Cost with Contingency														
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 1,513
	TOTAL PROJECT BUDGET														**$ 10,212**

Project Cost Estimate

Project M-1 Demand controlled ventilation

Cost Factors

Tax Rate	8.0%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.117

South Tahoe High School

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
1	Carbon Dioxide Sensor	1	Ea.	$ 500.00	4	$ 55	$ 220	$ -	$ 720.00	$ 500	$ 220	$ -	$ 40	$ 849	$ 1,019
2	Damper Actuator, Repairs	6	Ea.	$ 250.00	4	$ 55	$ 220	$ -	$ 470.00	$ 1,500	$ 1,320	$ -	$ 120	$ 3,284	$ 3,941
3	Low Voltage Wiring	150	linear feet	$ 3	0	$ 55	$ 8	$ -	$ 11	$ 450	$ 1,238	$ -	$ 36	$ 1,925	$ 2,310
4	Programming	1	Ea.	$ -	4	$ 55	$ 220	$ -	$ 220	$ -	$ 220	$ -	$ -	$ 246	$ 295
	INSTALLING CONTRACTOR COST														$ 7,565
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 1,135
	Construction Cost with Contingency														
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 1,513
	TOTAL PROJECT BUDGET														**$ 10,212**

South Tahoe Middle School

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
1	Carbon Dioxide Sensor	1	Ea.	$ 500.00	4.00	$ 55	$ 220	$ -	$ 720.00	$ 500	$ 220	$ -	$ 40	$ 849	$ 1,019
2	Damper Actuator, Repairs	4	Ea.	$ 250.00	4.00	$ 55	$ 220	$ -	$ 470.00	$ 1,000	$ 880	$ -	$ 80	$ 2,189	$ 2,627
3	Low Voltage Wiring	200	linear feet	$ 3.00	0.15	$ 55	$ 8	$ -	$ 11.25	$ 600	$ 1,650	$ -	$ 48	$ 2,567	$ 3,080
4	Programming	1	Ea.	$ -	4.00	$ 55	$ 220	$ -	$ 220.00	$ -	$ 220	$ -	$ -	$ 246	$ 295
	INSTALLING CONTRACTOR COST														$ 7,021
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 1,053
	Construction Cost with Contingency														
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 1,404
	TOTAL PROJECT BUDGET														**$ 9,478**

Project Cost Estimate

Project M-1 Demand controlled ventilation

Cost Factors

Tax Rate	8.0%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.117

South Tahoe High School

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
1	Carbon Dioxide Sensor	1	Ea.	$ 500.00	4	$ 55	$ 220	$ -	$ 720.00	$ 500	$ 220	$ -	$ 40	$ 849	$ 1,019
2	Damper Actuator, Repairs	6	Ea.	$ 250.00	4	$ 55	$ 220	$ -	$ 470.00	$ 1,500	$ 1,320	$ -	$ 120	$ 3,284	$ 3,941
3	Low Voltage Wiring	150	linear feet	$ 3	0	$ 55	$ 8	$ -	$ 11	$ 450	$ 1,238	$ -	$ 36	$ 1,925	$ 2,310
4	Programming	1	Ea.	$ -	4	$ 55	$ 220	$ -	$ 220	$ -	$ 220	$ -	$ -	$ 246	$ 295
	INSTALLING CONTRACTOR COST														$ 7,565
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 1,135
	Construction Cost with Contingency														
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 1,513
	TOTAL PROJECT BUDGET														**$ 10,212**

South Tahoe Middle School

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P

Tahoe Valley Elementary School

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
1	Carbon Dioxide Sensor	2	Ea.	$ 500.00	4.00	$ 55	$ 220	$ -	$ 720.00	$ 1,000	$ 440	$ -	$ 80	$ 1,698	$ 2,037
2	Damper Actuator, Repairs	6	Ea.	$ 250.00	4.00	$ 55	$ 220	$ -	$ 470.00	$ 1,500	$ 1,320	$ -	$ 120	$ 3,284	$ 3,941
3	Low Voltage Wiring	300	linear feet	$ 3.00	0.15	$ 55	$ 8	$ -	$ 11.25	$ 900	$ 2,475	$ -	$ 72	$ 3,850	$ 4,620
4	Programming	2	Ea.	$ -	4.00	$ 55	$ 220	$ -	$ 220.00	$ -	$ 440	$ -	$ -	$ 491	$ 590
	INSTALLING CONTRACTOR COST														$ 11,188
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 1,053
	Construction Cost with Contingency														
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 1,404
	TOTAL PROJECT BUDGET														**$ 13,646**

[1] Material and labor costs determined from RSMeans Mechanical Cost Data - 2015

Project Savings Estimate

Project M-1 Demand controlled ventilation

1. Dimensions of Large Spaces

School	Room	Width	Length	sq ft
STHS	Libe	85	85	7,225
STMS	Gym	85	100	8,500
TVES	MP	50	100	5,000
TVES	Libe	50	50	2,500
Total	-	-	-	**23,225**

2. Results of Equest Modeling for Prototypical 6,000 sq ft space

	Existing	With DCV	
Natural Gas Consumption	5088.8	3860.4	Th/yr

(no significant change in electricity consumption)

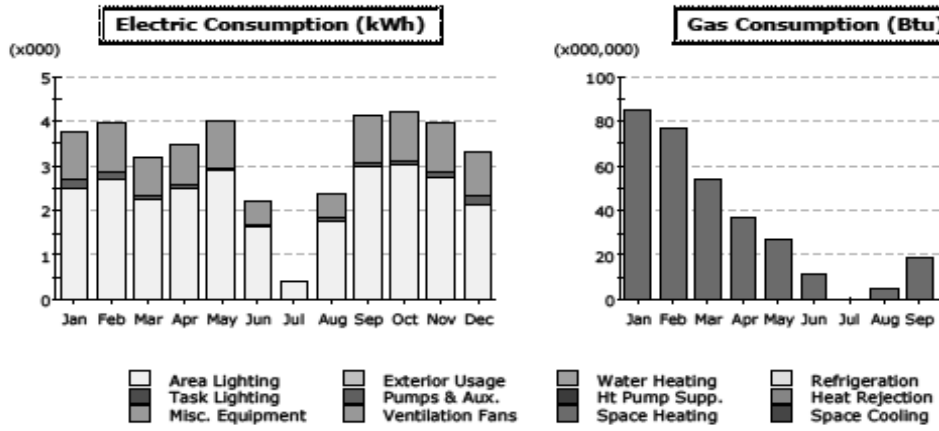
3. Estimated Savings

Facility	Natural Gas
STHS	1,479
STMS	1,740
TVES	1,536
TOTAL	**4,755**

Facility	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Cost Savings ($/yr)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
STHS	1,479	$0.825	$9,856	$1,220	8.1	$361	$9,494	7.8
STMS	1,740	$0.862	$9,147	$1,500	6.1	$425	$8,722	5.8
TVES	1,536	$0.961	$13,169	$1,475	8.9	$375	$12,794	8.7
TOTAL	**4,755**	**$0.882**	**$32,172**	**$4,195**	**7.7**	**$1,161**	**$31,011**	**7.4**

Existing Prototypical Space, 6,000 sq ft, 1.2 cfm/sq ft, 25% min OSA

Project/Run: LTUSD-MP Existing - Baseline Design Run Date/Time: 06/09/15 @ 09:22



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	1.06	1.11	0.84	0.91	1.03	0.51	-	0.56	1.08	1.11	1.08	0.95	10.25
Pumps & Aux.	0.17	0.14	0.09	0.08	0.08	0.04	-	0.04	0.08	0.09	0.12	0.20	1.12
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	2.51	2.72	2.27	2.50	2.89	1.64	0.42	1.77	3.00	3.01	2.75	2.14	27.62
Total	3.75	3.97	3.20	3.49	4.00	2.19	0.42	2.38	4.15	4.21	3.95	3.29	38.99

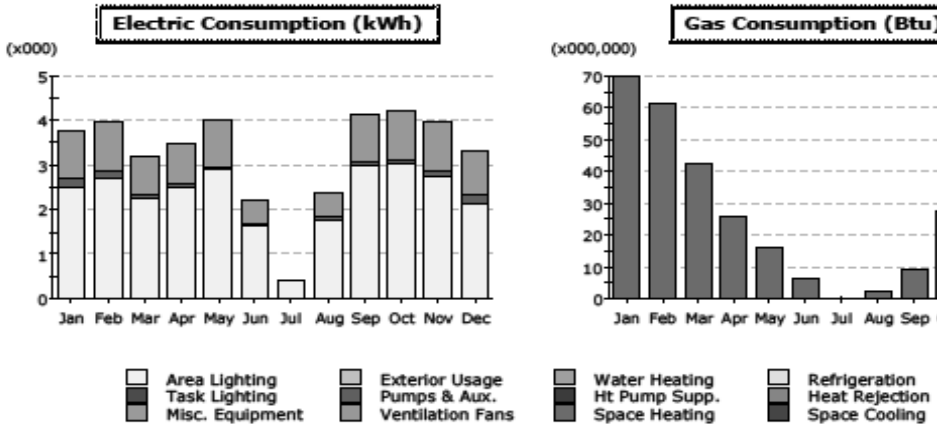
Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	84.54	76.73	54.40	36.52	26.87	11.79	-	5.04	18.94	39.13	72.63	82.30	508.88
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	84.54	76.73	54.40	36.52	26.87	11.79	-	5.04	18.94	39.13	72.63	82.30	508.88

eQUEST 3.65.7163 Monthly Energy Consumption by Enduse Page 1

With DCV--min OSA = % occupied x 25% of 1.2 cfm/sq ft

Project/Run: LTUSD-MP DCV - Baseline Design | Run Date/Time: 07/01/15 @ 14:19



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	1.06	1.11	0.84	0.91	1.03	0.51	-	0.56	1.08	1.11	1.08	0.95	10.25
Pumps & Aux.	0.17	0.14	0.09	0.08	0.08	0.04	-	0.04	0.08	0.09	0.12	0.20	1.12
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	2.51	2.72	2.27	2.50	2.89	1.64	0.42	1.77	3.00	3.01	2.75	2.14	27.62
Total	3.75	3.97	3.20	3.49	4.00	2.19	0.42	2.38	4.15	4.21	3.95	3.29	39.00

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	69.40	60.90	42.08	26.22	16.05	6.34	-	2.07	9.31	27.22	56.79	69.66	386.04
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	69.40	60.90	42.08	26.22	16.05	6.34	-	2.07	9.31	27.22	56.79	69.66	386.04

Project Cost Estimate

M2	**Occupancy based HVAC controls**

Cost Factors

Tax Rate	8.0%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.117

South Lake Tahoe HS

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
	(HVAC units controlled)	85													
1	Wiring (sensor to thermostat or EMS)	2550	L.F.	$ 1.50	0.10	$ 55	$ 6	$ -	$ 7.00	$ 3,825	$ 14,025	$ -	$ 306	$ 20,280	$ 24,336
2	Programming [3]	1	Ea.	$ -	2	$ 55	$ 110	$ -	$ 110	$ -	$ 110	$ -	$ -	$ 123	$ 147
3	Testing	1	Ea.	$ -	2	$ 55	$ 110	$ -	$ 110	$ -	$ 110	$ -	$ -	$ 123	$ 147
	INSTALLING CONTRACTOR COST														$ 24,631
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 2,192
	Construction Cost with Contingency														
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 2,922
	TOTAL PROJECT BUDGET														**$ 29,745**

Project Cost Estimate

M2 **Occupancy based HVAC controls**

Cost Factors

Tax Rate	8.0%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.117

South Lake Tahoe HS

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
	(HVAC units controlled)	85													
1	Wiring (sensor to thermostat or EMS)	2550	L.F.	$ 1.50	0.10	$ 55	$ 6	$ -	$ 7.00	$ 3,825	$ 14,025	$ -	$ 306	$ 20,280	$ 24,336
2	Programming [3]	1	Ea.	$ -	2	$ 55	$ 110	$ -	$ 110	$ -	$ 110	$ -	$ -	$ 123	$ 147
3	Testing	1	Ea.	$ -	2	$ 55	$ 110	$ -	$ 110	$ -	$ 110	$ -	$ -	$ 123	$ 147
	INSTALLING CONTRACTOR COST														$ 24,631
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 2,192
	Construction Cost with Contingency														
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 2,922
	TOTAL PROJECT BUDGET														**$ 29,745**

South Lake Tahoe MS

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
	(HVAC units controlled)	50													
1	Wiring (sensor to thermostat or EMS)	1500	L.F.	$ 1.50	0.10	$ 55	$ 6	$ -	$ 7.00	$ 2,250	$ 8,250	$ -	$ 180	$ 11,930	$ 14,315
2	Programming [3]	1	Ea.	$ -	2	$ 55	$ 110	$ -	$ 110	$ -	$ 110	$ -	$ -	$ 123	$ 147
3	Testing	1	Ea.	$ -	2	$ 55	$ 110	$ -	$ 110	$ -	$ 110	$ -	$ -	$ 123	$ 147
	INSTALLING CONTRACTOR COST														$ 14,610
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 2,192
	Construction Cost with Contingency														
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 2,922
	TOTAL PROJECT BUDGET														**$ 19,724**

Project Cost Estimate

M2	**Occupancy based HVAC controls**

Cost Factors

Tax Rate	8.0%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.117

South Lake Tahoe HS

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
	(HVAC units controlled)	85													
1	Wiring (sensor to thermostat or EMS)	2550	L.F.	$ 1.50	0.10	$ 55	$ 6	$ -	$ 7.00	$ 3,825	$ 14,025	$ -	$ 306	$ 20,280	$ 24,336
2	Programming [3]	1	Ea.	$ -	2	$ 55	$ 110	$ -	$ 110	$ -	$ 110	$ -	$ -	$ 123	$ 147
3	Testing	1	Ea.	$ -	2	$ 55	$ 110	$ -	$ 110	$ -	$ 110	$ -	$ -	$ 123	$ 147
	INSTALLING CONTRACTOR COST														$ 24,631
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 2,192
	Construction Cost with Contingency														
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 2,922
	TOTAL PROJECT BUDGET														**$ 29,745**

South Lake Tahoe MS

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P

Tahoe Valley ES

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
	(HVAC units controlled)	38													
1	Wiring (sensor to thermostat or EMS)	1140	L.F.	$ 1.50	0.10	$ 55	$ 6	$ -	$ 7.00	$ 1,710	$ 6,270	$ -	$ 137	$ 9,066	$ 10,880
2	Programming [3]	1	Ea.	$ -	2	$ 55	$ 110	$ -	$ 110	$ -	$ 110	$ -	$ -	$ 123	$ 147
3	Testing	1	Ea.	$ -	2	$ 55	$ 110	$ -	$ 110	$ -	$ 110	$ -	$ -	$ 123	$ 147
	INSTALLING CONTRACTOR COST														$ 11,175
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 2,192
	Construction Cost with Contingency														
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 2,922
	TOTAL PROJECT BUDGET														**$ 16,288**

[1] Material and labor costs determined from RSMeans Mechanical Cost Data - 2015
[2] CAT-5 Ethernet cable. Cost estimate assumes an estimated 30-ft per thermostat
[3] Existing PC at District Office may be used

Project Savings Estimate

M2	Occupancy based HVAC controls

1. Existing Breakdown of Energy End-Use (from Appendix B, for Audited Areas Only)

Electricity Use in Audited Areas

End Use	Fans & Pumps	Heat Pumps, Air Conditioning
South Lake Tahoe HS	194,468	0
South Lake Tahoe MS	128,668	11,474
Tahoe Valley ES	85,896	12,034
TOTAL	973,139	100,651

Natural Gas Use in Audited Areas

End Use	Space Heating
South Lake Tahoe HS	53,289
South Lake Tahoe MS	42,187
Tahoe Valley ES	16,940
TOTAL	235,547

2. Savings from Occupancy Sensor Control

Fan and Pump Electricity	10%
Heat Pumps, Air Conditioning	10%
Space Heat Natural Gas	10%

3. Estimated Savings

Facility	Electricity (kWh)	Natural Gas
South Lake Tahoe HS	19,447	5,329
South Lake Tahoe MS	14,014	4,219
Tahoe Valley ES	9,793	1,694
TOTAL	43,254	11,242

Energy Efficiency Measures

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Cost Savings ($/yr)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Lake Tahoe HS	--	19,447	$0.076	5,329	$0.825	$29,745	$5,874	5.1	$972	$28,772	4.9
South Lake Tahoe MS	--	14,014	$0.076	4,219	$0.862	$19,724	$4,705	4.2	$701	$19,023	4.0
Tahoe Valley ES	--	9,793	$0.101	1,694	$0.961	$16,288	$2,616	6.2	$490	$15,799	6.0
TOTAL	--	43,254	$0.084	11,242	$0.882	$65,757	$13,195	5.0	$2,163	$63,594	4.8

Project Cost Estimate

M3 **Install Network Thermostats**

Cost Factors

Tax Rate	8.0%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.117

South Lake Tahoe MS

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
1	Removal & Disposal of Existing Thermostat	8	Ea.		0.25	$ 32	$ 8	$ -	$ 8	$ -	$ 64	$ -	$ -	$ 71	$ 86
2	New Network Thermostat (Proliphix or Equal)	8	Ea.	$ 150	1	$ 55	$ 55	$ -	$ 205	$ 1,200	$ 440	$ -	$ 96	$ 1,939	$ 2,327
3	Communication Wiring (ft) [2]	240	L.F.	$ 0.20	0.05	$ 55	$ 3	$ -	$ 2.95	$ 48	$ 660	$ -	$ 4	$ 795	$ 954
4	Software and Programming [3]	1	Ea.	$ -	16	$ 55	$ 880	$ -	$ 880	$ -	$ 880	$ -	$ -	$ 983	$ 1,180
5	Training	1	Ea.	$ 1,000	8	$ 55	$ 440	$ -	$ 1,440	$ 1,000	$ 440	$ -	$ 80	$ 1,698	$ 2,037
	INSTALLING CONTRACTOR COST														$ 6,584
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 1,051
	Construction Cost with Contingency														
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 1,401
	TOTAL PROJECT BUDGET														**$ 9,035**

Project Cost Estimate

M3 **Install Network Thermostats**

Cost Factors

Tax Rate	8.0%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.117

South Lake Tahoe MS

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
1	Removal & Disposal of Existing Thermostat	8	Ea.		0.25	$ 32	$ 8	$ -	$ 8	$ -	$ 64	$ -	$ -	$ 71	$ 86
2	New Network Thermostat (Proliphix or Equal)	8	Ea.	$ 150	1	$ 55	$ 55	$ -	$ 205	$ 1,200	$ 440	$ -	$ 96	$ 1,939	$ 2,327
3	Communication Wiring (ft) [2]	240	L.F.	$ 0.20	0.05	$ 55	$ 3	$ -	$ 2.95	$ 48	$ 660	$ -	$ 4	$ 795	$ 954
4	Software and Programming [3]	1	Ea.	$ -	16	$ 55	$ 880	$ -	$ 880	$ -	$ 880	$ -	$ -	$ 983	$ 1,180
5	Training	1	Ea.	$ 1,000	8	$ 55	$ 440	$ -	$ 1,440	$ 1,000	$ 440	$ -	$ 80	$ 1,698	$ 2,037
	INSTALLING CONTRACTOR COST														$ 6,584
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 1,051
	Construction Cost with Contingency														
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 1,401
	TOTAL PROJECT BUDGET														**$ 9,035**

Tahoe Valley ES

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
1	Removal & Disposal of Existing Thermostat	9	Ea.		0.25	$ 32	$ 8	$ -	$ 8	$ -	$ 72	$ -	$ -	$ 80	$ 97
2	New Network Thermostat (Proliphix or Equal)	9	Ea.	$ 150	1	$ 55	$ 55	$ -	$ 205	$ 1,350	$ 495	$ -	$ 108	$ 2,182	$ 2,618
3	Communication Wiring (ft) [2]	270	L.F.	$ 0.20	0.05	$ 55	$ 3	$ -	$ 2.95	$ 54	$ 743	$ -	$ 4	$ 895	$ 1,073
4	Software and Programming [3]	1	Ea.	$ -	16	$ 55	$ 880	$ -	$ 880	$ -	$ 880	$ -	$ -	$ 983	$ 1,180
5	Training	1	Ea.	$ 1,000	8	$ 55	$ 440	$ -	$ 1,440	$ 1,000	$ 440	$ -	$ 80	$ 1,698	$ 2,037
	INSTALLING CONTRACTOR COST														$ 7,005
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 1,051
	Construction Cost with Contingency														
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 1,401
	TOTAL PROJECT BUDGET														**$ 9,456**

[1] Material and labor costs determined from RSMeans Mechanical Cost Data - 2013
[2] CAT-5 Ethernet cable. Cost estimate assumes an estimated 30-ft per thermostat
[3] Existing PC at District Office may be used

Project Savings Estimate

M3	**Install Network Thermostats**

Existing HVAC Energy Use - *from Energy Balance (Appendix B)*

South Tahoe Middle School--Audited Areas

			Fan/Pump Energy Use					*Natural Gas Heat Energy Use*					*Heat Pump Heat Energy Use*					*Electric Air Conditioning*				
Unit ID	**Area Served**	**# of Units**	**Motor HP**	**Motor Eff.**	**Ave. Load Factor**	**Annual Use Hours**	**kWh/ Year** [1]	**Max Input (MBH)**	**AFUE / Eff.**	**Ave. Load Factor**	**Annual Use Hours**	**Therms / Year**	**Electric Heat MBH**	**HSPF Value**	**Ave Load Factor**	**Annual Use Hours**	**kWh/yr**	**Tons**	**kW/ton**	**Ave Load Factor**	**Annual Use Hours**	**kWh/yr**
Heat Pumps	Portables	2	1/3	76%	80%	5,100	2,670						48	7.0	10%	5,100	6,994	4	1.4	50%	200	1,120
Gas Furnace/Electric AC	Portables	6	1/3	76%	80%	5,100	8,010	65	78%	12%	5,100	2,387						4	1.4	50%	200	3,360
TOTAL		**8**					**10,680**					**2,387**					**6,994**					**4,480**

Estimated HVAC Energy Savings

	Heating	*Cooling*	*Fans*
Savings from Improved Scheduling	4%	4%	4%
Savings from Improved Temperature Control	3%	3%	3%
Savings from Optimized Start/Stop	3%	3%	3%
Overall Savings from EMS Control	***10%***	***10%***	***10%***

Fan Savings	1,068	kWh
A/C Savings	448	kWh
Electric Heating Savings	699	kWh
Natural Gas Heating Savings	239	Th

Energy Efficiency Measures

Project Summary

Electricity Savings (kWh)	2,215
Electricity Rate ($/kWh)	$ 0.108
Energy Savings ($)	$ 239
Natural Gas Savings	239
Natural Gas Rate ($/Th)	$ 0.862
Energy Savings ($)	$ 206
Total Energy Savings ($)	$ 445
Project Costs ($)	$ 9,035
Simple Payback Period (Years)	20.3
Total Estimated Incentive ($)	$111
Poject Cost with Incentive ($)	$8,924
Simple Payback with Incentive (years)	20.1

Tahoe Valley Elementary School (Entire School = Audited Area)

			Fan/Pump Energy Use					*Natural Gas Heat Energy Use*					*Heat Pump Heat Energy Use*					*Electric Air Conditioning*				
Unit ID	**Area Served**	**# of Units**	**Motor HP**	**Motor Eff.**	**Ave. Load Factor**	**Annual Use Hours**	**kWh/ Year** [1]	**Max Input (MBH)**	**AFUE / Eff.**	**Ave. Load Factor**	**Annual Use Hours**	**Therms / Year**	**Electric Heat MBH**	**HSPF Value**	**Ave Load Factor**	**Annual Use Hours**	**kWh/yr**	**Tons**	**kW/ton**	**Ave Load Factor**	**Annual Use Hours**	**kWh/yr**
Heat Pumps	Portables	2	1/3	76%	80%	5,100	2,670						48	7.0	10%	5,100	6,994	4	1.4	50%	200	1,120
Gas Furnace/Electric AC	Portables	7	1/3	76%	80%	5,100	9,345	65	78%	7%	5,100	1,624						4	1.4	50%	200	3,920
TOTAL		**9**					**12,015**					**1,624**					**6,994**					**5,040**

Estimated HVAC Energy Savings

	Heating	*Cooling*	*Fans*
Savings from Improved Scheduling	4%	4%	4%
Savings from Improved Temperature Control	3%	3%	3%
Savings from Optimized Start/Stop	3%	3%	3%
Overall Savings from EMS Control	***10%***	***10%***	***10%***

Fan Savings	1,201	kWh
A/C Savings	504	kWh
Electric Heating Savings	699	kWh
Natural Gas Heating Savings	162	Th

Energy Efficiency Measures

Project Summary

Electricity Savings (kWh)	2,405
Electricity Rate ($/kWh)	$ 0.125
Energy Savings ($)	$ 300
Natural Gas Savings	162
Natural Gas Rate ($/Th)	$ 0.961
Energy Savings ($)	$ 156
Total Energy Savings ($)	$ 456
Project Costs ($)	$ 9,456
Simple Payback Period (Years)	20.7
Total Estimated Incentive ($)	$120
Poject Cost with Incentive ($)	$9,336
Simple Payback with Incentive (years)	20.5

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Tahoe Middle School--Audited Areas	--	2,215	$0.108	238.7	$0.862	$9,035	$445	20.3	$111	$8,925	20.1
Tahoe Valley Elementary School (Entire School = Audited Area)	--	2,405	$0.125	162.4	$0.961	$9,456	$456	20.7	$120	$9,336	20.5
Total	**-**	**4,620**	**$0.116**	**401.1**	**$0.911**	**$18,492**	**$901**	**20.5**	**$231**	**$18,261**	**20.3**

Project Cost Estimate

M4 **New Condensing Boilers**

Cost Factors

Tax Rate	8.0%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.117

South Tahoe Middle School

Item #	Description	Qty.	Units	Unit Material Cost ($)	Unit Labor Hours	Average Labor Rate	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
1	Remove and dispose of existing boiler	2	Ea.	$ -	40	$ 55	$ 2,200	$ 1,000	$ 3,200	$ -	$ 4,400	$ 2,000	$ -	$ 7,149	$ 8,579
2	New 4 million Btu/hr input natural gas fired low NOx condensing boiler	2	Ea.	$ 45,000	160	$ 55	$ 8,800	$ 2,500	$ 56,300	$ 90,000	$ 17,600	$ 5,000	$ 7,200	$ 133,817	$ 160,580
3	New flue for condensing exhaust	1	Ea.	$ 1,200	24	$ 55	$ 1,320		$ 2,520	$ 1,200	$ 1,320	$ -	$ 96	$ 2,922	$ 3,506
4	Wiring, controls, gas piping and fittings, heating hot water piping and insulation, drains, etc.		Ea.	$ 2,500	40	$ 55	$ 2,200		$ 4,700	$ -	$ -	$ -	$ -	$ -	$ -
5	Startup and commissioning		Ea.		16	$ 55	$ 880		$ 880	$ -	$ -	$ -	$ -	$ -	$ -
6	Training and programming		Ea.		16	$ 55	$ 880		$ 880	$ -	$ -	$ -	$ -	$ -	$ -
	INSTALLING CONTRACTOR COST														$ 172,665
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 25,900
	Construction Cost with Contingency														$ 198,565
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 39,713
	TOTAL PROJECT BUDGET														**$ 238,278**

Notes Costs for materials, labor and equipment based on data from RS Means 2015

Project Cost Estimate

M4 **New Condensing Boilers**

Cost Factors

Tax Rate	8.0%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.117

South Tahoe Middle School

Item #	Description	Qty.	Units	Unit Material Cost ($)	Unit Labor Hours	Average Labor Rate	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
1	Remove and dispose of existing boiler	2	Ea.	$ -	40	$ 55	$ 2,200	$ 1,000	$ 3,200	$ -	$ 4,400	$ 2,000	$ -	$ 7,149	$ 8,579
2	New 4 million Btu/hr input natural gas fired low NOx condensing boiler	2	Ea.	$ 45,000	160	$ 55	$ 8,800	$ 2,500	$ 56,300	$ 90,000	$ 17,600	$ 5,000	$ 7,200	$ 133,817	$ 160,580
3	New flue for condensing exhaust	1	Ea.	$ 1,200	24	$ 55	$ 1,320		$ 2,520	$ 1,200	$ 1,320	$ -	$ 96	$ 2,922	$ 3,506
4	Wiring, controls, gas piping and fittings, heating hot water piping and insulation, drains, etc.		Ea.	$ 2,500	40	$ 55	$ 2,200		$ 4,700	$ -	$ -	$ -	$ -	$ -	$ -
5	Startup and commissioning		Ea.		16	$ 55	$ 880		$ 880	$ -	$ -	$ -	$ -	$ -	$ -
6	Training and programming		Ea.		16	$ 55	$ 880		$ 880	$ -	$ -	$ -	$ -	$ -	$ -
	INSTALLING CONTRACTOR COST														$ 172,665
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 25,900
	Construction Cost with Contingency														$ 198,565
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 39,713
	TOTAL PROJECT BUDGET														**$ 238,278**

