



South San Francisco USD Energy Program Savings Update

October 6, 2022



Partnership Overview

Phase I (Completed October 2012)

- Installed 1.68 MW of solar PV capacity across all 15 schools
- Upgraded to high-efficiency lighting at 10 school sites
- Upgraded HVAC and boilers at two sites
- Installed new energy management systems at all school sites
- Installed irrigation control systems at all school sites
- Installed new roofs at three schools
- STEM energy education and professional development for teachers



Phase II (Completed March 2018)

- Installed new LED stadium light fixtures at the El Camino High School athletic field
- Retrofitted 1,822 interior/exterior lighting fixtures with LEDs
- Installed 352 kW of additional solar PV capacity at three sites
- STEM energy education and professional development for teachers
- All local construction professionals

Summer of STEM Program

2016 – 2021

- Hands-on STEM projects, learning modules, and curriculum with a focus on energy and sustainability
- Professional development for teachers
- Activity kits and resources for hands-on learning
- Focus on literacy connections
- Over 1,800 students engaged
- Continued engagement with teachers to enable District to run Summer program on own moving forward

District Awards

- CSBA Golden Bell Award, 2018
- USGBC Best of Green Schools Award, 2019
- Acterra Business Environmental Award Finalist, 2018



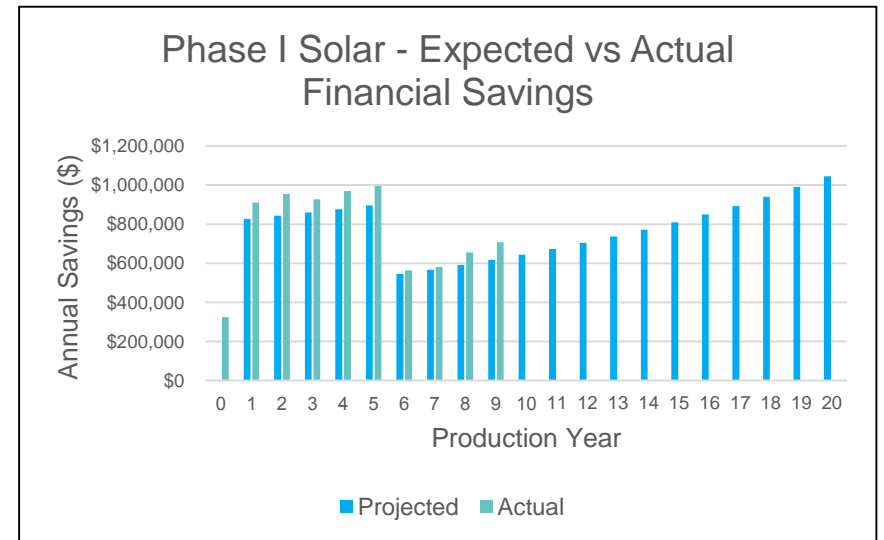
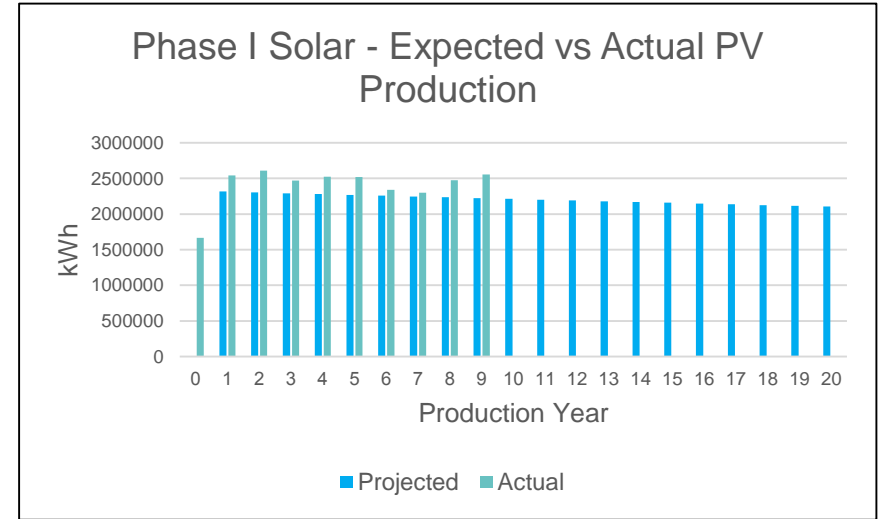
Phase I Savings Model

