Overview of the Financing Programme for JCM Model Projects

3th October 2019
(Ulaanbaatar in Mongolia)

Satoru TANGO
Global Environment Centre Foundation (GEC)
1. Basic concept of the JCM and Financing Programme

2. Guideline for Project Proposal

Appendix:
- 8 Projects in Mongolia (2013 ~ 2019)
- 11 Projects in 2019 (First selection results)
Facilitating diffusion of advanced low-carbon or decarbonizing technologies, products, system, services and infrastructure as well as implementation of mitigation actions, and contributing to sustainable development of developing country.

Appropriately evaluating contributions from Japan to GHG emission reductions or removals in a quantitative manner and use them to achieve Japan's emission reduction target.

Contributing to the ultimate objective of the UNFCCC by facilitating global actions for GHG emission reductions or removals.
Basic concept of the JCM Model Projects (2)

MOEJ

Incentivizes selecting low-carbon technologies by the financial support to initial cost

International Consortium

Japanese entity A representative participant

Project management & report MRV result

JCM partner-country entity B partner participant

Installation and maintenance of equipment & conduct MRV

Project in the partner country

Conventional equipment & facility

Low-carbon equipment & facility

Partner country government & entities

Japanese government & entities

Japan will acquire a part of JCM credits (in return to the financial support)

Expected to deliver at least half of JCM credits issued

The consortium conducts MRV to estimate GHG emission reductions

Partner country government & entities

GEC

Provides funds to cover up to half of project's investment cost.

Collaboration with “City-to-City Collaboration Programme for Low-Carbon Society”

Collaboration with various international financing schemes under JICA, JBIC, ADB, World Bank, etc.
JCM Financing Programme (FY2013-2019), as of Sep 3, 2019

**Total 147 projects in 16 partner countries**

- **Thailand:** 31 projects
  - Energy Saving at Convenience Store
  - Upgrading Air-conditioning System
  - Centrifugal Chiller in Tire Factory
  - Air Conditioning System & Chiller
  - Ion Exchange Membrane Electrolyzer
  - LED Lighting to Sales Stores
  - Co-generation System
  - 3MW Solar PV
  - Heat Recovery Heat Pump
  - 30MW Solar PV
  - Air-conditioning Control System
  - Energy Saving Equipment in Paper Industry
  - Introduction of Scheme for F-gas Recovery and Destruction
  - 37MW Solar PV and Melting Furnace

- **Bangladesh:** 6 projects
  - Centrifugal Chiller
  - 315KW PV-diesel Hybrid System
  - Centrifugal Chiller
  - Loom at Weaving Factory
  - 50MW Solar PV Power Plant
  - High Efficiency Transmission Line

- **Laos:** 4 projects
  - REDD+ through controlling slash-and-burn
  - Amorphous transformers
  - 14MW Floating Solar PV
  - 111MW Solar PV

- **Cambodia:** 5 projects
  - LED Street Lighting
  - Solar PV & Centrifugal Chiller
  - 200kW Solar PV at International School
  - Battambang Wastewater Treatment Project

- **Maldives:** 2 projects
  - 186KW Solar Power on School Rooftop
  - Smart Micro-Grid System

- **Mongolia:** 9 projects
  - Heat Only Boiler (HOB)
  - 21MW Solar PV
  - Fuel Conversion by Introduction of LPG Boilers

- **Viet Nam:** 22 projects
  - Digital Tachographs
  - Air-conditioning in Hotel
  - Amorphous transformers
  - 320kW Solar PV in Shopping Mall
  - Amorphous transformers
  - Energy Saving Equipment in Wire Production Factory
  - Amorphous transformers
  - Energy Saving Equipment in Brewery Factory
  - High Efficiency Chiller

- **Saudi Arabia:** 1 project
  - Electrolizer in Chlorine Production Plant

- **Kenya:** 2 projects
  - 1MW Solar PV at Salt Factory
  - 38MW Solar PV

- **Myanmar:** 7 projects
  - 700kW Waste to Energy Plant
  - Brewing Systems to Brewery Factory
  - Once-through Boiler in Instant Noodle Factory
  - 1.6MW Rice Husk Power Generation
  - Refrigeration System in Logistics Center
  - 8.8MW Waste Heat Recovery in Cement Plant
  - Brewing Systems and Biogas Boiler to Brewery Factory

