Feasibility Studies with the Aim of Developing a Bilateral Offset Credit Mechanism FY2011

Studies for Project Development and Organization

Program organization research of Multistage Deep Sea WaterUtilization Infrastructure in the Republic of Maldives

New Energy and Industrial Technology Development Organization (NEDO) Hitachi Plant Technologies Ltd.
Program organization research of
Multistage Deep Sea Water Utilization Infrastructure in the Republic of Maldives
FS by Hitachi Plant Technologies Ltd.

Overview

CO₂ emission reductions through introducing eco-friendly cooling system utilizing deep seawater, and industry promotion by multistage deep seawater utilization.

Study details
1. Detail investigation of potential project including oceanic survey
2. Detail investigation of MRV methodology including data collection for baseline verification
3. Economic & Financial analysis
4. Studying MRV methodology
5. F/S for industry promotion utilizing deep seawater

Partner / Site

■ Partner company
Male' Water & Sewerage Company Pvt. Ltd
(Water & sewerage service company in Maldives)
■ Site
Hulhule, Hulhumale and some other islands

Features of deep seawater

(1) Low temperature ･･･ Approx. 5°C at 1,000m depth and deeper even around equator generally.
(2) Cleanliness ･･･ Small amount of microorganisms and organic compounds.
(3) Rich nutrients ･･･ Rich in inorganic compounds which contributes growth of seaweeds and plankton.
(4) Sustainability ･･･ Supplied from the polar oceans continuously.
More than 60%* of electricity conservation for air-conditioning by utilizing the stable low temp.

Approx. 20%* of desalination cost reduction because of the cleanliness.

Contribution to domestic industries promotion and safe water source security.

* Compared with our conventional system
F/S for Bilateral Offset Mechanism

Country: Maldives  Category: Oceanic Energy

Pilot project

- DSW intake from Hulhumale’ offing in 800m depth
- Establish intake & chiller plant at MWSC Hulhumale’ site
- Supply chilled water to new airport terminal in Hulhule’, industrial and commercial area in Hulhumale’

Estimated GHG emission reduction

- Conventional A/C system (VRV)
  - Hulhumale’ 16,816
  - Reduction 13,823 (82%)
- DSW District cooling
  - Hulhule’ 2,993

- Based on the outdoor temperature condition provided by Maldives Meteorological Service.
- Chilled water supply temperature = 11degC
**Concept of the MRV methodology**

- *To be simpler than CDM to boost the investment for mitigation projects.*
- *to show higher international justification*

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**New methodology based on J-VER E012 (ver 4.0) and Domestic Credit 004-C**

<table>
<thead>
<tr>
<th>Cooling system for air-conditioning or refrigeration with deep seawater utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project outline</strong></td>
</tr>
<tr>
<td>This project is to reduce amount of CO₂ emission during operation of air-</td>
</tr>
<tr>
<td>conditioning or refrigeration equipments by introducing new system utilizing</td>
</tr>
<tr>
<td>renewable energy source, and fulfills every condition of eligibility criteria.</td>
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<table>
<thead>
<tr>
<th>Eligibility criteria</th>
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<tr>
<td><strong>Condition-1:</strong> To be newly installed district cooling system utilizing deep seawater. (District cooling system, which becomes subject item of this methodology is restricted only the newly installed system utilizing deep seawater and substituting for standard air-conditioning equipment at site.)</td>
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<tr>
<td><strong>Condition-2:</strong> Newly installed district cooling system shall have higher efficiency than standard type air conditioning equipment.</td>
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<td><strong>Condition-3:</strong> Energy source of air-conditioning equipment shall be electricity.</td>
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<td><strong>Condition-4:</strong> Prove the additionality by barrier analysis.</td>
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F/S for Bilateral Offset Mechanism  
Country: Maldives  
Category: Oceanic Energy

Calculation of GHG emission reduction

(Emission reduction) = (Base line emission) – (Project emission)

\[
\text{Base line emission} = \left( \text{Project electricity consumption [MWh]} \right) \times \frac{\text{(Project efficiency)}}{\text{(Base line efficiency)}} \times \left( \text{Emission factor} \right)
\]

- Standard efficiency of typical conventional A/C system
- Monitoring the operation of existing air-conditioning systems
- Standard efficiency of top-runner A/C system in the Maldives
**A/C monitoring work**

- At male’ international airport and MWSC head quarter building (as a typical office building)
- Electricity consumption, room air condition, outdoor air condition and operation record of the A/C system

**Estimated standard efficiency of top-runner system**

<table>
<thead>
<tr>
<th>Building</th>
<th>COP</th>
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<tbody>
<tr>
<td>Typical office (daytime operation)</td>
<td>4.45</td>
</tr>
<tr>
<td>Typical office (24 hours operation)</td>
<td>4.20</td>
</tr>
<tr>
<td>Airport terminal building (24 hours operation)</td>
<td>4.03</td>
</tr>
</tbody>
</table>
F/S for Bilateral Offset Mechanism

Country: Maldives  
Category: Oceanic Energy

Target schedule

<table>
<thead>
<tr>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
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<tbody>
<tr>
<td>2Q</td>
<td>3Q</td>
<td>4Q</td>
<td>1Q</td>
</tr>
<tr>
<td>F/S project</td>
<td>Site survey &amp; investigation</td>
<td>Business plan</td>
<td>SPC Establishment</td>
</tr>
</tbody>
</table>

Potential of GHG emission reduction

- Caribbean sea
  - Bahamas, Jamaica, Haiti, Cuba, Dominica, etc.

- Southern Pacific ocean
  - Palau, New Caledonia, Fiji, Tahiti, Samoa, Kiribati, Marshall Islands, Cook Islands, etc.

- Indian ocean
  - Maldives, Mauritius, Indonesia, Oman, etc.

- More than 100 cities in 20 countries are expected as potential sites for deep seawater cooling system.
- Up to 1 million t-CO₂/year of total GHG emission reduction is expected at those potential sites.