Year	Solar Electricity Produced (kWh)	CSI Incentive (\$/kWh)	Net Solar Project Savings	Energy Conservation Rebates	Energy Conservation Savings	Project Net Benefit	Cumulative Net Benefit
1	2,437,243	\$399,342	\$907,995	\$52,071	\$110,351	\$1,070,417	\$1,070,417
2	2,425,057	\$397,346	\$926,942		\$115,869	\$1,042,810	\$2,113,227
3	2,412,932	\$395,359	\$946,845		\$121,662	\$1,068,507	\$3,181,734
4	2,400,867	\$393,382	\$967,746		\$127,745	\$1,095,491	\$4,277,225
5	2,388,863	\$391,415	\$989,690		\$134,132	\$1,123,823	\$5,401,047
6	2,376,918		\$519,223		\$140,839	\$660,062	\$6,061,110
7	2,365,034		\$541,987		\$147,881	\$689,868	\$6,750,978
8	2,353,208		\$565,819		\$155,275	\$721,094	\$7,472,072
9	2,341,442		\$590,770		\$163,039	\$753,809	\$8,225,881
10	2,329,735		\$616,890		\$171,191	\$788,080	\$9,013,961
11	2,318,087		\$644,232		\$179,750	\$823,983	\$9,837,943
12	2,306,496		\$672,854		\$188,738	\$861,592	\$10,699,535
13	2,294,964		\$702,814		\$198,175	\$900,989	\$11,600,524
14	2,283,489		\$734,173		\$208,083	\$942,256	\$12,542,780
15	2,272,071		\$766,995		\$218,487	\$985,483	\$13,528,263
16	2,260,711		\$801,348			\$801,348	\$14,329,612
17	2,249,407		\$837,302			\$837,302	\$15,166,913
18	2,238,160		\$874,929			\$874,929	\$16,041,843
19	2,226,970		\$914,307			\$914,307	\$16,956,150
20	2,215,835		\$955,516			\$955,516	\$17,911,666
21	2,204,756		\$1,076,542			\$1,076,542	\$18,988,207
22	2,193,732		\$1,124,394			\$1,124,394	\$20,112,601
23	2,182,763		\$1,174,435			\$1,174,435	\$21,287,037
24	2,171,849		\$1,226,765			\$1,226,765	\$22,513,802
25	2,160,990		\$1,281,487			\$1,281,487	\$23,795,289
30	2,107,503		\$1,594,942			\$1,594,942	\$31,115,134
35	2,055,340		\$1,986,685			\$1,986,685	\$40,230,198
Total	68,055,530	\$1,976,844	\$37,796,911		\$2,381,216	\$40,230,198	

- Net Savings: \$31,115,134 savings over 30 years
- Costs:
 - Solar PV and Energy Efficiency: \$14,852,089
 - Infrastructure Upgrades, including new HVAC, roofs, boilers, HVAC, irrigation and energy management controls: \$9,828,744
- Bond Funded
- 20-year solar savings guarantee
- \$1,976,844 in solar incentive payments from California Solar Initiative (CSI) to District

