Current progress of the JCM & Climate Change related policy in Maldives



Ministry of Environment & Villa College, Maldives 1st March 2019, Tokyo, Japan



National Greenhouse Gas Inventory 2011



- Growth rate: 7% per year (last 10 yrs)
- 2 2.5 million tons of CO₂e by 2020

Emission by Sectors



- 291 g CO₂e per GDP (PPP) \$
- 3,697 kg CO₂e per capita

Maldives Energy Sector

- In 2015, 506,334 metric ton of fuel was imported.
- Achieved universal access of electricity in 2008.
- Inhabited islands of the Maldives have a total installed capacity of 194MW of diesel generators to cater for the electricity demand.
- Utility Companies : STELCO, FENAKA, MWSC
- Total of 189 powerhouses in inhabited islands.
- Cost of Electricity 0.3 0.7 USD/kWh
- Total renewable energy installed capacity to 4MW

JCM in Maldives

- Maldives signed the bilateral agreement with the Government of Japan for the introduction of the Joint Crediting Mechanism (JCM) on 29 June 2013.
- Held the first Joint Committee meeting on 20 March 2014
 - Approved basic rules and guidelines for JCM



JFJCM Funded – Addu Atoll (POISED)

Install smart Micro-grid systems with renewable energy, energy management system (EMS), and battery energy storage system (BESS)



Benefits of PV System, EMS and BESS

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Base Case : DG grid

• All power is supplied from the grid. DG grid 4.5 MW

With PV System

 PV possible about 700 kW, without EMS control (16% of grid capacity)

With PV, BESS, EMS

- 1.6 MW PV with EMS and battery, up to 40 % of grid capacity
- 12.5% diesel fuel saving, 8.1% saving compared with simple PV-DG system
- 1,066 kL/yr diesel oil saving
- 3,000 ton-CO2/yr CO2 saving

Other possible JCM Projects in Maldives.

Wind feasibility - KOMAI HALTEC Inc.

Feasibility Study on a JCM Project with Japanese Mid-size
Wind Turbines in outer islands of the Maldives

Villa Project

- Install **186kW** grid-connected roof top solar PV system
- Private sector partners (Pacific Consultants CO., LTD. / Villa Educational Services Private Limited,)
- Estimated emission reduction is **216 tCO2/year**

What is next?

- Create awareness on JCM among stakeholders
- Target to resorts
- Financial schemes to reduce the initial investment for new technologies
- Villa Shipping and Trading Company plans to invest in 2019 in Solar power generation projects in two of their properties, Adh. Maamigili Island and Maandhoo Fisheries Complex which include 1.4 Mega watt grid with a estimate investment of USD2million.



Climate Change Policy Framework (2015)



Maldives Nationally Determined Contribution (NDC)

	Un-conditional	Conditional
Contribution	10% of the BAU	24% of the BAU
Time period	2021 to 2030	2021 to 2030
Base year	2011	2011
Means of Implementation	Transform of the energy sector through renewable energy and energy efficiency	Donor assistance in the form of Low cost financial resources, technology transfer and capacity building



Energy Policy and measures in the Maldives

- Maldives Energy Policy and Strategy implemented in 2016 by Ministry of Environment and Energy
- The Maldives relies almost entirely on imported fossil fuel to meet its energy demands.
- Male' region accounts for approximately 63% of the total electricity consumed
- Under the current policy framework short-term objective is to produce a minimum of 30% of day time peak load of electricity in all inhabited islands from renewable energy sources by 2018.
- Policy measures undertaken so far include targeted electricity subsidies, import duty exemption for renewable energy products and introduction of net metering.
- Maldives Energy Policy and Strategy document is available:
- <u>http://www.environment.gov.mv/v2/wp-content/files/publications/20161220-pub-mv-energy-policy-strategy-2016-20dec2016.pdf</u>

Energy Policy and measures in the Maldives

- The Maldives Energy Policy and Strategy 2016:
 - Maldives Energy Policy and Strategy 2016 consist of revised policies derived from Maldives Energy Policy and Strategy 2010.

1. Strengthen the institutional and regulatory framework of the energy sector

2. Promote energy conservation and efficiency

3. Increase the share of renewable energy in the national energy mix

4. Improve the reliability and sustainability of electricity service and maintain universal access to electricity

5. Increase national energy security

Villa College Solar Panel installation project

Abdul Munnim Mohamed Manik



History of the project

- Villa College and PCKK began exploring the idea of installing solar power under JCM grant in July 2014.
- Initial idea was to establish 200Kwh of solar power worth \$600,000.
- Both institutions aim to submit a joint application by November 2014.
- Proposed financing was through Maldives Islamic Bank
 - Initial discussions were held with the bank by VC and PCKK staff
- The installation was aimed to commence in March 2015.

- Upon investigation it was determined at Villa College only 170KwH of solar panels can be installed.
 - Project size downgraded.
- Bank of Maldives was identified as an alternative source of finance.
- In September 2014 VC and PCKK signed joint MOU to commence the application and project.
 - Subsequently agreements were signed between parties.
- JCM approval of the project news came in January 2015.

• Villa College submitted a loan application to Maldives Islamic Bank in March 2015.

- Bank was not keen on financing the project.

- Meeting with Minister for Environment was held to gather government support to get finance for the project.
 - During the meeting Minister mentioned about the new Green loan.
- JCM was requested to consider project to be rolled to next fiscal year.
- Final agreed project size was 185KwH

- Meeting with Bank of Maldives was held with regard to Green Loan application in February 2016.
 - The requirement for a collateral that is 150% of the project value was an issue.
- JCM extended the project for 2016-2017 fiscal year under the condition that work must be completed by January 2017.
- Bank of Maldives approved the loan on 25th October 2016.