- **Philippines:** 11 projects
  - 15MW Hydro Power Plant
  - 1MW Rooftop Solar PV
  - 4MW Hydro Power Plant
  - 1.2MW Rooftop Solar PV
  - 4MW Solar PV
  - 18MW Solar PV
  - Biogas Power Generation and Fuel Conversion

- **Palau:** 5 projects
  - 370kW Solar PV for Commercial Facilities
  - 155kW Solar PV for School
  - 445kW Solar PV for Commercial Facilities II
  - 0.4MW Solar PV for Supermarket
  - 1MW Solar PV for Supermarket

- **Indonesia:** 31 projects
  - Centrifugal Chiller at Textile Factory
  - Refrigeration to Cold Chain Industry
  - Centrifugal Chiller at Textile Factory 2
  - 307KW Solar Power Hybrid System
  - Centrifugal Chiller at Textile Factory 3
  - Gas Co-generation System
  - 1.6MW Solar PV in Jakabaring Sport City
  - 10MW Hydro Power Plant
  - Industrial Wastewater Treatment System
  - Absorption Chiller
  - High Efficiency Autoclave
  - 12MW Biomass Power Plant

- **Costa Rica:** 2 projects
  - 5MW Solar PV
  - Chiller and Heat Recovery System

- **Chile:** 2 projects
  - 1MW Rooftop Solar PV
  - 2MW Solar PV and 4MWh Storage Battery

Underlined projects have started operation (93 projects)
Projects with * have been registered as JCM projects (44 projects)
Eligible Projects

What kind of projects are supported by this financing programme?

- Reduce energy-related CO2 emissions with leading low carbon technologies in partner countries.
- Contribute to the sustainable development in partner countries.
- Reduction of GHG emissions achieved by the projects can be quantitatively calculated and verified.
- Facilities installed by the projects do not receive any other subsidy by the Government of Japan.
(a) A representative participant of the model project shall be a Japanese entity of an international consortium.
(b) A participant shall have capability for the implementation, such as technical capacity to appropriately implement the eligible project.
(c) A participant shall have a financial basis to bear the costs necessary to appropriately implement the eligible project.
(d) A participant shall have adequate management structures and handling capacity for accounting and other administrative work related to the eligible project;
(e) A participant shall explain the contents, effect on GHG emission reductions, details of the cost, investment plan, etc. of the eligible project.

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### Guideline for Submitting JCM model project proposal in FY2019
What kind of cost is covered & not covered by this programme?

✓ COVERED

(a) Main construction work
(b) Ancillary work
(c) Machinery and appliances
(d) Surveying and testing
(e) Facilities/equipment (including monitoring equipment)
(f) Administrative work; and
(g) Other necessary costs approved by GEC
What is the criteria of cost-effectiveness?

**JPY4,000/tCO2equivalent**

\[
\text{Amount of financial support [JPY]} = \frac{\text{Emission reductions of GHG [tCO2equivalent/y]} \times \text{legal durable years [y]}}{}
\]

Legal durable years of the facilities is stipulated by the Japanese law, and are dependent on the industry classification.

