



California Air Resources Board
1001 "I" Street
Sacramento, CA 95814

June 13, 2012

Re: Investment of Cap and Trade Auction Proceeds

To whom it concerns:

A portion of the Cap and Trade Auction proceeds should be dedicated to improving energy efficiencies and installing renewable energy systems in California's public schools.

California has approximately 1,000 school districts with nearly 10,000 K-12 schools serving about 6 million students. Energy costs are a significant part of a district's overall budget, second only to personnel costs. Public schools can be made more energy efficient and are some of the best possible sites for the installation of photovoltaic (PV) systems.

The benefits of better energy management and renewable production on public schools are enormous. The benefits include:

- Significant reductions in GHGs and other toxic air contaminants from fossil fuel electricity generation
- Spurs local economic development which in turn improves the economic well being of the school district
- Reduces utility bills so that more teachers can be hired and programs maintained
- PV projects on schools can include educational components which bring the all aspects of renewable energy into the classrooms and school academies
- Creates local clean energy jobs
- Improves air quality in the areas where the fossil fuel electricity is generated
- Reduces health effects associated with pollution from electricity generation from non-renewable sources
- Demonstrates to our children that we are taking the reality of climate change seriously and are working to address it.

The attached spreadsheets demonstrate the value of renewable energy systems on public schools. The first spreadsheet characterizes the energy profiles from six greater Bay Area school districts. These six districts consume ~61 million kWh of electricity each year at a cost of almost \$10M. These districts have a total estimated PV capacity of 59 MW of PV that could produce more than 82M kWh each year. To offset approximately 75% of the districts' total consumption (thus reducing their electricity cost to near \$0) districts would only have to build about 27 MW

of PV that would produce ~37M kWh annually. These 27 MW would avoid about 9,500 tons of CO2 each year.

The second spreadsheet describes the economic, emissions and health benefits associated with the installation of 27 MW in the six school districts. This spreadsheet attempts to characterize how much money would flow into the local economies of the six districts if 27 MW of renewable energy were installed. It also demonstrates an accurate estimate of the avoided CO2 and other toxic air contaminants these PV systems would provide. Finally, we have tried to estimate the health impacts, both physical and financial, that would be avoided by replacing the fossil fuel generated electricity with renewable energy systems. The calculations on this spreadsheet are based on PG&E's fuel mix. Emissions, air quality, and health benefits will vary depending on the fuel mix of other utilities in the state.

The mechanisms for distributing the funds are also in place. The California Energy Commission and the Department of General Services have existing programs that support energy projects and other school infrastructure improvements. The initial program may target school districts that serve a significant population of children who receive free or subsidized lunches since these school districts do not often have the ability to raise funds for construction projects from the district's residents. As the auction program matures, school districts that are more affluent could become eligible.

Interested school districts should first be offered small grants to benchmark their district's energy use and cost, and to develop what we call a Solar Master Plan which is essentially an assessment of the renewable energy capacity in each district. Any grants for PV systems should allow districts to own them outright, rather than vesting ownership in a third party.

The benefits of energy efficiency improvements and renewable energy systems should be self evident, but I would be happy to answer any questions about our suggestion. We have been working with public schools in the development of Solar Master Plans (see, www.heliosproject.org) for the past several years and can attest to the interest that districts have in reducing their energy costs and the difficulties they have in organizing their resources to be able to take advantage of the opportunities that have arisen in the past. A grant program that uses the proceeds from the Cap and Trade Auction for energy efficiencies and renewable energy systems would be welcomed and would be entirely consistent with the intent and requirements of AB 32.

