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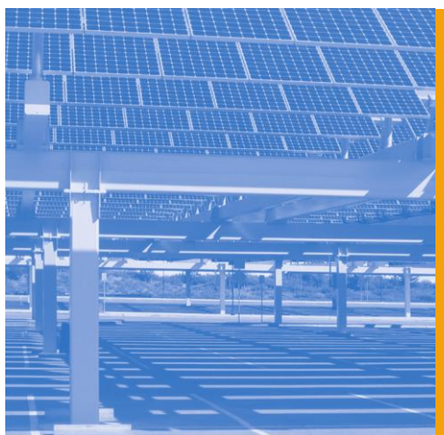
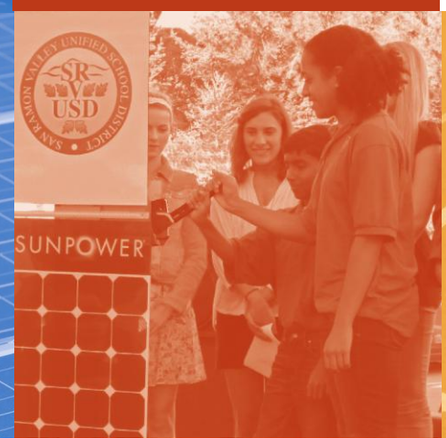
Fresno Unified
School District



Solar Master Plan *sampler*



a project of KyotoUSA

Fresno Unified School District Solar Assessment

Prepared by KyotoUSA
December 2013

The Assessment

This basic solar analysis includes two schools. It will demonstrate the cost of a renewable energy system at each site and the estimated savings that can be achieved. All information is preliminary and intended to provide the district with estimates of photovoltaic (PV) system sizing, electricity production, savings, and system costs. A more detailed analysis that includes all of the schools in the district can be provided upon the district's request (see **Solar Master Plan**).

Contents of the Assessment

Proposition 39 and Portfolio Manager

All school districts seeking Prop 39 funding will be required to "benchmark" the energy consumed at all project sites. School districts can use the free on-line energy management tool called Portfolio Manager. KyotoUSA uses the cost and consumption data provided by Portfolio Manager in its assessment and recommends that a district benchmark all its facilities.

Solar Master Plan (SMP)

The SMP can be used to assess the current feasibility of solar projects or as a planning tool that can become part of a district's Facilities Master Plan. The SMP is a detailed analysis of the PV potential at each school within a district. The SMP contains more information on the financial, technical, and environmental aspects of a PV project.

About Us

KyotoUSA, an East Bay non-profit working on climate change, started the HELiOS Project in 2007. The goal of the project is to provide free, impartial advice to public school districts on all aspects of renewable energy transactions. KyotoUSA has worked with school districts throughout the Bay Area on solar projects built or planned at over 40 schools.

Contact Us

Visit our websites
Kyotousa.org
Heliosproject.org

Questions
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"Tom Kelly and KyotoUSA have been key ingredients to our success when it comes to planning and implementing solar and other energy efficiency programs. Tom and his team have been there every step of the way providing unbiased advice and perspectives. We could not have done this on our own. No district or county office should jump into the solar arena without talking to Tom and KyotoUSA first. Their expertise and helpfulness was first rate. They have helped us create a program that will have a lasting legacy to our district and the communities we serve. They have my highest recommendation!"

Brett W. McFadden, Chief Business Officer, Pajaro Valley Unified

Table 1: Offsetting the Value of Electricity Consumed

Offsetting Electricity Consumption by 75%: This scenario describes a PV system at each school that would reduce a school's electricity costs to approximately $0. A school PV system that can produce about 75% of its annual electricity consumption is estimated to be enough to "zero out" a school's electric bill. This percentage varies from site to site and requires a more rigorous analysis when a PV project is proposed.

>>Panel Yield: 1,540 kWh/kWp

System Size (kWp)	Cost ($/W)
Roof (100-250)	$5.10
Roof (250-500)	$4.20
Roof (500-750)	$4.00
Roof (750-1000)	$3.90
Carport (100-250)	$5.40
Carport (250-500)	$4.80

>>The pricing chart is based on installing high efficiency SunPower Corp. solar panels and optimal conditions at each school site. Prices from vendors using less efficient panels can be lower.