**JPY3,000/tCO2equivalent**

In case the number of PV JCM Model Projects by each country is 5 or more. (Mongolia and Thailand)
<table>
<thead>
<tr>
<th><strong>Budget</strong></th>
<th>JPY9.9 billion (Approx. USD90million)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Executing Entity</strong></td>
<td>International Consortium that consists of a Japanese entity and a JCM partner-country entity(ies)</td>
</tr>
<tr>
<td><strong>Scope of Financing</strong></td>
<td>Facilities, equipment, vehicles, etc. which reduce CO2 from fossil fuel combustion as well as construction cost for installing those facilities, etc.</td>
</tr>
<tr>
<td><strong>Eligible Projects</strong></td>
<td>Start installation after the Contract of Finance is concluded and finish installation within 3 years.</td>
</tr>
<tr>
<td><strong>Maximum percentage of Financial Support</strong></td>
<td>Maximum of 50% and reduce the percentage according to the number of already selected project(s) using a similar technology in each partner country. ※ Number of already selected project(s) using a similar technology in each partner country: none (0) = up to 50%, up to 3 (1-3) = up to 40%, more than 3 (&gt;3) = up to 30%. The percentage of financial support will be determined by GEC.</td>
</tr>
<tr>
<td><strong>Cost-effectiveness</strong></td>
<td>Cost-effectiveness of GHG emission reductions is expected to be JPY4,000/tCO2eq or better. ※ If the number of PV projects in a partner country is 5 or more, cost-effectiveness is expected to be JPY3,000/tCO2eq or better.</td>
</tr>
</tbody>
</table>
JCM Model Projects Schedule in FY2019

From April 5 to November 29: Proposal acceptance period

Call for proposal

Evaluation of proposals
Proposal Review & interview with applicants

Submission of application

Review of application documents

Start Model projects

Selection of model projects
documentation briefing for the notice of contract of financing

Implementation of model projects

Notice of Contract of Financing

On May 14, the 1st selection starts

1-year project:
- Submission of final reports
- Onsite inspection

2 or 3-year project:
- Submission of midterm reports
- Midterm inspection

Inspection

Disbursement of financial support

1-year project:
Disbursement of financial support

2 or 3-year project:
Disbursement of financial support (rough estimate)

Guideline for Submitting JCM model project proposal in FY2019
## Categorization by Technology Type for JCM Model Projects

### Percentage of Financial Support:
- **White**: 0 project = Up to 50%
- **Yellow**: 1-3 project(s) = Up to 40%
- **Orange**: more than 4 projects = Up to 30%

### New Technologies Selected in FY2018

- **Autoclave**
- **Multi-effect Distillation System**
- **Injection Molding Machine**
- **Biogas Boiler**
- **Reefer Container**
- **CNG-Diesel Hybrid Bus**

### Table: Technologies, JCM Methodology, and Total Technologies

<table>
<thead>
<tr>
<th>Technology Type</th>
<th>JCM Methodology</th>
<th>Mongolia</th>
<th>Nepal</th>
<th>Bangladesh</th>
<th>Nepal</th>
<th>Malaysia</th>
<th>Vietnam</th>
<th>Laos</th>
<th>Cambodia</th>
<th>Indonesia</th>
<th>South Korea</th>
<th>Korea</th>
<th>China</th>
<th>Myanmar</th>
<th>Thailand</th>
<th>Philippines</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chiller</td>
<td>BEC_AM001, ID_AM002, CR_AM002, TH_AM001, TH_AM005</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>14</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Absorption Chiller Using Waste Heat Recovery System</td>
<td>ID_AM003, TH_AM008</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>7</td>
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<tr>
<td>Double Bundle Type Heat Pump</td>
<td>VN_AM010, ID_AM008</td>
<td>1</td>
<td>1</td>
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<td>1</td>
<td>1</td>
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</tr>
<tr>
<td>Solar Water Heater Using Waste Heat Recovery System</td>
<td>CR_AM001</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Air Conditioning System</td>
<td>ID_AM007, LA_AM001, ID_AM002</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
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<td>5</td>
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<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Power Generation by Waste Heat Recovery</td>
<td>ID_AM001, TH_AM007</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
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<td>1</td>
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</tr>
<tr>
<td>Waste-to-Energy Plant</td>
<td>VN_AM001</td>
<td>1</td>
<td>1</td>
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</tr>
</tbody>
</table>

### Additional Notes:
- **Total Number of Technology**: 45
- **No. of Methodology**: 53
- **1. Energy Efficiency Sector**: Total 7 projects
- **2. Renewable Energy**: Total 21 projects
- **3. Effective Use of Energy**: Total 33 projects
- **4. Waste Handling and Disposal**: Total 3 projects
- **5. Transportation**: Total 1 project
Infrastructure through JCM