Tahoe Valley Elementary School

Item #	Description	Qty.	Units	Unit Material Cost ($)	Unit Labor Hours	Average Labor Rate	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
1	Remove and dispose of existing boiler	2	Ea.	$ -	40	$ 55	$ 2,200	$ 1,000	$ 3,200	$ -	$ 4,400	$ 2,000	$ -	$ 7,149	$ 8,579
2	New 2 million Btu/hr input natural gas fired low NOx condensing boiler	2	Ea.	$ 20,000	80	$ 55	$ 4,400	$ 2,500	$ 26,900	$ 40,000	$ 8,800	$ 5,000	$ 3,200	$ 63,669	$ 76,403
3	New flue for condensing exhaust	1	Ea.	$ 800	24	$ 55	$ 1,320		$ 2,120	$ 800	$ 1,320	$ -	$ 64	$ 2,440	$ 2,927
4	Wiring, controls, gas piping and fittings, heating hot water piping and insulation, drains, etc.		Ea.	$ 1,500	40	$ 55	$ 2,200		$ 3,700	$ -	$ -	$ -	$ -	$ -	$ -
5	Startup and commissioning		Ea.		16	$ 55	$ 880		$ 880	$ -	$ -	$ -	$ -	$ -	$ -
6	Training and programming		Ea.		16	$ 55	$ 880		$ 880	$ -	$ -	$ -	$ -	$ -	$ -
	INSTALLING CONTRACTOR COST														$ 87,909
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 25,900
	Construction Cost with Contingency														$ 113,809
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 39,713
	TOTAL PROJECT BUDGET														**$ 153,521**

Project Savings Estimate

M4 New Condensing Boilers

Existing Equipment		
School:	STMS	TVES
Location	Gym Boiler	Boiler Room
Number of Boilers	2	2
Input Rating, MMBtuh each boiler	4	2.1
Nameplate Efficiency	80%	80%
Estimated Additional Losses	5%	5%
Annual Operating Hours, each boiler	5,100	2550
Average Load Factor	8%	7%
Annual Fuel Consumption, each boiler, Th/yr	16,320	3,481
Annual Output, MMBtu/yr heat, each boiler	1,224	261
Annual Fuel Consumption, all boilers, Th/yr	32,640	6,962
Proposed Equipment		
Number of Boilers	2	2
Input Rating, MMBtuh each boiler	4	2.1
Overall Efficiency	88%	88%
Annual Output, MMBtu/yr heat, each boiler	1224	261.0563
Annual Fuel Consumption, each boiler, Th/yr	13,909	2,967
Annual Fuel Consumption, all boilers, Th/yr	27,818	5,933

Project Savings Estimate

M4 **New Condensing Boilers**

Project Summary

Total Th Saved	4,822	1,028
Natural Gas Rate ($/Th)	$0.86	$0.96
Total Natural Gas Savings ($)	$4,155	$988
Project Cost ($)	$238,278	$153,521
Estimated Incentive ($)	$5,000	$2,625
Project Cost with Incentive ($)	$233,278	$150,896
Simple Payback Period w/out Incentive (years)	57.3	155.4
Simple Payback Period with Incentive (years)	56.1	152.7

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Tahoe Middle School	--	0	--	4,821.8	$0.862	$238,278	$4,155	57.3	$5,000	$233,278	56.1
Tahoe Valley Elementary School	--	0	--	1,028.4	$0.961	$153,521	$988	56.1	$2,625	$150,896	152.7
Total	**-**	**0**	**-**	**5,850.2**	**$0.911**	**$391,799**	**$5,143**	**73.8**	**$7,625**	**$384,174**	**74.7**

M2 EMS Expansion and VFD for Pool Pump at Jackets Pool

Project Cost Estimate

M5 **Snow Melt Controls**

Cost Factors

Tax Rate	8.0%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.117

South Tahoe High School

Item #	Description	Qty.	Units	Unit Material Cost ($)	Unit Labor Hours	Average Labor Rate	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
1	Remove and Dispose of Existing Controls and Sensors	3	Ea.		2	$ 55	$ 110		$ 110	$ -	$ 330	$ -	$ -	$ 369	$ 442
2	Install new controllers	3	Ea.	$ 5,000	4	$ 55	$ 220		$ 5,220	$ 15,000	$ 660	$ -	$ 1,200	$ 18,833	$ 22,599
3	Install new remote operator station	1	Ea.	$ 400	12	$ 55	$ 660		$ 1,060	$ 400	$ 660	$ -	$ 32	$ 1,220	$ 1,464
4	Install new snow and ice sensors	6	Ea.	$ 1,200	24	$ 55	$ 1,320	$ 200	$ 2,720	$ 7,200	$ 7,920	$ 1,200	$ 576	$ 18,873	$ 22,647
5	Wiring, interface to existing energy management system, repairs to hydronic components (allowance)	3	Ea.	$ 5,000	40	$ 55	$ 2,200		$ 7,200	$ 15,000	$ 6,600	$ -	$ 1,200	$ 25,468	$ 30,561
6	Programming, startup, commissioning, and training	1	Ea.		16	$ 55	$ 880		$ 880	$ -	$ 880	$ -	$ -	$ 983	$ 1,180
	INSTALLING CONTRACTOR COST														$ 78,893
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 11,834
	Construction Cost with Contingency														$ 90,727
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 18,145
	TOTAL PROJECT BUDGET														**$ 108,873**

Notes Materials costs based on suggested retail prices from manufacturer

Project Savings Estimate

M5 Snow Melt Controls

Existing System		
Approximate square feet of pavement with snow melt	20,798	
Location	STHS B, MO, and ST buildings	
Estimated annual Btu/sq ft pavement	139,775	Btu/sq ft including back losses
Boiler Efficiency	82%	
Annual Natural Gas for Snow Melt	35,452	Th/yr
Pump horsepower	12.75	hp
Motor efficiency (average)	85%	
Motor Load	80%	
Hr/yr operation	1600	hr/yr
Annual Electricity for Snow Melt	14,323	kWh/yr
Proposed System		
Estimated annual Btu/sq ft pavement	71,486	Btu/sq ft including back losses
Boiler Efficiency	82%	
Annual Natural Gas for Snow Melt	18,131	Th/yr
Pump horsepower	12.75	hp
Motor efficiency (average)	85%	
Motor Load	80%	
Hr/yr operation	818	hr/yr
Annual Electricity for Snow Melt	7,325	kWh/yr

Project Savings Estimate

M5 **Snow Melt Controls**

Project Summary

Total kW Saved	-	
Total kWh Saved	6,998	
% Savings from Baseline	48.9%	
Electricity Rate ($/kWh)	$0.076	
Total Electricity Savings ($)	$532	/yr
Total Th Saved	17,321	
Natural Gas Rate ($/Th)	$0.825	
Total Natural Gas Savings ($)	$14,288	/yr
Total Electricity and Natural Gas Savings	$14,820	/yr
Project Cost ($)	$108,873	
Estimated Incentive ($)	$350	
Project Cost with Incentive ($)	$108,523	
Simple Payback Period w/out Incentive (years)	7.3	
Simple Payback Period with Incentive (years)	7.3	

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Tahoe High School	--	6,998	$0.076	17,320.6	$0.825	$108,873	$14,820	7.3	$350	$108,523	7.3

Project Savings Calculations

M5 Snow Melt Controls

Snow Melt System Data

1. Heat Exchanger and Pump Ratings

Facility	Location	Value	Units	Notes
STHS	central	5400.0	MBH	
STHS	B mech	786.7	MBH	audited area
STHS	MO mech	640.6	MBH	audited area
STHS	E mech	1802.5	MBH	
STHS	ST mech	3900	MBH	audited area
STHS	H mech	1910.6	MBH	
Total	**-**	**14440.4**	**MBH**	**total, not including CTE building**

2. Pavement Areas

Facility	Location	Value	Units	Notes
STHS	B mech	3297	sq ft est	based on drawings
STHS	ST mech	15000	sq ft est	based on drawings

3. Average Heat Exhanger per square foot of pavement

256 Btu/hr/sq f average design heat output

4. Estimated Pavement Area in Audited Areas

20,798 sq ft est for audited areas
70,470 sq ft est for STHS entire school
8,000 sq ft est for STMS entire school

5. Estimate of Annual Heat and Natural Gas Requirements (audited areas only)

7,421 btu/sq ft/yr for melt mode operation in Ely NV per ASHRAE [1]
364% increase for Tahoe City/Meyers vs Ely annual snowfall
26,985 btu/sq ft/yr for melt mode operation in South Lake Tahoe
141,288 btu/sq ft/yr for idling mode operation in Ely NV per ASHRAE [1]
43% decrease for South Lake Tahoe vs Ely annual hours/yr below 32 degrees F
80,534 btu/sq ft/yr for idling mode operation
107,520 Btu/sq ft/yr total melt and idling
30% estimated back losses
139,775 Btu/sq ft/yr total melt and idling including back losses
2,907 MMBtu/yr snow melt and idling
82% boiler efficiency
35,452 Th/yr for snow melt and idling
730 MMBtu/yr snow melt without any idling
82% boiler efficiency
8,898 Th/yr for snow melt only without any idling

Note: 2011 ASHRAE Handbook HVAC Applications
Chapter 51, Table 3

6. Pump Ratings

Facility	Location	Value	Units
STHS	B mech	2	HP
STHS	MO mech	2	HP
STHS	ST mech	8.75	HP
Total		**12.75**	**HP**
Average		**0.000613**	**hp/sq ft**

7. Estimate of Annual Pump Power Requirements (audited areas only)

1600	hr/yr now based on hr/yr below freezing (melt + idling)
85%	motor eff
80%	motor load
8.952	kW total pump motor electric demand
14,323	kWh/yr for snow melt and idling
75%	reduction in pumping if no idling (based on heat requirements)
402	hr/yr for melt only
0.69	kWh/sq ft/yr for melt + idling
0.17	kWh/sq ft/yr for melt only without any idling

8. Estimate of Annual Heat and Natural Gas Requirements (entire schools)

20,798	sq ft estimated pavement area for audited areas
70,470	sq ft estimated pavement area for STHS entire school
8,000	sq ft estimated pavement area for STMS entire school
35,452	est Th/yr for audited areas
120,121	est Th/yr for entire STHS
4,449	est Th/yr for entire STMS--MELT ONLY

9. Estimate of Annual Pump Power Requirements (audited areas only)

14,323	est kWh/yr for audited areas
48,531	est kWh/yr for entire STHS
1,383	est kWh/yr for entire STMS--MELT ONLY

K-1 **Natural gas booster heaters for dishwashers**

Cost Estimate

Cost Factors

Tax Rate	8%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.12

South Lake Tahoe HS

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
######	Remove and Dispose of Existing Booster Heater	1	Ea.		4.00	$ 32	$ 128	$ -	$ 128	$ -	$ 128	$ -	$ -	$ 143	$ 172
######	Natural Gas Fired Booster Heater	1	Ea.	$5,000.00	16.00	$ 55	$ 880	$ -	$ 5,880	$ 5,000	$ 880	$ -	$ 400	$ 7,015	$ 8,418
######	Flue, gas piping, 120V power	1	Ea.	$1,250.00	8.00	$ 55	$ 440	$ -	$ 1,690	$ 1,250	$ 440	$ -	$ 100	$ 1,999	$ 2,399
	INSTALLING CONTRACTOR COST														$ 10,989
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 1,648
	Construction Cost with Contingency														$ 12,637
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 2,198
	TOTAL PROJECT BUDGET														$14,834.61

South Lake Tahoe MS

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
######	Remove and Dispose of Existing Booster Heater	1	Ea.		4.00	$ 32	$ 128	$ -	$ 128	$ -	$ 128	$ -	$ -	$ 143	$ 172
######	Natural Gas Fired Booster Heater	1	Ea.	$5,000.00	16.00	$ 55	$ 880	$ -	$ 5,880	$ 5,000	$ 880	$ -	$ 400	$ 7,015	$ 8,418
######	Flue, gas piping, 120V power	1	Ea.	$1,250.00	8.00	$ 55	$ 440	$ -	$ 1,690	$ 1,250	$ 440	$ -	$ 100	$ 1,999	$ 2,399
	INSTALLING CONTRACTOR COST														$ 10,989
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 1,648
	Construction Cost with Contingency														$ 12,637
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 2,198
	TOTAL PROJECT BUDGET														$14,834.61

Tahoe Valley ES

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
######	Remove and Dispose of Existing Booster Heater	1	Ea.		4.00	$ 32	$ 128	$ -	$ 128	$ -	$ 128	$ -	$ -	$ 143	$ 172
######	Natural Gas Fired Booster Heater	1	Ea.	$5,000.00	16.00	$ 55	$ 880	$ -	$ 5,880	$ 5,000	$ 880	$ -	$ 400	$ 7,015	$ 8,418
######	Flue, gas piping, 120V power	1	Ea.	$1,250.00	8.00	$ 55	$ 440	$ -	$ 1,690	$ 1,250	$ 440	$ -	$ 100	$ 1,999	$ 2,399
	INSTALLING CONTRACTOR COST														$ 10,989
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 1,648
	Construction Cost with Contingency														$ 12,637
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 2,198
	TOTAL PROJECT BUDGET														$14,834.61

K-1 Natural gas booster heaters for dishwashers

Facility	South Lake Tahoe HS	South Lake Tahoe MS	Tahoe Valley ES
Electric Booster Heater kW	15	15	15
Run-hours/day	1.0	2.0	2.0
kWh/day	15	30	30
days/year	180	180	180
Cost/kWh	0.10603036	0.108059767	0.124897366
Total Annual Cost of Electricity	$286	$584	$674
Natural Gas Booster Heater Btuh input rating	60,000	60,000	60,000
Btu's needed per day	51,195	102,390	102,390
Heater Efficiency	85%	85%	85%
Therms/day	0.6	1.2	1.2
Cost/th	$0.825	$0.862	$0.961
Days/yr	180	180	180
Total Annual Cost of Natural Gas	$89	$187	$208
Annual Savings	$197	$397	$466
Project Cost	$14,834.61	$14,834.61	$14,834.61
Simple Payback	75.4	37.4	31.8

Facility	kWh Saved	Rate ($/kWh)	Therms Consumed	Rate ($/Th)	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Lake Tahoe HS	2,700	$0.076	108	$0.825	$14,835	$205	72.3	$135	$14,700	71.6
South Lake Tahoe MS	5,400	$0.076	217	$0.862	$14,835	$412	36.0	$270	$14,565	35.3
Tahoe Valley ES	5,400	$0.101	217	$0.961	$14,835	$545	27.2	$270	$14,565	26.7
Total	**13,500**	**$0.084**	**542**	**$0.882**	**$44,504**	**$1,162**	**45.2**	**$675**	**$43,829**	**37.7**

Project Kitchen-2 **Automatic door closers on walk-in refrigerators and freezers**

Cost Estimate

Cost Factors

Tax Rate	8%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.117

South Tahoe High School

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
######	Remove and Dispose of Existing Door Closer	3	Ea.		0.50	$ 32	$ 16	$ -	$ 16	$ -	$ 48	$ -	$ -	$ 54	$ 64
######	New Door Closer	3	Ea.	$100.00	0.50	$ 55	$ 28	$ -	$ 128	$ 300	$ 83	$ -	$ 24	$ 454	$ 545
	INSTALLING CONTRACTOR COST														$ 609
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 91
	Construction Cost with Contingency														$ 701
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 122
	TOTAL PROJECT BUDGET														$822.44

Project Kitchen-2	K-2	Automatic door closers on walk-in freezers and refrigerators

South Tahoe High School

Number of Door Closers Needed	3	
Approx Door Height	7	ft
Approx Door Width	4	ft
Approx Door Opening with Existing	1/2	in
Square Feet Opening	0.4583	sq ft
Ave air velocity into refrig or freezer	4	fpm
Ave air flow per door	1.833333	cfm
Room temp	72	deg F
Refrig Temp	35	deg F
Freezer Temp	0	deg F
Total Heat	3292043	Btu/yr
Condensing Unit COP	2	
Electricity Required	482.4213	kWh/yr

Facility	kWh Saved	Rate ($/kWh)	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Tahoe High School	482	$0.076	$861	$37	23.5	$24	$837	22.8

K-3 **Electronically Commuted fan motors and speed controls for walk-in refrigerators**

Cost Estimate

Cost Factors

Tax Rate	8%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.117

South Lake Tahoe HS

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
######	Remove and Dispose of Existing Motors	5	Ea.		1.00	$ 32	$ 32	$ -	$ 32	$ -	$ 160	$ -	$ -	$ 179	$ 214
######	ECM Motors for Kitchen	5	Ea.	$350.00	1.00	$ 55	$ 55	$ -	$ 405	$ 1,750	$ 275	$ -	$ 140	$ 2,418	$ 2,902
######	Motor Speed Controls	3	Ea.	$250.00	1.00	$ 55	$ 55	$ -	$ 305	$ 750	$ 165	$ -	$ 60	$ 1,089	$ 1,307
	INSTALLING CONTRACTOR COST														$ 4,423
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 663
	Construction Cost with Contingency														$ 5,087
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 885
	TOTAL PROJECT BUDGET														$5,971.48

South Lake Tahoe MS

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
######	Remove and Dispose of Existing Motors	4	Ea.		1.00	$ 32	$ 32	$ -	$ 32	$ -	$ 128	$ -	$ -	$ 143	$ 172
######	ECM Motors for Kitchen	4	Ea.	$350.00	1.00	$ 55	$ 55	$ -	$ 405	$ 1,400	$ 220	$ -	$ 112	$ 1,935	$ 2,322
######	Motor Speed Controls	2	Ea.	$250.00	1.00	$ 55	$ 55	$ -	$ 305	$ 500	$ 110	$ -	$ 40	$ 726	$ 871
	INSTALLING CONTRACTOR COST														$ 3,364
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 663
	Construction Cost with Contingency														$ 4,028
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 885
	TOTAL PROJECT BUDGET														$4,912.57

K-3 Electronically Commuted fan motors and speed controls for walk-in refrigerators

South Lake Tahoe HS

Item	Existing	Proposed
Number of Fans in Kitchen Walkin Refrigerator and Freezer	5	5
Watts Input to each fan [1]	102	33
COP of Condensing Units for Kitchen Walkin Refrigerator and	2.0	2.0
Watts Input to Condensing Unit to remove each fan's motor heat	51	17
Total kW Input	0.8	0.2
Watts Input to each fan at 50% speed with Speed Controls [2]		16.5
Watts Input to Condensing Unit to remove each fan's motor heat		8.3
Total kW Input at 50% speed		0.1
Hr/yr Fan Operation Now [3]	8,322	
Hr/yr Fan Operation100% speed with Speed Controls [4]		2,081
Hr/yr Fan Operation 50% speed with Speed Controls [4]		6,242
kWh/yr	6,366	1,287

Notes

[1] Based on "GE ECMtm Evaporator Fan Monitoring", FSTC Report #5011.05.13, July 2006
[2] Includes estimated efficiency of speed control
[3] Based on fans shutting down 5% of time for evaporator coil defrost
[4] Assumed 25% load factor for evaporator

South Lake Tahoe MS

Item	Existing	Proposed
Number of Fans in Kitchen Walkin Refrigerator and Freezer	4	4
Watts Input to each fan [1]	136	44
COP of Condensing Units for Kitchen Walkin Refrigerator and	2.0	2.0
Watts Input to Condensing Unit to remove each fan's motor h	68	22
Total kW Input	0.8	0.3
Watts Input to each fan at 50% speed with Speed Controls [1]		22.0
Watts Input to Condensing Unit to remove each fan's motor heat		11.0
Total kW Input at 50% speed		0.1
Hr/yr Fan Operation Now [3]	8,322	
Hr/yr Fan Operation100% speed with Speed Controls [4]		2,081
Hr/yr Fan Operation 50% speed with Speed Controls [4]		6,242
kWh/yr	6,791	1,373

Notes

[1] Based on "GE ECMtm Evaporator Fan Monitoring", FSTC Report #5011.05.13, July 2006
[2] Includes estimated efficiency of speed control
[3] Based on fans shutting down 5% of time for evaporator coil defrost
[4] Assumed 25% load factor for evaporator

Facility	kWh Saved	Rate ($/kWh)	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Lake Tahoe HS	5,079	$0.076	$5,971	$386	15.5	$254	$5,718	14.8
South Lake Tahoe MS	5,418	$0.076	$4,913	$414	11.9	$271	$4,642	11.2
Total	10,497	$0.076	$10,884	$800	13.6	$525	$10,359	13.0

Project Kitchen-4 | **Pre-rinse spray valve**

Cost Estimate

Cost Factors

Tax Rate	8%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.117

South Tahoe High School

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
######	Remove and Dispose of Existing Spray Valve	1	Ea.		1.00	$ 32	$ 32	$ -	$ 32	$ -	$ 32	$ -	$ -	$ 36	$ 43
######	New Spray Valve	1	Ea.	$250.00	1.00	$ 32	$ 32	$ -	$ 282	$ 250	$ 32	$ -	$ 20	$ 337	$ 405
	INSTALLING CONTRACTOR COST														$ 448
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 67
	Construction Cost with Contingency														$ 515
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 90
	TOTAL PROJECT BUDGET														$604.39

Tahoe Valley Elementary School

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
######	Remove and Dispose of Existing Spray Valve	1	Ea.	$0.00	$1.00	$32.00	$32.00	$0.00	$ 32	$ -	$ 32	$ -	$ -	$ 36	$ 43
######	New Spray Valve	1	Ea.	$250.00	$1.00	$32.00	$32.00	$0.00	$ 282	$ 250	$ 32	$ -	$ 20	$ 337	$ 405
	INSTALLING CONTRACTOR COST														$ 448
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 67
	Construction Cost with Contingency														$ 515
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 90
	TOTAL PROJECT BUDGET														$604.39

Project Kitchen-4 Pre-rinse spray valve

Estimated flow rate from existing valve	5	gpm
Flow rate from new valve	1.25	gpm
use per day	1	hour
days/yr	180	
water use now	54000	gal/yr
water use with energy efficient valve	13500	gal/yr
Savings	40500	gal/yr
Spray water temp	180	deg F
Btu/gal	1082.9	Btu/gal
water heater efficiency	80%	
annual fuel savings	548	Therms

Number of valves to be replaced:

South Tahoe High School	1
South Tahoe Middle School	0
Tahoe Valley Elementary	1

Facility	Th Saved	Rate ($/Th)	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Tahoe High School	548	$0.825	$633	$452	1.4	$0	$633	1.4
Tahoe Valley Elementary School	548	$0.961	$633	$527	1.2	$0	$633	1.2

Project Kitchen-5 | **Anti-Sweat Heater (ASH) Controls**

Cost Estimate

Cost Factors

Tax Rate	8%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.117

South Tahoe High School

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
######	New Anti-Sweat Heater Control	3	Ea.	$625.00	4.00	$ 55	$ 220	$ -	$ 845	$ 1,875	$ 660	$ -	$ 150	$ 2,999	$ 3,599
	INSTALLING CONTRACTOR COST														$ 3,599
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 540
	Construction Cost with Contingency														$ 4,139
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 720
	TOTAL PROJECT BUDGET														$4,858.61

South Tahoe Middle School

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
######	New Anti-Sweat Heater Control	3	Ea.	$625.00	4.00	$ 55	$ 220	$ -	$ 845	$ 1,875	$ 660	$ -	$ 150	$ 2,999	$ 3,599
	INSTALLING CONTRACTOR COST														$ 3,599
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 540
	Construction Cost with Contingency														$ 4,139
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 720
	TOTAL PROJECT BUDGET														$4,858.61

Project Kitchen-5 Anti-Sweat Heater (ASH) Controls

1. Estimated Wattage of Heaters on Windows, Glass Doors of Walkins and Display Refrigerators

School	Equipment	Heater Watts	Controls Needed
STHS	Walkins	1188	3
STMS	Walkins	792	2
STMS	Side by side 60" wide refrigerator	500	1

2. Estimated Heater Operation

Existing	8000	hr/yr
With Anti-Sweat Heater Controls	1500	hr/yr
Savings	6500	hr/yr

3. Estimated Heater Load on Refrigeration Compressors

Estimated Glass R-Value	2
Estimated Room-side R-value	1
Estimated COP for Refrigeration Condenser	2
Condenser Watts Saved per Heater Watt Saved	0.25

Facility	kWh Saved	Rate ($/kWh)	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Tahoe High School	9,653	$0.076	$6,249	$734	8.5	$483	$5,767	7.9
South Tahoe Middle School	10,498	$0.076	$5,141	$801	6.4	$525	$4,616	5.8
Total	**20,150**	**$0.076**	**$11,391**	**$1,535**	**7.4**	**$1,008**	**$10,383**	**6.8**

Project Kitchen-6 | **High-Efficiency Refrigerators**

Cost Estimate

Cost Factors

Tax Rate	8%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.12

South Tahoe Middle School

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
######	Remove and Dispose of Existing Refrigerator	1	Ea.		1.00	$ 32	$ 32	$ 50	$ 82	$ -	$ 32	$ 50	$ -	$ 92	$ 110
######	New Energy Efficient Refrigerator	1	Ea.	$750.00	2.00	$ 55	$ 32	$ -	$ 782	$ 750	$ 32	$ -	$ 60	$ 941	$ 1,129
	INSTALLING CONTRACTOR COST														$ 1,239
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 186
	Construction Cost with Contingency														$ 1,424
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 248
	TOTAL PROJECT BUDGET														$1,672.01

Tahoe Valley Elementary School

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
######	Remove and Dispose of Existing Refrigerator	1	Ea.		1.00	$ 32	$ 32	$ 50	$ 82	$ -	$ 32	$ 50	$ -	$ 92	$ 110
######	New Energy Efficient Refrigerator	1	Ea.	$750.00	2.00	$ 55	$ 32	$ -	$ 782	$ 750	$ 32	$ -	$ 60	$ 941	$ 1,129
	INSTALLING CONTRACTOR COST														$ 1,239
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 186
	Construction Cost with Contingency														$ 1,424
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 248
	TOTAL PROJECT BUDGET														$1,672.01

Project Kitchen-6 High-Efficiency Refrigerators

South Tahoe Middle School

Estimated Annual Electricity Consumption for Existing Refrigerator	1237	kWh
Annual Electricity Consumption for Energy Efficient Refrigerator (ba	386	kWh

Tahoe Valley Elementary School

Estimated Annual Electricity Consumption for Existing Refrigerator	1400	kWh
Annual Electricity Consumption for Energy Efficient Refrigerator (ba	386	kWh

Facility	kWh Saved	Rate ($/kWh)	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Tahoe Middle School	851	$0.076	$1,750	$65	27.1		$1,750	27.1
Tahoe Valley Elementary School	1,014	$0.101	$1,750	$102	17.1		$1,750	17.1
TOTAL	**1,865**		**$3,500**	**$167**	**21.0**		**$3,500**	**21.0**

Project Cost Estimate

Project E-1 Replace existing standard efficiency motors with new premium-efficiency motors

Cost Factors

Tax Rate	8.0%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.117

South Tahoe Middle School

Item #	Description	Qty.	Units	Unit Material Cost ($)	Unit Labor Hours	Average Labor Rate	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
1	Remove and dispose of existing standard efficiency m	2	Ea.		2	$ 55	$ 110		$ 110	$ -	$ 220	$ -	$ -	$ 246	$ 295
2	New 10 hp premium efficiency motor	2	Ea.	$ 1,100	4	$ 55	$ 220		$ 1,320	$ 2,200	$ 440	$ -	$ 176	$ 3,145	$ 3,775
	INSTALLING CONTRACTOR COST														$ 4,069
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 610
	Construction Cost with Contingency														$ 4,680
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 936
	TOTAL PROJECT BUDGET														**$ 5,616**

Project Savings Estimate

Project E-1 — **Replace existing standard efficiency motors with new premium-efficiency motors**

Existing Equipment

Motor Location	South Tahoe Middle School, Gym boiler room
Service	Heating Hot Water Pumps
Number of Motors	2
Horsepower each	10
Motor Loading	80%
Motor Efficiency	88.50%
Hr/yr operation	2,550
kW each	6.7
kWh/yr each	17,196
kW total	13.5
kWh/yr total	34,392

Proposed Equipment

Number of Motors	2
Horsepower each	10
Motor Loading	0.8
Motor Efficiency	92.50%
Hr/yr operation	2,550
kW each	6.5
kWh/yr each	16,452
kW total	12.9
kWh/yr total	32,905

Project Summary

Total kW Saved	0.6
Total kWh Saved	1,487
Electricity Rate ($/kWh)	$0.108
Total Electricity Savings ($)	$161
Total Th Saved	0
Natural Gas Rate ($/Th)	0.824938
Total Natural Gas Savings ($)	0
Project Cost ($)	$5,616
Estimated Incentive ($)	$1,645
Project Cost with Incentive ($)	$3,971
Simple Payback Period w/out Incentive (years)	34.9
Simple Payback Period with Incentive (years)	24.7

Facility	kW Saved	kWh Saved	Rate ($/kWh)	Natural Gas Therms Saved	Rate ($/Therm)	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Lake Tahoe Middle School	--	1,487	$0.108	0.0	$0.825	$5,616	$161	34.9	$1,645	$3,971	24.7

ENV-1 **Adding window film and weather stripping to improve envelope efficiency**