>>Annual electricity usage and cost figures are based on averages from other Bay Area schools. KyotoUSA can substitute actual cost and consumption data if made available.

Location	Address	Annual Usage (kWh)	Annual Cost ($)	Target kWh: 75% of Consumption	kWp Needed to Reach 75% Target
Cooper Academy	2277 West Bellaire Way, Fresno, CA 93705	452,670	$72,781	339,503	220
Hoover High	5550 North First, Fresno, CA 93710	1,280,956	$192,919	960,717	624
	Total	**1,733,626**	**$265,701**	**1,300,219**	**844**

Offset Consumption Using Roofs

Location	Potential Roof System Size (kWp)	Recommended Roof System Size (kWp)	kWh Production	Estimated System Cost	Value of Avoided Electricity: Year 1	Meets 75% Target
Cooper Academy	588	220	339,503	$1,124,327	$61,110	75%
Hoover High	1,499	624	960,717	$2,495,368	$172,929	75%
Total	**2,087**	**844**	**1,300,219**	**$3,619,695**	**$234,040**	

Offset Consumption Using Parking Lots

Location	Potential Parking System Size (kWp)	Recommended Parking System Size (kWp)	kWh Production	Estimated System Cost	Value of Avoided Electricity: Year 1	Meets 75% Target
Cooper Academy	258	220	339,503	$1,190,464	$61,110	75%
Hoover High	1,888	624	960,717	$2,994,442	$172,929	75%
Total	**2,146**	**844**	**1,300,219**	**$4,184,906**	**$234,040**	

>>The value ($/kWh) of the electricity produced by a PV system is different than the value of the electricity consumed when there is no PV system present. We conservatively estimate the value of the electricity produced by a PV system at $0.18/kWh, however, this value can be higher. A more rigorous analysis should be done when a district is closer to procuring PV systems for its schools.

Table 2: California Energy Commission Loan

Key Energy Saving Inputs and Assumptions	
System Size (kWp)	844
Price ($/Wp)	$4.96
Solar Yield (kWh/kWp)	1,540
Annual Rate of PV Degradation	0.50%
Estimated Avoided Cost ($/kWh)	$0.180
Annual Electricity Cost Inflation	3.00%
Operations & Maintenance Cost: Year 1	$13,793
Annual O&M Escalation Rate	3.00%

Key Financing Inputs and Assumptions	
Solar Contract Turnkey Price	$4,184,906
Performance Guarantee: Years 0-10	$55,097
Total CEC Loan	$4,240,003
Interest	1.00%
Term (years)	20

Projected Results	
Total General Fund Savings	$3,065,777
Average Annual Savings	$122,631
General Fund NPV (3%)	$1,803,392