Along with the Overseas Development Strategy (Environment) compiled by Cabinet Office, Government of Japan in June 2018, the JCM model project aims to contribute to global GHG emission reductions, through the diffusion of leading low carbon or decarbonizing technologies.
<table>
<thead>
<tr>
<th>Year</th>
<th>Country</th>
<th>Partner</th>
<th>Entity</th>
<th>Project Title</th>
<th>Sector</th>
<th>Expected GHG Emission Reductions (tCO2/y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>Mongolia</td>
<td>Saisan Co., Ltd.</td>
<td>Fuel Conversion by Introduction of LPG Boilers to Beverage Factory</td>
<td>Energy Efficiency</td>
<td>5,781</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>Mongolia</td>
<td>Farmdo Co., Ltd.</td>
<td>Installation of 8.3MW Solar Power Plant in Ulaanbaatar suburb Farm</td>
<td>Renewable Energy</td>
<td>9,585</td>
<td></td>
</tr>
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</table>
Fuel Conversion by Introduction of LPG Boilers to Beverage Factory
PP (Japan): Saisan Co., Ltd., PP (Mongolia): MCS International LLC, MCS Coca Cola LLC

Outline of GHG Mitigation Activity

LPG boilers are introduced for the purpose of mitigation of GHG emissions as well as air pollution in Ulaanbaatar City.

By introducing the most efficient and newest model of LPG once-through boilers and vacuum type water heaters, the efficiency of the system is improved with less fuel consumption.

Expected GHG Emission Reductions

5,781 tCO$_2$/year
\[= \text{Reference CO}_2 \text{ emissions (Ry) [tCO}_2/\text{y}] \]
\[- \text{Project CO}_2 \text{ emissions (Py) [tCO}_2/\text{y}] \]
\[= 12,692 \text{ [tCO}_2/\text{y}] \- 6,911 \text{ [tCO}_2/\text{y}] \]

Ry= Reference fuel consumption (RQfy) [t/y] 
\[\times \text{Fuel emission factor (furf) [tCO}_2/\text{t}] + \text{Reference electricity consumption (RQey) [MWh/y]} \times \text{Grid emission factor (gef) [tCO}_2/\text{MWh}] \]

Py= Project fuel consumption (PQfy) [t/y] \times \text{Fuel emission factor (fupf) [tCO}_2/\text{t]} + \text{Project electricity consumption (PQey) [MWh]} \times \text{(gef) [tCO}_2/\text{MWh}] \]

Sites of Project

Project Site
10km northeast from Chinggis Khaan International Airport

Map Data © 2019 Google
21MW Solar Power Project in Bayanchandmani

Outline of GHG Mitigation Activity

Sharp Energy Solutions Corporation and Solar Energy Chandmani LLC introduce a 21MWac ground-mount solar PV system in Bayanchandmani village, Mongolia for the sale of power.

This project contributes Mongolian energy policy to increase renewables up to 30% by 2030.

Expected GHG Emission Reductions

27,008 tCO₂/year

= (Reference CO₂ emissions) [tCO₂/year]
  - (Project CO₂ Emission) [tCO₂/year]

= ((Reference Power consumption) [MWh/year] - 0 [MWh/year]) × Emission Factor [tCO₂/MWh]

Sites of Project

Map Data ©2018Google

60km northeast from Ulaanbaatar city

Bayanchandmani village

Ulaanbaatar city
Introduction of 20MW Solar Power System in Darkhan City


**Outline of GHG Mitigation Activity**

Sharp and Darkhan Selenge Electricity Distribution Network JSC construct PV plant in Darkhan City in Mongolia.

This project contributes Mongolian energy policy to increase renewables up to 30% by 2030.

**Expected GHG Emission Reductions**

22,927 t-CO2/year

\[
22,927 \text{ t-CO}_2 /\text{year} = (\text{Reference CO}_2 \text{ emissions}) \text{ [tCO}_2\text{/year]} - (\text{Project CO}_2 \text{ Emission}) \text{ [tCO}_2\text{/year]}
\]

\[
= ((\text{Reference Power consumption}) \text{ [MWh/year]} - 0 \text{ [MWh/year]}) \times \text{Emission Factor [tCO}_2\text{/MWh]}
\]
Sharp and Tenuun Gerel Construction LLC construct PV plant in Khushig khundii near New airport in Mongolia.