Solar PV Performance To Date

Phase 1 Solar						
Year	Guaranteed Production (kWh)	Avoided Rate (\$/kWh)	Guaranteed Savings (\$/yr)	Actual Energy Production (kWh)	Actual Savings (\$/yr)	Percent of Guarantee
	In Contract	In Contract	In Contract	As Measured	As Measured	
0		\$0.195		1,668,180	\$325,296	
1	2,315,381	\$0.358	\$827,909	2,543,494	\$910,571	110%
2	2,303,804	\$0.366	\$843,329	2,607,380	\$954,301	113%
3	2,292,285	\$0.375	\$859,640	2,472,282	\$927,106	108%
4	2,280,824	\$0.384	\$876,948	2,525,420	\$969,761	111%
5	2,269,420	\$0.395	\$895,337	2,521,007	\$995,798	111%
6	2,258,072	\$0.241	\$544,967	2,339,620	\$563,848	104%
7	2,246,782	\$0.253	\$567,648	2,301,531	\$582,287	102%
8	2,235,548	\$0.265	\$591,679	2,475,568	\$656,026	111%
9	2,224,370	\$0.277	\$617,185	2,557,528	\$708,435	115%
10	2,213,249	\$0.291	\$644,367			
11	2,202,182	\$0.306	\$673,236			
12	2,191,171	\$0.321	\$703,995			
13	2,180,216	\$0.338	\$736,829			
14	2,169,314	\$0.356	\$772,023			
15	2,158,468	\$0.375	\$809,629			
16	2,147,676	\$0.396	\$849,935			
17	2,136,937	\$0.418	\$893,220			
18	2,126,253	\$0.442	\$939,894			
19	2,115,621	\$0.468	\$990,081			
20	2,105,043	\$0.496	\$1,044,195			
	44,172,616		\$15,682,047	24,012,010	\$7,593,429	118%



Expected 25-year lifetime production: 57,411,578 kWh
 Production year starts Nov. 1 each year

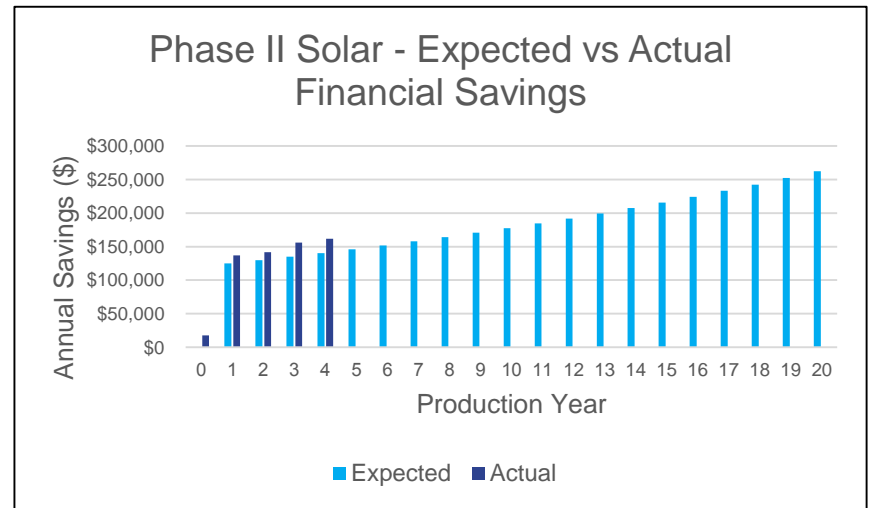
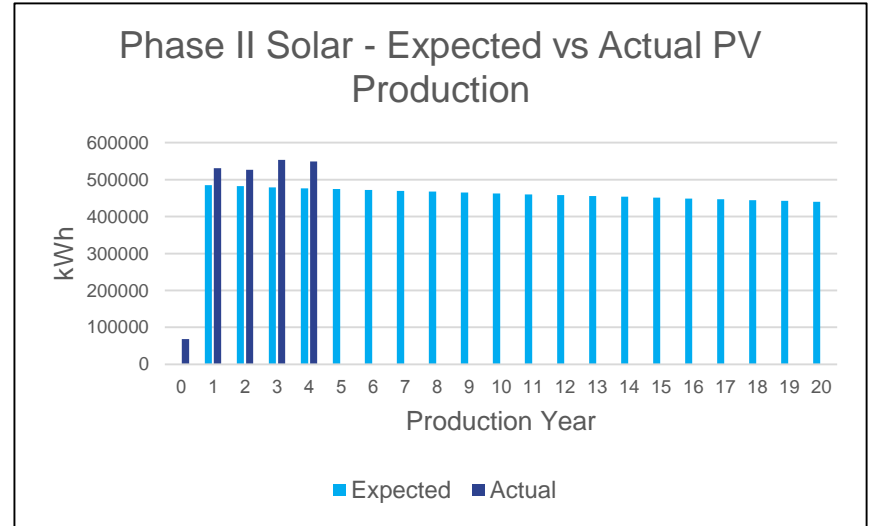
Phase II Savings Model