Year	Savings of Utility Bill	Cost of O&M Contract (Years 0-10)	Net Energy Savings	Principal Repayment	Supplemental Interest	Net Payment	Annual General Fund Benefit	Cumulative General Fund Benefit
1	$234,040	($13,793)	$220,247	($125,023)	($42,400)	($167,423)	$52,823	$52,823
2	$239,855	($14,207)	$225,649	($131,675)	($41,150)	($172,825)	$52,823	$105,647
3	$245,816	($14,633)	$231,183	($138,526)	($39,833)	($178,359)	$52,823	$158,470
4	$251,924	($15,072)	$236,852	($145,581)	($38,448)	($184,029)	$52,823	$211,294
5	$258,185	($15,524)	$242,661	($152,845)	($36,992)	($189,837)	$52,823	$264,117
6	$264,601	($15,990)	$248,611	($160,324)	($35,464)	($195,787)	$52,823	$316,941
7	$271,176	($16,469)	$254,706	($168,023)	($33,860)	($201,883)	$52,823	$369,764
8	$277,915	($16,964)	$260,951	($175,947)	($32,180)	($208,128)	$52,823	$422,588
9	$284,821	($17,472)	$267,348	($184,104)	($30,421)	($214,525)	$52,823	$475,411
10	$291,899	($17,997)	$273,902	($192,499)	($28,580)	($221,078)	$52,823	$528,235
11	$299,152		$299,152	($219,674)	($26,655)	($246,329)	$52,823	$581,058
12	$306,586		$306,586	($229,305)	($24,458)	($253,763)	$52,823	$633,882
13	$314,205		$314,205	($239,217)	($22,165)	($261,381)	$52,823	$686,705
14	$322,013		$322,013	($249,417)	($19,773)	($269,189)	$52,823	$739,529
15	$330,015		$330,015	($259,913)	($17,278)	($277,191)	$52,823	$792,352
16	$338,216		$338,216	($270,713)	($14,679)	($285,392)	$52,823	$845,176
17	$346,620		$346,620	($281,825)	($11,972)	($293,797)	$52,823	$897,999
18	$355,234		$355,234	($293,256)	($9,154)	($302,410)	$52,823	$950,823
19	$364,061		$364,061	($305,017)	($6,221)	($311,238)	$52,823	$1,003,646
20	$373,108		$373,108	($317,119)	($3,171)	($320,290)	$52,818	$1,056,464
21	$382,380		$382,380	-	-	$0	$382,380	$1,438,844
22	$391,882		$391,882	-	-	$0	$391,882	$1,830,727
23	$401,621		$401,621	-	-	$0	$401,621	$2,232,347
24	$411,601		$411,601	-	-	$0	$411,601	$2,643,948
25	$421,829		$421,829	-	-	$0	$421,829	$3,065,777
Total	**$7,978,753**	**($158,120)**	**$7,820,633**	**($4,240,003)**	**($514,853)**	**($4,754,856)**	**$3,065,777**	

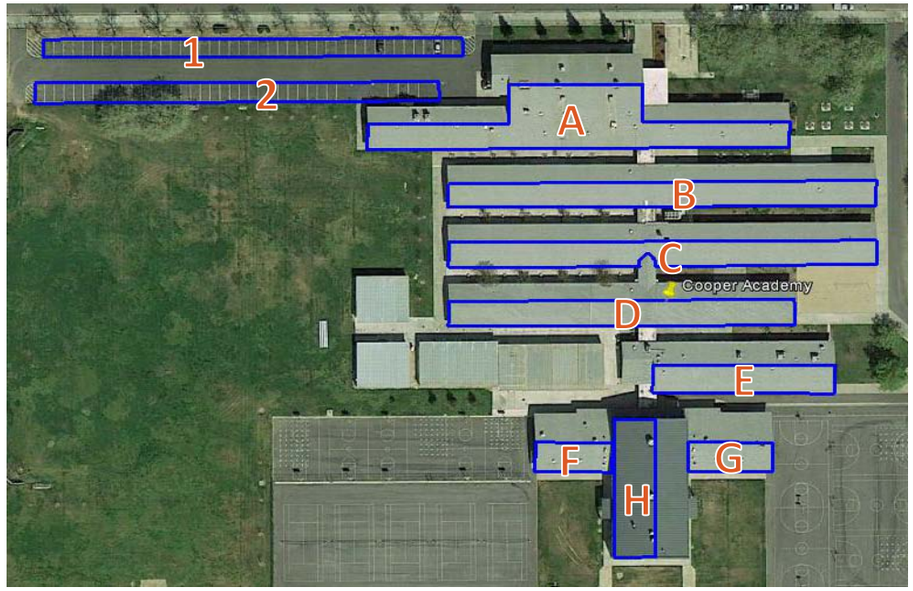
>>Financial Analysis: The cost analysis assumes the system is financed with a California Energy Commission (CEC) loan at an interest rate of 1% and a payoff period of 20 years.

>>The net energy savings equals the utility bill savings less the cost of the Operations and Maintenance (O&M). The annual utility bill savings assumes an annual panel degradation rate of 0.50% and an annual electricity cost increase of 3.00%.

>>The system price ($/Wp) includes equipment, design, permitting, installation, labor, commissioning, equipment warranties, and equipment guarantees.

