

The recommendation of the installation of PV Solar Panels to reduce the electricity costs in Schofield Barracks Commissary, Hawaii

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ABSTRACT

The Schofield Barracks Commissary is a supermarket that sells groceries and household goods only to military members and their families; is located in Wahiawa, Hawaii. The store experiences high electricity bills due to the oil price fluctuation in Hawaii. The Schofield Barracks Commissary annual energy consumption average is approximately 304,650 kWh. The most common solar power provided in Hawaii are the community solar and the rooftop solar PV. The rooftop solar PV installation with Customer Self-Supply is recommended due to the significant power, the Schofield Barracks Commissary utilizes. The principal contractors selected were SunPower by Eco Solar, Pacific Energy Strategies, and SolarCity. The only contractor to give a verbal quote was SunPower by Eco Solar which they estimated \$6M for the whole system (installation, battery storage, inverter, warranty). Based on the current energy consumption, if the system is purchased and the store does not receive incentives, the system will pay for itself in approx. 99 months (8.25 years).

BACKGROUND

The Schofield Barracks Commissary is a supermarket that sells groceries and household goods only to military members and their families; is located in Wahiawa, Hawaii. The store's yearly electricity cost averages from \$790,000 to \$1M. The store's management exchanged the whole store's equipment to energy efficient systems, as a solution to reduce electricity expenses. However, their cost remains high. The management's objectives are to reduce the electricity cost by at least 25% of its monthly cost by utilizing renewable energy and to contribute in the world's reduction of greenhouse gases. The photovoltaic (PV) solar panels are recommended as an alternative to fulfill their objectives. By installing the PV solar panels, the store could reduce energy demands and gain opportunities such as protection and extension of roof life.

OBJECTIVES

- To reduce energy demands and electricity costs
- To protect and extend the roof life

METHODS

- The SMART criteria method was applied for the project's management of the Schofield Barracks Commissary. Specific data of the electricity usage, the building measurements, the area location, weather information, and competitive renewable resources information were collected. Solar sellers such as SunPower by Eco Solar, Pacific Energy Strategies, and SolarCity were contacted for comparison of product and prices. The sellers received a timeline to complete the estimates and submit their bids.

Data Collection

Electricity Usage Comparison from 2015 and 2016.

Usage History - Meter #6679					
Date	Read	Units	kWh	Days	kWh/Day
5/4/2015	163661	697	278800		
5/27/2015	164267	698	282400	23	10599
7/8/2015	165355	1088	435200	42	10362
8/6/2015	166245	890	356000	29	12276
8/31/2015	166985	740	296000	25	11840
10/5/2015	168160	1175	470000	35	13429
11/2/2015	168995	835	334000	28	11929
12/1/2015	169848	853	341200	29	11766
1/8/2016	170808	960	384000	38	10105
2/1/2016	171375	567	226800	24	9450
3/2/2016	172100	725	290000	30	9667
3/28/2016	172733	633	253200	26	9738
5/4/2016	173671	938	375200	37	10141
6/3/2016	174253	582	232800	28	8314

Usage History - Meter #6679					
Date	Read	Units	kWh	Days	kWh/Day
5/4/2016	173671	938	375200		
6/3/2016	174253	582	232800	28	8314
7/7/2016	175070	817	326800	36	9078
8/4/2016	175729	659	263600	28	9414
8/29/2016	176303	574	229600	25	9184
9/30/2016	177039	736	294400	32	9200
11/1/2016	177756	717	286800	32	8963
12/5/2016	178504	748	299200	34	8800
12/30/2016	179040	536	214400	25	8576
2/2/2017	179757	717	286800	34	8435
3/2/2017	180359	602	240800	28	8600
3/31/2017	181002	643	257200	29	8869
5/1/2017	181716	714	285600	31	9213
6/5/2017	182497	781	312400	35	8926