This project contributes to Mongolian energy policy to increase renewables up to 30% by 2030.

**Expected GHG Emission Reductions**

18,438 t-CO2 /year

= (Reference CO2 emissions) [tCO2/year] - (Project CO2 Emission) [tCO2/year]

= ((Reference Power consumption) [MWh/year] - 0 [MWh/year]) × Emission Factor [tCO2/MWh]
**Introduction of 20MW Solar Power System in Darkhan City**


**Outline of GHG Mitigation Activity**

Sharp and Darkhan Selenge Electricity Distribution Network JSC construct PV plant in Darkhan City in Mongolia.

This project contributes Mongolian energy policy to increase renewables up to 30% by 2030.

**Expected GHG Emission Reductions**

22,927 t-CO2/year

= (Reference CO2 emissions) [tCO2/year] - (Project CO2 Emission) [tCO2/year]

= ((Reference Power consumption) [MWh/year] - 0 [MWh/year]) x Emission Factor [tCO2/MWh]
Installation of 2.1MW Solar Power Plant for Power Supply in Ulaanbaatar Suburb
PP (Japan): Farmdo Co., Ltd. / PP (Mongolia): Everyday Farm LLC, Bridge LLC

Outline of GHG Mitigation Activity
The purpose of this project is to reduce CO₂ emission, mitigate air pollution and stabilize power supply in Mongolia by installing 2.1MW scale solar power plants in the suburbs of Ulaanbaatar. This power plants can replace some part of power generation by coal-fired thermal power. Moreover, lots of achievements in daily life, mitigating air pollution, resolving power shortage, food supplying, etc., can be expected by synergy of agricultural and solar power generation technology.

Expected GHG Emission Reductions
2,424 tCO₂/year
= Project Electricity Generation(EG) x Emission Factor (EF)
= Power Generation Capacity[kW] x Annual Operating Rate[%] x 24hours x 365days x EF

Site of JCM Model Project
Monnaran Farm (24ha), District of Songinokhairkhan
Project site situated in the farm Everyday Farm owns is located 37km northwest of Ulaanbaatar city center.
The project aims to reduce CO₂ emissions by constructing a 10MW Solar Power Generation Plant beside the 110kV substation in Darkhan City, which locates approximately 230 km North of the capital city Ulaanbaatar, and supplying the generated electricity through the power transmission network.

The power plant employs crystalline solar modules of maximum output of 310W per panel and module conversion efficiency of 15.9%. Approximately 32,000 numbers (72 series) of these modules and peripheral systems are installed on a land of 36 ha.

Expected GHG Emission Reductions

**11,221 tCO₂/year**

CO₂ emission reduction

\[ \text{CO}_2 \text{ emission reduction} = \text{PV generation (a)} \times \text{Reference emission factor (b)} \]

\[ = 14,079 \text{ MWh/yr} \times 0.797 \text{ tCO}_2/\text{MWh} \]
1. This JCM model project consists of two model sites: Bornuur sum in a rural area and the 118th School in Ulaanbaatar City. The Bornuur sum project includes the installation of heat only boilers (HOBs) as well as pipe laying work, electrical construction and boiler building construction. This project alters the current heat supply system in Bornuur sum of individual building-based heating, under which low efficiency HOBs and stoves are used. The centralized control system of high-efficiency HOBs is installed in this project.

2. The other project is the replacement of low-efficiency, old-type boilers with the latest high-efficiency model boilers at the 118th School in Ulaanbaatar City. This project also leads to the reduction of coal consumption to mitigate CO₂ emissions as well as air pollutants.