>>The repayment method is designed to set the same annual general fund benefit during the 20 years in which the loan is repaid.

Table 3: Cooper Academy



Location: **Cooper Academy**
Address: 2277 West Bellaire Way, Fresno, CA 93705

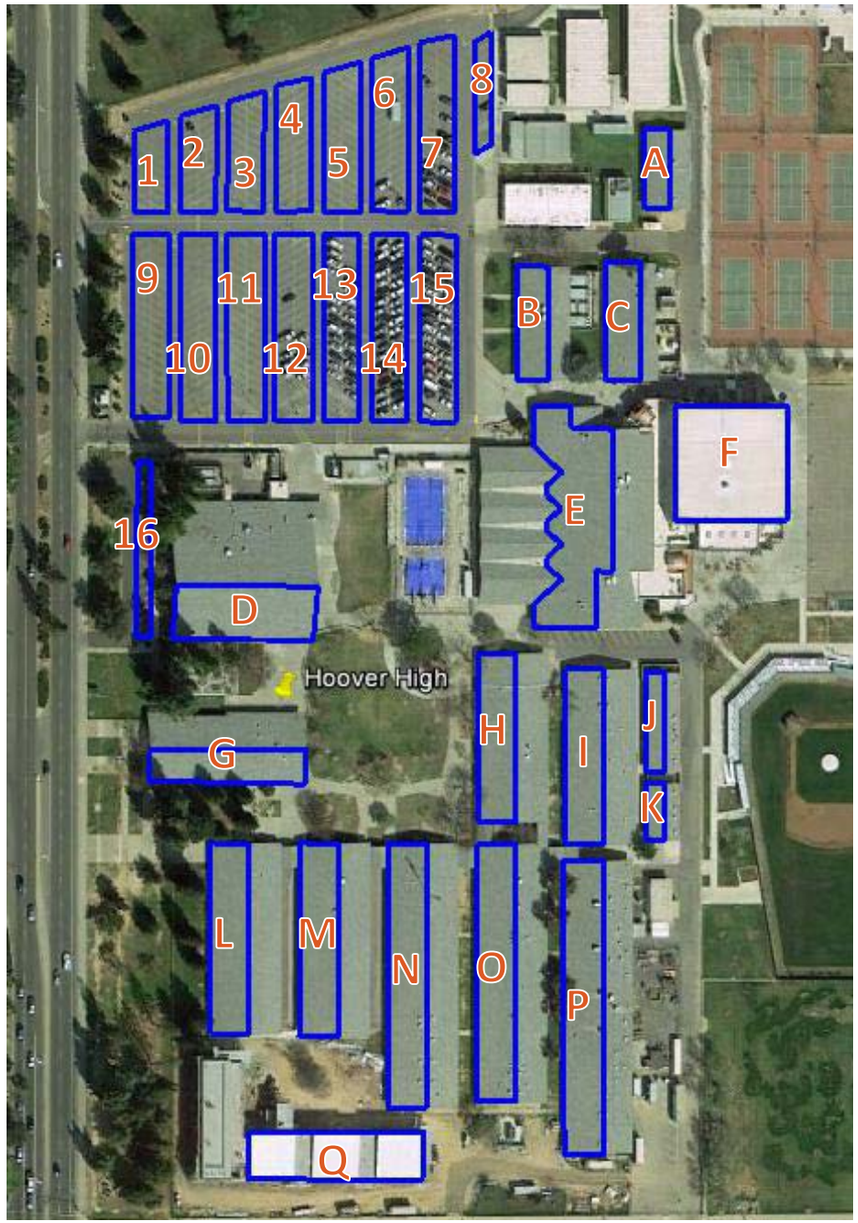
PARKING					
Array #	**Total Area**	**Use (%)**	**Usable Area**	**kWp**	**kWh**
1	7,055	100%	7,055	125	192,305
2	7,505	100%	7,505	133	204,571
	14,560		**14,560**	**258**	**396,876**
ROOF					
Array #	**Total Area**	**Use (%)**	**Usable Area**	**kWp**	**kWh**
A	14,935	55%	8,214	145	223,904
B	9,868	60%	5,921	105	161,389
C	9,813	60%	5,888	104	160,490
D	8,203	60%	4,922	87	134,158
E	4,774	60%	2,864	51	78,078
F	2,130	55%	1,172	21	31,933
G	2,305	55%	1,268	22	34,556
H	5,370	55%	2,954	52	80,507
	57,398		**33,202**	**588**	**905,015**
TOTAL	**71,958**		**47,762**	**845**	**1,301,891**