Year	Solar Electricity Produced (kWh)	Net Solar Project Savings	Lighting Rebates	Interior / Exterior Lighting Savings	Stadium Lighting Savings	District Prop 39 Funds (years 3, 4 & 5)	Total Energy Savings	Estimated Lease Payment	Project Net Savings	Cumulative Program Savings
1	483,984	\$138,400	\$10,157	\$22,682	\$826	\$322,416	\$494,481	\$462,766	\$31,715	\$31,715
2	481,564	\$143,905		\$23,703	\$863	\$364,000	\$532,471	\$500,755	\$31,715	\$63,431
3	479,156	\$149,629		\$24,769	\$902	\$364,000	\$539,300	\$507,585	\$31,715	\$95,146
4	476,760	\$155,580		\$25,884	\$943		\$182,407	\$150,691	\$31,715	\$126,861
5	474,377	\$161,768		\$27,049	\$985		\$189,802	\$158,087	\$31,715	\$158,577
6	472,005	\$154,044		\$28,266	\$1,029		\$183,339	\$151,624	\$31,715	\$190,292
7	469,645	\$160,309		\$29,538	\$1,076		\$190,923	\$159,207	\$31,715	\$222,007
8	467,297	\$166,828		\$30,867	\$1,124		\$198,819	\$167,104	\$31,715	\$253,722
9	464,960	\$173,610		\$32,256	\$1,175		\$207,041	\$175,326	\$31,715	\$285,438
10	462,635	\$180,667		\$33,708	\$1,228		\$215,602	\$183,887	\$31,715	\$317,153
11	460,322	\$188,009		\$35,224	\$1,283		\$224,516	\$192,801	\$31,715	\$348,868
12	458,020	\$195,647		\$36,810	\$1,340		\$233,797	\$202,082	\$31,715	\$380,584
13	455,730	\$203,595		\$38,466	\$1,401		\$243,461	\$211,746	\$31,715	\$412,299
14	453,452	\$211,863		\$40,197	\$1,464		\$253,523	\$221,808	\$31,715	\$444,014
15	451,184	\$220,465		\$42,006	\$1,530		\$264,000	\$232,285	\$31,715	\$475,730
16	448,929	\$229,414		\$43,896	\$1,599		\$274,909	\$243,194	\$31,715	\$507,445
17	446,684	\$238,725		\$45,871	\$1,670		\$286,267	\$254,552	\$31,715	\$539,160
18	444,450	\$248,412		\$47,936	\$1,746		\$298,094	\$266,378	\$31,715	\$570,876
19	442,228	\$258,490		\$50,093	\$1,824		\$310,407	\$278,692	\$31,715	\$602,591
20	440,017	\$268,975		\$52,347	\$1,906		\$323,228	\$77,205	\$246,023	\$848,614
21	437,817	\$279,883		\$54,702			\$334,585		\$334,585	\$1,183,199
22	435,628	\$291,231		\$57,164			\$348,395		\$348,395	\$1,531,594
23	433,450	\$303,037		\$59,736			\$362,773		\$362,773	\$1,894,367
24	431,283	\$315,319		\$62,425			\$377,743		\$377,743	\$2,272,110
25	429,126	\$328,096		\$65,234			\$393,330		\$393,330	\$2,665,440
Total	11,400,704	\$5,365,901		\$1,010,828	\$25,913	\$1,050,416	\$7,463,215	4,797,775	\$2,665,440	

- Net Savings after financing costs: \$2,665,440
- PV and Energy Efficiency Costs: \$4,925,719
- Prop 39 Funds (year 1&2): \$700,000
- Capital Contribution: \$300,000
- Net Amount Financed: \$3,925,719
- 20-year solar savings guarantee