Cost Estimate

Cost Factors

Tax Rate	8%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.17

South Lake Tahoe HS

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
######	Clean, Inspect, and Repair Old Windows	1,940	sq.ft.	$0.25	0.10	$ 32	$ 3	$ 500	$ 503	$ 485	$ 6,209	$ 500	$ 39	$ 8,455	$ 10,146
######	Clean, Inspect, and Repair Old Exterior Doors	60	Ea.	$15.00	1.00	$ 32	$ 32	$ -	$ 47	$ 900	$ 1,920	$ -	$ 72	$ 3,381	$ 4,057
######	Clean, Inspect, and Repair Outside Air and Exhaust	116	Ea.	$15.00	3.00	$ 32	$ 96	$ -	$ 111	$ 1,740	$ 11,136	$ -	$ 139	$ 15,215	
######	Install Window Film	1,940	sq.ft.	$0.25	0.05	$ 32	$ 2	$ -	$ 2	$ 485	$ 3,104	$ -	$ 39	$ 4,241	$ 5,090
######	Install Weatherstripping and Gaskets	2,400	lin. Ft.	$1.00	0.10	$ 32	$ 3	$ -	$ 4	$ 2,400	$ 7,680	$ -	$ 192	$ 12,008	
	INSTALLING CONTRACTOR COST														$ 19,292
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 2,894
	Construction Cost with Contingency														$ 22,186
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 3,858
	TOTAL PROJECT BUDGET														$26,044.53

South Lake Tahoe MS

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
######	Clean, Inspect, and Repair Old Windows	6,778	sq.ft.	0.25	0.1	32	$ 3	$ 500	$ 503	$ 1,695	$ 21,690	$ 500	$ 136	$ 28,079	$ 33,695
######	Clean, Inspect, and Repair Old Exterior Doors	50	Ea.	15	1	32	$ 32	$ -	$ 47	$ 750	$ 1,600	$ -	$ 60	$ 2,817	$ 3,381
######	Clean, Inspect, and Repair Outside Air and Exhaust	68	Ea.	15	3	32	$ 96	$ -	$ 111	$ 1,020	$ 6,528	$ -	$ 82	$ 8,919	$ 10,703
######	Install Window Film	6,778	sq.ft.	0.25	0.05	32	$ 2	$ -	$ 2	$ 1,695	$ 10,845	$ -	$ 136	$ 14,817	$ 17,780
######	Install Weatherstripping and Gaskets	2,000	lin. Ft.	1	0.1	32	$ 3	$ -	$ 4	$ 2,000	$ 6,400	$ -	$ 160	$ 10,007	$ 12,008
	INSTALLING CONTRACTOR COST														$ 47,778
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 2,894
	Construction Cost with Contingency														$ 50,672
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 3,858
	TOTAL PROJECT BUDGET														$54,530.61

Tahoe Valley ES

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
######	Clean, Inspect, and Repair Old Windows	3,133	sq.ft.	0.25	0.1	32	$ 3	$ 500	$ 503	$ 783	$ 10,026	$ 500	$ 63	$ 13,293	$ 15,952
######	Clean, Inspect, and Repair Old Exterior Doors	30	Ea.	15	1	32	$ 32	$ -	$ 47	$ 450	$ 960	$ -	$ 36	$ 1,690	$ 2,028
######	Clean, Inspect, and Repair Outside Air and Exhaust	0	Ea.	15	3	32	$ 96	$ -	$ 111	$ -	$ -	$ -	$ -	$ -	$ -
######	Install Window Film	3,133	sq.ft.	0.25	0.05	32	$ 2	$ -	$ 2	$ 783	$ 5,013	$ -	$ 63	$ 6,849	$ 8,219
######	Install Weatherstripping and Gaskets	1,200	lin. Ft.	1	0.1	32	$ 3	$ -	$ 4	$ 1,200	$ 3,840	$ -	$ 96	$ 6,004	$ 7,205
	INSTALLING CONTRACTOR COST														$ 17,980
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 2,894
	Construction Cost with Contingency														$ 20,874
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 3,858
	TOTAL PROJECT BUDGET														$24,732.69

ENV-1	Adding window film and weather stripping to improve envelope efficiency

Facility	kWh Saved	Rate ($/kWh)	Therms Saved	Rate ($/Th)	Project Cost ($)	Cost Savings	Payback Period	Approx. Incentive	Project Costs w/ Incentive ($)	Payback Period
South Lake Tahoe HS	31,972	$0.076	9,265	$0.825	$26,045	$10,073	2.6	$970	$25,074	2.5
South Lake Tahoe MS	21,154	$0.076	7,335	$0.862	$54,531	$7,936	6.9	$3,389	$51,142	6.4
Tahoe Valley ES	14,122	$0.101	2,945	$0.961	$24,733	$4,255	5.8	$1,567	$23,166	5.4
Total	67,248	$0.084	19,545	$0.882	$105,308	$22,925	4.6	$5,926	$99,382	4.3

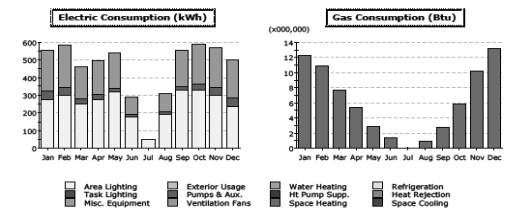
Results of Equest Model*	Existing	Post-Install	Units	Savings
Fan & Pump Electric Consumption	2,462.80	2,057.90	kWh/yr	16%
Space Heat Natural Gas Consumption	734.5	606.8	Th/yr	17%

*Based on 1000 sq. ft prototypical room

Facility	South Lake Tahoe HS	South Lake Tahoe MS	Tahoe Valley ES
Audited Area	73,170	67,827	43,374
Fan & Pump Elec	194,468	128,668	85,896
Space Heat Natural Gas	53,289	42,187	16,940
Estimated Electricity Savings	31,972	21,154	14,122
Estimated Natural Gas Savings	9,265	7,335	2,945

Equest Model of Existing Conditions

Project/Run: LTUSD-Existing - Baseline Design — Run Date/Time: 06/05/15 @ 07:13



Electric Consumption (kWh)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	229.6	238.5	180.2	189.7	199.0	98.8	0.1	107.2	206.9	227.7	228.3	215.2	2,122.0
Pumps & Aux.	47.9	43.6	33.1	30.5	20.6	10.1	0.2	9.7	19.3	32.9	40.8	51.8	340.8
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	275.9	298.6	248.9	274.5	316.6	179.7	45.7	194.7	328.6	330.1	301.6	235.3	3,030.2
Total	553.4	581.0	462.1	494.7	537.0	288.6	46.1	311.6	554.8	590.7	570.6	502.3	5,493.0

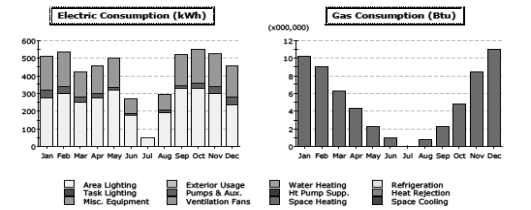
Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	12.28	10.96	7.69	5.39	2.94	1.35	0.04	0.94	2.71	5.88	10.12	13.15	73.45
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	12.28	10.96	7.69	5.39	2.94	1.35	0.04	0.94	2.71	5.88	10.12	13.15	73.45

eQUEST 3.65.7163 — Monthly Energy Consumption by Enduse — Page 1

Equest Model of Conditions after Weatherstripping

Project/Run: LTUSD-weatherized - Baseline Design — Run Date/Time: 06/05/15 @ 07:14



Electric Consumption (kWh)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	190.4	198.0	149.6	158.3	168.1	83.0	0.0	90.4	174.3	190.7	190.4	177.1	1,770.4
Pumps & Aux.	41.1	37.1	27.6	24.9	16.8	8.5	0.1	8.5	16.7	27.2	34.6	44.4	287.5
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	275.9	298.6	248.9	274.5	316.6	179.7	45.7	194.7	328.6	330.1	301.6	235.3	3,030.2
Total	507.5	533.7	426.1	457.7	501.5	271.2	45.8	293.6	519.7	548.0	526.6	456.8	5,088.1

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	10.27	9.11	6.29	4.35	2.30	1.06	0.01	0.77	2.23	4.83	8.51	10.96	60.68
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	10.27	9.11	6.29	4.35	2.30	1.06	0.01	0.77	2.23	4.83	8.51	10.96	60.68

eQUEST 3.65.7163 — Monthly Energy Consumption by Enduse — Page 1

ENV-2 **New dual pane, low emmissivity windows**

Cost Estimate

Cost Factors

Tax Rate	8%
Sub Contractor Overhead & Profit Multiplier	1.20
City Location Price Multiplier	1.12

South Lake Tahoe HS

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
######	Remove and Dispose of Old Windows	1,940	sq.ft.	$0.25	0.50	$ 32	$ 16	$ 0.26	$ 17	$ 485	$ 31,043	$ 500	$ 39	$ 35,819	$ 42,983
######	New Dual-Pane Windows	1,940	sq.ft.	$44.00	1.00	$ 32	$ 32	$ 0.52	$ 77	$ 85,369	$ 62,086	$ 1,000	$ 6,830	$ 173,453	$ 208,144
	INSTALLING CONTRACTOR COST														$ 251,126
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 37,669
	Construction Cost with Contingency														$ 288,795
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 50,225
	TOTAL PROJECT BUDGET														$339,020.50

South Lake Tahoe MS

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
######	Remove and Dispose of Old Windows	6,778	sq.ft.	0.25	0.5	32	$ 16	$ 0.26	$ 17	$ 1,695	$ 108,448	$ 1,747	$ 136	$ 125,132	$ 150,158
######	New Dual-Pane Windows	6,778	sq.ft.	44	1	32	$ 32	$ 0.52	$ 77	$ 298,232	$ 216,896	$ 3,493	$ 23,859	$ 605,950	$ 727,140
	INSTALLING CONTRACTOR COST														$ 877,298
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 37,669
	Construction Cost with Contingency														$ 914,967
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 50,225
	TOTAL PROJECT BUDGET														$965,192.44

Tahoe Valley ES

Item #	Description	Qty.	Units	Unit Material Cost ($) [1]	Unit Labor Hours	Average Labor Rate [1]	Unit Labor Cost ($)	Unit Equipment Cost ($)	Total Unit Cost ($)	Material Cost ($)	Labor Cost ($)	Equipment Cost ($)	Taxes ($)	TOTAL DIRECT COST ($)	CONTRACTOR COST WITH SUB O&P
######	Remove and Dispose of Old Windows	3,133	sq.ft.	0.25	0.5	32	$ 16	$ 0.26	$ 17	$ 783	$ 50,128	$ 807	$ 63	$ 57,840	$ 69,408
######	New Dual-Pane Windows	3,133	sq.ft.	44	1	32	$ 32	$ 0.52	$ 77	$ 137,852	$ 100,256	$ 1,615	$ 11,028	$ 280,089	$ 336,107
	INSTALLING CONTRACTOR COST														$ 405,514
	General Contractor O&P	0%													$ -
	Construction Contingency	15%													$ 37,669
	Construction Cost with Contingency														$ 443,183
	Soft Costs Markup (i.e. design, CM, Cx)	20%													$ 50,225
	TOTAL PROJECT BUDGET														$493,408.42

ENV-2 New dual pane, low emmissivity windows

Facility	kWh Saved	Rate ($/kWh)	Therms Saved	Rate ($/Th)	Project Cost	Cost Savings	Payback Period	Approx. Incentive	Project Costs w/ Incentive ($)	Payback Period
South Lake Tahoe HS	5,284	$0.076	1,529	$0.825	$339,021	$1,663	203.9	$264	$338,756	203.7
South Lake Tahoe MS	18,461	$0.076	5,341	$0.862	$965,192	$6,012	160.5	$923	$964,269	160.4
Tahoe Valley ES	8,533	$0.101	2,469	$0.961	$493,408	$3,233	152.6	$427	$492,982	152.5

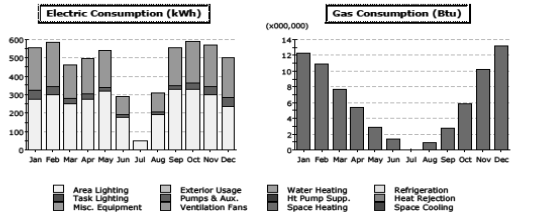
Results of Equest Model*	Existing	Post-Install	Units	Savings	Units
Fan & Pump Electric Consumption	2,462.80	1,946.40	kWh/yr	2.72	kWh/yr/sq ft window
Space Heat Natural Gas Consumption	734.5	585.1	Th/yr	0.79	Th/yr/sq ft window

*Based on 1000 sq ft prototypical facility size and window area of 189.6 sq. ft

Facility	South Lake Tahoe HS	South Lake Tahoe MS	Tahoe Valley ES
Audited Area	73,170	67,827	43,374
Fan & Pump Elec	194,468	128,668	85,896
Space Heat Natural Gas	53,289	42,187	16,940
Single Pane Window Area	1,940	6,778	3,133
Estimated Electricity Savings	5,284	18,461	8,533
Estimated Natural Gas Savings	1,529	5,341	2,469

Equest Model of Existing Conditions

Project/Run: LTUSD-Existing - Baseline Design — Run Date/Time: 06/05/15 @ 07:13



Electric Consumption (kWh)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	229.6	238.5	180.2	189.7	199.8	98.8	0.1	107.2	206.9	227.7	228.3	215.2	2,122.0
Pumps & Aux.	47.9	43.9	33.1	30.5	20.6	10.1	0.2	9.7	19.3	32.9	40.8	51.8	340.8
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	275.9	298.6	248.9	274.5	316.6	179.7	45.7	194.7	328.6	330.1	301.6	235.3	3,030.2
Total	553.4	581.0	462.1	494.7	537.0	288.6	46.1	311.6	554.8	590.7	570.6	502.3	5,493.0

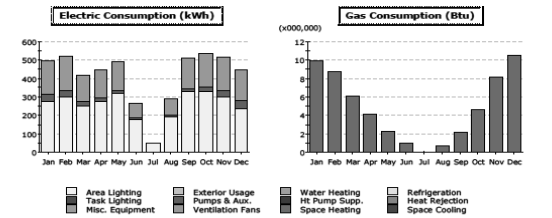
Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	12.28	10.96	7.69	5.39	2.94	1.35	0.04	0.94	2.71	5.86	10.12	13.15	73.45
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	12.28	10.96	7.69	5.39	2.94	1.35	0.04	0.94	2.71	5.86	10.12	13.15	73.45

eQUEST 3.65.7163 — Monthly Energy Consumption by Enduse — Page 1

Equest Model of Conditions with New Windows

Project/Run: LTUSD-windowchange - Baseline Design — Run Date/Time: 06/05/15 @ 07:08



Electric Consumption (kWh)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	179.9	187.0	141.3	149.5	159.2	78.6	-	85.6	165.0	180.1	179.8	167.2	1,673.1
Pumps & Aux.	39.2	35.6	26.1	23.4	15.9	8.1	-	8.1	15.9	25.5	32.7	42.6	273.2
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	275.9	298.6	248.9	274.5	316.6	179.7	45.7	194.7	328.6	330.1	301.6	235.3	3,030.2
Total	495.1	521.2	416.3	447.3	491.7	266.4	45.7	288.4	509.6	535.7	514.1	445.1	4,976.6

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	9.92	8.77	6.10	4.17	2.24	1.04	-	0.75	2.16	4.62	8.21	10.54	58.51
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	9.92	8.77	6.10	4.17	2.24	1.04	-	0.75	2.16	4.62	8.21	10.54	58.51

eQUEST 3.65.7163 — Monthly Energy Consumption by Enduse — Page 1

Measurements of Existing Single Pane Windows

Summary of All Schools

School	Sq Ft single pane glass
South Tahoe High School	1940
South Tahoe Middle School	6778
Tahoe Valley Elementary	3133
Total	**11851**

South Tahoe High School

Building	Room	Facing	Quantity	Width	Height	Comments	sq ft
C	4	NW	7	4	5		140
C	6	SE		6	7		42
C	7	SE		6	7		42
C	8	SE		3	5		15
B	hall by 12	SW		5	5		25
A/B stairs	entry	SE	2	2	6		24
A	9	SE		6	7		42
A	8	SE		6	7		42
A	7	SE		3	8		24
A	4	NW		3	8		24
A	1	NW		3	8		24
A/B stairs	stairs	NW	2	7	8	sloping top	112
A/B stairs	stairs	NW		6	7	sloping top	42
B	hall by 9	SW		1	6		6
B	1	NW		3	7		21
B	FL	NW		6	7		42
B	4	NW		3	7		21
B/C stairs	stairs	NW	2	7	8	sloping top	112
B/C stairs	stairs	NW		6	7	sloping top	42
B/C stairs	entry	NW		1.5	6		9
Main Office	Library	S	6	4.7	7		197.4
Main Office	Library	S	6	4.7	9		253.8
Main Office	Library	E		5	7		35
Main Office	Library	W		5	7		35
Main Office	Library	W		2	7		14
Main Office	Library	W	6	5	9		270
Main Office	Library	E		2	7		14
Main Office	Library	E	6	5	9		270
Total			**37**	**-**	**-**		**1940.2**

South Tahoe Middle School

Building	Room	Facing	Quantity	Width	Height	Comments	sq ft
Angora	15	S	7	4	4		112
Angora	15	W	2	2	2	doorglass	8
Angora	15	N	12	4	5	clerestory	240
Angora	15	N	7	4	4		112
Angora	14	N	5	4	8		160
Angora	13	N	7	4	8		224
Angora	12 & 13	N	7	4	8		224
Angora	12	N	4	4	8		128
Angora	11	N	8	4	8		256
Angora	E entry	E	2	3	2	doorglass	12
Angora	breezeway 11 to 13	S	27	4	7		756
Angora	breezeway door by 13	S		3	2	doorglass	6
Angora	breezeway 13 to 14	S	15	4	7		420
Breezeway	between Angora 1 & 2 and 15 & 14	E and W	2	8	4		64
Breezeway	between Angora 1 & 2 and 15 & 14	E and W	2	3	1	above door	6
Breezeway	E entry between Angora and Gym	E	2	3	2	doorglass	12
Freel (angle)	36	W	6	4	9		216
Freel (angle)	37	W	6	4	9		216
Freel (angle)	38	W	6	4	9		216
Freel (angle)	39	W	6	4	9		216
Freel (angle)	39	W	3	4	7		84
Freel (angle)	40	W		4	7		28
Freel (angle)	40	W	3	4	9		108
Freel (angle)	40	S	2	4	4		32
Freel (angle)	40	E	2	4	7		56
Freel (angle)	breezeway by 40	E		4	3		12
Freel (angle)	breezeway by 40	E	2	3	2	doorglass	12
Freel (angle)	breezeway by 39	E		16	7		112
Freel (angle)	breezeway by 39	E	2	3	2	doorglass	12
Freel (angle)	breezeway 36 to 39	E	31	4	7		868
Breezeway	breezeway Freel to Rubicon	W	7	4	4		112
Breezeway	breezeway Freel to Rubicon	W	9	4	4		144
Rubicon	41	W		8	3		24
Rubicon	W entry	W	2	3	2	doorglass	12
Rubicon	W entry	W		8	1		8
Rubicon	W entry	W	2	4	1		8
Rubicon	W entry	W	2	2	2		8
Rubicon	42	N	2	4	8		64
Rubicon	43	N	2	4	7		56
Rubicon	44	N		4	7		28
Rubicon	44	N		3.5	3.5	doorglass	12.25
Rubicon	46	N	6	4	7		168
Rubicon	46	N		3.5	3.5	doorglass	12.25
Rubicon	48	N	6	4	7		168
Rubicon	48	N		3.5	3.5	doorglass	12.25
Rubicon	50	N	7	4	7		196
Rubicon	50	N		3.5	3.5	doorglass	12.25
Rubicon	51	S	7	4	7		196
Rubicon	51	S		3.5	3.5	doorglass	12.25
Rubicon	49	S	6	4	7		168
Rubicon	49	S		3.5	3.5	doorglass	12.25
Rubicon	47	S	6	4	7		168
Rubicon	47	S		3.5	3.5	doorglass	12.25
Rubicon	45	S	8	4	7		224
Rubicon	45	S		3.5	3.5	doorglass	12.25
Total			**250**	**-**	**-**		**6778**

Tahoe Valley Elementary School

Building	Room	Facing	Quantity	Width	Height	Comments	sq ft
Office	Kitchen	SW	7	4	4		112
Office	Principals	NW	4	3.5	4		56
Office	Staff Lounge	SE	6	3.5	3		63
MP/Library	Kitchen	NW	7	3	6		126
MP/Library	Office by Stage	NW	3	4	4		48
MP/Library	Library	NE	8	4	8		256
Breezeway	between B and MP/Library	NE	5	6	6		180
Breezeway	between B and MP/Library	NE	5	6	8		240
B	13	NW	6	4	4		96
B	15	NW	6	4	4		96
B	17	NW	6	4	4		96
B	19	NW	6	4	4		96
B	20	SE	6	4	4		96
B	18	SE	6	4	4		96
B	16	SE	6	4	4		96
B	14	SE	6	4	4		96
Breezeway	Between A and B	NE	7	5	4		140
Breezeway	Between A and B	SW	6	5	4		120
A	3	NW	6	4	4		96
A	5	NW	6	4	4		96
A	7	NW	6	4	4		96
A	9	NW	6	4	4		96
A	10	SE	6	4	4		96
A	8	SE	6	4	4		96
A	6	SE	6	4	4		96
A	4	SE	6	4	4		96
A	2	SE	8	4	4		128
A	1	SW	8	4	4		128
Total			**170**	**-**	**-**		**3133**

Project Cost Estimate

PV1	**Install Solar Panels**

Cost Factors

Tax Rate	8.0%
Sub Contractor Overhead & Profit (%)	1.20
City Location Price Multiplier	1.117

											% of total project cost:	37%	20%	4%	3%		
Item #	**Description**	**Qty.**	**Units**	**Unit Material Cost ($)** [1]	**Unit Labor Hours**	**Average Labor Rate** [1]	**Unit Labor Cost ($)**	**Unit Equipment Cost ($)**	**Total Unit Cost ($)**	**Material Cost ($)**	**Labor Cost ($)**	**Equipment Cost ($)**	**Taxes ($)**	**TOTAL DIRECT COST ($)**	**CONTRACTOR COST WITH SUB O&P**
1	***South Tahoe High School***	12.8	kW DC	$ 1,739	17	$ 55	$ 940.00	$ 188	$ 2,867	$ 22,259.20	$ 12,032	$ 2,406	$ 1,781	$ 38,478	$ 46,174.00
2	***South Tahoe Middle School***	121.6	kW DC	$ 1,739	17	$ 55	$ 940.00	$ 188	$ 2,867	$ 211,462.40	$ 114,304	$ 22,861	$ 16,917	$ 365,544	$ 438,653.03
3	***Tahoe Valley Elementary--parking***	19.2	kW DC	$ 1,739	17	$ 55	$ 940.00	$ 188	$ 2,867	$ 33,388.80	$ 18,048	$ 3,610	$ 2,671	$ 57,718	$ 69,261.00
4	***Tahoe Valley Elementary--ground mount***	40	kW DC	$ 1,554	15	$ 55	$ 840.00	$ 168	$ 2,562	$ 62,160.00	$ 33,600	$ 6,720	$ 4,973	$ 107,453	$ 128,943.36
	General Contractor O&P	0%													$ -
	Construction Contingency	10%													$ 68,303
	Construction Cost with Contingency														$ 751,335
	Soft Costs Markup (i.e. design, CM, Cx)	15%													$ 112,700.18
	TOTAL PROJECT BUDGET														**$ 864,035**

kW DC total	193.6	kW DC	
Inverter sizing assumed	1.1	kW DC /	kW AC
kW AC total size	176	kW AC	

	%	4700	4200
Material	37%	1739	1554
Labor	20%	940	840
Equipment	4%	188	168
Tax on Materials	3%	139.12	124.32
Subcontractor O&P	13%	601.224	537.264
Contingency	8%	360.734	322.3584
Design, CM, CX	16%	731.922	654.0576
	100.00%		

PV-1 Solar Photovoltaic (PV) Generation

Project Savings Estimate

PV1	Install Solar Panels

System Analysis

	SLT HS Building B Parking	SLT MS Parking	TV ES Parking	TV ES Ground Mount
Number Parking Spaces	8	76	12	na
Row Orientation	E-W	N-S	SE-NW	E-W
Panel Azimuth	S	E	SW	S
Tilt	10	10	10	40
Solar PV module capacity, kW DC	12.8	121.6	19.2	40
kWh/yr AC per kW DC	1,572	1,456	1,501	1,684
Number of Panels	41	392	62	129
Watts per Panel DC at STC	310	310	310	310
Inverter Capacity, kW AC	12	111	17	36
Inverter Efficiency	96%	96%	96%	96%
Estimated Annual Production--School Year	12,980	110,249	18,891	47,058
Estimated Annual Production--Breaks	7,139	66,838	9,935	20,283
Electricity Rate ($/kWh)--School Year	$0.125	$0.125	$0.141	$0.141
Electricity Rate ($/kWh)--Breaks	$0.100	$0.100	$0.141	$0.141
Energy Savings ($)	$2,336	$20,465	$4,077	$9,524
Maintenance Cost-annual	$858	$8,147	$1,286	$2,680
Net Annual Savings	$1,479	$12,318	$2,790	$6,844
Project Costs ($)	$58,410	$554,896	$87,615	$163,113
Simple Payback Period (Years)	39.5	45.0	31.4	23.8

PV-1 Solar Photovoltaic (PV) Generation

California Solar Initiative Incentives
Status: not accepting applications

Location	kWDC	kWh Saved	Rate ($/kWh)	Project Cost ($)	Maint-enance Cost	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Tahoe High School	12.8	20,119	$0.116	$58,410	$858	$1,479	39.5	$0	$58,410	39.5
South Tahoe Middle School	121.6	177,088	$0.116	$554,896	$8,147	$12,318	45.0	$0	$554,896	45.0
Tahoe Valley Elementary--parking	19.2	28,825	$0.141	$87,615	$1,286	$2,790	31.4	$0	$87,615	31.4
Tahoe Valley Elementary--ground mount	40.0	67,341	$0.141	$163,113	$2,680	$6,844	23.8	$0	$163,113	23.8
Totals	**193.6**	**293,374**	**$0.129**	**$864,035**	**$12,971**	**$23,431**	**36.9**	**$0**	**$864,035**	**36.9**

Year 1 Energy Cost Savings 37739.071

South Tahoe High School

PVWatts: Monthly PV Performance Data

Requested Location:	South Lake Tahoe, CA
Location:	SOUTH LAKE TAHOE, CA
Lat (deg N):	38.9
Long (deg W):	120
Elev (m):	1909
DC System Size (kW):	13
Module Type:	Standard
Array Type:	Fixed (open rack)
Array Tilt (deg):	10
Array Azimuth (deg):	180
System Losses:	14
Invert Efficiency:	96
DC to AC Size Ratio:	1.1
Average Cost of Electricity Purchased from Utility ($/kWh):	0.13
Initial Cost	4.7
Cost of Electricity Generated by System ($/kWh):	0.18

Month	AC System Output(kWh)	Solar Radiation (kWh/m^2/day)	Plane of Array Irradiance (W/m^2)	DC array Output (kWh)
1	875.697	2.650	82.157	919.733
2	1148.247	3.859	108.040	1200.136
3	1298.954	3.882	120.342	1361.086
4	2032.862	6.564	196.915	2119.786
5	2349.029	7.513	232.896	2448.190
6	2483.117	8.455	253.662	2587.532
7	2359.092	7.939	246.096	2458.522
8	2297.035	7.808	242.057	2393.902
9	1929.606	6.619	198.558	2010.297
10	1438.714	4.555	141.209	1503.521
11	1083.110	3.500	104.999	1132.686
12	823.779	2.525	78.268	866.013
Total	**20119.242**	**65.868**	**2005.199**	**21001.404**

School Year 12980 Breaks 7139.244

South Tahoe Middle School

PVWatts: Monthly PV Performance Data

Requested Location:	South Lake Tahoe, CA
Location:	SOUTH LAKE TAHOE, CA
Lat (deg N):	38.9
Long (deg W):	120
Elev (m):	1909
DC System Size (kW):	122
Module Type:	Standard
Array Type:	Fixed (open rack)
Array Tilt (deg):	10
Array Azimuth (deg):	90
System Losses:	14
Invert Efficiency:	96
DC to AC Size Ratio:	1.1
Average Cost of Electricity P	0.13
Initial Cost	4
Cost of Electricity Generatec	0.17

Month	AC System Output(kWh)	Solar Radiation (kWh/m^2/day)	Plane of Array Irradiance (W/m^2)	DC array Output (kWh)
1	6587.918	2.132	66.107	6952.879
2	9181.701	3.259	91.239	9617.937
3	11454.213	3.591	111.327	12016.067
4	18347.237	6.202	186.074	19141.381
5	22101.197	7.404	229.519	23028.173
6	23493.471	8.366	250.991	24475.411
7	22354.296	7.876	244.141	23290.024
8	20990.692	7.468	231.496	21885.110
9	16770.228	6.020	180.609	17477.101
10	11619.233	3.876	120.159	12169.673
11	8160.610	2.800	84.005	8566.816
12	6026.899	1.983	61.466	6374.887
Total	**177087.695**	**60.977**	**1857.133**	**184995.459**

School Year 110249.2 Breaks 66838.46

Tahoe Valley Elementary--parking

PVWatts: Monthly PV Performance Data

Requested Location:	South Lake Tahoe, CA
Location:	RENO, NV
Lat (deg N):	39.5
Long (deg W):	119.78
Elev (m):	1341
DC System Size (kW):	19
Module Type:	Standard
Array Type:	Fixed (open rack)
Array Tilt (deg):	10
Array Azimuth (deg):	225
System Losses:	14
Invert Efficiency:	96
DC to AC Size Ratio:	1.1
Average Cost of Electricity P	0.13
Initial Cost	4.7
Cost of Electricity Generatec	0.19