>>Using Google Earth Pro we are able to estimate the usable space on school rooftops and parking lots. Carports that are free of obstructions (e.g. shadows cast by trees, buildings, etc.) have the greatest percentage of usable space. Rooftop PV systems are likely to use less of the usable space due to equipment, setbacks, orientation, tilt and more. Carports are generally more expensive than rooftop systems, but can be less costly if work has to be done on a roof before a PV system is installed.

Current Annual Consumption (kWh)	Current Annual Cost ($)	Target kWh: 75% of Consumption	kWp Needed to Offset 75% Consumption
452,670	$72,781	339,503	220

	Potential System Size (kWp)		Recommended System Size (kWp)		kWh Production	Estimated System Cost	Value of Avoided Electricity: Year 1	Meets 75% Target
	Parking	Roof	Parking	Roof				
Roof		588		220	339,503	$1,124,327	$61,110	75%
Parking	258		220		339,503	$1,190,464	$61,110	75%

Table 4: Hoover High School



Location: **Hoover High**
Address: 5550 North First, Fresno, CA 93710

PARKING					
Array #	**Total Area**	**Use (%)**	**Usable Area**	**kWp**	**kWh**
1	3,719	100%	3,719	66	101,373
2	4,653	100%	4,653	82	126,831
3	5,292	100%	5,292	94	144,249
4	5,852	100%	5,852	104	159,514
5	6,765	100%	6,765	120	184,400
6	7,317	100%	7,317	130	199,447
7	7,677	100%	7,677	136	209,260
8	2,434	100%	2,434	43	66,346
9	8,379	100%	8,379	148	228,395
10	8,482	100%	8,482	150	231,202
11	8,858	100%	8,858	157	241,451
12	8,892	100%	8,892	157	242,378
13	8,408	100%	8,408	149	229,185
14	8,400	100%	8,400	149	228,967
15	8,409	100%	8,409	149	229,213
16	3,118	100%	3,118	55	84,990
	106,655		**106,655**	**1,888**	**2,907,202**

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ROOF					
Array #	Total Area	Use (%)	Usable Area	kWp	kWh
A	2,536	60%	1,522	27	41,476
B	4,554	55%	2,505	44	68,273
C	5,208	60%	3,125	55	85,176
D	9,613	60%	5,768	102	157,219
E	16,282	45%	7,327	130	199,717
F	16,290	55%	8,960	159	244,218
G	6,628	60%	3,977	70	108,400
H	8,183	60%	4,910	87	133,831
I	8,491	60%	5,095	90	138,869
J	2,353	60%	1,412	25	38,483
K	1,355	60%	813	14	22,161
L	9,157	60%	5,494	97	149,761
M	9,458	60%	5,675	100	154,684
N	13,032	60%	7,819	138	213,136
O	12,784	60%	7,670	136	209,080
P	14,948	60%	8,969	159	244,472
Q	10,493	35%	3,673	65	100,106
	151,365		**84,711**	**1,499**	**2,309,059**
TOTAL	**258,020**		**191,366**	**3,387**	**5,216,261**

Current Annual Consumption (kWh)	Current Annual Cost ($)	Target kWh: 75% of Consumption	kWp Needed to Offset 75% Consumption
1,280,956	$192,919	960,717	624

	Potential System Size (kWp)		Recommended System Size (kWp)		kWh Production	Estimated System Cost	Value of Avoided Electricity: Year 1	Meets 75% Target
	Parking	Roof	Parking	Roof				
Roof		1,499		624	960,717	$2,495,368	$172,929	75%
Parking	1,888		624		960,717	$2,994,442	$172,929	75%