Solar in Schools

Solar Master Plans for Bay Area Schools

Presentation to Bay Area Air Quality Management District
Climate Protection Committee

Tom Kelly, KyotoUSA
November 17, 2016

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BAAQMD – KyotoUSA Partnership

Reducing greenhouse gas emissions by bringing solar power to Bay Area public schools

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Bay Area School Districts Face Challenges to Going Solar

- 159 school districts: from a single school serving a dozen children to more than 100 schools serving thousands of children
- Facilities needs far exceed available funding
- Understaffed and frequency of transitions
- Lack of in-house expertise

How the Project Helps Schools Overcome These Challenges

1. Help school districts understand their energy use
2. Provide information on benefits of solar
3. Assess each school district's potential for solar
4. Research and present financing options
5. Provide non-biased, detailed Solar Master Plans to school districts

Benefits of Solar on Schools

Economic

- Utility bill savings benefit the General Fund

Environmental

- Reduces climate warming greenhouse gas emissions, toxic air contaminants, and water consumption

Educational

- Educational benefits/opportunities for teachers and students included in the purchase

Community

- Demonstrates commitment to future generations

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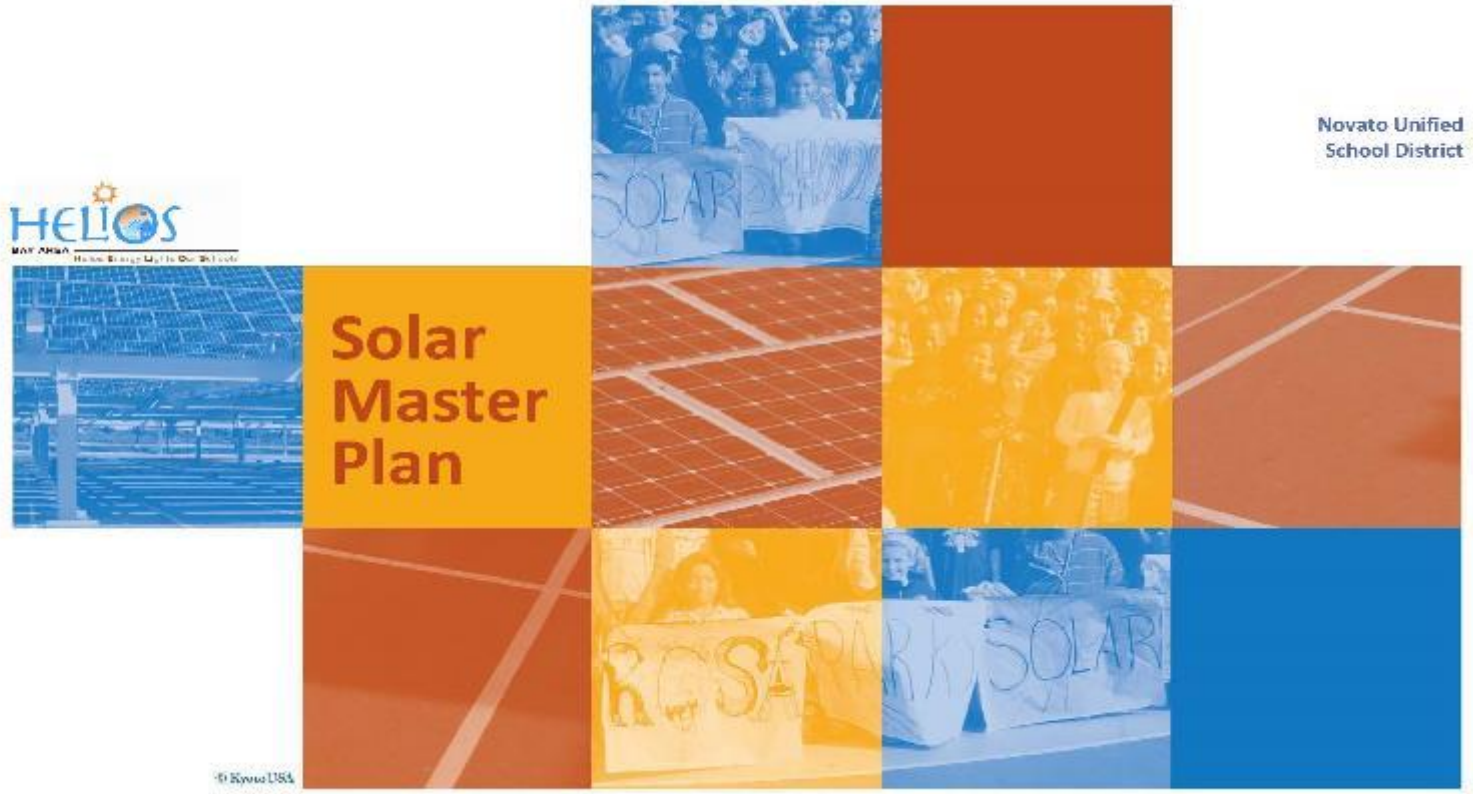
Navigating Potential Funding Sources

