Small-Scale JCM MODEL PROJECT for Commercial Facilities in Island States





WCTC Solar Power Generation Project

In the early 2000s, fossil fuel price was sky rocketing and the awareness of Green House Gas (GHG) emission was becoming very real.

The rise of fuel prices led to an increase in power bills for countries like Palau that depended on diesel power generation.

WCTC being among one of the heavy electric power users for our equipment, started looking into ways to save on electricity consumption in all our store locations. Our search for alternate power source, led us into Photovoltaic power generation yet the investment costs were very high.

In Mid 2013, we were informed by Japan's Ministry of the Environment through Melekau Environmental Consultant of Palau about JCM Financing Program from the Japan government initiative to assist commercial entities in the island countries and invest in energy savings and renewable energy solutions.

This piece of information was very welcoming and we opted to partner with Japan's Ministry of Environment JCM Financing Program that was being organized by Pacific Consultant of Japan and Melekau Environmental Consultant of Palau.

By mid 2014, WCTC signed the MOU to contribute to saving the environment and reducing carbon emission. And as a result, our Solar PV power generation took effect and by November 2014, we commissioned phase one installation of 220.5kW Solar PV Power Plant under JCM project at T - Dock, Koror.

Subsequent installations of phase 2 & 3 followed in mid 2016 at our Central Warehouse in Malakal for 263.64kW of Solar PV and 80.03kW of Solar PV Power plant installed and commissioned in January 2017 at Desekel building.

We are currently working towards phase 4 of JCM project for 427.46kW Solar PV Power plant on Shopping Center Roof Top by the middle of February 2020.

Solar PV Power Plant



Energy Savings Comparison ACE Hardware, T-Dock

			WITHOUT S	SOLAR					WITH SOLAR				
Billing Period	# OF DAYS	PER DAY KWH USAGE	KWH USAGE (A)	RATE/KWH (B)	ELECTRICIT Y (A*B)	Billing Period	# OF DAYS	PER DAY KWH USAGE	KWH USAGE (A)	RATE/KWH (B)	ELECTRICIT Y (A*B)	UTILITY SAVINGS	
03/29/2014- 04/28/2014	31	1048	32480	0.427	\$ 13,868.96	03/24/2015- 04/24/2015	32	405	12960	0.274	\$ 3,551.04	\$ (10,317.92)	
04/29/2014- 05/26/2014	28	1080	30240	0.427	\$ 12,912.48	04/2/2015- 05/25/2015	31	459	14240	0.274	\$ 3,901.76	\$ (9,010.72)	
05/27/2014- 06/27/2014	32	1155	36960	0.427	\$ 15,781.92	05/26/2015- 06/22/2015	28	514	14400	0.296	\$ 4,262.40	\$ (11,519.52)	
06/28/2014- 07/28/2014	31	1055	32720	0.427	\$ 13,971.44	06/23/2015- 07/24/2015	32	538	17200	0.296	\$ 5,091.20	\$ (8,880.24)	
07/29/2014- 08/29/2014	32	1148	36720	0.427	\$ 15,679.44	07/25/2015- 08/24/2015	31	467	14480	0.296	\$ 4,286.08	\$ (11,393.36)	
08/30/2014- 09/26/2014	28	1037	29040	0.427	\$ 12,400.08	08/25/2015- 09/25/2015	32	373	11920	0.296	\$ 3,528.32	\$ (8,871.76)	

Energy Savings Comparison Desekel Building, Ngerbeched

			WITHOUT S	SOLAR					WITH SC	DLAR				
Billing Period	# OF DAYS	PER DAY KWH USAGE	KWH USAGE (A)	RATE/KWH (B)	ELECTRICIT Y (A*B)	Billing Period	# OF DAYS	PER DAY KWH USAGE	KWH USAGE (A)	RATE/KWH (B)	ELECTRICIT Y (A*B)	UTILITY SAVINGS		
07/25/2015- 08/24/2015	31	472	14640	0.296	\$ 4,333.44	07/26/2016- 08/26/2016	32	183	5840	0.313	\$ 1,827.92	\$ (2,505.52)		
08/25/2015- 09/25/2015	32	485	15520	0.296	\$ 4,593.92	08/27/2016- 09/26/2016	31	186	5760	0.275	\$ 1,584.00	\$ (3,009.92)		
09/26/2015- 10/25/2015	30	523	15680	0.296	\$ 4,641.28	09/27/2016- 10/24/2016	28	249	6960	0.275	\$ 1,914.00	\$ (2,727.28)		
1026/2015- 11/26/2015	32	495	15840	0.296	\$ 4,688.64	10/25/2016- 11/25/2016	32	250	8000	0.275	\$ 2,200.00	\$ (2,488.64)		
11/27/2015- 12/22/2015	26	606	15760	0.296	\$ 4,664.96	11/26/2016- 12/23/2016	28	220	6160	0.275	\$ 1,694.00	\$ (2,970.96)		
12/23/2015- 01/25/2016	34	400	13600	0.296	\$ 4,025.60	12/27/2016- 01/23/2017	31	217	6720	0.275	\$ 1,848.00	\$ (2,177.60)		
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Energy Savings Comparison Central Warehouse, Malakal