Sincerely,

Tom Kelly
Director

Benefits and characteristics of PV at 6 greater Bay Area school districts

SUMMARY of Renewable Energy System Benefits to Public Schools										
			BUSD	OUSD	WCCUSD	SLUSD	PVUSD	BSD	Total	
No. of schools and other facilities			17	72	45	17	29	7	187	
Annual electricity consumption at these sites (kWh)			6,974,388	24,239,172	16,343,250	5,711,963	6,952,072	1,178,586	61,399,431	kWh
Annual electricity cost for these Districts (annual)			\$ 1,086,717	\$ 3,837,354	\$ 2,703,869	\$ 942,186	\$ 1,166,686	\$ 197,082	\$ 9,933,893	
PV Capacity (kWp)										
	Full scale		1,970	19,520	14,780	6,726	13,440	2,507	58,944	kWp
	75% of load (to offset electricity bill)		1,367	11,278	7,413	3,034	3,285	612	26,989	kWp
Electricity production (kWh) (annual)										
	Full scale		2,530,650	26,352,000	19,953,000	9,635,140	20,574,652	3,711,637	82,757,079	kWh
	75% of load		1,830,296	15,224,986	9,987,621	4,264,100	5,214,054	883,940	37,404,996	kWh*
Annual consumption offset by PV (%)										
	Full scale		36%	109%	122%	169%	296%	315%		
	75% of load		26%	63%	61%	75%	75%	75%		
Value of avoided electricity			at \$0.19 per kWh	at \$0.19 per kWh	at \$0.19 per kWh	at \$0.19 per kWh	at \$0.19 per kWh	at \$0.19 per kWh		
	Full Scale		\$ 480,824	\$ 5,006,880	\$ 3,791,070	\$ 1,830,677	\$ 3,909,184	\$ 705,211	\$ 15,723,845	
	75% of load		\$ 347,756	\$ 2,892,747	\$ 1,897,648	\$ 810,179	\$ 990,670	\$ 167,949	\$ 7,106,949	
Annual cost offset by PV										
	Full Scale		44%	130%	140%	194%	335%	358%		
	75% of load		32%	75%	70%	86%	85%	85%		
Greenhouse Gas emissions avoided annually (MT)										
	75% of load		465	3,867	2,554	1,083	1,324	225	9,518	MT
(Emissions factor for PG&E = .000254/kWh)										
Renewable Energy Credits generated annually										
	75% of load		1,830	15,225	10,055	4,264	5,214	884	37,472	RECs
* Not every facility has the ability to host enough PV to offset 75% of current load										