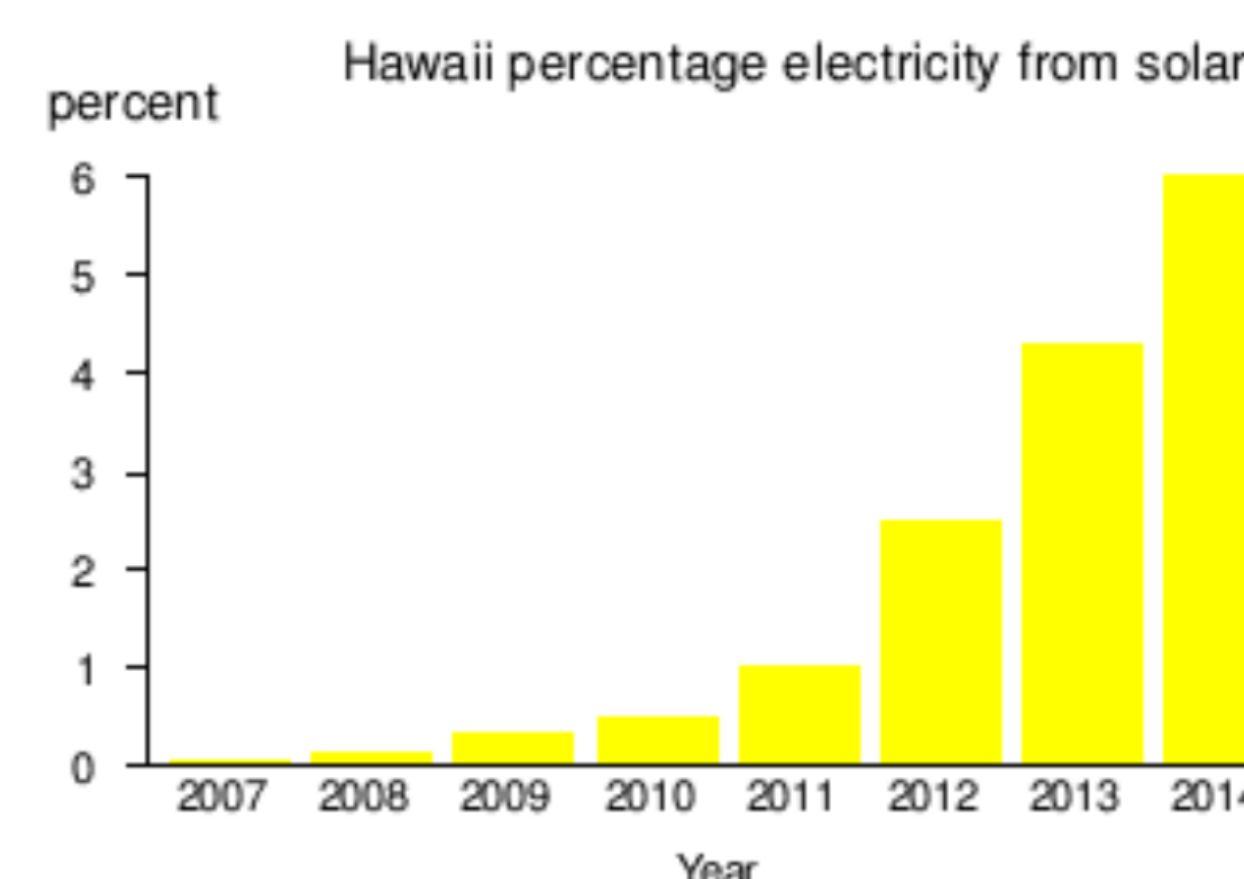
Monthly Comparison Between May 2015 and May 2017

May-2015					
Customer:	SB Commissary & Warehouse	Rate:	A		
Area:	Schofield Barracks, Bldg 698	Agreement #:	WX3JP7-92121-001	To:	6/1/2016
Period:	From: 5/4/2016	Days:	28		
Meter #:	6679				
Current Reading:	174253				
Previous Reading:	173671				
Difference:	582				
Multiplier:	400				
kWh Usage:	232,800	Avg Usage/Day:	8,314		
Rate/kWh:	50.18283				
AMT DUE:	542,562.82				

May-2017					
Customer:	SB Commissary & Warehouse	Rate:	A		
Area:	Schofield Barracks, Bldg 698	Agreement #:	WX3JP7-92121-001	To:	6/5/2017
Period:	From: 5/1/2017	Days:	35		
Meter #:	6679				
Current Reading:	182497				
Previous Reading:	181716				
Difference:	781				
Multiplier:	400				
kWh Usage:	312,400	Avg Usage/Day:	8,926		
Rate/kWh:	50.22033				
AMT DUE:	568,831.09				

RESULTS

- From the data collected it was found that Hawaii's tropical moderated climate permits substantial renewable resources throughout the island chain, such as solar power, wind power, natural gas, and thermal power. That the solar power edged out wind power in 2015 to become the state's largest renewable source of electricity, providing 35% of renewable generation, primarily because of the growth of distributed solar generation.



RESULTS

Maxeon Quality Cells

Compared to a Conventional Panel, a SunPower solar panel produces 70% more energy over the first 25 years.

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- The only contractor to give a verbal quote was SunPower by Eco Solar which they estimated \$6M for the whole system (installation, battery storage, inverter, warranty). Unfortunately, all the contractors selected for this project shared the same lack of response when requesting a quote. There is no quote available to collect bids. There are no product specification sheets to compare the generation capacity of each system and the estimated amount of energy it will produce annually based on sunlight conditions in the Schofield Barracks Commissary's area. Therefore, there is no company to be selected.
- However, because of the technology research, it is recommended to select the Concentrated Photo Voltaic panels (CPV). CPV produces 25% - 30% more power compared to conventional cells; they are 15% more efficient.
- Also, to meet the objectives of the project, it is recommended to select the rooftop PV installation with CSS. This option will reduce the electricity cost and lower the demand of energy. Thus, it will contribute with the reduction of greenhouse gases. Based on the only verbal quote (\$6M by SunPower), by buying the system, the store could gain incentives; however, this benefit was in doubt because SunPower did not know if the store could benefit from it since it is a government facility. Assuming the current energy consumption will remain constant for the next 25 years, if the system is purchased and the store does not receive incentives, the system will pay for itself in approx. 99 months (8.25 years). The other 17 years (based on the standard warranty) will be returned in profit.

CONCLUSIONS

Finally, the Schofield Barracks Commissary is located in an area where there is abundant sun and no shade to obstruct the sunlight to reach the PV solar panels installed. The store's roof is 79,481 sq. Ft. which allows at least an installation of 239-panel on it, maybe more. The average sunny days for this area is 271 days with an approx. 6 hours of sun per day. Unfortunately, accurate data could not be acquired due to the contractor's lack of response. The results did not contribute to the knowledge of the field. However, for future works it was found that when selecting a contractor, it is essential to have more than the minimum data of the project to be able to pressure the contractor to receive a quote to provide concurrent data.