Current progress of the JCM & Climate Change related policy in Maldives
National Greenhouse Gas Inventory 2011

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

- 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)

Population: approx. 32,000
Peak load: 4.5 MW, Current power supply: by 7 nos of diesel
1.6 MW PV system will be installed with cable trench 8200m in POISED project.
Benefits of PV System, EMS and BESS

**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.
Maldives
CLIMATE CHANGE POLICY FRAMEWORK

Climate Change Policy Initiatives
Climate Change Policy Framework (2015)

- **Inculcate National, Regional and International Climate Change Advocacy** role in leading international negotiations and awareness in cross-sectorial areas in favor of the most vulnerable and SIDS.

- **Strengthen Adaptation** actions and opportunities and build climate – resilient infrastructure and communities.

- **Foster Sustainable Development** while ensuring security, economic sustainability and sovereignty from the negative consequences of the changing climate.

- **Ensure and integrate sustainable financing** into climate change adaptation opportunities and low emission development measures.

- **Low Emission Development** future and ensure energy security for the Maldives.
Maldives Nationally Determined Contribution (NDC)

<table>
<thead>
<tr>
<th></th>
<th>Un-conditional</th>
<th>Conditional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribution</td>
<td>10% of the BAU</td>
<td>24% of the BAU</td>
</tr>
<tr>
<td>Time period</td>
<td>2021 to 2030</td>
<td>2021 to 2030</td>
</tr>
<tr>
<td>Base year</td>
<td>2011</td>
<td>2011</td>
</tr>
<tr>
<td>Means of Implementation</td>
<td>Transform of the energy sector through renewable energy and energy efficiency</td>
<td>Donor assistance in the form of Low cost financial resources, technology transfer and capacity building</td>
</tr>
</tbody>
</table>
Energy Policy and measures in the Maldives

- 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:
Energy Policy and measures in the Maldives

• The Maldives Energy Policy and Strategy 2016:
    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.
Background

• 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.
Background

- 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
Background

• 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 1\textsuperscript{st} Net- Metering agreement
The largest private investment in Capital of Maldives

Ministry of Environment and Energy
Republic of Maldives

Ministry of the Environment
Government of Japan

Joint Crediting Mechanism (JCM)
Model Project (2014)
MALDIVES and JAPAN
Background

• 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:

<table>
<thead>
<tr>
<th>Costs</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed Capacity</td>
<td>Annual Saving In Electricity bill</td>
</tr>
<tr>
<td>186 Kw</td>
<td>MVR 1,000,000</td>
</tr>
<tr>
<td>investment</td>
<td>JCM Funded 50%, effective Investment Cost</td>
</tr>
<tr>
<td>MVR 4,200,000.00</td>
<td>MVR 2,100,000</td>
</tr>
</tbody>
</table>

NPV is MVR 401057.97 over economic life of 15 years.

Payback is expected to be 4 years without JCM
With JCM funding 3 years
### How much Can be Saved in expenditure?

<table>
<thead>
<tr>
<th>Month</th>
<th>Total Usage</th>
<th>Export to National Grid</th>
<th>Billed Usage</th>
<th>Bill Period (days)</th>
<th>Bill Total</th>
<th>PV system reading production</th>
<th>Total saving</th>
<th>tarrif highest marginal rate</th>
<th>Total Saving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep-17</td>
<td>42354</td>
<td>3314</td>
<td>39040</td>
<td>36</td>
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<td>10510</td>
<td>13824</td>
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<td>36231</td>
<td>2073</td>
<td>34158</td>
<td>30</td>
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<td>26203</td>
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<td>34429</td>
<td>35</td>
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<td>16030</td>
<td>18058</td>
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<td>3509</td>
<td>17501</td>
<td>27</td>
<td>75,697.35</td>
<td>20030</td>
<td>25539</td>
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<td>31955</td>
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<td>34845</td>
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<td>24640</td>
<td>27574</td>
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<td>19300</td>
<td>24100</td>
<td>4.35</td>
<td>104,835.00</td>
</tr>
</tbody>
</table>

| Total       | 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

Energy and Power | 185kW PV System - Villa College QI Campus

- Total yield [MWh]
  - 2017: 60
  - 2018: 240
  - 2019: 30

185kW PV System - Villa College QI Campus: 2017 - 2019
CO2 avoided

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

- **Current PV Power**: 68.00 kW
- **Communication Monitoring**: Last contact: just now
- **Inverter comparison status**: Warning: Unexpected deviation at 2/21/2019

- **PV Energy**: 752.14 kWh
  - Today
  - Total: 354.699 MWh

- **Reimbursement**: 351.63 EUR
  - Today
  - Total: 165,822.00 EUR

- **CO2 avoided**: 526 kg
  - Today
  - Total: 248 t

- **PV system information**: PV system power: 195.35 kWp
  - Commissioning: 9/16/2017

- **Irradiation**: Configure the irradiation sensor now

- **Performance Ratio**: 1.11
  - yesterday
  - 1.18
  - last 30 days

- **Weather for**: Weather data cannot be determined

- **Location**: Please enter the PV system location

- **PV System Properties**
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 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

- No deposit required
- No arrangement fee
- Low equity contribution of 15% with BML financing the remaining 85%
- 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 feasibility 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.
Thank You