Month	AC System Output(kWh)	Solar Radiation (kWh/m^2/day)	Plane of Array Irradiance (W/m^2)	DC array Output (kWh)
1	1309.655	2.665	82.628	1376.277
2	1574.013	3.593	100.591	1649.126
3	2382.979	4.981	154.425	2490.365
4	2920.288	6.350	190.504	3049.163
5	3161.828	6.824	211.535	3301.583
6	3339.200	7.673	230.197	3487.200
7	3413.682	7.877	244.185	3563.895
8	3181.623	7.231	224.164	3319.563
9	2732.260	6.372	191.151	2852.203
10	2121.326	4.590	142.305	2217.755
11	1467.038	3.222	96.649	1538.666
12	1221.318	2.528	78.378	1284.659
Total	**28825.208**	**63.907**	**1946.712**	**30130.455**

School Year 18890.7 Breaks 9934.505

Tahoe Valley Elementary--ground mount

PVWatts: Monthly PV Performance Data

Requested Location:	South Lake Tahoe, CA
Location:	SOUTH LAKE TAHOE, CA
Lat (deg N):	38.9
Long (deg W):	120
Elev (m):	1909
DC System Size (kW):	40
Module Type:	Standard
Array Type:	Fixed (open rack)
Array Tilt (deg):	40
Array Azimuth (deg):	180
System Losses:	14
Invert Efficiency:	96
DC to AC Size Ratio:	1.1
Average Cost of Electricity P	0.13
Initial Cost	3.7
Cost of Electricity Generatec	0.14

Month	AC System Output(kWh)	Solar Radiation (kWh/m^2/day)	Plane of Array Irradiance (W/m^2)	DC array Output (kWh)
1	3907.887	3.758	116.507	4087.763
2	4668.828	5.017	140.480	4871.695
3	4396.005	4.221	130.842	4604.835
4	6343.862	6.563	196.885	6620.562
5	6688.444	6.819	211.375	6976.545
6	6750.271	7.273	218.194	7040.959
7	6572.436	7.013	217.417	6856.095
8	6960.480	7.570	234.682	7261.242
9	6669.352	7.358	220.750	6947.886
10	5670.075	5.752	178.302	5917.977
11	4838.328	4.960	148.806	5044.202
12	3875.496	3.742	115.994	4051.433
Total	**67341.463**	**70.046**	**2130.234**	**70281.193**

School Year 47058.28 Breaks 20283.19

Project Cost Estimate

CHP-1	**Clean Combined Heat and Power Generation**

Cost Factors

Tax Rate	8.0%
Sub Contractor Overhead & Profit (%)	1.20
City Location Price Multiplier	1.078

South Tahoe HS

										% of total project cost:	37%	20%	4%	3%		
Item #	**Description**	**Qty.**	**Units**	**Unit Material Cost ($)** [1]	**Unit Labor Hours**	**Average Labor Rate** [1]	**Unit Labor Cost ($)**	**Unit Equipment Cost ($)**	**Total Unit Cost ($)**	**Material Cost ($)**	**Labor Cost ($)**	**Equipment Cost ($)**	**Taxes ($)**	**TOTAL DIRECT COST ($)**	**CONTRACTOR COST WITH SUB O&P**
1	***Reciprocating Engine***	75	kW	$ 1,360	17	$ 55	$ 735.00	$ 147	$ 2,242	$ 101,981.25	$ 55,125	$ 11,025	$ 8,159	$ 176,290	$ 211,547.70
	General Contractor O&P	0%													$ -
	Construction Contingency	10%													$ 21,155
	Construction Cost with Contingency														$ 232,702
	Soft Costs Markup (i.e. design, CM, Cx)	15%													$ 34,905.37
	TOTAL PROJECT BUDGET														**$ 267,608**

Project Savings Estimate

CHP-1 **Clean combined heat and power generation**

Location	kW AC	kWh/yr Output	Rate ($/kWh)	Th/yr Boiler Gas Savings	Rate ($/Th)	Th/yr Fuel Consumption	Rate ($/Th)	Maint-enance Cost	Project Cost ($)	Cost Savings ($)	Payback Period without Incentive (Years)	Approx. Incentive ($)	Project Costs w/ Incentive ($)	Payback Period with Incentive (Years)
South Tahoe High School	75	473,040	$0.106	20,121	$0.825	62,122	$0.809	$14,191	$267,608	$2,313	115.7	$0	$267,608	115.7

	Reciprocating	Gas Turbine	Fuel Cell	
Size	75	65	300	kW
parasitic power	3	5	10	kW
Net power	72	60	290	kW
Installed Cost	$262,500	$292,500	$1,650,000	
Natural Gas Fuel Input, Therms p	9.5	8.7	24.0	Therms/hr
Maintenance Cost, $ per kWh ger	$0.03	$0.01	$0.04	/kWh generated
Heat Output, MMBtu/hr at 180F	0.49	0.32	0.5	MMBtu
Operating Time	75%	75%	75%	of hours in year
kWh produced	473040	394200	1905300	kWh/yr
Value of Power	0.10603036	0.10603036	0.10603036	/kWh
Electricity Value	$50,157	$41,797	$202,020	/year
Heat Usable	50%	50%	50%	of time when operating
Annual Useful Heat	1609.65	1051.2	1642.5	MMBtu/yr
Boiler Efficiency	80%	80%	80%	heat out/fuel in HHV
Natural Gas Savings	20120.625	13140	20531.25	Therms/yr
Value of Gas Saved	0.82493842	0.82493842	0.82493842	/Therm
Heat Value	$16,598	$10,840	$16,937	/year
Fuel Consumed	62121.978	57310.11	157404.06	Therms/yr
Cost of Gas Fuel	0.8089	0.8089	0.8089	/Therm
Gas Cost	$50,250	$46,358	$127,324	/year
Maintenance Cost	$14,191	$2,662	$76,212	/year
Net Operating Savings	$2,313	$3,617	$15,421	
Simple Payback	113.5	80.9	107.0	years

APPENDIX D
Local Weather Data

TAHOE CITY, CALIFORNIA

Period of Record General Climate Summary - Cooling Degree Days

Station:(048758) TAHOE													
From Year=1903 To Year=2012													
Cooling Degree Days for Selected Base Temperature (F)													
Base	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
55	0	0	0	0	7	57	198	180	60	4	0	0	505
57	0	0	0	0	3	34	144	128	34	1	0	0	343
60	0	0	0	0	1	12	76	64	10	0	0	0	164
65	0	0	0	0	0	1	14	9	0	0	0	0	25
70	0	0	0	0	0	0	1	0	0	0	0	0	1

Cooling Degree Day units are computed as the difference between the daily average temperature and the base temperature. (Daily Ave. Temp. - Base Temp.) One unit is accumulated for each degree Fahrenheit the average temperature is above the base temperature. Negative numbers are discarded. Example: If the days high temperature was 95 and the low temperature was 51, the base 60 heating degree day units is ((95 + 51) / 2) - 60 = 13. This is done for each day of the month and summed.

Table updated on Oct 31, 2012
Months with 5 or more missing days are not considered
Years with 1 or more missing months are not considered

Western Regional Climate Center, wrcc@dri.edu

TAHOE CITY, CALIFORNIA

Period of Record General Climate Summary - Heating Degree Days

Station:(048758) TAHOE													
From Year=1903 To Year=2012													
Heating Degree Days for Selected Base Temperature (F)													
Base	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
65	1121	986	981	790	584	342	135	150	318	604	860	1067	7936
60	966	845	826	640	429	203	42	50	178	449	710	912	6249
57	873	760	733	550	338	135	17	21	111	357	620	819	5332
55	811	704	671	490	280	98	8	11	78	297	560	757	4764
50	656	562	516	341	156	37	1	2	27	164	410	602	3475

Heating Degree Day units are computed as the difference between the base temperature and the daily average temperature. (Base Temp. - Daily Ave. Temp.) One unit is accumulated for each degree Fahrenheit the average temperature is below the base temperature. Negative numbers are discarded. Example: If the days high temperature was 65 and the low temperature was 31, the base 50 heating degree day units is 50 - ((65 + 31) / 2) = 2. This is done for each day of the month and summed.

Table updated on Oct 31, 2012
Months with 5 or more missing days are not considered
Years with 1 or more missing months are not considered

Western Regional Climate Center, wrcc@dri.edu

TAHOE CITY, CALIFORNIA

Period of Record General Climate Summary - Temperature

Station:(048758) TAHOE															
From Year=1903 To Year=2012															
	Monthly Averages			Daily Extremes				Monthly Extremes				Max. Temp.		Min. Temp.	
	Max.	Min.	Mean	High	Date	Low	Date	Highest Mean	Year	Lowest Mean	Year	>= 90 F	<= 32 F	<= 32 F	<= 0 F
	F	F	F	F	dd/yyyy or yyyymmdd	F	dd/yyyy or yyyymmdd	F	-	F	-	# Days	# Days	# Days	# Days
January	38.6	19.1	28.9	59	10/1990	-14	09/1937	36.6	2003	16.4	1937	0.0	5.6	30.0	0.7
February	40.3	19.9	30.1	60	17/1985	-15	07/1989	38.8	1963	22.5	1911	0.0	4.0	27.6	0.5
March	44.0	22.8	33.4	67	27/1988	-6	10/1935	41.9	1934	25.6	1952	0.0	2.6	29.4	0.2
April	50.4	26.9	38.7	74	30/1981	5	12/1911	46.5	1992	29.4	1967	0.0	0.6	26.1	0.0
May	59.6	32.8	46.2	89	30/1910	9	18/1974	53.9	1992	38.6	1953	0.0	0.1	15.4	0.0
June	68.7	38.6	53.6	90	22/1961	24	01/1955	59.1	1940	48.1	1953	0.0	0.0	4.0	0.0
July	77.9	44.4	61.1	93	20/1931	22	01/1975	66.0	1931	56.3	1983	0.2	0.0	0.3	0.0
August	77.2	43.7	60.4	94	15/1933	28	30/1912	64.6	1931	53.7	1976	0.2	0.0	0.2	0.0
September	69.8	39.0	54.4	87	03/1931	21	30/1950	59.2	2009	48.1	1911	0.0	0.0	3.2	0.0
October	58.8	32.3	45.5	80	03/1933	9	28/1971	52.1	2003	40.0	1946	0.0	0.1	16.8	0.0
November	46.9	25.8	36.3	70	06/1988	1	23/1931	43.6	1995	29.4	1994	0.0	1.3	26.5	0.0
December	40.3	20.8	30.6	60	10/1990	-16	11/1972	37.0	1958	22.9	1932	0.0	4.3	29.5	0.4
Annual	56.0	30.5	43.3	94	19330815	-16	19721211	46.2	1992	39.5	1911	0.4	18.6	209.0	1.8
Winter	39.7	19.9	29.8	60	19850217	-16	19721211	34.6	1963	22.0	1949	0.0	13.9	87.1	1.6
Spring	51.3	27.5	39.4	89	19100530	-6	19350310	46.2	1992	34.6	1912	0.0	3.3	71.0	0.2
Summer	74.6	42.2	58.4	94	19330815	22	19750701	61.5	1931	54.3	1912	0.4	0.0	4.4	0.0
Fall	58.5	32.3	45.4	87	19310903	1	19311123	49.7	2001	41.4	1911	0.0	1.4	46.5	0.0

Table updated on Oct 31, 2012
For monthly and annual means, thresholds, and sums:
Months with 5 or more missing days are not considered
Years with 1 or more missing months are not considered
Seasons are climatological not calendar seasons

Winter = Dec., Jan., and Feb. Spring = Mar., Apr., and May

Summer = Jun., Jul., and Aug. Fall = Sep., Oct., and Nov.

Western Regional Climate Center, wrcc@dri.edu

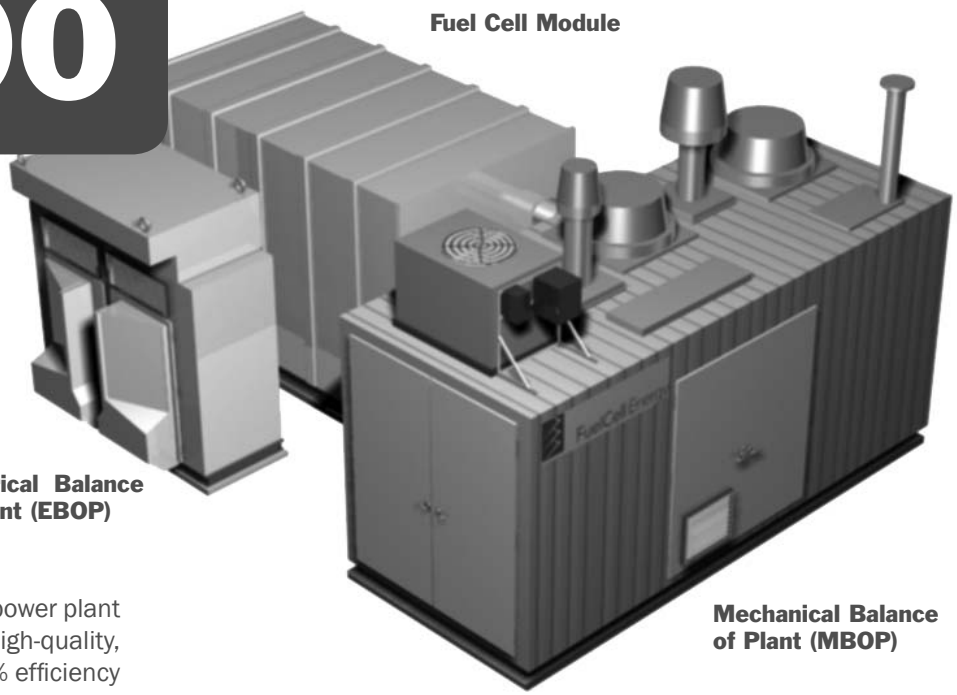
Appendix E

Manufacturers Product Literature

Disclaimer:

References to specific brand names, products or manufacturers are provided for illustrative purposes only and shall not be considered endorsements by the Energy Commission, the State of California, its employees, contractors, and subcontractors.

300 KILOWATTS
DFC300



KEY FEATURES

- **High Efficiency**
- **Low Environmental Impact**
- **Fuel Flexibility**
- **High Reliability**
- **Quiet Operation**

ADVANTAGES

The DFC®300™ stationary fuel cell power plant from FuelCell Energy provides high-quality, Ultra-Clean electrical power with 47% efficiency in a compact footprint. Designed for commercial and industrial applications, the system offers operation around-the-clock, easy transport, quiet and reliable operation, and simple site planning and regulatory approval.

300 kW, 480 VAC,
333 kVA, 50 or 60 Hz

PERFORMANCE

Gross Power Output	
Power @ Plant Rating	300 kW
Standard Output AC voltage	480 V
Standard Frequency	60 Hz
Optional Output AC Voltages	460, 440, 420, 400, 380 V
Optional Output Frequency	50 Hz
Efficiency	
LHV	47 +/- 2 %
Available Heat	
Exhaust Temperature	700 +/- 50 °F
Exhaust Flow	3,950 lb/h
Allowable Backpressure	5 iwc
Heat Energy Available for Recovery	
(to 250 °F)	480,000 Btu/h
(to 120 °F)	808,000 Btu/h
Fuel Consumption	
Natural gas (at 930 Btu/ft^3)	39 scfm
Heat rate, LHV	7,260 Btu/kWh

Water Consumption	
Average	0.9 gpm
Peak during WTS backflush	10 gpm
Water Discharge	
Average	0.45 gpm
Peak during WTS backflush	10 gpm
Pollutant Emissions	
NOx	0.01 lb/MWh
SOx	0.0001 lb/MWh
PM10	0.00002 lb/MWh
Greenhouse Gas Emissions	
CO_2	980 lb/MWh
CO_2 (with waste heat recovery)	520-680 lb/MWh
Sound Level	
Standard	72 dB(A) at 10 feet
Optional	65 dB(A) at 10 feet

FuelCell Energy
Ultra-Clean, Efficient, Reliable Power

SPECIFICATIONS

DFC300

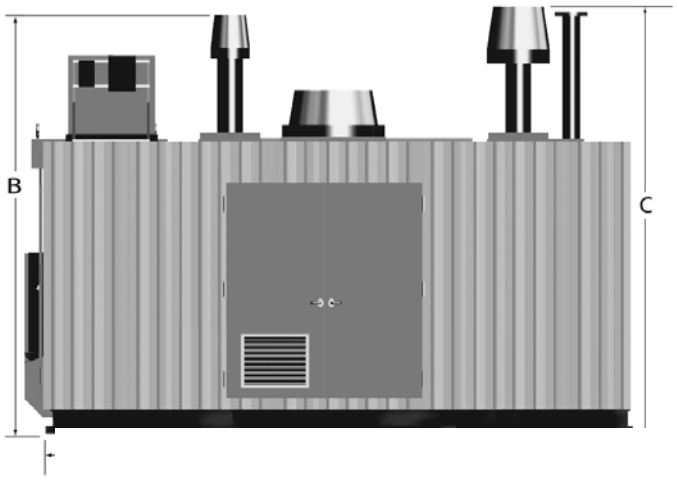
DIMENSIONS

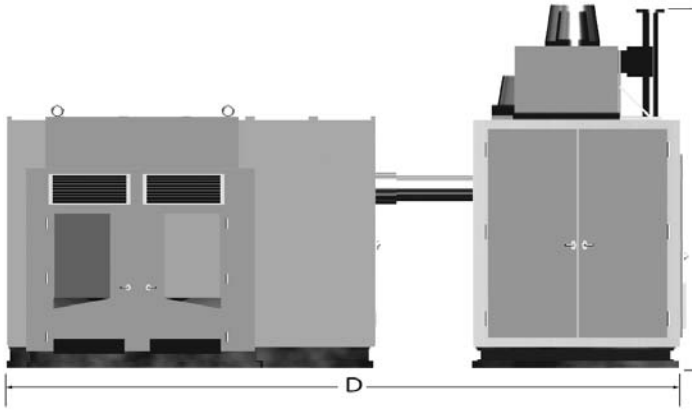
Front View

A	Overall Width	20.0 ft
B	Height of Air Intake Filter	15.1 ft
C	Height of Exhaust Stack	14.5 ft

Side View

D	Overall Length	20.0 ft
E	Height of EBOP	15.1 ft
F	Height of Discharge Vent	14.5 ft





WEIGHTS

Mechanical Balance of Plant	27,000 lb
Electrical Balance of Plant	15,000 lb
Fuel Cell Module	35,000 lb

EXPERIENCE & CAPABILITIES

Direct FuelCell® power plants are generating ultra-clean, efficient and reliable power at more than 50 locations worldwide. With more than 300 megawatts of power generation capacity installed or in backlog, FuelCell Energy is a global leader in providing ultra-clean baseload distributed generation to utilities, industrial operations, universities, municipal water treatment facilities, government installations and other customers around the world. The Company's power plants have generated more than 1.7 billion kilowatt hours of ultra-clean power using a variety of fuels including renewable biogas from wastewater treatment and food processing, as well as clean natural gas.

This brochure provides a general overview of FuelCell Energy products and services. This brochure is provided for informational purposes only. Warranties for FuelCell Energy products and services are provided only by individual sales and service conracts, and not by this brochure. This brochure is not an offer to sell any FuelCell Energy products and services. Contact FuelCell Energy for detailed product information suitable for your specific application. FuelCell Energy reserves the right to modify its products, services, and related information at any time without prior notice.

FuelCell Energy's fleet of Direct FuelCell power plants are certified to or comply with a variety of commercial and industrial standards, such as: ANSI/CSA America, UL, CARB, OSHA, IEEE and NFPA.

FuelCell Energy
Ultra-Clean, Efficient, Reliable Power

3 Great Pasture Road | Danbury, CT 06813-1305 | 203 825-6000 | **www.fuelcellenergy.com** | **YouTube.com/FuelCellEnergyInc**

click picture to zoom in

AS20z Anti-Sweat Heater Refrigerated Display Case Controller

SKU: E0.0000

Part #: AS-20z

$559.61

Quantity: 1

+ ADD TO CART

Usually ships within 1 to 2 business days

Overview | Specifications

Product Description

Normal 0

- false false false
- EN-US X-NONE X-NONE
- /* Style Definitions */ table.MsoNormalTable {mso-style-name:"Table Normal"; mso-tstyle-rowband-size:0; mso-tstyle-colband-size:0; mso-style-noshow:yes; mso-style-priority:99; mso-style-qformat:yes; mso-style-parent:""; mso-padding-alt:0in 5.4pt 0in 5.4pt; mso-para-margin-top:0in; mso-para-margin-right:0in; mso-para-margin-bottom:10.0pt; mso-para-margin-left:0in; line-height:115%; mso-pagination:widow-orphan; font-size:11.0pt; font-family:"Calibri","sans-serif"; mso-ascii-font-family:Calibri; mso-ascii-theme-font:minor-latin; mso-fareast-font-family:"Times New Roman"; mso-fareast-theme-font:minor-fareast; mso-hansi-font-family:Calibri; mso-hansi-theme-font:minor-latin;}
- AS20z Anti-Sweat Heater Control Anti Sweat Heaters assure proper heater function of your commercial refrigerator and commercial freezer equipment while providing the most savings achievable, with out any condensation.
- Standard anti-sweat heaters are set to a constant temperature and run 100% of the time—a wasteful and costly strategy. The ControlTec AS-20z Anti Sweat Heater revolutionizes anti-sweat technology by providing the automation, management, and reporting needed to reduce costs as well as document savings.
- DESCRIPTION: Mechanical Housing dimensions: 1.68 x 1.08 x 8.82
- Mounting pattern 8.312 x 1.125
- Mounting hardware: (2) #6-32 x 1/2lg self tapping screws
- (Optional) 3/4" threaded bib directly into junction box
- Sensors: DP sensor, Dew Point with gray wiring
- FT sensor, Frame Temp with black wiring
- CT sensor, Case Temp with white wiring (optional)
- Electrical 120/240 VAC 50/60hz
- 20 Amp rated
- (30 Amp relay)
- UL Listed: temperature regulating equipment 3LHL
- Wireless Network: ZigBee
- FCC: IC: 5619A-SURAAS20

Related Product

Kolpak Breaker strip L/H side trim-24207-1075

$59.67

SKU:R0.0063

AS20z Anti-Sweat Heater Refrigerated Display Case Controller

$559.61

SKU:E0.0000

Heater Wire (25 Ft)

$37.56

SKU:AP.22815

60-12336-1001 Anthony Heater Plug SJ Cord

$60.29

SKU:B1.0086

Defrost Heater Northland

$82.23

SKU:R0.0046

Category Map

Refrigeration
- Gaskets
- Curtains and Doors
- Evaporators, Condensers, and Parts
- Thermostats
- Timers and Controls

Appliances and Kitchen Equipment
- Mixer Parts
- Opener Parts
- Ovens and Broilers
- Slicer Parts
- Accessories
- Burners
- Kitchen Equipment

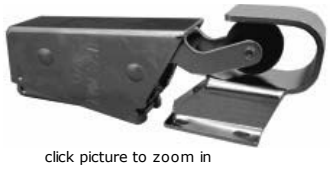
Accessories
- Tape and Adhesive
- Cleaning Products
- Fasteners
- Part Trays
- Thermometers
- Tools

Hardware
- Bearings and Slides
- Latches and Handles
- Window Glass
- Latches & Handles
- Hinges
- Closers
- Drawer Hardware
- Hold-opens

Electrical
- Connectors and Terminal Blocks
- Contactors and Relays
- Cords
- Fuses and Fuse Holders
- Heaters
- Ignition Control
- Motors and Accessories
- Plugs and Recepticles
- Pumps, Motors, and Fans
- Signal Lights
- Switches
- Terminals
- Transformers
- Door Heaters
- Lighting

Plumbing
- Coffee and Water Dispenser Parts
- Conversion Adapters
- Faucets
- Hot Water and Steam
- Sink Drains and Strainers
- Swirl Water Hoses
- Waste Drain Parts
- Waste Drains
- Filtration
- Pre-Rinse

Brands
- A-C
- D-F
- G-I
- J-L
- M-O
- P-R
- S-U
- V-X



click picture to zoom in

Kason 1095 Door Closer Assembly Flush

SKU: A4.0000

Part #: A4.0000

$93.57

Quantity: 1

+ ADD TO CART

Usually ships within 1 to 2 business days

Overview | Specifications

Product Description

Kason Series 1095

- Spring-actuated walk-in closer assembly
- Hook head type
- Polished Chrome Finish
- Stainless steel construction with concealed mounting
- For flush mount doors
- Provides fast, full closure for heavy walk-in doors
- Mounting Holes Drilled for No. 10 (5.0mm) screws

Related Product

Kason 1255-1 Spring Cartridge Kit Polished Chrome

$34.02

SKU:A5.0215

02-60606-0001 Displayrite Torque Rod

$32.92

SKU:B2.0007

Kason 1094 Door Closer 1094000013 Concealed Body

$86.88

SKU:A5.0222

Kason 1093 Hydraulic Door Closer Flush Offset

$72.16

SKU:A5.0210

Kason 1095/1094 Door Closer Hook Flush

$19.95

SKU:A5.0217

Category Map

Refrigeration
- Gaskets
- Curtains and Doors
- Evaporators, Condensers, and Parts
- Thermostats

Appliances and Kitchen Equipment
- Mixer Parts
- Opener Parts
- Ovens and Broilers
- Slicer Parts

Accessories
- Tape and Adhesive
- Cleaning Products
- Fasteners
- Part Trays
- Thermometers

Hardware
- Bearings and Slides
- Latches and Handles
- Window Glass
- Latches & Handles
- Hinges

Timers and Controls
Accessories
Burners
Kitchen Equipment
Tools
Closers
Drawer Hardware
Hold-opens

Electrical

Connectors and Terminal Blocks
Contactors and Relays
Cords
Fuses and Fuse Holders
Heaters
Ignition Control
Motors and Accessories
Plugs and Recepticles
Pumps, Motors, and Fans
Signal Lights
Switches
Terminals
Transformers
Door Heaters
Lighting

Plumbing

Coffee and Water Dispenser Parts
Conversion Adapters
Faucets
Hot Water and Steam
Sink Drains and Strainers
Swirl Water Hoses
Waste Drain Parts
Waste Drains
Filtration
Pre-Rinse

Brands

A-C
D-F
G-I
J-L
M-O
P-R
S-U
V-X

HOME FAQ REBATES SHIPPING AND RETURNS CONTACT US

Product Catalog




Reliable power when and where you need it.
Clean and simple.

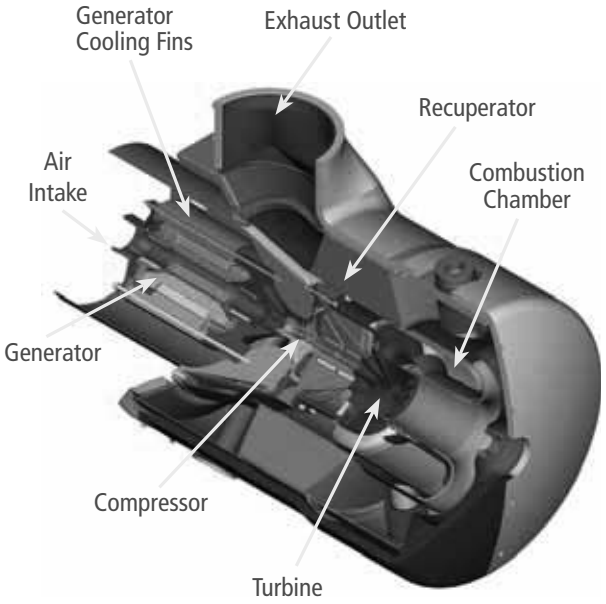
Capstone Microturbines

Capstone microturbines are used in distributed power generation applications including cogeneration, resource recovery, secure power, and hybrid electric vehicles (HEV).

Low-emission, clean-and-green Capstone microturbines are scalable from 30kW to 10MW. The C1000 Power Package, the world's first megawatt microturbine power system, can be configured into smaller 800kW and 600kW solutions – all within a single ISO-type container. Models are available that operate on: Natural Gas, Propane, Landfill Gas, Digester Gas, Diesel, Aviation, and Kerosene fuels.