Key to cells:												
Input information here												
Key calculation												
1. About the Renewable System	Input											
	Cost of System	\$134,945,000										
	Size of Renewable System (MW)	26.989										
	PV production = 1400 kWh / kW	37,784,600										
	Conversion to MWh / year	37,785										
2. Portion of Expenditure to Local Wages	Labor Type	Amt. of System Costs to Labor	Overhead Portion	Direct	Indirect	Induced	Type of Wage Effect					
				1.00	1.13	1.22	Total					
	Mounting	13%	55%	\$7,894,300	\$0	\$0	\$7,894,300					
	Electrical	13%	55%	\$7,894,300	\$0	\$0	\$7,894,300					
	Design	3%	55%	\$1,821,800	\$0	\$0	\$1,821,800					
	Wages related to supply purchases and employee purchases				\$0	\$2,289,352	\$3,874,288	\$6,163,640				
	Total (One-time, wages)				\$17,610,400	\$2,289,352	\$3,874,288	\$23,774,040				
3. Employment Impacts				Type of Employment Effect								
	Labor Type			Direct	Indirect	Induced	Total					
				1.26	0.2	0.4						
	Mounting			99.47	19.89	39.79	159.15					
	Electrical			99.47	19.89	39.79	159.15					
Design			22.95	4.59	9.18	36.73						
Total (Job-years)				221.89	44.38	88.76	355.03					
4. Sample Fuel Mix				Coal	Natural Gas	Petroleum	Nuclear	Hydro-power	Other	Renewables	Total	
	National			49%	20%	2%	20%	7%	0%	2%	100%	
	Regional (Mi,IL,IN,OH,WI)			67%	5%	0%	24%	1%	0%	3%	100%	
	Detroit Energy			77%	2%	0%	19%	0%	0%	1%	99%	
	Selected States											
	California			33%	42%	0%	5%	18%	0%	2%	100%	
	Colorado			75%	22%	0%	0%	2%	0%	1%	100%	
	Indiana			95%	2%	0%	0%	0%	3%	0%	100%	
	West Virginia			97%	0%	0%	2%	0%	0%	0%	100%	
	Selected California Utilities											
	City of Palo Alto			0%	35%	0%	0%	45%	0%	20%	100%	
LA Dept of Water and Power (2009)			41%	30%	0%	11%	4%	0%	14%	100%		
Pacific Gas & Electric (2009)			1%	50%	0%	20%	13%	2%	14%	100%		
Sacramento Municipal Utility District (2008-est)			0%	56%	0%	0%	22%	0%	22%	100%		
San Diego Gas and Electric			7%	62%	0%	18%	3%	0%	10%	100%		
Southern California Edison (2008 - est)			7%	50%	0%	19%	6%	0%	18%	100%		
5. MWh/ Year Reduced				Coal	Natural Gas	Petroleum	Nuclear	Hydro-power	Other	Renewables	Total	
	Geography Grid Fuel Mix			1%	50%	0%	20%	13%	2%	14%	100%	
	MWh/ year reduced, by source			378	18,892	0	7,557	4,912	756	5,290	37,785	
6. Emissions Factors: Pounds per MWh Reduction	Emission			Coal	Natural Gas	Petroleum	Nuclear	Hydro-power	Other	Renewables		
	CO ₂			2,155	1,042	1,980	See note 1.					
	NO _x			7.75	1.9	4.9	See note 1.					
	SO ₂			46.6	0	14.9	See note 1.					
Pounds per Gigawatt	Hg (Mercury)			0.105	0.001	0.005	See note 1.					
7. Emissions in Pounds Reduced per Year, due to Renewable System	Emission			Coal	Natural Gas	Petroleum	Nuclear	Hydro-power	Other	Renewables	Total	
	CO ₂			814,258	19,685,777	0					20,500,035	
	NO _x			2,928	36,746	0					39,674	
	SO ₂			17,608	0	0					17,608	
Pounds per Gigawatt	Hg (Mercury)			0.039485	0.018892	0.000000				0.058		
8. Health Impacts	Per Megawatt			Total for System								
	Cases Reduced per Year											
	Mortality			0.004	0.0606							
	Chronic Bronchitis			0.003	0.0413							
	Heart Attacks			0.007	0.0991							
	Hospital Admissions - Respiratory			0.002	0.0303							
	Hospital Admissions - Cardiovascular			0.002	0.0248							
	Emergency room visits, Asthma			0.005	0.0661							
	Acute Bronchitis			0.007	0.0964							
	Lower Respiratory Symptoms			0.079	1.0929							
	Upper Respiratory Symptoms			0.064	0.8782							
Work Loss Days			0.508	6.9868								
Minor Restricted Activity Days			3.488	48.0074								
[1] Despite emitting no GHGs or air pollutants, Power Scorecard assigned Nuclear energy the highest environmental impact score of all power sources because its solid waste storage requirement is estimated to be 10,000 years.												
Health Impact Costs avoided (Machol & Rizk, 2012 (in press)) US EPA Analysis												
Health Impact Costs (\$/kWh)			mean	high estimate (Laden 2006)	low estimate (Pope 2002)	Avoided Health Impact Costs	mean	high estimate (Laden 2006)	low estimate (Pope 2002)			
California Grid, accounting for imports			\$0.03	\$0.05	\$0.01		\$ 1,133,538	\$ 1,889,230	\$ 377,846			
California FF, accounting for imports			\$0.05	\$0.03	\$0.07		\$ 1,889,230	\$ 1,133,538	\$ 2,644,922			
California Fossil Fuels (FF)			\$0.01	\$0.013	\$ 0.005		\$ 357,869	\$ 508,337	\$ 207,401			
Colorado FF			\$0.12	\$0.18	\$ 0.07		\$ 4,680,401	\$ 6,648,296	\$ 2,712,505			
Indiana FF			\$0.36	\$0.51	\$ 0.21		\$ 13,631,358	\$19,362,724	\$ 7,899,991			