Solar PV Performance To Date

Phase II Solar						
Year	Guaranteed Production (kWh)	Avoided Rate (\$/kWh)	Guaranteed Savings (\$/yr)	Actual Energy Production (kWh)	Actual Savings (\$/yr)	Percent of Guarantee
	In Contract	In Contract	In Contract	As Measured	As Measured	
0		\$0.257		68,360	\$17,587	
1	484,606	\$0.258	\$125,004	531,181	\$137,018	110%
2	482,216	\$0.270	\$129,976	526,343	\$141,870	109%
3	479,154	\$0.282	\$135,145	553,434	\$156,076	116%
4	476,757	\$0.295	\$140,521	549,056	\$161,786	115%
5	474,373	\$0.308	\$146,110			
6	472,001	\$0.322	\$151,922			
7	469,641	\$0.336	\$157,964			
8	467,293	\$0.351	\$164,247			
9	464,957	\$0.367	\$170,780			
10	462,632	\$0.384	\$177,573			
11	460,319	\$0.401	\$184,636			
12	458,017	\$0.419	\$191,980			
13	455,727	\$0.438	\$199,616			
14	453,448	\$0.458	\$207,556			
15	451,181	\$0.478	\$215,811			
16	448,925	\$0.500	\$224,395			
17	446,681	\$0.522	\$233,320			
18	444,447	\$0.546	\$242,601			
19	442,225	\$0.570	\$252,250			
20	440,014	\$0.596	\$262,283			
	9,234,615		\$3,713,690	2,228,374	\$614,337	116%



Expected 25-year lifetime production: 11,400,704 kWh
 Production year starts May 1 each year

Thank You

Team Contact Info

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Measurement & Verification Services

Measurement and Verification (M&V) Reporting

- Measurement & Verification (M&V) Reporting
 - › annual savings guarantee reconciliation reports & customer meeting
- Solar PV Performance Monitoring
 - › continuous monitoring of PV systems by experienced monitoring technicians
 - › identify and respond to system alarms & communication issues
 - › performance alerts when systems are outside of expected operating parameters
 - › user interface web accessible (utilityvision) to customer 24/7

Operations & Maintenance Services

Preventive Maintenance Scope (annually)

- Visually inspect arrays, panel mounting, wiring, combiner boxes, sub combiner boxes, and disconnect switches
- Inspect PV modules for damage, discoloration or de-lamination
- Inspect mounting system for damage or corrosion
- Visually inspect combiner boxes, sub combiner boxes, and disconnect switch panels.
- Visually inspect array racking components (rooftop mount).
- Visually inspect racking hardware and components for abnormal wear or excessive corrosion.
- Visually inspect roof penetrations for signs of damage or compromised seals.
- Inspection of non-penetrating racking system for any abnormal movement.
- Inspection of exposed array wiring.
 - DC wiring not installed in a raceway will be inspected for chaffing, deterioration, and proper MC connections.
- Replacement/cleaning of inverter air filters.
- Clean inverter air intake and vent ducts.
- Clean and remove dust from inverter control boards. (Using canned compressed, non-static air)
- Remove all dirt and debris from inverter caged area.
- Clean outside of inverter cabinet, louvres, transformer cabinet and louvres, and switchboard cabinets. Remove all spider webs, insects and debris.
- Notify customer once inspection is complete and report any concerns immediately.
- Provide detailed reporting of all maintenance activities to customer.

Operations & Maintenance Services

Electrical Maintenance Scope (annually)

- Torque checks on critical electrical terminations
- Inverter IR scanning and servicing of all internal components per manufacturer's guidelines. (Electrician)
- Inspection and IR scanning of all combiner boxes and disconnects, test all fuses for continuity. (Electrician)
- Notify customer once electrical maintenance is complete and report immediately any concerned issues.
- Provide detailed report of all maintenance activities to customer.

Solar Circuit Re-commissioning (annually)

- Perform testing on all solar circuits utilizing Solmetric PV Analyzer.
- Notify customer with any immediate concerns. Include results in an annual report to customer.

Operations & Maintenance Services

Array Cleaning (annually + as needed based on performance)

- Clean modules, according to solar panel manufacturer's warranty specifications, minimally once (1x) per year.
- Additional module cleaning upon detection of soiling generation loss of 5% or greater at ENGIE's direction.
- Notify customer immediately of any damaged modules
- Provide detailed annual inspection and cleaning report with before and after photo to customer