- Ultra-low emissions
- One moving part – minimal maintenance and downtime
- Patented air bearing – no lubricating oil or coolant required
- 5 and 9 year Factory Protection Plans available
- Remote monitoring and diagnostic capabilities
- Integrated synchronization and protection
- Reliable – tens of millions of run hours and counting

PATENTED AIR BEARING



C30

C65

C65 ICHP

C65 CARB

HAZARDOUS LOCATIONS

Model	Fuels	Power Output [1]	Electrical Efficiency	Exhaust Gas Flow		Exhaust Temperature		Net Heat Rate		Dimensions [2] (W x D x H)	
		kW	%	kg/s	lbm/s	C°	F°	MJ/kWh	btu/kWh	m	in
GASEOUS FUELS [3]											
C30 LP	NG	28	25	0.31	0.68	275	530	13.8	13,100	0.76 x 1.5 x 1.8	30 x 60 x 70
C30 HP	NG, P, LG, DG	30	26	0.31	0.68	275	530	13.8	13,100	0.76 x 1.5 x 1.8	30 x 60 x 70
C30 HZLC [4]	NG	30	26	0.32	0.70	275	530	13.8	13,100	0.87 x 2.9 x 2.2	34 x 112 x 85
C65	NG, P	65	29	0.49	1.08	309	588	12.4	11,800	0.76 x 1.9 x 1.8	30 x 77 x 76
C65 ICHP	NG, P, LG, DG	65	29	0.49	1.08	309	588	12.4	11,800	0.76 x 2.2 x 2.4	30 x 87 x 93
C65 CARB	NG	65	28	0.51	1.13	311	592	12.9	12,200	0.76 x 2.2 x 2.6	30 x 87 x 103
C65 CARB	LG, DG	65	29	0.49	1.08	309	588	12.4	11,800	0.76 x 2.2 x 2.6	30 x 77 x 85
C65 HZLC [4]	NG	65	29	0.50	1.09	325	617	12.9	12,200	0.87 x 3.2 x 2.3	35 x 128 x 90
C200 LP	NG	190	31	1.3	2.9	280	535	11.6	11,000	1.7 x 3.8 x 2.5	67 x 150 x 98
C200 HP	NG, P, LG, DG	200	33	1.3	2.9	280	535	10.9	10,300	1.7 x 3.8 x 2.5	67 x 150 x 98
C200 HZLC [4]	NG	200	33	1.3	2.9	280	535	10.9	10,300	1.9 x 3.2 x 3.1	74 x 126 x 122
C600 LP	NG	570	31	4.0	8.8	280	535	11.6	11,000	2.4 x 9.1 x 2.9	96 x 360 x 114
C600 HP	NG, P, LG, DG	600	33	4.0	8.8	280	535	10.9	10,300	2.4 x 9.1 x 2.9	96 x 360 x 114
C800 LP	NG	760	31	5.3	11.7	280	535	11.6	11,000	2.4 x 9.1 x 2.9	96 x 360 x 114
C800 HP	NG, P, LG, DG	800	33	5.3	11.7	280	535	10.9	10,300	2.4 x 9.1 x 2.9	96 x 360 x 114
C1000 LP	NG	950	31	6.7	14.7	280	535	11.6	11,000	2.4 x 9.1 x 2.9	96 x 360 x 114
C1000 HP	NG, P, LG, DG	1000	33	6.7	14.7	280	535	10.9	10,300	2.4 x 9.1 x 2.9	96 x 360 x 114
LIQUID FUELS [5]											
C30	D, A, K	29	25	0.31	0.69	275	530	14.4	13,700	0.76 x 1.5 x 1.9	30 x 60 x 70
C65	D, A, K	65	29	0.49	1.08	309	588	12.4	11,800	0.76 x 1.9 x 1.8	30 x 77 x 76
C65 ICHP	D, A, K	65	29	0.49	1.08	309	588	12.4	11,800	0.76 x 2.2 x 2.4	30 x 87 x 93
C200	D	190	30	1.3	2.9	280	535	10.9	10,300	1.7 x 3.8 x 2.5	67 x 150 x 98

[1] Nominal full power performance at ISO conditions: 59° F, 14.696 psia, 60% RH
[2] Height dimensions are to the roofline. Exhaust outlet can extend up to 7 inches above the roofline.
[3] Models available to operate on these different fuels: NG – Natural Gas; P – Propane; LG – Landfill Gas; DG – Digester Gas
[4] Hazardous Location units suitable for use in potentially explosive atmospheres (UL Class I, Division 2 or Atex Class I, Zone 2)
[5] Models available to operate on these different fuels: D – Diesel; A – Aviation; K – Kerosene
Specifications are not warrantied and are subject to change without notice.

C200

C1000

Capstone Turbine Corporation® is the world's leading producer of low-emission microturbine systems, and was first to market with commercially viable air bearing turbine technology. The company has shipped thousands of Capstone turbines to customers worldwide. These award-winning systems have logged millions of documented runtime operating hours.

Capstone is a member of the U.S. Environmental Protection Agency's Combined Heat and Power Partnership which is committed to improving the efficiency of the nation's energy infrastructure and reducing emissions of pollutants and greenhouse gases.

A UL-Certified ISO 9001:2008 and ISO 14001:2004 company, Capstone is headquartered in the Los Angeles area with sales and/or service centers in China, Mexico, Singapore, South America, the United Kingdom, and the United States.

For more information about Capstone Turbine Corporation and its clean-and-green microturbine technology solutions, please visit www.capstoneturbine.com or call 818.734.5300.

Capstone Turbine Corporation
21211 Nordhoff Street
Chatsworth • CA • 91311
818.734.5300 • Fax 818.734.5320
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Bloomenergy®

ES-5700

Clean, Reliable, Affordable Energy

CLEAN, RELIABLE POWER ON DEMAND

Bloom Energy's ES-5700 delivers clean power that reduces emissions and energy costs. The modular architecture enables the installation to be tailored to the actual electricity demand, with a flexibility to add servers as the load increases. The ES-5700 actively communicates with Bloom Energy's network operations centers so system performance can be monitored and maintained 24 hours per day, 365 days per year.

INNOVATIVE TECHNOLOGY

Utilizing patented solid oxide fuel cell (SOFC) technology, the ES-5700 produces combustion-free power at unprecedented efficiencies, meaning it consumes less fuel and produces less CO_2 than competing technologies. Additionally, no water is needed under normal operating conditions.

ALL-ELECTRIC POWER

The ES-5700, which operates at a very high electrical efficiency, eliminates the need for complicated and costly CHP systems. Combining the standard electrical and fuel connections along with compact footprint and sleek design, the ES-5700 is the most deployable fuel cell on the market.

CONTROLLED AND PREDICTABLE COST

By providing efficient on-site power generation, the economic and environmental benefits are central to the ES-5700 value proposition. Bloom Energy customers can lock in their long term energy costs and mitigate the risk of electricity rate increases. The ES-5700 has been designed in compliance with a variety of safety standards and is backed by a comprehensive warranty.

About Bloom Energy

Bloom Energy is making clean, reliable energy affordable. Our unique on-site power generation systems utilize an innovative fuel cell technology with roots in NASA's Mars program. By leveraging breakthrough advances in materials science, Bloom Energy systems are among the most efficient energy generators, providing for significantly reduced operating costs and dramatically lower greenhouse gas emissions. Bloom Energy Servers are currently producing power for many Fortune 500 companies including Apple, Google, Walmart, AT&T, eBay, Staples, as well as notable non-profit organizations such as Caltech and Kaiser Permanente.

Headquarters:
Sunnyvale, California

For More Information:
www.bloomenergy.com

ES-5700

Technical Highlights	
Outputs	
Nameplate power output (net AC)	210 kW
Base load output (net AC)	200 kW
Electrical connection	480 V, 3-phase, 60 Hz
Inputs	
Fuels	Natural gas, directed biogas
Input fuel pressure	15 psig
Water	None during normal operation
Efficiency	
Cumulative electrical efficiency (LHV net AC)	52-60%
Heat rate (HHV)	6,295-7,264 Btu/kWh
Emissions	
NOx	< 0.01 lbs/MWh
SOx	Negligible
CO	< 0.10 lbs/MWh
VOCs	< 0.02 lbs/MWh
CO_2 @ stated efficiency	735-849 lbs/MWh on natural gas; carbon neutral on directed biogas
Physical Attributes and Environment	
Weight	19.4 tons
Dimensions	26' 5" x 8' 7" x 6' 9"
Temperature range	-20° to 45° C
Humidity	0% - 100%
Seismic vibration	IBC site class D
Location	Outdoor
Noise	< 70 dBA @ 6 feet
Codes and Standards	
Complies with Rule 21 interconnection and IEEE1547 standards	
Exempt from CA Air District permitting; meets stringent CARB 2007 emissions standards	
Product listed by Underwriters Laboratories Inc. (UL) to ANSI/CSA America FC 1-2004	
Additional Notes	
Access to a secure website to monitor system performance & environmental benefits	
Remotely managed and monitored by Bloom Energy	
Capable of emergency stop based on input from the site	

Bloomenergy®

Bloom Energy Corporation
1299 Orleans Drive
Sunnyvale CA 94089
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$240.99 /ea

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Brushless DC Motor, ECM, 1/3 HP, 1050 rpm

by GENTEQ (/b/GENTEQ/)

Technical Specifications

Zoro #: G3648057 | **Mfr #:** 5SME39DXL227

Plug Type: 1/4" and 3/8" Straight Male Quick Connect Terminals	**Voltage**: 208-230/277
Body Dia.: 5-2/3"	**Motor Shaft Design**: Flat
Motor Enclosure Design: Open Air-Over	**Motor Shaft Rotation**: CCWLE
Frame: 48	**Standards**: UL Recognized, CSA Certified
Frame Material: Steel	**Green Environmental Attribute**: Product Contributes to Reducing Energy Consumption
Capacitor Required: No	**Phase**: 1
Thermal Protection: Electronic	**Nameplate RPM**: 1050
Shaft Length: 3-15/16"	**Service Factor**: 1
Motor Sub Application: Direct Dr Fan/Blower	**Application**: Air Handler Systems
Motor Mounting Type: Band	**Motor Application**: HVAC/R
Frequency: 60/50 Hz	**Shaft Dia.**: 1/2"
Item: ECM Direct Drive Blower Motor	**Insulation Class**: B
Bearings: Ball	**Motor Design**: ECM
Number of Speeds: 5	**Duty**: Continuous
Length Less Shaft: 5-1/4"	**Ambient Temperature**: -40 to 55 Degrees C
Overall Length: 9-3/16"	**Output Watts**: 246
HP: 1/3	**Full Load Amps**: 2.6

Zoro Number: G3648057	**Mfr Number**: 5SME39DXL227

Product Description

ECM Direct Drive Blower Motor, ECM, Motor Enclosure Design Open Air-Over, 1/3 HP, Output Watts 246, 1050 Nameplate RPM, 48 Frame, Voltage 208-230/277, Frequency 60/50 Hz, 1 Phase, Full Load Amps 2.6, Motor Mounting Type Band, Electronic Thermal Protection, Insulation Class B, Number of Speeds 5, Motor Shaft Rotation CCWLE, Ball Bearings, Service Factor 1, Ambient Temperature -40 to 55 Degrees C, Frame Material Steel, Overall Length 9-3/16 In., Length Less Shaft 5-1/4 In., Motor Shaft Design Flat

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Canadian customers can shop at **zorocanada.com (http://www.zorocanada.com)**

click picture to zoom in

Evaporator Fan EC Motor 16W, CW

SKU: G0.00029

Part #: SSC2B13AJHBEAR1

$127.33

Quantity: 1

+ ADD TO CART

Usually ships within 1 to 2 business days

Overview | Specifications

Product Description

ARKTIK SSC

EC Motor

16 Watt

Clockwise (CW)

115Volt

- Electrical
- Voltage: 115 (90-132) or 208-230 (180-264) V Single Phase Output: 2 – 38 watts Efficiency: ~66% peak Speed Range: 1000 – 3600 RPM Speeds: 1 (constant speed) Rotation: CW (determined from the lead end of the motor)
- Mechanical
- Type: 3.3" electronically commutated aluminum or cast iron unit bearing Shaft: ¼" x 20 thread is standard. Optional features include flatted end, smooth end, and 5/16' diameter shaft Enclosure: Aluminum or Cast Iron (totally enclosed) Bearing: Unit bearing Bearing Oil: (ISO grades 15, 32, or 68) high quality paraffinic based oil selected for excellent oxidations resistance, wear protection, protection against rust and corrosion, and resistance to foaming. Also available, an oil with optimum flow characterictics at sub-zero temperatures. (ISO grades 10/15 or 68) synthetic diester-based lubricant formulated to offer extended lubrication over a wide temperature range, and minimize wear. Mounting: Five .150" diameter cored holes on rear (aluminum), three #8-36 drilled through and tapped (cast iron),and optional 2 side mounting bosses for pedestal mounting Operating Position: Horizontal shaft (+/- 15°), optional all-angle, or vertical shaft up Leads: Standard 18 gauge, 2 conductor. Lead cord may be terminated with 1/2" stripped wire, in-house molded plugs, eyelets, ¼" quick connects, or special terminals. Other customized lead options are available. Compliance: RoHS

Related Product

Arktic 59 Evaporator Fan EC Motor 230V, CW
$139.05
SKU:G0.0028

Evaporator Fan EC Motor 230, 16W, CW
$127.33
SKU:G0.0030

Evaporator Fan EC Motor 16W, CCW
$127.33
SKU:G0.0002

Arktic 59 Evaporator Fan EC Motor 115V
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SKU:G0.0000

Arktic 59 Evaporator Fan EC Motor 115V, CW
$139.05
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Category Map

Refrigeration
- Gaskets
- Curtains and Doors

Appliances and Kitchen Equipment
- Mixer Parts

Accessories
- Tape and Adhesive
- Cleaning Products

Hardware
- Bearings and Slides
- Latches and Handles

- Evaporators, Condensers, and Parts
- Thermostats
- Timers and Controls
- Opener Parts
- Ovens and Broilers
- Slicer Parts
- Accessories
- Burners
- Kitchen Equipment
- Fasteners
- Part Trays
- Thermometers
- Tools
- Window Glass
- Latches & Handles
- Hinges
- Closers
- Drawer Hardware
- Hold-opens

Electrical

- Connectors and Terminal Blocks
- Contactors and Relays
- Cords
- Fuses and Fuse Holders
- Heaters
- Ignition Control
- Motors and Accessories
- Plugs and Recepticles
- Pumps, Motors, and Fans
- Signal Lights
- Switches
- Terminals
- Transformers
- Door Heaters
- Lighting

Plumbing

- Coffee and Water Dispenser Parts
- Conversion Adapters
- Faucets
- Hot Water and Steam
- Sink Drains and Strainers
- Swirl Water Hoses
- Waste Drain Parts
- Waste Drains
- Filtration
- Pre-Rinse

Brands

- A-C
- D-F
- G-I
- J-L
- M-O
- P-R
- S-U
- V-X

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Frigitek EC Motor Controller

By : Energy Control Equipment Inc.

Item #: 1033

Email This Item To A Friend

Introducing EC Motors and the Frigitek® ECMotor Controller EC motors are a dramatic improvement over the older shaded pole motors commonly used in refrigeration systems. They are actually DC motors with an electronic commutation control to make them turn. ("EC" = "Electronically Commutated") They typically can save about 50% of the energy used by the shaded-pole motors they replace. Because of their improved efficiency, some states have mandated their use in new equipment. The addition of the Frigitek ECMotor Controller to an evaporator using the EC motors can almost double the savings provided by the motors alone. The Frigitek ECMotor Controller functions by sensing the operational status of the cooling system, and controlling the speed of the evaporator fans. It is a fact that all of the electrical power which is used by the fan motors ends up as heat inside the refrigerated space. By operating the fans at a low speed when no cooling is called for, and at high speed only when the system is actively cooling the refrigerator, much less heat is introduced into the refrigerator. Although this results in an additional saving in evaporator fan motor power, the reduction in fan motor heat generated causes a significant reduction in refrigeration operation, saving enough energy at the compressor to almost double the savings provided by the EC motors alone. The Frigitek ECMotor Controller is designed to be easily installed when upgrading to EC motors, or to be retrofit into existing units. Installation typically takes about a half hour (as does each EC motor), and can be done by any competent electrician or refrigeration technician. The ECMotor Controller is usually mounted inside the evaporator case, in the compartment with the electrical connections. In addition to its energy saving qualities, the Frigitek ECMotor Controller also provides some intrinsic advantages. The low speed of the fans results in lower evaporation from sensitive stored foods, and the lower noise levels contribute to worker efficiency, and a more pleasant workspace. The Frigitek ECMotor Controller is patent pending.

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PayPal

Sale Price : $325.00
Was : $399.00
Qty 1 add to basket

Recommended Items

Frigitek ECM - Electrically Commutated Motors
Very Energy Efficient Electric Motors are sized according to application and prices will vary. See item drop box for prices.
Sale Price : $125.00
Was : $149.00

eZEio Data Logger Controller Metering Kit
This includes a watt meter and 3 current transformers to measure energy consumption in volts, watts and power factor. Real-Time data logging direct to the internet.
Sale Price : $1,299.00
Was : $1,499.00

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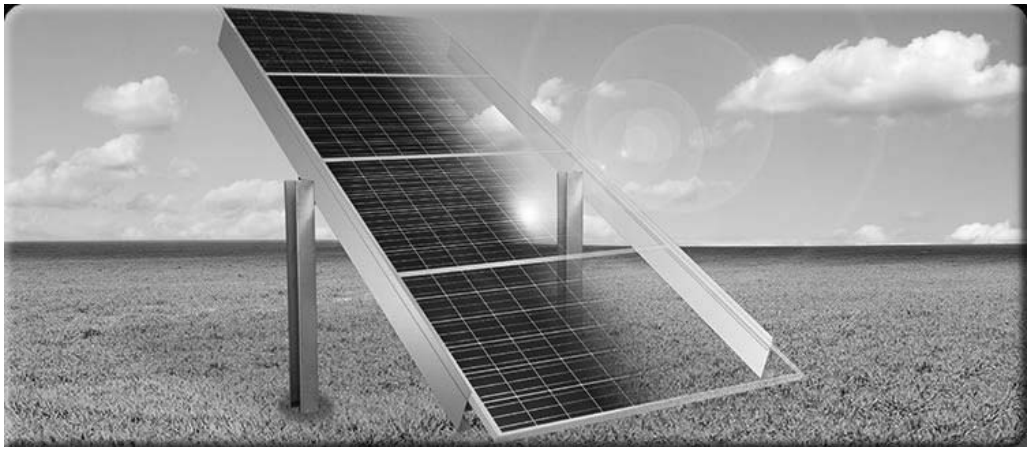

Ground Mount #2 Benefits

Assembly

Pricing

Engineering

Gator Clamp Installation

Panel Removal

Ground Mount #2 Pricing

Concrete Footings or Pile Driven Options

GROUND MOUNT #2 WITH CONCRETE FOOTING	
30 DEGREE GROUND MOUNT - 65" BETWEEN POSTS	
1 - 10' Post: 12Gauge Galvanized (52 Ibs)	$41.20
1 - 11' SLIDE-IN SOLAR PURLIN: 8" w/Button Punch 11" 16Gauge Galvanized (44 lbs)	$55.00
16 - CLIPS	$9.60
TOTAL	**$105.80**
4 - 240 WATT PANELS = 960 WATTS	
$105.80/960 = .11 per WATT	
WEIGHT = 99 POUNDS	

GROUND MOUNT #2 WITH PILE DRIVEN POSTS	
30 DEGREE GROUND MOUNT - 65" BETWEEN POSTS	
1 - 10' Post: 10Gauge Galvanized (67 Ibs)	$50.20
1 - 11' PURLIN: 8" 16 GAUGE GALVANIZED (44 POUNDS)	$55.00
16 - CLIPS	$9.60
TOTAL	**$114.80**
4 - 240 WATT PANELS = 960 WATTS	
$114.80/960 = .12 per WATT	
WEIGHT = 114 POUNDS	

Patent Pending

Powers Solar Frames, LLC

4118 East Elwood Street
Phoenix, Arizona 85040
888.525.0108

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Natural Gas Booster Water Heater - 3.5 Gallon Capacity

Natural Gas Powered With A 58,000 BTU Heating Capacity

PDF SPECS

Brand: Hatco
Mfg Part#: PMG-60

Model#: 315-343

Your Cost:
$4,930.00 /Each

Quantity: 1 Add to Cart

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LEASE FOR AS LITTLE AS $157.41/MONTH*

Product Details

Natural Gas Booster Water Heater is for single tank, door-type machines. Features a burner system that utilizes both primary and secondary air for consistent ignition. Spark to light with standing pilot. Stainless steel tank. 6" Black legs. Eight blade type burners. Temperature/pressure relief valve. Low-water cut-off. Quick Ship model ships within 24 hours. Single phase. 3.5 Gallon capacity. 120V. $20\frac{7}{16}$"Wx$24\frac{1}{2}$"Dx$24\frac{3}{8}$"H. 130 lbs.

TEN YEAR PARTS AND ONE YEAR PARTS AND LABOR WARRANTY

Back to Top

Specifications

Model#:	315-343
Weight:	130 lbs.

Width:	20 7/16"
Depth:	24 1/2"
Height:	24 3/8"
Capacity:	3.5 Gallon
Phase:	Single
Type:	Natural Gas
Voltage:	120V

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Kenmore 20.4 cu. ft. Top Freezer Refrigerator - White

view key features

- Deli Storage Drawer
- Gallon Door Bins
- Clear Plastic Storage Bins
- Frost Free Freezer
- Garage Ready

On Sale

Sold by: **Sears**

Regular price	~~$939.99~~
Your savings	**- $190.00**

$749.99

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Get it as soon as 06/16/15

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Sears — Arrives by Jun 16 — HILLTOP MALL — RICHMOND, CALIFORNIA

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Description

Item # 04660622000P Model # 60622

Kenmore 20.4 cu. ft. Top Freezer Refrigerator - Organized and Efficient Food Storage

Finding your food is easy in this **Kenmore 6062 top-mount refrigerator**, thanks to the energy-efficient LED lighting that casts a natural light inside and side mounted controls. Full-width, spill-proof glass shelves are easy to wipe clean and help stop liquids from spilling over to other parts of your fridge. Plus, humidity-controlled crispers allow you to make adjustments to each crisper individually. The Adapt and Store door storage system™ allows you to easily adjust your refrigerator door configuration to suit your ever-changing lifestyle needs.

- Full width deli storage drawer ensures easy access to your favorite items
- Gallon door bins easily hold jugs, bottles and gallon containers to help clear the shelves and give you space to stock up
- Crafted from a completely transparent plastic, these clear storage bins give you a fast count of what's on hand, while reminding you when it's time to stock up
- Enhanced LED lighting gives you a better view of what's inside so you can quickly find condiments, produce, ingredients and leftovers
- Slide-out, spillproof glass storage shelves shift positions and move easily while delivering the support, visibility and airflow needed to keep food fresh and delicious
- ENERGY STAR® rated so you can save energy
- Space-saving model fits your unique size restrictions
- Frost Free Freezer helps you save time with hassle free operation

Kenmore 20.4 cu. ft. Top Freezer Refrigerator - White

view key features

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- Space-saving model fits your unique size restrictions
- Frost Free Freezer helps you save time with hassle free operation

Designed to work in garage environments as low as 39 degrees

Adapt and Store Door Storage System helps you keep items organized and accessible

Feature Highlights

Bins that Fit More

Gallon door bins easily hold jugs, bottles and gallon containers to help clear the shelves and give you space to stock up.

Take Stock in Seconds

Crafted from a completely transparent plastic, these clear storage bins give you a fast count of what's on hand, while reminding you when it's time to stock up.

Long Lived Lighting

LEDs brighten corners and shelves, while offering a longer service life than their incandescent counterparts.

Spills that Stay Put

Spill-proof tempered glass shelves keep drips, drizzles and spills from spreading throughout the fridge, making cleanup fast and easy.

Consider These Alternatives

Kenmore 23.8 cu. ft. Top-Freezer Refrigerator - White

$849.99

Kenmore 23.8 cu. ft. Top-Freezer Refrigerator w/ Icemaker- White

$999.99

Kenmore 18 cu. ft. Top Mount Refrigerator - White

$681.99

Kenmore 23.8 cu. ft. Top-Freezer Refrigerator w/ Internal Water Dispenser - White

$1099.99

Specifications

Product Specifications

Dimensions and Capacity:	
Weight (lbs.):	210
Depth w/out Handle (In.):	31.75
Adjustable Legs:	Yes
Freezer Capacity (Cu Ft):	5.14
Overall Capacity (Cu Ft):	20.43
Standard or Counter Depth:	Standard Depth
Depth w/ Handle (in.):	34
Height to Top of Case (in.):	68.25
Height to Top of Hinge (in.):	69
Refrigerator Capacity:	15.29
Width w/Door Open 90 Degrees (In.):	32.75
Depth w/ Door Open 90 Degrees:	61.38
Width w/ Door Closed (In.):	29.63
Panel Dimensions:	30X69X34
Dimensions Details:	Fits standard 30" W X 69" H Opening
Depth without Door (in.):	28.5
Color and Styling:	
Door Style:	Contoured
Door Finish:	Smooth
Color Family:	White
Handle Color:	White
Door Color:	White
Cabinet Color:	White
Crisper Color:	Clear
Product Overview:	
Weight, Shipping:	220
Reversible Door:	Yes
Voltage (V):	115
Ice Dispenser:	No
Automatic Defrost:	Yes
Fast Freeze:	No
Door Hinge:	Right
Dynamic Cooling:	No
Exterior Features:	Exclusive Kenmore Handle Design
Performance:	
Kilowatt Hrs. per Year:	386
Control Type:	Electromechanical
General Features:	
General Warranty:	1 year limited
Power Cord Included:	Yes
Durability:	
Refrigerator Shelf Material:	Glass
Handle Material:	Plastic
Freezer Shelf Material:	Wire
Filtration & Dispensing:	
Ice Maker:	Optional
Internal Water Dispenser:	No
Thru Door Dispenser:	None
Water Filter:	No

Ice Style:	None

Refrigeration Conveniences:

Crisper Style:	Slide-out
Control Location:	Interior
Gallon Door Storage:	Yes
Number of Refrigerator Drawers:	3
Number of Refrigerator Door Bins:	5
Refrigerator Interior Light:	Yes
Adjustable Shelves:	Yes
Humidity-Controlled Crisper:	Yes
Number of Refrigerator Shelves:	3

Freezer Conveniences:

Defrost System:	Frost-free
Freezer Interior Light:	Yes
Number of Freezer Door Bins:	2
Number of Freezer Shelves/Baskets:	2
Flexible Storage Shelf:	No

Certifications:

ENERGY STAR Compliant:	Yes

Frequently Bought Together

This product:

Kenmore 20.4 cu. ft. Top
Freezer Refrigerator - White

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○

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Overall, others give this: 1 Reviews

1 Reviewers (100%) would recommend this

Overall Rating Breakdown:

5	(1)
4	(0)
3	(0)
2	(0)
1	(0)

Reviewers may have received a benefit, like a sweepstakes entry or rewards program points, in exchange for writing a review. Those benefits were not conditioned on the positive or negative content of the review.

5 stars – based out of 1 reviews

11 visitors found this helpful **Verified Purchase**

great product

I am very happy with this refrigerator.It is very spacious and has all the shelving I could ask for.It also fits well in the space designated for it.

I would recommend this product to a friend.

by **Chigana**

Bloomingdale, IL | Tue, Mar 17, 2015

Kenmore Top Freezer Refrigerators

Kenmore Top Freezer Refrigerators

All Kenmore

Research Before You Buy

what is dual cooling in refrigerators
product insights kenmore replacement water filter
product insights kenmore elite cleanflow filter
chest freezers vs upright freezers
what is manual defrost

sears Knowledge Center

Questions & Answers

2 Questions | ask a question

Q: With this m20.4 model for 749.99 will there be pickup available for removing old refrigerator from premises?

asked by **BethHumphrey2510**
Garland, TX | Mon, Jun 8, 2015

0 Answers | Add your Answer | Flag

Q: Is this refrigerator loud?

asked by **dsweb**
Expert
Thu, May 21, 2015

0 Answers | Add your Answer | Flag

Payment Options

$749.99	Choose this offer and pay the discounted price.
$939.99	Buy at regular price and receive a Sears Gift Card for 10% more than your cash savings. To redeem, email Salescheck #, first and last name, and telephone number to the email address saveonall@customerservice.sears.com. Please allow up to 30 days for processing. See Details

10HP BALDOR 1760RPM 215T TEFC 3PH MOTOR EM3774T

Catalog Number: EM3774T

Description: 10HP,1760RPM,215T,TEFC,3PH,60HZ,SUPER-E

Ship Weight: 188 lbs.

(http://imageserv11.team-logic.com/store-logic/products/59/3/2/0/0/5/EM3581T_1.jpg)

Click Image to Enlarge

Image for quick reference only.

Features | **Specs** | **Files**

BALDOR Super-E Motors are designed to conserve energy over extended time periods. These premium efficiency designs are available in both Totally Enclosed Fan Cooled and Open Drip Proof construction. All three phase motors are Inverter Ready per NEMA Standard MG1, Part 31.4.4.2. This means the motors in 230 and 460 volts meet NEMA's corona inception voltage requirements, under this Standard, and can withstand peak voltages of up to 1600 volts.

APPLICATIONS: Pumps, compressors, fans, conveyors, machine tools and other applications where three phase power is available.

FEATURES:

- Ball bearings
- Suitable for mounting any position
- Heavy gauge steel and cast iron frames

Manufacturer Part Number: EM3774T
Stock # EM3774T

Price: $998.00

Compare At: $1,687.00

Quantity: 1

Add To Cart

Related Products

(/LEESON-170140/)

10HP LEESON 1760RPM 215T TEFC 3PH WATTSAVER MOTOR 170140.60 (/LEESON-170140/)

$705.00

(/LENZE-ESV752N02TXB.html)

10HP LENZE SMVECTOR VFD 208-240VAC 3PH INPUT ESV752N02TXB (/LENZE-

(/AEG-MBS25-O.html)

MBS25-O AEG 20-25A 3-Phase Manual Motor Starter (/AEG-MBS25-O.html)

(/LENZE-ESV752N04TXB.html)

10HP LENZE SMVECTOR VFD 400-480VAC 3PH INPUT ESV752N04TXB (/LENZE-

(/AEG-MBS25-M.html)

MBS25-M AEG 10-16A 3-Phase Manual Motor Starter (/AEG-MBS25-M.html)

Product Reviews

There are currently no customer reviews for this product.

Be the first to write a review!

We value your opinion. Please take a moment and share what you like or don't like about a product.

Write a review now (/index.cfm?fuseaction=reviews.newReview&prodid=32005)

Semi-Cantilever DSA Solar Carport Frame Pricing

For price quotes and questions, please **contact us**.