The 1st Net- Metering agreement The largest private investment in Capital of Maldives



- Ordering of parts commenced in November/December 2016
 - Installation followed shortly in 2017
 - Installation was completed in September 2017





186 kw Solar PV System



Inverter room





Financial feasibility

• The basis by which VC undertook financial feasibility study is as follows:

Costs		
Proposed Capacity	186	Kw
investment	MVR 4,200,000.00	
Benefits		MVR
Annual Saving In Electricit	ty bill	MVR1,000,000
JCM Funded 50%, effectiv	MVR2,100,000	

NPV is MVR 401057.97 over economic life of 15 years.

Payback is expected to b 4 years without JCM With JCM funding 3 years

• How much Can be Saved in expenditure?

<u>Month</u>	<u>Total Usage</u>	Export to National Grid	Billed Usage	Bill Period (days)	Bill Total	<u>PV system reading production</u>	Total saving	tarrif highest marginal rate	<u>Total Ssaving</u>		
Sep-17	42354	3314	39040	36	169,248.00	10510	13824	4.35	60,134.40		
Oct-17	36231	2073	34158	30	145,977.30	24130	26203	4.35	113,983.05	2017	355,064.40
Nov-17	36457	2028	34429	35	149,206.15	16030	18058	4.35	78,552.30		
Dec-17	21010	3509	17501	27	75,697.35	20030	23539	4.35	102,394.65		
Jan-18	31955	2113	29842	30	129,332.70	20350	22463	4.35	97,714.05	-	
Feb-18	37349	2504	34845	31	151,079.75	21660	24164	4.35	105,113.40		
Mar-18	34849	2934	31915	29	138,366.25	24640	27574	4.35	119,946.90		
Apr-18	35455	1642	33813	29	146,622.55	21440	23082	4.35	100,406.70		4 475 653 45
May-18	31190	2223	28967	30	125,526.45	18570	20793	4.35	90,449.55		
Jun-18	32146	2342	29804	31	129,151.40	18610	20952	4.35	91,141.20	2010	
Jul-18	34664	2045	32619	29	139,369.65	18200	20245	4.35	88,065.75	2018	1,1/5,052.45
Aug-18	34660	3375	31285	32	135,577.75	20190	23565	4.35	102,507.75		
Sep-18	32926	3885	29041	30	125,848.35	20270	24155	4.35	105,074.25		
Oct-18	34592	789	33803	30	146,563.05	18680	19469	4.35	84,690.15		
Nov-18	37698	2065	35633	33	154,475.55	17500	19565	4.35	85,107.75		
Dec-18	22196	4800	17396	30	75,192.60	19300	24100	4.35	104,835.00		
	535,732.00	41,641.00	494,091.00) 492.00	2,137,234.85	239,410.00	351,751.00		1,530,116.85	3,667,351.70	42%

Data from Sunny Portable



CO2 avoided

PV System Overview | 185kW PV System - Villa College QI Campus

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Current PV Power	Communication Monitoring	Inverter comparison status			
33 minutes ago	- P Last contact	Warning Unovported doviation			
68.00 kw	just now	at 2/21/2019			
	/				
Energy and Power »	PV System Monitoring »	PV System Monitoring »			
PV Energy	Reimbursement	CO2 avoided			
1 752.14 kWh	A 351.63 FUR	526 kg			
Today	Today	Today			
Total: 354.699 MWh	Total: 165,822.00 EUR	Total: 248 t			
PV system information	Irradiation	Performance Ratio			
PV system power:	Configure the irradiation	Q111 Q110			
Commissioning:	sensor now »				
9/16/2017	888	yesterday last 30 days			
PV system profile »					
Weather for	Location				
Weather data cannot be determined	Please enter the PV system location				
reaction and control of determined:					
	and the second				

CO2 Avoided

As per JCM – Villa College has avoided approximately 190 Tonnes of Carbon dioxide until 22 February 2019

Challenges we faced

- The structure of JCM project requires a lot of finance to be committed before the spending is reimbursed.
 - There is very limited opportunity in the Maldives to finance such projects through Bank loans
 - The collateral on these loans make it impossible for small business to undertake such projects relating to renewable energy.

BML Green Loan

BML Green Loan

BML Green Loan is targeted for individuals and businesses looking to invest and promote the use of green technology and resources. Eligible individuals or businesses have the opportunity of obtaining a loan value of up to MVR 20 million.

Key Features

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- · No deposit required
- No arrangement fee
- Low equity contribution of 15% with BML financing the remaining 85%

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- Loan amount from MVR 50,000 to MVR 20 million
- Interest rate of 11% (Base rate + 1%)
- · Repayment period of 20 years

Challenges we faced

- One of bases of our saving in the financial feasability comes from benefits of net metering arrangement from the State electronic provider.
 - A legislation on net metering exists in the Maldives.
 - The state electricity provider (STELCO) was hesitant to facilitate a net metering arrangement
 - VC negotiated with STELCO and we were the first in the Maldives to conclude a successful net metering agreement to benefit from solar power use.

Indirect benefit to supply chain

- The JCM technical supervision and scrutiny makes suppliers responsible to make everything to be up to the standard set out in the internal standards expected and have an efficient delivery system in place.
 - Suppliers needed to raise to the occasion to ensure job is successful
 - Suppliers had to find their internal lapses and correct them to pass the supervision and scrutiny.
 - This was a huge learning experience for them.

Our gratitude

- We thank JCM for being flexible to roll the project until the finance issue has been resolved.
- We thank Ministry of Environment and Energy for their role in facilitating the finance options via Green Loan.
- We thank PCKK for guiding and pushing us to get the project completed.