1. General Obligation Bonds
2. Prop 51 (passed November 2016)
3. Clean Renewable Energy Bonds (CREBs) - ~1% interest
4. Qualified Zone Academy Bonds (QZABs) - ~1% interest
5. California Energy Commission loans ($3M max) – 0% + 1% interest
6. Prop 39
7. Tax Exempt Lease Financing
8. Cash Reserves
9. Any combination of the above
10. Power Purchase Agreements

Solar Master Plan



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Location: San Jose Middle
Address: 1000 Sunset Parkway, Novato, CA 94949

PARKING						
Array #	Total Area	Use (%)	Usable Area	kWp	Yield	Kwh
1	6,405	100%	6,405	113	1,456.6	165,133
	6,405		**6,405**	**113**	**1,456.6**	**165,133**

ROOF						
Array #	Total Area	Use (%)	Usable Area	kWp	Yield	kWh
A	7,320	55%	4,026	71	1,489.4	106,135
B	3,510	55%	1,931	34	1,489.4	50,893
C	3,404	55%	1,872	33	1,489.4	49,356
	14,234		**7,829**	**139**	**1,489.4**	**206,383**

TOTAL	20,639	14,234	252	371,516

Total estimated PV Capacity - parking and roof

Current Annual Consumption (kWh)	Current Annual Cost ($)	Target kWh	kWp Needed to Reach Target
177,036	$34,640	132,777	90

PV needed to offset electricity costs

	Actual System Size (kWp)		kWh Production (kWh)	Estimated System Cost ($)	Value of Avoided Electricity- Year 1 ($)	Annual Avoided GHGs (tons)	Annual RECs Earned (mWh)	Meets Target
	Parking	Roof						
Roof		89	132,777	$427,911	$25,228	24	133	75%
Parking	91		132,777	$446,652	$25,228	24	133	75%

Table 2b: California Energy Commission Loan

Key Energy Saving Inputs and Assumptions	
System Size (kWp)	1,616
Price ($/Wp)	$4.85
Solar Yield (kWh/kWp)	1,486
Annual Rate of PV Degradation	0.50%
Estimated Avoided Cost ($/kWh)	$0.190
Annual Electricity Cost Inflation	3.00%
Operations & Maintenance Cost: Year 1	$67,928
Annual O&M Escalation Rate	3.00%

Key Financing Inputs and Assumptions	
Solar Contract Turnkey Price	$7,837,771
Performance Guarantee: Years 0-10	$129,578
Total CEC Loan	$3,000,000
Interest	0.00%
Term (years)	20
GO Bond	$4,967,349

Projected Results	
Total General Fund Savings	$6,806,989
Average Annual Savings	$340,349
General Fund NPV (3%)	$5,063,541

Year	Savings of Utility Bill	Cost of O&M Contract (Years 0-20)	Net Energy Savings	Principal Repayment	Supplemental Interest	Net Payment	Annual General Fund Benefit	Cumulative General Fund Benefit
1	$456,056	($67,928)	$388,129	($47,779)	$0	($47,779)	$340,350	$340,350
2	$467,389	($69,965)	$397,424	($57,074)	$0	($57,074)	$340,350	$680,699
3	$479,004	($72,064)	$406,940	($66,590)	$0	($66,590)	$340,350	$1,021,049
4	$490,907	($74,226)	$416,681	($76,331)	$0	($76,331)	$340,350	$1,361,399
5	$503,106	($76,453)	$426,653	($86,303)	$0	($86,303)	$340,350	$1,701,749
6	$515,608	($78,747)	$436,862	($96,512)	$0	($96,512)	$340,350	$2,042,098
7	$528,421	($81,109)	$447,312	($106,962)	$0	($106,962)	$340,350	$2,382,448
8	$541,553	($83,542)	$458,010	($117,660)	$0	($117,660)	$340,350	$2,722,798
9	$555,010	($86,049)	$468,962	($128,612)	$0	($128,612)	$340,350	$3,063,148
10	$568,802	($88,630)	$480,172	($139,822)	$0	($139,822)	$340,350	$3,403,497
11	$582,937	($91,289)	$491,648	($151,298)	$0	($151,298)	$340,350	$3,743,847
12	$597,423	($94,028)	$503,395	($163,045)	$0	($163,045)	$340,350	$4,084,197
13	$612,269	($96,849)	$515,420	($175,071)	$0	($175,071)	$340,350	$4,424,547
14	$627,484	($99,754)	$527,730	($187,380)	$0	($187,380)	$340,350	$4,764,896
15	$643,077	($102,747)	$540,330	($199,980)	$0	($199,980)	$340,350	$5,105,246
16	$659,057	($105,829)	$553,228	($212,878)	$0	($212,878)	$340,350	$5,445,596
17	$675,435	($109,004)	$566,431	($226,081)	$0	($226,081)	$340,350	$5,785,945
18	$692,219	($112,274)	$579,945	($239,596)	$0	($239,596)	$340,350	$6,126,295
19	$709,421	($115,642)	$593,779	($253,429)	$0	($253,429)	$340,350	$6,466,645
20	$727,050	($119,111)	$607,939	($267,595)	$0	($267,595)	$340,344	$6,806,989
Total	**$11,632,229**	**($1,825,240)**	**$9,806,989**	**($3,000,000)**	**$0**	**($3,000,000)**	**$6,806,989**	