Solar Carport Frames

No Weld Bolted Frames

Solar Carport Frame Designs

Solar Carport Frame Engineering

Solar Carport Frame Galleries

Pricing: Semi-Cantilever

Pricing: Semi-Cantilever DSA

Pricing: Tee & Tee-DSA

Carport Installers

Semi-Cant Pricing **Semi-Cant DSA Pricing** **Tee (w/ DSA) Pricing**

DSA seismic 1.81 • 19'-4 1/2" Semi-Cant Frame, 10ga. G90
18' Spacing • 3 Rows • 77" Modules in Portrait < >

DSA seismic 1.81 • 22'-2" Semi-Cant Frame, 10ga. G90
18' Spacing • 4 Rows • 66" Modules in Portrait

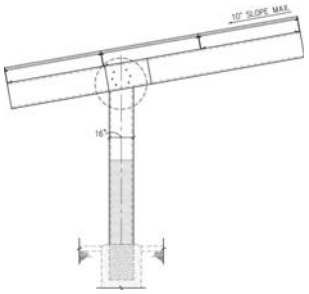
DSA seismic 3.56 • 19'-4 1/2" Semi-Cant Frame, 10ga. G90
18' Spacing • 3 Rows • 77" modules in Portrait

DSA seismic 3.56 • 22'-2" Semi-Cant Frame, 10ga. G90
18' Spacing • 4 Rows • 66" Modules in Portrait

Click button above to change drawings, click drawings below larger image.

DSA seismic 3.56
Solar Carport
19'-4 1/2" Semi-Cant Frame, 10ga. G90

18' Spacing
3 Rows • 77" modules in Portrait

▪ 1) 10ga. 16" x 8" x 20' G90 Box Column with 12ga. x 14' inserts ▪ 1) 10ga. 16" x 8" x 19'-4 1/2" G90 Straight Box Rafter with 30" Welded Side Plates with 2 End and 2 Interior Purlin Clips Screwed in Place ▪ 12) 1/4" x 4" x 4" Plate Washers shipped loose		**1202.69#**	**$1290.00**
▪ 36') 9" x .060" G90 Super Purlin (INT) @ $3.20/lft		**126.00#**	**$115.20**
▪ 36') 9" x .060" G90 Super Purlin (EXT) @ $2.90/lft		**106.20#**	**$104.40**
▪ 66) Gator Clamp @ $1.50/ea *(Now TÜV approved for grounding)*		**9.57#**	**$99.00**
▪ 1) L-2" x 2" x 19'-5" 16ga Sag Angle @ $1.25/lft		**16.51#**	**$24.28**
▪ 2) 2" x 10" 12ga Galv. Knee Brace (for Sag Angle) $2.00/ea		**1.20#**	**$4.00**
Total Weight / Price for 18' section		**1462.17#**	**$1636.88**

Powers Solar Frames, LLC

4118 East Elwood Street
Phoenix, Arizona 85040
888.525.0108

Email Us

16.5 panels x 300 watt = 4950 watt
$1636.88 ÷ 4950 watt = 33.07¢ per watt

End Caps are not included in pricing

T&S B-0165-C35-68H Spray Assembly with 68" Flex Stainless Steel Hose and 0.65 GPM Spray Valve

Only
$243.99/Each

- EPAct 2005 Compliant
- 0.65 GPM spray valve included
- 68" flex stainless steel hose and hanger hook

Item:	510B0165C35H
Units:	Each
Shipping:	Usually Ships in 1-2 Business Days
MFR Item:	B-0165-C35-68H
Condition:	New

Details

SPECS	
Hose Length	68 Inches

WebstaurantStore

http://www.gotowebstore.com/600FPRSVLL

Regency 1.42 GPM Low Lead Pre Rinse Spray Valve

Only
$29.99

✔ 1.42 GPM

Item:	600FPRSVLL
Units:	Each
Shipping:	Usually Ships in 1 Business Day When will I receive my Item?
Reviews:	★★★ 5 reviews

REGENCY
Stainless Steel Commercial
Tables And Sinks

Details

Install a convenient and dependable spray valve on your pre rinse faucet with the Regency 1.42 GPM spray valve! This spray valve features 1.42 GPM flow rate for powerful and consistent use, and it easily attaches to your faucet for fast and easy installation.

SPECS

Flow Rate	1.42 GPM
Lead Free Compliant	Yes
With Hose	No

Customer questions about this product

How hot can the water that I use with this unit be?

This faucet has a maximum operating temperature of 140 degrees Fahrenheit.

Resources

Choosing the Right Faucet Guide

Pre Rinse Faucet Accessories and Components

331 Products

Deck Mount Pre Rinse Faucet Assemblies

144 Products

Wall Mount Pre Rinse Faucet Assemblies

106 Products

Pre Rinse Baskets and Detachable Drainboards

23 Products

Customer Reviews

Overall User Rating: ★★★ (2.6 stars from 5 reviews)

★★★★★

I ordered this sprayer to replace an old, worn out one. I am so impressed! This sprayer looks great, works well, has lots of water pressure and fits comfortably in my hand. Great value!!!

Dorothea A. from **Fisherman's Point Marina** Posted on 03/18/2015

★★★★

Product has worked great as a replacement for our worn out one. Helps save on the water bill as well by focusing water more directly on dishes.

Avery D. from **Ziggeys Inn** Posted on 03/16/2015

★

It was ok , i really did not like it , no pressure , i had to order another one from another supplies because i cant return it .

Mohamed S. from **Luce cucina** Posted on 03/02/2015

Thank you for your review. We are sorry to hear that the faucet was not as strong as you had hoped. We suggest this T&S Pre Rinse Spray Valve for a stronger spray valve.

WEBstaurantStore.com Customer Solutions

★★

This product worked great for a couple of months. But after that it started leaking and has not stopped. Not sure if it's a defective product or it's of that quality because of the price.

Denny B. from **MT Noodles** Posted on 07/03/2014

Thank you for your review! This faucet should not be leaking. A Customer Solutions Representative will be in contact shortly.

WEBstaurantStore.com Customer Solutions

★

No real pressure from this unit. I would look for one with smaller holes on the grate. the rubber ring around the sprayer came off in less after minimal use.

Jerry R. Posted on 05/04/2014

Thank you for reviewing this product. Your account has been credited for the defective spray valve. This product is an excellent value, and should not be leaking. For a more durable option, try a similar pre rinse spray valves such as the T&S 5SV-WH Equip spray valve. Please feel free to contact a Customer Solutions Representative if you are ever unhappy with your purchase.

WEBstaurantStore.com Customer Solutions

WebstaurantStore

http://www.gotowebstore.com/517C8PR4086

Curtron CZN-8-PR-4086 Curtronizer Strip Door for Coolers and Freezers NSF Listed - 40" x 86"

Only
$104.99

Other Available Sizes:

40" x 80"

- For coolers, freezers, and other conditioned storage areas
- Fast and easy installation
- NSF Listed

Item:	517C8PR4086
Units:	Each
Shipping:	Usually Ships in 1-2 Business Days
MFR Item:	CZN-8-PR-4086

Curtron Products
a division of TML LLC

Details

Affordably maintain low temperatures in your walk-in refrigerator or freezer with the Curtron CZN-8-PR-4086 Curtronizer 40" x 86" freezer / refrigerator strip door! This strip door features enough surface area to cover an opening up to 36" wide and 84" high, and the included low-profile polypropylene hardware securely holds your

SPECS

Width	40 Inches
Height	86 Inches
Strip Width	8 Inches
Material	Polar Reinforced
Strip Style	Punched Hole
Thickness	.09375 Inches

PVC strips above a doorway. Each strip comes with holes punched in the top so you can space them evenly across the mounting hardware. These USDA polar reinforced strips are effective in freezer and cooler temperatures as low as -20 degrees Fahrenheit.

NSF Listed.

Dimensions:

Door Width: 40"
Door Height: 86"
Strip Width: 8"
Strip Thickness: 3/32"

Certifications

Resources

- The National Sanitation Foundation (NSF International)
- Health Department Regulations and Inspections

Strip Doors

173 Products

Air Curtains

32 Products

Anti Fatigue Floor Mats

75 Products

Step Stools

2 Products

Get paid to review this product!

If you've used this product, simply log in and share your text, video, and photo

Write a text review
Earn $2.00

Post a product photo
Earn $4.00

Post a product video
Earn $10.00

reviews of it. The customers on the left did it, and you can too! Earn up to $16.00 per product.

Tecogen®

Advanced Modular CHP Systems

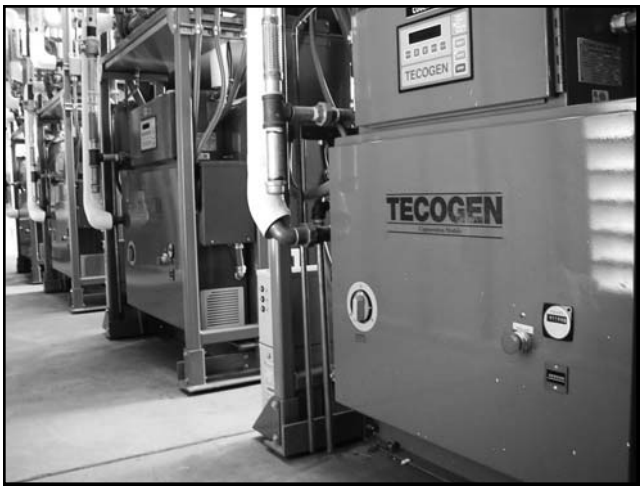
TECOGEN® CM-60 & CM-75 *Ultra*

Ultra Low Emissions Combined Heat and Power Modules

Energy efficiency re-imagined.

Powered by clean, plentiful natural gas.

Tecogen, the pioneer in modular CHP.



Exceptional Cost Savings

Tecogen CHP products are among the most efficient ways to provide electricity and heat to a building. Fueled by plentiful and inexpensive natural gas, a proven internal combustion engine provides on-site generation of electricity while its high-grade waste heat is recovered and purposefully used to serve the building's hot water needs. This boost in overall efficiency translates into immediate dollar savings of up to 50% for building owners.

Clean Energy

Extraordinary efficiency translates into less fuel consumption for the same amount of electrical and thermal energy produced. This results in a considerable reduction in greenhouse gas (GHG) emissions of more than 40%. Also, with Tecogen's patented *Ultra* system, pollutant emissions are nearly eliminated, meeting the toughest air emission standards in the United States including in California and the Northeast. In New Jersey, for instance, the *Ultra* system is air permit exempt. With Ultra, the resulting NOx/CO emissions levels are comparable to, or lower than, those from less efficient gas-consuming generation technologies, such as microturbines and fuel cells.

Unsurpassed Quality and Safety

TECOGEN™ modules are ETL-Listed for product safety certification and have been type tested to comply with the interconnection standards of IEEE P1547/ D07 and NYSIR, and are certified by UL as Non-Islanding. All units are factory run-tested at full-load prior to shipment to ensure superior quality.

Simplified Installation and Interconnection

Modules come fully pre-packaged from the factory, including engine, generator, oil/ jacket/ exhaust heat recovery, controls, electrical switchgear, emissions controls, and modem for remote monitoring and data-logging. This allows for standardization and minimizes installation cost and complexity in the field. Also, the comprehensive third-party (ETL/IEEE/NYSIR/UL) certifications provide streamlined interconnection permitting with the local electric utility.

Tecogen is a leading next-generation manufacturer of natural-gas-fueled, engine-driven, combined heat and power (CHP) products that aim to reduce energy costs, reduce greenhouse gas emissions, and alleviate congestion on the national power grid. The installed base of more than 2,000 units is supported by a unique and established network of factory engineering and field sales and service personnel located in California, the Midwest and the Northeast.

INTERTEK ETL LISTED US

CA Rule 21 - Certified
NJDEP - Air Permit Exempt
NYSIR - Certified

Tecogen Inc. • 45 First Avenue, Waltham, MA 02451 • 781-466-6400 • 781-466-6466 (fax) • www.tecogen.com

Induction-Based Cogeneration

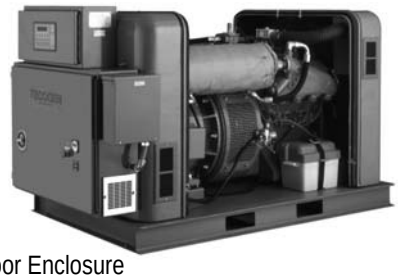
Specifications: [1]

Engine	*Proven Low-Emission Natural Gas V-8 Engine, 454 cid, 1820 rpm*
Generator	*Marathon Induction-Based Generator*
Controls	*TecoNet™ Microprocessor-Based System, Fully Automatic, Fault Monitoring, Lead/Lag Multiple Unit Control, Modbus Networking & Internet-Based Remote Telecommunications*

Model	CM-60 Ultra Low Emissions	CM-75 Ultra Low Emissions
Electrical Output (kW)	60 kW	75 kW
Thermal Output (Btu/hr)	439,000	489,000
Engine Jacket/Exhaust Manifolds **Remote Exhaust Gas Heat Exchanger**	301,000 138,000	336,000 153,000
Gas Input	782 scfh	927 scfh
Overall Efficiency **@ LHV of 905 Btu/scf** **@ HHV of 1020 Btu/scf**	 90.9% 80.7%	 88.8% 78.7%
Required Gas Pressure	10-28" wc	
Design Hot Water Flow	22 gpm (24 gpm max)	
Air Emissions (SCAQMD & NJ DEP Compliant) [2] • **NOx** • **CO** • **VOC**	 < 0.07 lb/MWh < 0.2 lb/MWh < 0.1 lb/MWh	
Maximum Leaving Water Temperature	230° F	
Maximum Entering Water Temperature	180° F	
Electrical Service	208V / 230V / 460V, 3 PH, 3-wire	
Acoustic Level [3]	70 dBa @ 20'	
Dimensions [3]	7' 2"L x 3' 8"W x 3' 10"H	
Weight [3]	3000 lbs	
IEEE P1547/D07 - Certified by Intertek Testing Services to be in compliance with this Draft Standard for Interconnecting Distributed Resources with Electric Power Systems.		
California Rule 21 - Certified to meet the Type Testing and Production Testing requirements for California Rule 21. (www.energy.ca.gov./distgen/interconnection/certification.html)		
NYSIR—Accepted as Type Tested and Approved Equipment by the New York State Public Service Commission Standard Interconnect Requirements. (www.dps.ny.gov/distgen.htm)		

[1] All specifications are +/- 5% and are subject to change without notice.
[2] Emission limits include 60% system efficiency (HHV) credit for Distributed Generation as per CARB 2007.
[3] Specifications shown are for indoor enclosure model.

Performance data is valid up to 100 °F ambient temperature.



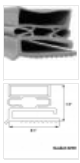
Indoor Enclosure

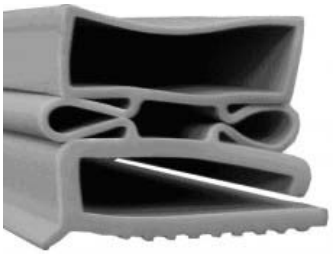
Outdoor Enclosure Option

Tecogen products are covered under one or more of the following U.S. patents: 8,578,704 7,239,034 7,243,017 and other patents pending

Tecogen®

Advanced Modular CHP Systems





click picture to zoom in

Vulcan-Hart Cooler and Freezer Door Gasket Style 2250 36 1/4 x 78

SKU: A2.0202

Part #: A2.0202

$69.88

Quantity: 1

+ ADD TO CART

Usually ships within 1 to 2 business days

Overview | Specifications

Product Description

Commercial Refrigerator/Freezer Gasket 2250

- Screw-in magnetic gasket
- Found on Vulcan commercial walk-in units
- Gasket material constructed of poly-vinyl-chloride (PVC)
- Gasket in gray color
- Gasket is cut and welded at the corners to size
- Customer receives 1 complete gasket
- Gaskets made in an NSF certified facility in the USA
- 36.25 inches wide X 78 inches high
- 3-sided gasket

Cooler make and model data is for reference only. Please use your model number and serial number to ensure that you receive the correct gasket.

How to measure a refrigeration gasket

Related Product

Perlick Cooler and Freezer Door Gasket Style 2209 24 x 63 3/4

$53.05

SKU:A2.0241

Leer Cooler and Freezer Door Gasket Style 10095 20 1/8 x 22 1/8

$28.11

SKU:A2.0439

True Cooler and Freezer Door Gasket Style 2209 30 x 68 1/4

$59.40

SKU:A2.1729

Randell Cooler and Freezer Door Gasket Style 2257 25 15/16 x 57 1/2

$55.80

SKU:A2.0182

Victory/Raetone Cooler and Freezer Door Gasket Style 9555 25 3/8 x 53 1/2

$49.23

SKU:A2.1843

Category Map

Refrigeration
- Gaskets
- Curtains and Doors
- Evaporators, Condensers, and Parts

Appliances and Kitchen Equipment
- Mixer Parts
- Opener Parts
- Ovens and Broilers

Accessories
- Tape and Adhesive
- Cleaning Products
- Fasteners
- Part Trays

Hardware
- Bearings and Slides
- Latches and Handles
- Window Glass
- Latches & Handles

- Thermostats
- Timers and Controls
- Slicer Parts
- Accessories
- Burners
- Kitchen Equipment
- Thermometers
- Tools
- Hinges
- Closers
- Drawer Hardware
- Hold-opens

Electrical

- Connectors and Terminal Blocks
- Contactors and Relays
- Cords
- Fuses and Fuse Holders
- Heaters
- Ignition Control
- Motors and Accessories
- Plugs and Recepticles
- Pumps, Motors, and Fans
- Signal Lights
- Switches
- Terminals
- Transformers
- Door Heaters
- Lighting

Plumbing

- Coffee and Water Dispenser Parts
- Conversion Adapters
- Faucets
- Hot Water and Steam
- Sink Drains and Strainers
- Swirl Water Hoses
- Waste Drain Parts
- Waste Drains
- Filtration
- Pre-Rinse

Brands

- A-C
- D-F
- G-I
- J-L
- M-O
- P-R
- S-U
- V-X

Frost King - V75 - Weatherstripping Type: Indoor Shrink Film and Tape Weather Kit Length: 210.000 (Decimal Inch)

Mfr Part #: V75 MSC Part #: 32996019 Write the first review

Price: $28.02 ea.

Qty: 1

Order Qty of 1 = (1) 2 Piece Kit

$28.02

Add to Cart

In Stock

Would you like to provide feedback on this item?

Specs

Weatherstripping; Type: Indoor Shrink Film and Tape Weather Kit; Length: 210.000 (Decimal Inch); Width: 62 (Inch); Material: Clear Plastic

Type	Indoor Shrink Film and Tape Weather Kit
Length (Decimal Inch)	210.000
Width (Inch)	62
Material	Clear Plastic

Frost King

Brand:	Frost King
MSC Part #:	32996019
Mfr Part #:	V75
UPC #:	077578018485
Big Book Page #:	**2222**

Customers Also Viewed

Pemko
MSC #: 32963175
Weatherstripping Type: SiliconsealTM Self-Adhesive
Price: $40.80 ea.
Add to Cart

Pemko
MSC #: 79629002
Weatherstripping Type: Adhesive Perimeter Gasketing
Price: $50.20 ea.
Add to Cart

Pemko
MSC #: 32962300
Weatherstripping Type: Head & Jamb Length: 84.000
Price: $50.87 ea.
Add to Cart

Pemko
MSC #: 32962417
Weatherstripping Type: Heavy-Duty Head & Jamb
Price: $36.86 ea.
Add to Cart

Alternate Products

There are no Alternates listed for this item.

Product Reviews

Be the first to write a review

Customers Also Bought

Energizer
MSC #: 06505788

Batteries Type: General Purpose Battery Size: AA

Price: $4.54 ea.

Add to Cart

Duracell
MSC #: 00186502

Batteries Type: General Purpose Battery Size: AA

Price: $4.54 ea.

Add to Cart

Interstate
MSC #: 01180223

11/32 Inch, 118 Degree Point Angle, Oxide Coated, High

Price: $3.80 ea.

Add to Cart

Made in USA
MSC #: 00390823

1 Inch Outside Diameter x 1/4 Inch Thick Reducing Wheel

Price: $2.89 ea.

Add to Cart

Popular Items

MSA
MSC #: 98713845

Hard Hats Type: Standard ANSI Type I

Add to Cart

3M
MSC #: 03356540

9 Inch Long x 6 Inch Wide x 1/4 Inch Thick Aluminum Oxide

Add to Cart

Energizer
MSC #: 76580935

Batteries Type: Button/Coin Cell Battery Size: 357/303

Add to Cart

PRO-SAFE
MSC #: 89374268

Lens Cleaning Towelettes & Tissues Cleaner Type:

Add to Cart

Price: $19.53 ea.	**Price: $1.45 ea.**	**Price: $2.32 ea.**	**Price: $11.40 ea.**

From the Manufacturer

Manufacturer information is not available at this time.

Similar Keywords

material plastic clear

Similar Items

"National Guard Products

Weatherstripping| Type: Heavy Duty ... ...

Quickview

Pemko Weatherstripping; Type:

Weatherstripping| Type: Adhesive ... ...

Quickview

"National Guard Products

Weatherstripping| Type: Head & ... ...

Quickview

Appendix F

Consultant Field Data Sheets

Utility Rate Analysis

Simulation based on Existing Utility Rates

Rate Simulation Summary

ELECTRICITY

Comment:

Rate Simulation is a tool used to determine a facility's present-day electricity rate ($/kWh) by means of recently published utility data and a facility's historical energy use patterns. Resulting rates are used in the payback analysis of proposed projects presented in this study. In the simulation, an "Energy Rate" and an "Effective Electricity Rate" are calculated. The "Energy Rate" excludes demand charges (if any), whereas the "Effective Rate" includes all charges. 'Non-Demand-Saving' rates are utilized in projects such as occupancy sensors, 'Demand Saving' rates are utilized in projects such as lighting conversions and HVAC unit replacements.

Facility	Meter	Rate	Energy Use (kWh)	% of Total Energy Use	Energy Charges	Demand Charges	Energy Rate ($/kWh)	Effective Rate ($/kWh)
South Lake Tahoe HS	197686	A3	1,316,400	43%	$100,057	$39,521	$0.076	$0.106
South Lake Tahoe MS	200744	A3	790,000	26%	$60,302	$25,065	$0.076	$0.108
Tahoe Valley Elementary School--permanent buildings	117239	A2	245,040	8%	$24,731	$5,874	$0.101	$0.125
Tahoe Valley Elementary School--Portable Classrooms	191037	A1	52,140	2%	$7,778	$0	$0.149	$0.149
Tahoe Valley Elementary School--Outdoor Lighting	OLG06-1252	SL/OL	479	0.0%	$0	na	na	na
South Tahoe High School -- Areas Not Audited	various	various	680,938	22%	na	na	na	na
South Tahoe MIddle School -- Areas Not Audited	various	various	7,728	0.2%	na	na	na	na
Total			**3,092,725**	**100%**				

Note: entries above for "Areas Not Audited" are for meters that do not serve equipment in the audited areas
Streetlight/Outdoor lighting rate SL/OL has no separate charge for energy

NATURAL GAS

Facility	Account	Rate	Energy Use (Therms)	% of Total Energy Use	Energy Cost ($)	Effective Rate ($/Therm)
South Lake Tahoe HS	141-1233003-002	SLT-40	300,820	76%	$248,158	$0.82
South Lake Tahoe MS	141-1072205-001	SLT-40	75,011	19%	$64,645	$0.86
Tahoe Valley Elementary School	141-1072205-001	SLT-40	17,623	4%	$16,930	$0.96
Total			**393,454**	**100%**	**$329,733**	**$0.84**

ELECTRICITY

Site Name: STHS
Service Address: 1735 Lake Tahoe Blvd.
Building: All except CTE, Scoreboard, Snack Shack, and outdoor lights
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule: A3
Service Agreement ID:
Account ID: 88543852
Meter #: 197686

Note: Summer Season: June-September Winter Season: October -May

Season		Total Energy Rate *($/kWh)*	Demand charge *($/kw)*	Customer Charges *($/meter/ month)*
	Winter Rate			
1	Maximum Demand		$3.87	$1,341.77
	On-Peak	$0.0828	$6.32	
	Partial-Peak	$0.0819	$2.47	
	Off-Peak	$0.0634		
	Summer Rate			
2	Maximum Demand		$3.87	
	On Peak	$0.0877	$12.56	
	Off-Peak	$0.0637		

Rate Effective : January 1, 2015

Total Energy Rate includes Carbon Pollution Permit Cost of $0.00332 per kWh
Customer Charges include Vegetation Management fee of $698.29 per month

No.	Month	Date Read	Days Billed	Total Usage	*Winter Energy*			*Summer Energy*		*Max Demand*	*Winter Demand*			*Summer*
					On Peak	Partial Peak	Off Peak	Partial Peak	Off Peak		On Peak	Part Peak	Off Peak	On Peak
				kWh	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kW*	*kW*	*kW*	*kW*	*kW*
1	May	5/29/14	30	109,280	19,680	55,040	34,560	0	0	264	180	264	190	0
2	June	6/27/14	29	95,440	1,920	4,400	2,480	44,560	42,080	258	0	0	0	258
3	July	7/30/14	33	86,320	0	0	0	43,200	43,120	146	0	0	0	146
4	August	8/28/14	29	80,480	0	0	0	41,840	38,640	237	0	0	0	237
5	September	9/29/14	32	107,840	0	0	0	57,920	49,920	239	0	0	0	239
6	October	10/28/14	29	98,800	15,040	48,800	29,200	3,760	2,000	249	158	249	178	238
7	November	11/26/14	29	113,200	20,000	56,080	37,120	0	0	272	179	272	200	0
8	December	12/29/14	33	132,720	24,480	62,560	45,680	0	0	290	230	290	216	0

9	January	1/28/15	30	126,000	22,720	61,440	41,840	0	0	284	190	284	222	0
10	February	2/27/15	30	124,000	22,160	60,560	41,280	0	0	289	231	289	220	0
11	March	3/27/15	28	119,120	20,000	60,160	38,960	0	0	288	231	288	220	0
12	April	4/28/15	32	123,200	21,120	60,000	42,080	0	0	277	169	277	220	0
TOTAL			364	1,316,400	167,120	469,040	313,200	191,280	175,760	-	-		-	-

NATURAL GAS

Site Name: South Tahoe High School
Service Address: 1735 Lake Tahoe Blvd.
Service Type: **Natural Gas**
Service Provider: Southwest Gas Co
Rate Schedule: SLT-40
Service Account ID:
Account ID: 141-1233003-002
Meter #:

SLT-40-Core General Gas Service
Rate Effective May 1, 2015

First Tier	Second Tier	Third Tier
$1.05238	$0.99073	$0.92908

				AS PAID						AT CURRENT RATES		
No.	Month	Date Read	Days Billed	First Tier	Second Tier	Third Tier	Fourth Tier	Total Therms	Gas Cost	Ave. Rate			*Char*
									$	*$/Therms*	First Tier	Second Tier	Third Tier
1	May	6/3/14	29	100	500	2,400	8,259	11,259	$10,434.04	*$0.93*	$105.24	$495.37	$2,229.79
2	June	7/3/14	30	100	500	1,361	0	1,961	$1,975.85	*$1.01*	$105.24	$495.37	$1,264.48
3	July	8/4/14	32	57	0	0	0	57	$114.89	*$2.02*	$59.99	$0.00	$0.00
4	August	9/3/14	30	100	63	0	0	163	$190.68	*$1.17*	$105.24	$62.42	$0.00
5	September	10/2/14	29	100	361	0	0	461	$496.25	*$1.08*	$105.24	$357.65	$0.00
6	October	10/31/14	29	100	500	2,400	3,906	6,906	$6,460.77	*$0.94*	$105.24	$495.37	$2,229.79
7	November	12/4/14	34	100	500	2,400	38,516	41,516	$37,037.43	*$0.89*	$105.24	$495.37	$2,229.79
8	December	1/6/15	33	100	500	2,400	57,116	60,116	$53,182.52	*$0.88*	$105.24	$495.37	$2,229.79
9	January	2/4/15	29	100	500	2,400	48,046	51,046	$50,365.93	*$0.99*	$105.24	$495.37	$2,229.79
10	February	3/6/15	30	100	500	2,400	49,229	52,229	$49,858.81	*$0.95*	$105.24	$495.37	$2,229.79
11	March	4/6/15	31	100	500	2,400	39,984	42,984	$39,767.08	*$0.93*	$105.24	$495.37	$2,229.79
12	April	5/5/15	29	100	500	2,400	29,122	32,122	$27,180.91	*$0.85*	$105.24	$495.37	$2,229.79
	Total		**365**	1,157	4,924	20,561	274,178	300,820	$277,065.16	*$0.92*	$1,217.60	$4,878.35	$19,102.81

AS PAID

Demand	Total Charges		
Off Peak	Electric Charges	Average Rate	
kW	*$*	*$/kWh*	
0	$13,094.56	$	0.120
245	$10,901.29	$	0.114
144	$11,902.02	$	0.138
230	$14,140.60	$	0.176
238	$12,017.85	$	0.111
231	$13,474.81	$	0.136
0	$13,474.81	$	0.119
0	$15,472.48	$	0.117