			WITHOUT S	OLAR			WITH SOLAR					
Billing Period	# OF DAYS	PER DAY KWH USAGE	KWH USAGE (A)	RATE/KWH (B)	ELECTRICIT Y (A*B)	Billing Period	# OF DAYS	PER DAY KWH USAGE	KWH USAGE (A)	RATE/KWH (B)	ELECTRICIT Y (A*B)	UTILITY SAVINGS
09/09/2015- 09/18/2015	10	1232	12320	0.296	\$ 3,646.72	08/20/2016- 09/19/2016	31	266	8240	0.275	\$ 2,266.00	\$ (1,380.72)
09/19/2015- 10/19/2015	32	1218	38960	0.296	\$ 11,532.16	09/20/2016- 10/17/2016	28	271	7600	0.275	\$ 2,090.00	\$ (9,442.16)
10/20/2015- 11/20/2015	32	1433	45840	0.296	\$ 13,568.64	10/18/2016- 11/18/2016	32	350	11200	0.275	\$ 3,080.00	\$ (10,488.64)
11/21/2015- 12/18/2015	28	1374	38480	0.296	\$ 11,390.08	11/1/2016- 12/16/2016	28	446	12480	0.275	\$ 3,432.00	\$ (7,958.08)
12/19/2015- 01/18/2015	31	1324	41040	0.296	\$ 12,147.84	12/17/2016- 01/16/2017	31	325	10080	0.275	\$ 2,772.00	\$ (9,375.84)
01/19/2015- 02/15/2015	28	743	20800	0.296	\$ 6,156.80	01/17/2017- 02/13/2017	28	517	14480	0.275	\$ 3,982.00	\$ (2,174.80)

Data from Sunny Portal ACE Hardware, T-Dock



Data from Sunny Portal ACE Hardware, T-Dock

Energy and Power | WCTC ACE HARDWARE





Data from Sunny Portal Yearly Meter Change ACE Hardware, T-Dock

Diagram values: Total

	WCTC ACE HARDWARE Total yield Meter change [kWh]
2014	39089.097
2015	327034,776
2016	293758,370
2017	281820.112
2018	279675.858
2019	236003,848



Data from Sunny Portal Central Warehouse, Malakal



Data from Sunny Portal Central Warehouse, Malakal

Energy and Power | WCTC CENTRAL WAREHOUSE





Data from Sunny Portal Yearly Meter Change Central Warehouse, Malakal



Diagram values: Total

	WCTC CENTRAL WAREHOUSE Total yield Meter change [kWh]
2016	323417.686
2017	324758,554
2018	334712,935
2019	257170.058



Data from Sunny Portal Desekel Building, Ngerbeched



Data from Sunny Portal Desekel Building, Ngerbeched

Energy and Power | WCTC DESEKEL





Data from Sunny Portal Yearly Meter Change Desekel Building, Ngerbeched



Diagram values: Total

	WCTC DESEKEL Total yield Meter change [kWh]
2016	93428.766
2017	96657,354
2018	102325,189
2019	79446.226





Estimated Project Costs and CO2 Reduction

Plant Location	System Size in Watts	Total Project Cost	JCM Subsidy	Subsidized Project Cost
ACE Hardware	220,500	\$713,826.00	\$266,319.89	\$477,506.11
Central Warehouse	263,640	\$842,389.00	\$440,590.87	\$401,798.13
Desekel Mall	80,030	\$251,294.00	\$133,744.83	\$117,549.17
Shopping Center	427,460	\$1,086,720.28	\$76,942.80	\$1,009,777.48

Totals:991,630\$2,894,229.28\$917,598,39\$1,976,630.89

Reference: Island Engineering

Estimated Project Costs and CO2 Reduction

Plant Location	Contract Cost/Watt	JCM Subsidy/Watt	Final Cost/Watt	JCM % Project Cost
ACE Hardware	\$3.24	\$1.21	\$2.03	37%
Central Warehouse	\$3.20	\$1.67	\$1.52	52%
Desekel Mall	\$3.14	\$1.67	\$1.47	53%
Shopping Center	\$2.54	\$0.18	\$2.36	7%

Totals:\$2.92\$0.93\$1.9932%Reference: Island Engineering

Estimated Project Costs and CO2 Reduction

Plant Location	Total Energy Generated kWh since Installation to Oct. 2, 2019	CO2t / kWh as per JCM	Total CO2t since Installation to Oct. 2, 2019	
ACE Hardware	1,419,621	0.000533	756.66	
Central Warehouse	1,152,219	0.000533	614.13	
Desekel Mall	368,227	0.000533	196.27	
Total Generation and CO2t	2,940,067	-	1,567	
Ton CO2 Offset per kWp Installed			2.78	CO2t/kWp

Reference: Island Engineering

Challenges we are facing. . .

- We have received limited training on maintenance and troubleshooting of Solar PV system.
- Most of the time when an inverter or sensors have issue, we have to address it to Island Engineering, and wait for their availability.
- These issues cause extended downtime of the system. The more downtime we encounter, the more energy we are wasting, especially when the issue is on the inverter.

Suggestions for Future Projects on the JCM

- Build a PV solar power plant in T-dock area, to use as charging station for electric cars.
- Slowly upgrade company cars and customer cars with electric cars.
- Ask JCM if they could also help us with applying for subsidy in purchasing electric cars.

As they say: "Solar panels and electric cars are a match made in heaven."

Gratitude:

- We would like to extend our thanks and greatest appreciation to MOEJ and the Administrators of JCM financing program for extending the program to us and challenging us with this project.
- We thank Pacific consultant Co. (PCKK) and Melekau Environmental Consulting for guiding and pushing us to get the projects completed within a timely basis.
- We would also like to thank Island Engineering for Designing and Installing the Solar PV Power plants to suit the island conditions and PPUC requirement. And for their continued assistance in monitoring the Solar PV.
- Acknowledgement to WCTC Financial Controller for Monitoring vital KWH savings generated from PPUC to cut our Solar Projects investment cost.
- I want to extend a thank you to WCTC Technicians who are constantly monitoring the Solar PV with the limited resource and experience.

Central Warehouse Solar PV



Aerial View of ACE Hardware T-Dock.



Thank you!