Novato Unified School District

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Novato Unified School District
Solar Master Plan
Solar Cost/Benefit Analysis

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Annual Rate of PV Degradation	0.50%
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Annual Electricity Cost Inflation	3.00%
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Annual O&M Escalation Rate	3.00%

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Solar Master Plan
Solar Financing Analysis

Key Financing Inputs and Assumptions		
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Performance Guarantee: Years 0-10	$	129,578
Total CEC Loan	$	3,000,000
Interest		0.00%
Term (years)		20
GO Bond	$	4,967,349

Novato Unified School District
Moving $$ to General Fund

Annual General Fund Benefit	Cumulative General Fund Benefit
$340,350	$340,350
$340,350	$680,699
$340,350	$1,021,049
$340,350	$1,361,399
$340,350	$1,701,749
$340,350	$2,042,098
$340,350	$2,382,448
$340,350	$2,722,798
$340,350	$3,063,148
$340,350	$3,403,497
$340,350	$3,743,847
$340,350	$4,084,197
$340,350	$4,424,547
$340,350	$4,764,896
$340,350	$5,105,246
$340,350	$5,445,596
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$340,350	$6,126,295
$340,350	$6,466,645
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Results for Novato Unified School District

- Solar installations at 10 schools totals 1.4MW
- Power Purchase Agreement with SolarCity
- PPA price = ~$0.147/KWh fixed for 20 years – provides savings and rate stability
- Estimated savings = $3.7 million over 20 years; $6.5 million over 25 years
- Approximately 318 metric tons of CO2 avoided annually

San Ramon Valley Unified School District*

Environmental benefits of 3.7 MW installed solar

Climate Protection

Avoided **17,653** tons of Carbon Dioxide (equivalent to not driving **36,882,000** miles)

Air Quality Improvements

Avoided **9,649** pounds of Nitrogen Oxides

Avoided **1,664** pounds of Sulfur Oxides

See, http://www.srvusd.net/solar

* Since September 2011

BAAQMD – KyotoUSA Partnership Key Outcomes

- Solar Master Plans provided to 19 school districts, including 252 schools
- Mini-Solar Master Plans provided to an additional 49 school districts
- More than 50 solar installations in process and more to come

For the 19 school districts that received SMPs:

- Potential PV system size > 18MW
- Savings ranging from $29M to $122M depending on financing method
- Annual GHG reductions = 8,500 metric tons of CO2

And, of course, we couldn't have done it without you. Thank you for making it possible, from all the kids, in all the schools!

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AGENDA: 5

Climate Forward Bay Area:
A Leadership Forum

Climate Protection Committee

Lisa Fasano, Communications Officer

November 17, 2016

Survey Responses

- ***86 percent*** *found the conversations valuable*
- *Greg Dalton's moderating style was praised*
- ***77%*** *found Tech and Energy Water and Waste plenary valuable*
- *Air District Board members were complimented for moderating and keeping the conversation flowing*

Forum Highlights

- *Overall, respondents appreciated conversational style*
- *The Set the Stage plenary and Van Jones keynote best sessions*
- *Friday opening session provided a voice to:*
  - ***Ms. Margaret Gordon*** - West Oakland Environmental Indicators Project and the Alameda County Stakeholder Project for the Environmental Health
  - ***Ms. Marie Harrison*** – Community Organizer for Greenaction for Health and Environmental Justice
  - ***Jed Holztman*** – 350BayArea.org
  - ***Julian Pelzner*** – sophomore UC, Berkeley, Environmental Economics/Policy
  - ***Jazmine Jolly*** – senior, Windsor High School

Breakout Sessions

- *88% found the Tech and Transportation & Housing breakout conversation valuable*
- *78% found Tech and Energy conversation valuable*
- *71% found Tech and Water conversation valuable*
- *77% found Tech and Waste conversation valuable*

Keynote Results

Van Jones' Keynote

- *90% of respondents found Van's Keynote valuable (of that 70% strongly agreed)*

Keynote Responses

- *Inspiring presentation and thoughtful responses to questions.*
- *This was by far the highlight of the conference. Very relevant and inspiring.*
- *He was worth the wait. His inspirational spirit / words / insights gave wind to my wings....*
- *Van Jones is excellent. Great conclusion to the conference.*
- *I was skeptical that Van Jones would deliver a meaningful conversation. He was fantastic.*

Lessons Learned

- Tech and Transportation Plenary received 57% favorability level;
  - ➢ *many respondents surprised by MTC's position*
- More discussion about new and emerging technologies
- Desire for more elected officials to attend
- More diversity
- Fracking discussion and impact of animal agriculture

By the numbers

	2016 Climate Forward Bay Area
Event Cost	$365,139
Sponsorship	$66,000
Attendees	275
Cost per attendee per day	$664