AT CURRENT RATES

Charges at Current Rates						
Energy Charges	**Demand Charges**	**Total Energy and Demand Cost**	**Customer Charges**	**Total Electric Charges**	**Average Energy Rate**	**Effective Rate**
$	*$*	*$*	*$*	*$*	*$/kWh*	*$/kWh*
$8,327	$2,811	$11,138	$1,298	$12,436	$0.076	$0.102
$7,263	$4,022	$11,285	$1,255	$12,540	$0.076	$0.118
$6,534	$2,405	$8,939	$1,428	$10,367	$0.076	$0.104
$6,129	$3,891	$10,020	$1,255	$11,275	$0.076	$0.125
$8,257	$3,930	$12,187	$1,385	$13,572	$0.077	$0.113
$7,549	$3,909	$11,458	$1,255	$12,713	$0.076	$0.116
$8,600	$2,857	$11,458	$1,255	$12,713	$0.076	$0.101
$10,045	$3,292	$13,337	$1,428	$14,765	$0.076	$0.100

0	$14,553.20	$ 0.116	$9,564	$3,004	$12,568	$1,298	$13,866	$0.076	$0.100
0	$14,701.14	$ 0.119	$9,410	$3,292	$12,702	$1,298	$14,000	$0.076	$0.102
0	$14,312.32	$ 0.120	$9,051	$3,286	$12,337	$1,212	$13,549	$0.076	$0.104
0	$13,675.38	$ 0.111	$9,329	$2,822	$12,150	$1,385	$13,535	$0.076	$0.099
	$ 161,720	$ 0.123	$ 100,057	$ 39,521	$ 139,578	$ 15,755	$ 155,333	$0.076	$0.106

Fourth Tier	Customer
$0.81271	$11.00

ges at Current Rates

Fourth Tier	Customer	Gas Cost	Ave. Rate
$6,712.17	$11.00	$9,553.57	$0.85
$0.00	$11.00	$1,876.08	$0.96
$0.00	$11.00	$70.99	$1.25
$0.00	$11.00	$178.65	$1.10
$0.00	$11.00	$473.89	$1.03
$3,174.45	$11.00	$6,015.84	$0.87
$31,302.34	$11.00	$34,143.73	$0.82
$46,418.74	$11.00	$49,260.14	$0.82
$39,047.46	$11.00	$41,888.86	$0.82
$40,008.90	$11.00	$42,850.30	$0.82
$32,495.40	$11.00	$35,336.79	$0.82
$23,667.74	$11.00	$26,509.14	$0.83
$222,827.20	$132.00	$248,157.97	$0.82

ELECTRICITY

Site Name: STMS
Service Address: 2950 Lake Tahoe Blvd.
Building: All except pump and outdoor lights
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule: A3
Service Agreement ID:
Account ID: 88543902
Meter #: 200744

Note: Summer Season: June-September Winter Season: October -May

Season		Total Energy Rate *($/kWh)*	Demand charge *($/kw)*	Customer Charges *($/meter/ month)*
	Winter Rate			
1	Maximum Demand		$3.87	
	On-Peak	$0.0828	$6.32	
	Partial-Peak	$0.0819	$2.47	
	Off-Peak	$0.0634		$1,341.77
	Summer Rate			
2	Maximum Demand		$3.87	
	On Peak	$0.0877	$12.56	
	Off-Peak	$0.0637		

Rate Effective :

Total Energy Rate includes Carbon Pollution Permit Cost of $0.00332 per kWh
Customer Charges include Vegetation Management fee of $698.29 per month

No.	Month	Date Read	Days Billed	Total Usage	*Winter Energy*			*Summer Energy*		*Max Demand*	*Winter Demand*			*Summer*
					On Peak	Partial Peak	Off Peak	Partial Peak	Off Peak		On Peak	Part Peak	Off Peak	On Peak
				kWh	*kWh*	*kWh*	*kWh*	*kWh*	*kWh*	*kW*	*kW*	*kW*	*kW*	*kW*
1	May	6/9/14	31	71,600	10,300	26,700	16,400	9,300	8,900	171	119	171	130	154
2	June	7/9/14	30	48,200	0	0	0	24,700	23,500	139	0	0	0	138
3	July	8/7/14	29	39,400	0	0	0	20,000	19,400	84	0	0	0	84
4	August	9/8/14	32	47,900	0	0	0	25,600	22,300	149	0	0	0	141
5	September	10/7/14	29	53,300	1,900	6,700	3,600	23,300	17,800	170	91	170	109	157
6	October	11/6/14	30	67,500	11,900	36,100	19,500	0	0	199	114	199	139	0
7	November	12/8/14	32	76,500	14,400	38,200	23,900	0	0	207	121	207	154	0

8	December	1/7/15	30	74,100	14,300	35,000	24,800	0	0	202	125	202	154	0
9	January	2/5/15	29	82,200	15,500	41,700	25,000	0	0	209	137	209	161	0
10	February	3/9/15	32	82,900	15,900	40,500	26,500	0	0	213	135	213	158	0
11	March	4/8/15	30	76,100	13,900	39,000	23,200	0	0	198	129	198	156	0
12	April	5/7/15	30	70,300	12,600	36,300	21,400	0	0	196	136	196	147	0
TOTAL			364	790,000	110,700	300,200	184,300	102,900	91,900	-	-		-	-

NATURAL GAS

Site Name: South Tahoe Middle School
Service Address: 2940 Lake Tahoe Blvd.
Service Type: **Natural Gas**
Service Provider: Southwest Gas Co
Rate Schedule: SLT-40
Service Account ID:
Account ID: 141-1072205-001
Meter #:

SLT-40-Core General Gas Service
Rate Effective May 1, 2015

First Tier	Second Tier	Third Tier
$1.05238	$0.99073	$0.92908

				AS PAID						AT CURRENT RATES		
												Charc
No.	Month	Date Read	Days Billed	First Tier	Second Tier	Third Tier	Fourth Tier	Total Therms	Gas Cost	Ave. Rate	First Tier	Second Tier	Third Tier
									$	*$/Therms*			
1	May	6/18/14	29	100	500	2,400	26	3,026	$2,830.33	*$0.94*	$105.24	$495.37	$2,229.79
2	June	7/18/14	30	100	74	0	0	174	$212.40	*$1.22*	$105.24	$73.31	$0.00
3	July	8/18/14	31	100	70	0	0	170	$202.90	*$1.19*	$105.24	$69.35	$0.00
4	August	9/17/14	30	100	218	0	0	318	$351.39	*$1.11*	$105.24	$215.98	$0.00
5	September	10/16/14	29	100	500	1,405	0	2,005	$2,031.48	*$1.01*	$105.24	$495.37	$1,305.36
6	October	11/17/14	32	100	500	2,400	4,621	7,621	$7,118.29	*$0.93*	$105.24	$495.37	$2,229.79
7	November	12/17/14	30	100	500	2,400	8,046	11,046	$9,985.72	*$0.90*	$105.24	$495.37	$2,229.79
8	December	1/20/15	34	100	500	2,400	12,168	15,168	$14,559.98	*$0.96*	$105.24	$495.37	$2,229.79
9	January	2/19/15	30	100	500	2,400	7,676	10,676	$10,676.21	*$1.00*	$105.24	$495.37	$2,229.79
10	February	3/20/15	29	100	500	2,400	7,217	10,217	$9,999.89	*$0.98*	$105.24	$495.37	$2,229.79
11	March	4/20/15	31	100	500	2,400	5,619	8,619	$7,920.86	*$0.92*	$105.24	$495.37	$2,229.79
12	April	5/19/15	31	100	500	2,400	2,971	5,971	$5,307.99	*$0.89*	$105.24	$495.37	$2,229.79
	Total		**366**	1,200	4,862	20,605	48,344	75,011	$71,197.44	*$0.95*	$1,262.86	$4,816.93	$19,143.69

AS PAID

Demand	*Total Charges*	
Off Peak	Electric Charges	Average Rate
kW	*$*	*$/kWh*
166	8,393	$ 0.117
139	6,917	$ 0.144
76	5,865	$ 0.149
149	7,487	$ 0.156
159	7,976	$ 0.150
0	8,716	$ 0.129
0	9,529	$ 0.125

AT CURRENT RATES

Charges at Current Rates						
Energy Charges	**Demand Charges**	**Total Energy and Demand Cost**	**Customer Charges**	**Total Electric Charges**	**Average Energy Rate**	**Effective Rate**
$	*$*	*$*	*$*	*$*	*$/kWh*	*$/kWh*
$5,461	$2,057	$7,518	$1,342	$8,859	$0.076	$0.105
$3,662	$2,156	$5,818	$1,298	$7,116	$0.076	$0.121
$2,989	$1,380	$4,369	$1,255	$5,624	$0.076	$0.111
$3,665	$2,348	$6,012	$1,385	$7,397	$0.077	$0.126
$4,110	$2,428	$6,538	$1,255	$7,793	$0.077	$0.123
$5,177	$1,982	$7,159	$1,298	$8,458	$0.077	$0.106
$5,835	$2,077	$7,912	$1,385	$9,297	$0.076	$0.103

0	9,274	$ 0.125
0	10,027	$ 0.122
0	10,086	$ 0.122
0	9,334	$ 0.123
0	8,753	$ 0.125
	$ 102,356	$ 0.130

$5,622	$2,071	$7,692	$1,298	$8,991	$0.076	$0.104
$6,282	$2,191	$8,473	$1,255	$9,728	$0.076	$0.103
$6,312	$2,204	$8,516	$1,385	$9,901	$0.076	$0.103
$5,815	$2,071	$7,885	$1,298	$9,184	$0.076	$0.104
$5,372	$2,102	$7,474	$1,298	$8,773	$0.076	$0.106
$ 60,302	$ 25,065	$ 85,367	$ 15,755	$ 101,122	$0.076	$0.108

Fourth Tier	Customer
$0.81271	$11.00

ges at Current Rates

Fourth Tier	Customer	Gas Cost	Ave. Rate
$21.13	$11.00	$2,862.53	$0.95
$0.00	$11.00	$189.55	$1.09
$0.00	$11.00	$185.59	$1.09
$0.00	$11.00	$332.22	$1.04
$0.00	$11.00	$1,916.96	$0.96
$3,755.53	$11.00	$6,596.93	$0.87
$6,539.06	$11.00	$9,380.46	$0.85
$9,889.06	$11.00	$12,730.45	$0.84
$6,238.36	$11.00	$9,079.76	$0.85
$5,865.33	$11.00	$8,706.72	$0.85
$4,566.62	$11.00	$7,408.01	$0.86
$2,414.56	$11.00	$5,255.96	$0.88
$39,289.65	$132.00	$64,645.13	$0.86

ELECTRICITY

Site Name: Tahoe Valley ES
Service Address: 943 Tahoe Island Drive
Building: Main
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule: A2
Service Agreement ID:
Account ID: 88543857
Meter #: 117239

Note: Summer Season: June-September Winter Season: October - May

Season		Total Energy Rate *($/kWh)*	Demand charge *($/kw)*	Customer Rate *($/meter/month)*
1	**Summer Rate**			$92.54
	all	$0.1312	$5.08	
2	**Winter Rate**			
	all	$0.0893	$7.81	

Rate Effective : January 1, 2015

Total Energy Rate includes Carbon Pollution Permit Cost of $0.00332 per kWh
and Vegetation Management Charge of $0.00513 per kWh

				AS PAID								AT CURRENT RATES		
				Energy			*Demand*			*Total Charges*		*Charg*		
No.	Month	Date Read	Days Billed	Total Energy	Summer Energy	Winter Energy	Max Demand	Summer Demand	Winter Demand	Electric Charges	Ave. Rate	**Energy Charges**	**Demand Charges**	**Total Energy and Demand Cost**
				kWh	*kWh*	*kWh*	*kW*	*kW*	*kW*	*$*	*$/kWh*	*$*	*$*	*$*
1	May	6/3/14	31	22,680	2,195	20,485	73	7	66	$ 2,855	$ 0.126	$2,118	$552	$2,670
2	June	7/2/14	29	17,520	17,520	0	67	67	0	$ 2,804	$ 0.160	$2,299	$341	$2,640
3	July	8/1/14	30	12,000	12,000	0	43	43	0	$ 1,936	$ 0.161	$1,574	$219	$1,794
4	August	9/2/14	32	16,920	16,920	0	62	62	0	$ 2,700	$ 0.160	$2,220	$317	$2,537
5	September	10/1/14	29	19,200	19,200	0	72	72	0	$ 3,036	$ 0.158	$2,519	$366	$2,885
6	October	10/31/14	30	21,600	0	21,600	73	0	73	$ 2,682	$ 0.124	$1,930	$572	$2,501
7	November	12/2/14	32	23,280	0	23,280	79	0	79	$ 2,887	$ 0.124	$2,080	$619	$2,698
8	December	12/31/14	29	21,000	0	21,000	76	0	76	$ 2,644	$ 0.126	$1,876	$590	$2,466
9	January	1/29/15	29	23,040	0	23,040	77	0	77	$ 2,830	$ 0.123	$2,058	$600	$2,658
10	February	3/3/15	33	25,320	0	25,320	73	0	73	$ 3,015	$ 0.119	$2,262	$572	$2,834
11	March	3/31/15	28	21,480	0	21,480	73	0	73	$ 2,656	$ 0.124	$1,919	$572	$2,491
12	April	4/30/15	30	21,000	0	21,000	71	0	71	$ 2,504	$ 0.119	$1,876	$555	$2,431
TOTAL			362	245,040	67,835	177,205	-	-	-	$ 32,548	$ 0.133	$ 24,731	$5,874	$ 30,605

Consultant Sheets

Consultant Sheets

Site Name: Tahoe Valley ES
Service Address: 943 Tahoe Island Drive
Building: Portables
Service Type: **Electricity**
Service Provider: Liberty Utilities
Rate Schedule: A1
Service Agreement ID:
Account ID: 88525742
Meter #: 191037

Note: Summer Season: June-September Winter Season: October - May

Season		Total Energy Rate *($/kWh)*	Demand charge *($/kw)*	Customer Rate *($/meter/month)*
1	**Summer Rate**			$13.44
	all	$0.1492	$0.00	
2	**Winter Rate**			
	all	$0.1492	$0.00	

Rate Effective : January 1, 2015

Total Energy Rate includes Carbon Pollution Permit Cost of $0.00332 per kWh
and Vegetation Management Charge of $0.00443 per kWh

				AS PAID								AT CURRENT RATES		
				Energy			*Demand*			*Total Charges*				*Charg*
No.	Month	Date Read	Days Billed	Total Energy	Summer Energy	Winter Energy	Max Demand	Summer Demand	Winter Demand	Electric Charges	Ave. Rate	**Energy Charges**	**Demand Charges**	**Total Energy and Demand Cost**
				kWh	*kWh*	*kWh*	*kW*	*kW*	*kW*	*$*	*$/kWh*	*$*	*$*	*$*
1	May	6/3/14	31	4,080	395	3,685				$ 638	$ 0.156	$609	$0	$609
2	June	7/2/14	29	2,660		2,660				$ 421	$ 0.158	$397	$0	$397
3	July	8/1/14	30	1,520		1,520				$ 246	$ 0.162	$227	$0	$227
4	August	9/2/14	32	3,100		3,100				$ 488	$ 0.157	$462	$0	$462
5	September	10/1/14	29	3,380		3,380				$ 531	$ 0.157	$504	$0	$504
6	October	10/31/14	30	4,180		4,180				$ 653	$ 0.156	$624	$0	$624
7	November	12/2/14	32	5,620	5,620	0				$ 874	$ 0.156	$838	$0	$838
8	December	12/31/14	29	5,640	5,640	0				$ 877	$ 0.156	$841	$0	$841
9	January	1/29/15	29	6,160	6,160	0				$ 953	$ 0.155	$919	$0	$919
10	February	3/3/15	33	6,480	6,480	0				$ 1,002	$ 0.155	$967	$0	$967
11	March	3/31/15	28	4,360	4,360	0				$ 679	$ 0.156	$650	$0	$650
12	April	4/30/15	30	4,960	4,960	0				$ 745	$ 0.150	$740	$0	$740
TOTAL			362	52,140	33,615	18,525	-	-	-	$ 8,108	$ 0.156	$ 7,778	$0	$ 7,778

NATURAL GAS

Site Name: South Tahoe Middle School
Service Address: 2940 Lake Tahoe Blvd.
Service Type: **Natural Gas**
Service Provider: Southwest Gas Co
Rate Schedule: SLT-40
Service Account ID:
Account ID: 141-1072205-001
Meter #:

SLT-40-Core General Gas Service
Rate Effective May 1, 2015

First Tier	Second Tier	Third Tier	Fourth Tier
$1.05238	$0.99073	$0.92908	$0.81271

				AS PAID						AT CURRENT RATES			
													Charges at Curren
No.	Month	Date Read	Days Billed	First Tier	Second Tier	Third Tier	Fourth Tier	Total Therms	Gas Cost *$*	Ave. Rate *$/Therms*	First Tier	Second Tier	Third Tier	Fourth Tier
1	May	6/2/14	30	100	500	631	0	1,231	$1,183.51	*$0.96*	$105.24	$495.37	$586.25	$0.00
2	June	7/1/14	29	100	173	0	0	273	$292.19	*$1.07*	$105.24	$171.40	$0.00	$0.00
3	July	7/31/14	30	100	4	0	0	104	$134.31	*$1.29*	$105.24	$3.96	$0.00	$0.00
4	August	8/29/14	29	100	0	0	0	100	$123.86	*$1.24*	$105.24	$0.00	$0.00	$0.00
5	September	9/30/14	32	100	309	0	0	409	$442.55	*$1.08*	$105.24	$306.14	$0.00	$0.00
6	October	10/29/14	29	100	500	764	0	1,364	$1,408.05	*$1.03*	$105.24	$495.37	$709.82	$0.00
7	November	12/2/14	34	100	500	1,802	0	2,402	$2,456.72	*$1.02*	$105.24	$495.37	$1,674.20	$0.00
8	December	1/2/15	31	100	500	2,482	0	3,082	$3,060.37	*$0.99*	$105.24	$495.37	$2,305.98	$0.00
9	January	2/2/15	31	100	500	2,456	0	3,056	$3,401.90	*$1.11*	$105.24	$495.37	$2,281.82	$0.00
10	February	3/4/15	30	100	500	1,805	0	2,405	$2,613.82	*$1.09*	$105.24	$495.37	$1,676.99	$0.00
11	March	4/2/15	29	100	500	1,045	0	1,645	$1,771.81	*$1.08*	$105.24	$495.37	$970.89	$0.00
12	April	5/1/15	29	100	500	952	0	1,552	$1,533.95	*$0.99*	$105.24	$495.37	$884.48	$0.00
	Total		**363**	1,200	4,486	11,937	0	17,623	$18,423.04	*$1.05*	$1,262.86	$4,444.41	$11,090.43	$0.00

es at Current Rates

Customer Charge	Total Charge	Average Energy Rate ($/kWh)	Effective Rate ($/kWh)
$	*$*	*$/kWh*	*$/kWh*
$93	$2,763	$0.093	$0.118
$93	$2,732	$0.131	$0.151
$93	$1,886	$0.131	$0.149
$93	$2,629	$0.131	$0.150
$93	$2,977	$0.131	$0.150
$93	$2,594	$0.089	$0.116
$93	$2,791	$0.089	$0.116
$93	$2,559	$0.089	$0.117
$93	$2,751	$0.089	$0.115
$93	$2,926	$0.089	$0.112
$93	$2,583	$0.089	$0.116
$93	$2,523	$0.089	$0.116
$ 1,110	$ 31,715	$0.101	$0.125

Consultant Sheets

es at Current Rates

Customer Charge	Total Electric Charges	Average Energy Rate ($/kWh)	Effective Rate ($/kWh)
$	*$*	*$/kWh*	*$/kWh*
$13	$622	$0.149	$0.149
$13	$410	$0.149	$0.149
$13	$240	$0.149	$0.149
$13	$476	$0.149	$0.149
$13	$518	$0.149	$0.149
$13	$637	$0.149	$0.149
$13	$852	$0.149	$0.149
$13	$855	$0.149	$0.149
$13	$932	$0.149	$0.149
$13	$980	$0.149	$0.149
$13	$664	$0.149	$0.149
$13	$753	$0.149	$0.149
$ 161	$ 7,939	$0.149	$0.149

Customer
$11.00

ıt Rates

Customer	Gas Cost	Ave. Rate
$11.00	$1,197.85	$0.97
$11.00	$287.63	$1.05
$11.00	$120.20	$1.16
$11.00	$116.24	$1.16
$11.00	$422.37	$1.03
$11.00	$1,321.42	$0.97
$11.00	$2,285.81	$0.95
$11.00	$2,917.58	$0.95
$11.00	$2,893.42	$0.95
$11.00	$2,288.59	$0.95
$11.00	$1,582.49	$0.96
$11.00	$1,496.09	$0.96
$132.00	$16,929.70	$0.96

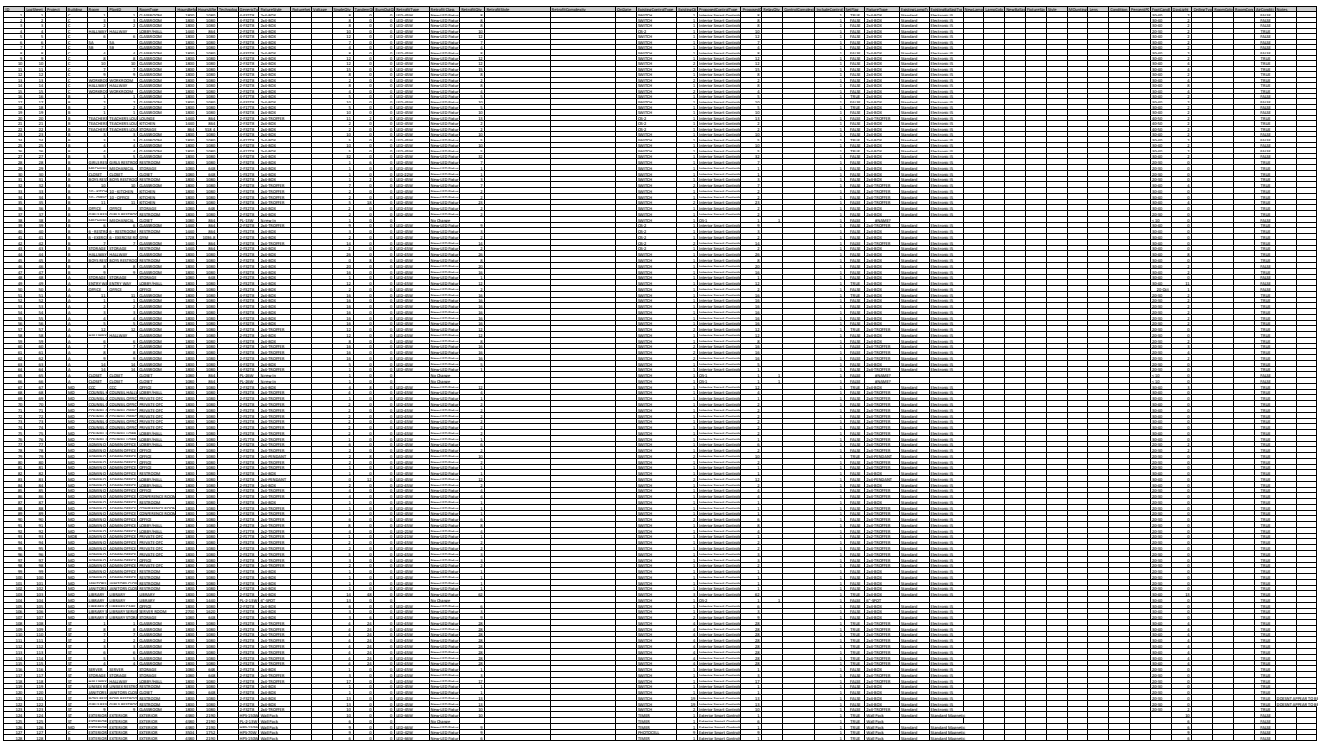
Lighting Systems Audit

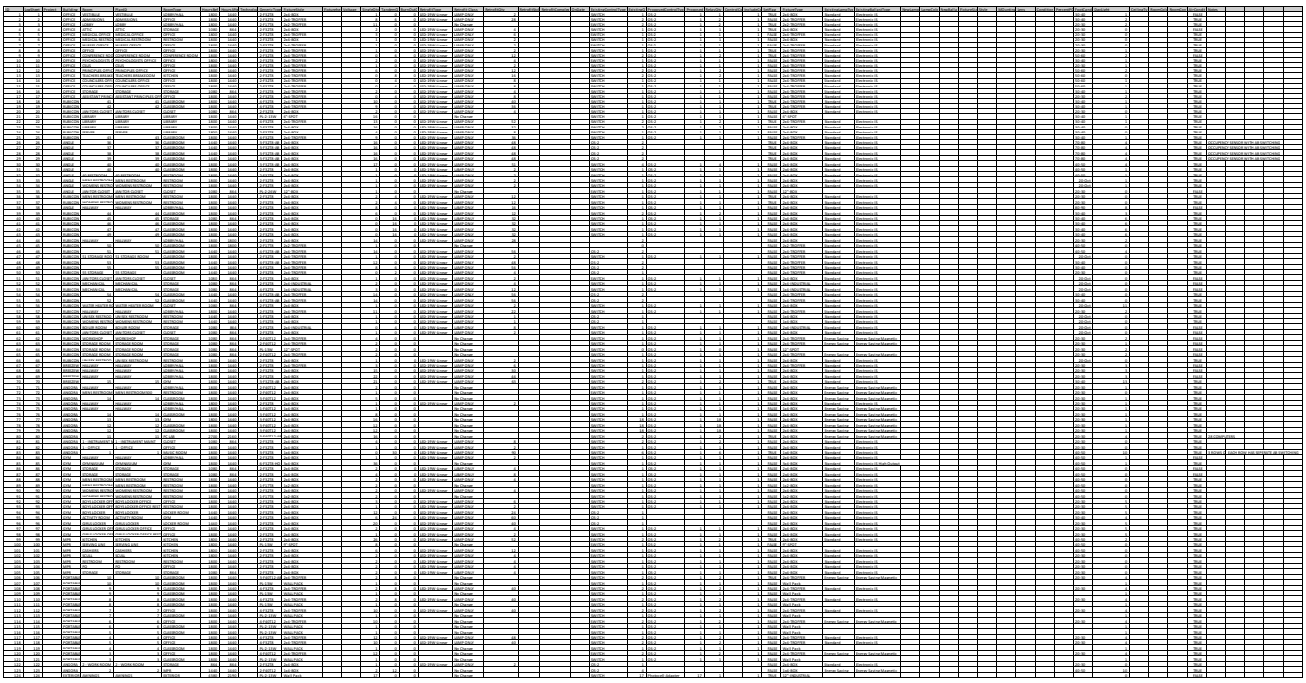
CELite Lighting Audit Software

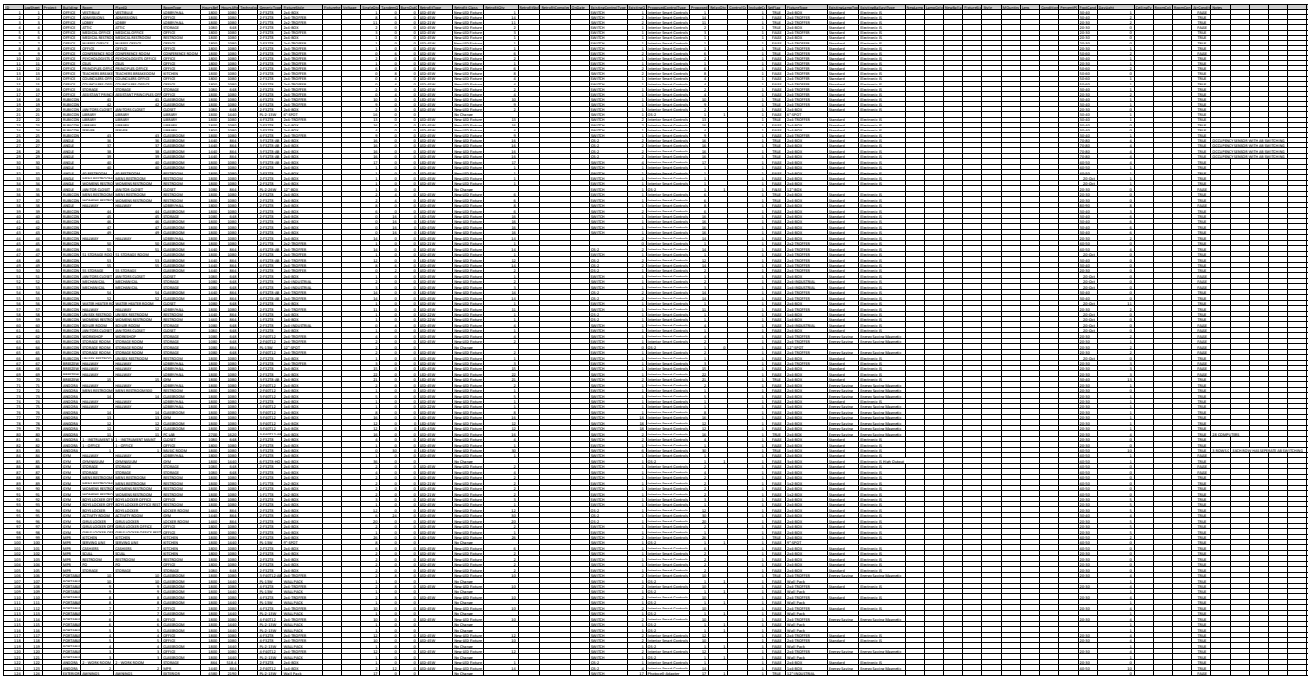
ID	LogSheet	Project	Building	Room	PlanID	RoomType	HoursBefo	HoursAfter	Technolog	GenericTyp	FixtureStyle	Fixtureheig	Voltage	SingleQty	TandemQt	BurnOutQt
124	124		ST	EXTERIOR	EXTERIOR	EXTERIOR	4380	2190		HPS-150W	Wall Pack			10	0	0
126	126		MO	EXTERIOR	EXTERIOR	EXTERIOR	4380	2190		HPS-150W	Wall Pack			9	0	0
127	127		C	EXTERIOR	EXTERIOR	EXTERIOR	3504	1752		HPS-70W	Wall Pack			9	0	0
128	128		B	EXTERIOR	EXTERIOR	EXTERIOR	4380	2190		HPS-150W	Wall Pack			6	0	0

RetrofitType	Retrofit Class	RetrofitQty	RetrofitStyle	RetrofitComplexity	OnDate	ExistingControlType	ExistingQty	ProposedControlTyp	ProposedQ	RelayQty	ControlComplexit	IncludeControlS
LED-66W	New-LED Fixture	10				TIMER	1	Exterior Smart Cont	1			1
LED-66W	New-LED Fixture	9				TIMER	1	Exterior Smart Cont	1			1
LED-42W	New-LED Fixture	4				PHOTOCELL	9	Exterior Smart Cont	9			1
LED-66W	New-LED Fixture	2				TIMER	1	Exterior Smart Cont	1			1

SetFlag	FixtureType	ExistingLampTyp	ExistingBallastTyp	NewLampT	LampColor	NewBallas	FixtureSize	Style	MOunting	Lens	Condition	PercentPC	FootCandle	DayLight	CeilingType	RoomColor	RoomCond	AirConditio
TRUE	Wall Pack	Standard	Standard Magnetic											10				FALSE
TRUE	Wall Pack	Standard	Standard Magnetic											6				FALSE
TRUE	Wall Pack	Standard	Standard Magnetic											9				FALSE
TRUE	Wall Pack	Standard	Standard Magnetic											6				FALSE

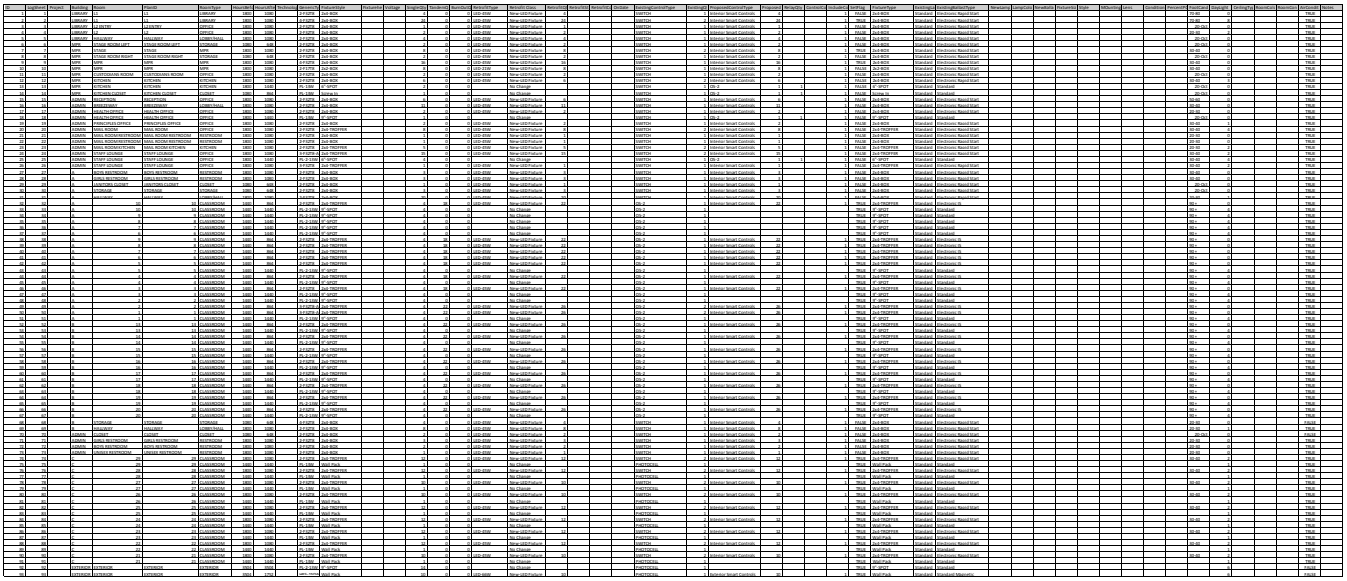




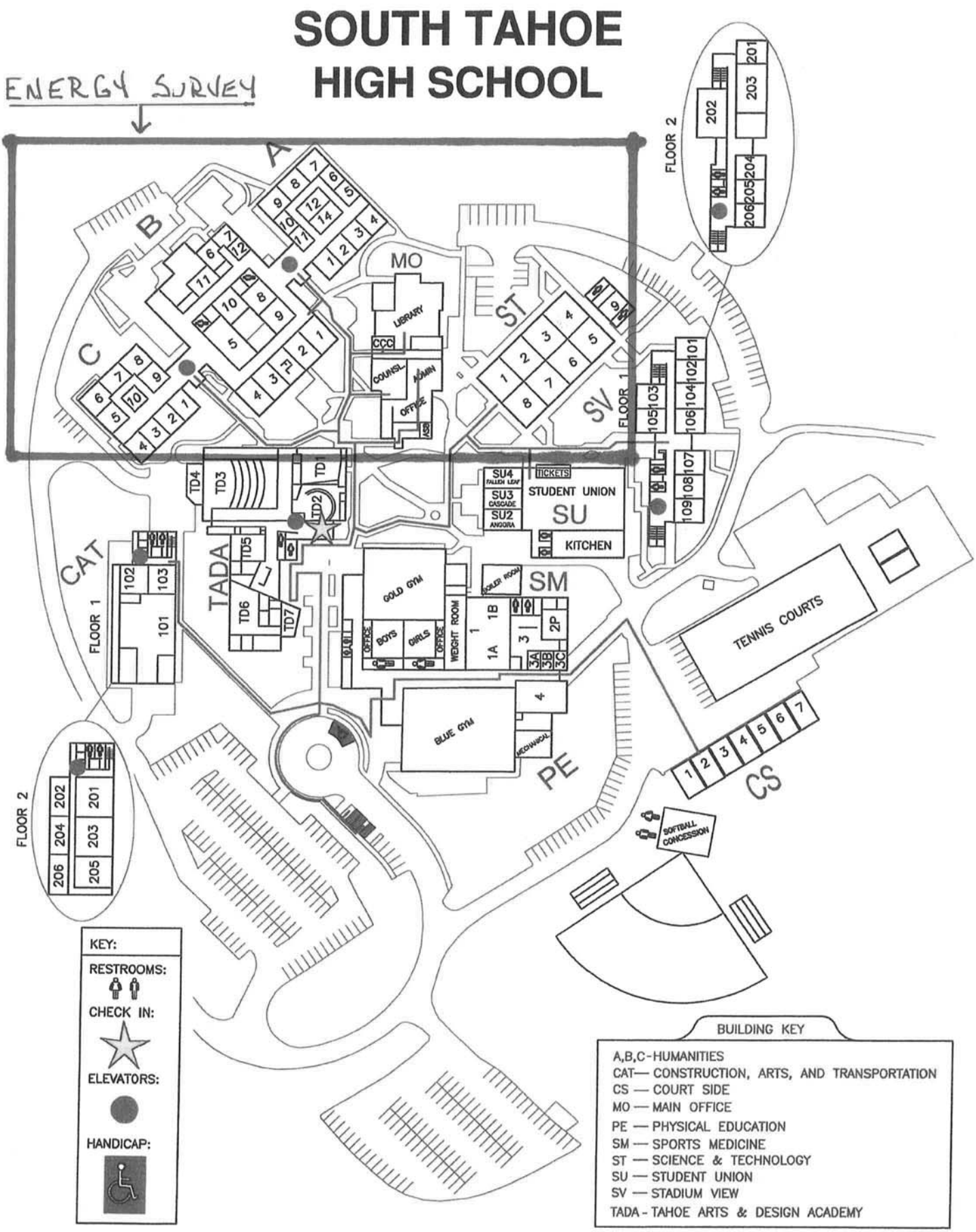


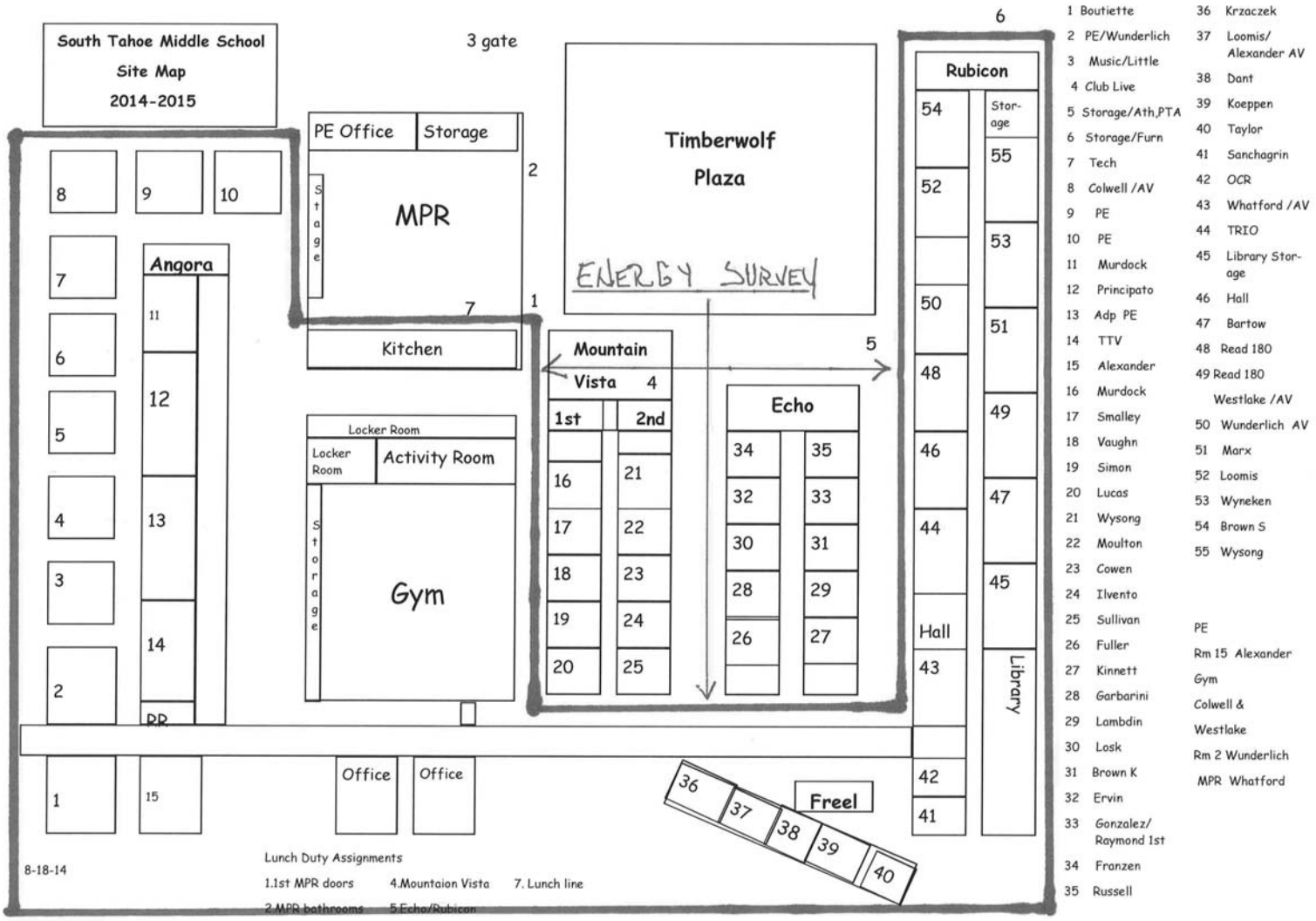
ID	LogSheet	Project	Building	Room	PlanID	RoomType	HoursBefo	HoursAfte	Technolog	GenericTy	FixtureStyle	Fixturehe	Voltage	SingleQty	TandemQ	BurnOutC	RetrofitType	Retrofit Class	RetrofitQ	RetrofitSt	RetrofitCo	OnDate	ExistingControlType
93	93		EXTERIOR	EXTERIOR	EXTERIOR	EXTERIOR	3504	1752		HPS-150W	Wall Pack			10	0	0	LED-66W	New-LED Fixture	10				PHOTOCELL

ID	ExistingQ	ProposedControlType	Proposed	RelayQty	ControlCo	IncludeCo	SetFlag	FixtureType	ExistingLa	ExistingBallastType	NewLamp	LampColo	NewBalla	FixtureSiz	Style	MOunting	Lens	Condition	PercentP(	FootCand	DayLight	CeilingTy	RoomColo	RoomCon	AirCondit	Notes
93	1	Exterior Smart Controls	10			1	TRUE	Wall Pack	Standard	Standard Magnetic											6				FALSE	



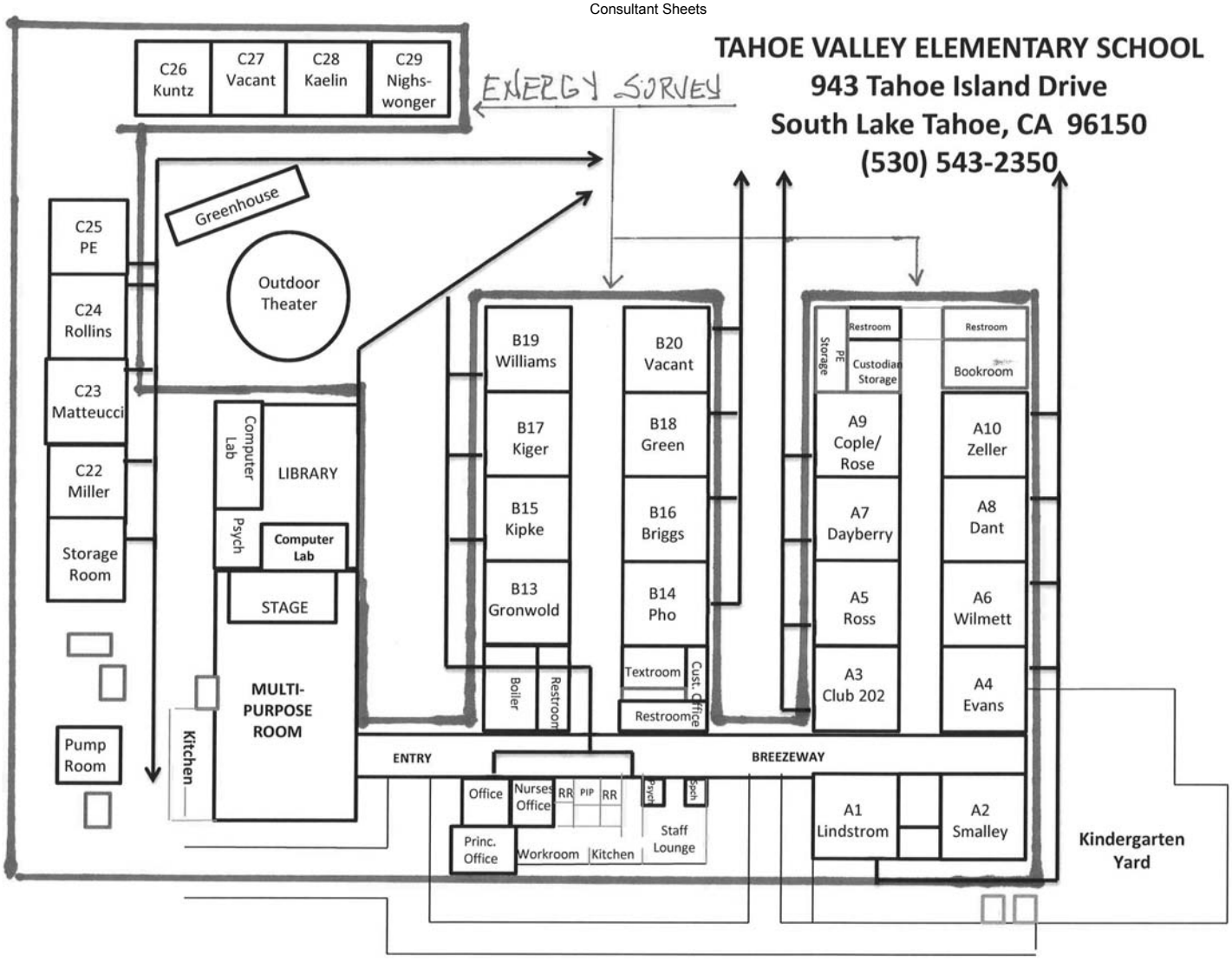
School Maps


SOUTH TAHOE
HIGH SCHOOL
ENERGY SURVEY
A
B
C
MO
LIBRARY
CCC
COUNSL.
ADMIN
OFFICE
ASB
ST
SV
FLOOR 1
FLOOR 2
SU4 FALLEN LEAF
SU3 CASCADE
SU2 ANGORA
TICKETS
STUDENT UNION
SU
KITCHEN
TD1
TD2
TD3
TD4
TD5
TD6
TD7
TADA
CAT
GOLD GYM
LOCKER ROOM
SM
WEIGHT ROOM
BOYS
GIRLS
OFFICE
BLUE GYM
MECHANICAL
PE
TENNIS COURTS
CS
SOFTBALL CONCESSION
KEY:
RESTROOMS:
CHECK IN:
ELEVATORS:
HANDICAP:
BUILDING KEY
A,B,C-HUMANITIES
CAT— CONSTRUCTION, ARTS, AND TRANSPORTATION
CS — COURT SIDE
MO — MAIN OFFICE
PE — PHYSICAL EDUCATION
SM — SPORTS MEDICINE
ST — SCIENCE & TECHNOLOGY
SU — STUDENT UNION
SV — STADIUM VIEW
TADA - TAHOE ARTS & DESIGN ACADEMY



1 Boutiette
2 PE/Wunderlich
3 Music/Little
4 Club Live
5 Storage/Ath,PTA
6 Storage/Furn
7 Tech
8 Colwell /AV
9 PE
10 PE
11 Murdock
12 Principato
13 Adp PE
14 TTV
15 Alexander
16 Murdock
17 Smalley
18 Vaughn
19 Simon
20 Lucas
21 Wysong
22 Moulton
23 Cowen
24 Ilvento
25 Sullivan
26 Fuller
27 Kinnett
28 Garbarini
29 Lambdin
30 Losk
31 Brown K
32 Ervin
33 Gonzalez/ Raymond 1st
34 Franzen
35 Russell
36 Krzaczek
37 Loomis/ Alexander AV
38 Dant
39 Koeppen
40 Taylor
41 Sanchagrin
42 OCR
43 Whatford /AV
44 TRIO
45 Library Storage
46 Hall
47 Bartow
48 Read 180
49 Read 180 Westlake /AV
50 Wunderlich AV
51 Marx
52 Loomis
53 Wyneken
54 Brown S
55 Wysong

PE
Rm 15 Alexander
Gym
Colwell &
Westlake
Rm 2 Wunderlich
MPR Whatford


TAHOE VALLEY ELEMENTARY SCHOOL
943 Tahoe Island Drive
South Lake Tahoe, CA 96150
(530) 543-2350
ENERGY SURVEY
C26 Kuntz
C27 Vacant
C28 Kaelin
C29 Nighs-wonger
Greenhouse
Outdoor Theater
C25 PE
C24 Rollins
C23 Matteucci
C22 Miller
Storage Room
Pump Room
Computer Lab
LIBRARY
Psych
Computer Lab
STAGE
MULTI-PURPOSE ROOM
Kitchen
B19 Williams
B17 Kiger
B15 Kipke
B13 Gronwold
Boiler
Restroom
B20 Vacant
B18 Green
B16 Briggs
B14 Pho
Textroom
Cust. Office
Restroom
Restroom
PE Storage
Custodian Storage
Restroom
Bookroom
A9 Cople/ Rose
A7 Dayberry
A5 Ross
A3 Club 202
A10 Zeller
A8 Dant
A6 Wilmett
A4 Evans
ENTRY
BREEZEWAY
Office
Nurses Office
RR
PIP
RR
Psych
Spch
Princ. Office
Workroom
Kitchen
Staff Lounge
A1 Lindstrom
A2 Smalley
Kindergarten Yard

Appendix G. PV Systems Concept

Lake Tahoe
Unified School District

SHEET INDEX	
DESCRIPTION	SHEET #
TITLE SHEET	T-1
SOUTH TAHOE HIGH SCHOOL PV LAYOUT	PV-1
SOUTH TAHOE MIDDLE SCHOOL PV LAYOUT	PV-2
TAHOE VALLEY ELEMENTARY SCHOOL PV LAYOUT	PV-3

October 2, 2015

PHOTOVOLTAIC SYSTEM
CONCEPT

Lake Tahoe
Unified School District
1021 Tahoe Blouljevard,
South Lake Tahoe, CA 96150

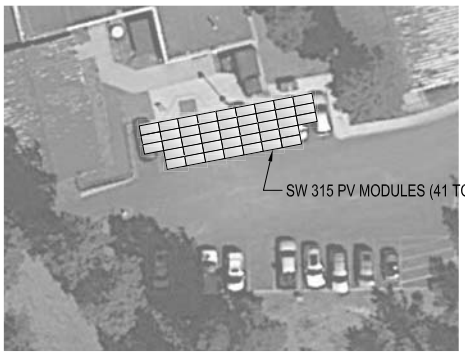
128 Auburn Court
Suite 106
Westlake Village
CA. 91362
Tel: 805-374-1777
DIGITAL ENERGY,INC. www.digitalenergy.com

Sheet No.
T-1

NOTES:

1. PHOTOVOLTAIC PANELS USED IN THIS DESIGN IS SOLARWORLD SW 315 WITH DIMENSION OF 78.15"L X 38.98"W.
2. PANELS TILTED @10° FACING SOUTH.
3. GAP PROVIDED IN BETWEEN PANELS IS 1/2".

1 CAMPUS SITE MAP
Not to Scale



2 PV LAYOUT (PARKING LOT SOUTH)
Scale: 1/32":1'-0"

PV PANEL SCHEDULE - SOUTH TAHOE HIGH SCHOOL (1735 Lake Tahoe Blvd., South Lake Tahoe, CA 96150)						
LOCATION	NO. OF PV MODULES	PROPOSED kW - DC	PV MODULE	TILT	AZIMUTH	PV PANEL SUPPORT SYSTEM
PARKING LOT SOUTH	41	12.8	Solarworld SW-315	10° FACING SOUTH	169°	SINGLE BAY STEEL CANOPY

October 2, 2015

PHOTOVOLTAIC SYSTEM CONCEPT

Lake Tahoe Unified School District
1021 Tahoe Boulevard,
South Lake Tahoe, CA 96150

128 Auburn Court
Suite 106
Westlake Village
CA. 91362
Tel: 805-374-1777
DIGITAL ENERGY,INC. www.digitalenergy.com

Sheet No.
PV-1

NOTES:

1. PHOTOVOLTAIC PANELS USED IN THIS DESIGN IS SOLARWORLD SW 315 WITH DIMENSION OF 78.15"L X 38.98"W.
2. PANELS TILTED @10° FACING SOUTH.
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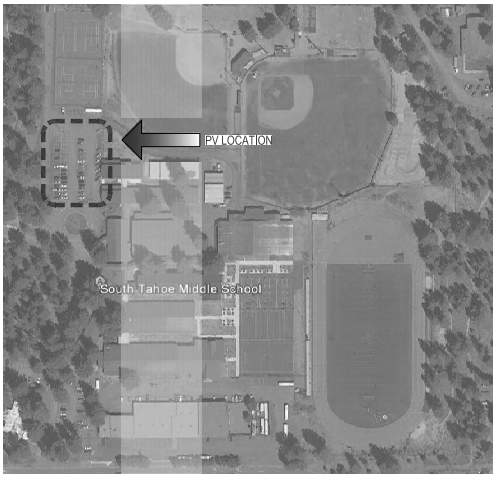
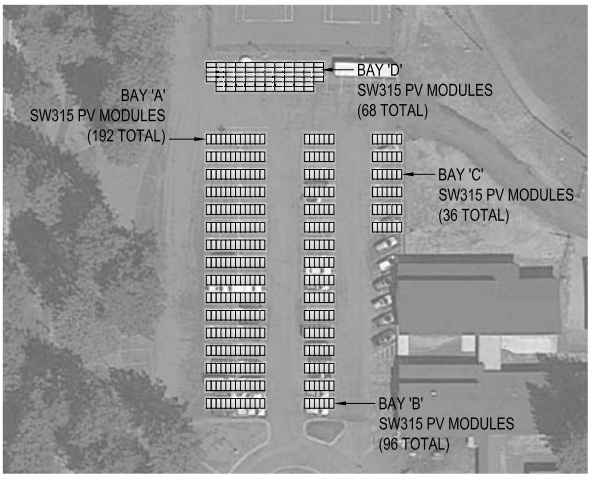


1 CAMPUS SITE MAP

Not to Scale



2 PARKING LOT PV LAYOUT

Scale: 1/64":1'-0"

PV PANEL SCHEDULE - SOUTH TAHOE MIDDLE SCHOOL (2940 Lake Tahoe Blvd., South Lake Tahoe, CA 96150)						
LOCATION	NO. OF PV MODULES	PROPOSED kW - DC	PV MODULE	TILT	AZIMUTH	PV PANEL SUPPORT SYSTEM
PARKING LOT	392	121.6	Solarworld SW-315	10° FACING SOUTH	180°	DOUBLE BAY/ SINGLE BAY STEEL CANOPY

October 2, 2015

PHOTOVOLTAIC SYSTEM CONCEPT

Lake Tahoe Unified School District
1021 Tahoe Boulevard,
South Lake Tahoe, CA 96150

DIGITAL ENERGY, INC.
128 Auburn Court
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Westlake Village
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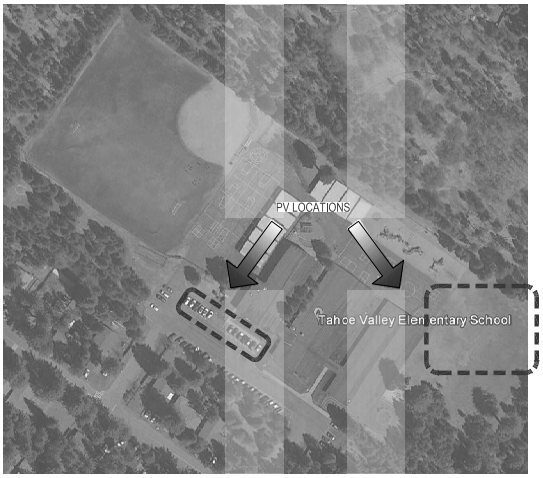
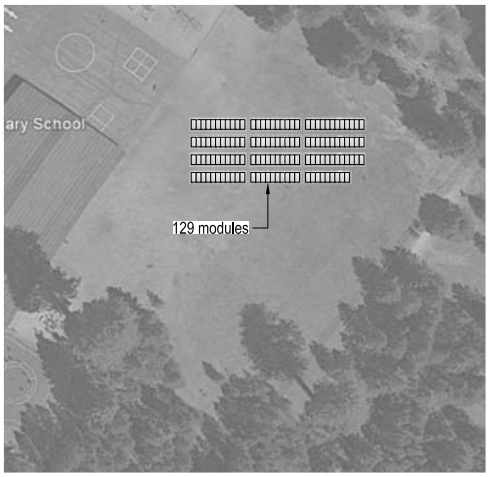
www.digitalenergy.com

Sheet No.
PV-2



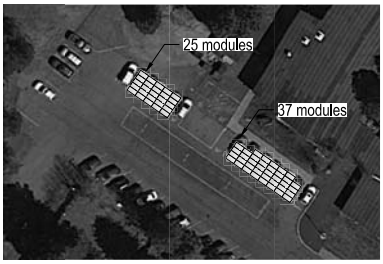
1 CAMPUS SITE MAP

Not to Scale



2 GROUND MOUNT PV LAYOUT

Scale: 1/64":1'-0"



2 PARKING LOT PV LAYOUT

Scale: 1/64":1'-0"

NOTES:

1. PHOTOVOLTAIC PANELS USED IN THIS DESIGN IS SOLARWORLD SW 315 WITH DIMENSION OF 78.15"L X 38.98"W.
2. PANELS TILTED @10° FACING SOUTH.
3. GAP PROVIDED IN BETWEEN PANELS IS 1/2".

PV PANEL SCHEDULE - TAHOE VALLEY ELEMENTARY SCHOOL (943 Tahoe Island Dr., South Lake Tahoe, CA 96150)						
LOCATION	NO. OF PV MODULES	PROPOSED kW - DC	PV MODULE	TILT	AZIMUTH	PV PANEL SUPPORT SYSTEM
PARKING LOT	62	19.2	Solarworld SW-315	10° FACING SOUTH	216°	SINGLE BAY STEEL CANOPY
GROUND MOUNT	129	40	Solarworld SW-315	10° FACING SOUTH	180°	GROUND MOUNT

October 2, 2015

PHOTOVOLTAIC SYSTEM CONCEPT

Lake Tahoe Unified School District
1021 Tahoe Boulevard,
South Lake Tahoe, CA 96150

128 Auburn Court
Suite 106
Westlake Village
CA. 91362
Tel: 805-374-1777
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Sheet No.

PV-3