**Expected GHG Emission Reductions**

298 tCO₂/year

**Sites of JCM Model Project**

Bornuur sum & Ulaanbaatar City, Mongolia
<table>
<thead>
<tr>
<th>Year</th>
<th>Partner Country</th>
<th>Entity</th>
<th>Project Title</th>
<th>Sector</th>
<th>Expected GHG Emission Reductions (tCO₂/y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>Mongolia</td>
<td>Saisan Co.,Ltd.</td>
<td>Fuel Conversion by Introduction of LPG Boilers to Beverage Factory</td>
<td>Energy Efficiency</td>
<td>5,781</td>
</tr>
<tr>
<td>2019</td>
<td>Philippines</td>
<td>ITOCHU Corporation</td>
<td>Biogas Power Generation and Fuel Conversion Project in Pineapple Canneries</td>
<td>Renewable Energy</td>
<td>52,156</td>
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<tr>
<td>2019</td>
<td>Philippines</td>
<td>Voith Fuji Hydro K.K.</td>
<td>19 MW Mini Hydro Power Plant Project in Isabela Province</td>
<td>Renewable Energy</td>
<td>46,836</td>
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<tr>
<td>2019</td>
<td>Vietnam</td>
<td>Yokohama Water Co., Ltd.</td>
<td>Energy Saving by Introduction of High Efficiency Water Pumps in Hue City</td>
<td>Energy Efficiency</td>
<td>4,060</td>
</tr>
<tr>
<td>2019</td>
<td>Vietnam</td>
<td>Hitachi Zosen Corporation</td>
<td>Waste to Energy Project in Hanoi City</td>
<td>Waste Handling and Disposal</td>
<td>119,870</td>
</tr>
</tbody>
</table>

Results of first selection. Second selection is now under evaluating.
Fuel Conversion by Introduction of LPG Boilers to Beverage Factory
PP (Japan): Saisan Co., Ltd., PP (Mongolia): MCS International LLC, MCS Coca Cola LLC

Outline of GHG Mitigation Activity

LPG boilers are introduced for the purpose of mitigation of GHG emissions as well as air pollution in Ulaanbaatar City.

By introducing the most efficient and newest model of LPG once-through boilers and vacuum type water heaters, the efficiency of the system is improved with less fuel consumption.

Expected GHG Emission Reductions

5,781 tCO₂/year

\[ \text{Ry} \times \text{furf} + \text{RQey} \times \text{gef} \]

<table>
<thead>
<tr>
<th>Project Fuel Consumption (PQfy) [t/y]</th>
<th>Fuel Emission Factor (fuf) [tCO₂/t]</th>
<th>Project Electricity Consumption (PQey) [MWh/y]</th>
<th>Grid Emission Factor (gef) [tCO₂/MWh]</th>
</tr>
</thead>
</table>

Sites of Project

Project Site
10km northeast from Chinggis Khaan International Airport
This project aims the reduction of CO\textsubscript{2} emission by installing 37 MW solar power system on the rooftop of the vehicle factory of Toyota Motor Thailand Co., Ltd. (TMT) located in Samutprakarn & Chachoengsao and engine factory of Siam Toyota Manufacturing co., Ltd. (STM) located in Chonburi in eastern Bangkok. Electricity generated by solar power system is consumed in-house and replaces part of grid electricity consumption.

CO\textsubscript{2} emissions are also reduced by replacing the existing melting furnace in STM with a high efficient medium-frequency induction melting furnace.

### Expected GHG Emission Reductions

\textbf{19,483 tCO\textsubscript{2}/year}

Solar system: 16,858 tCO\textsubscript{2}/year

\[ = \left( \text{Reference Power Consumption} \right) [\text{MWh/year}] - 0 [\text{MWh/year}] \times \text{Emission Factor} [\text{tCO}_2/\text{MWh}] \]

High efficiency melting furnace: 2,625 tCO\textsubscript{2}/year

\[ = \left( \text{Reference CO}_2 \text{ Emissions} \right) [\text{tCO}_2/\text{year}] - \left( \text{Project CO}_2 \text{ Emissions} \right) [\text{tCO}_2/\text{year}] \]
Efficiency Improvement of Co-generation System by Installation of Heat Exchanger in Fiber Factory


Outline of GHG Mitigation Activity

This project aims to efficiently utilize unused thermal energy of the co-generation system to heat boiler feed water. A heat exchanger is additionally installed to the existing co-generation system which is composed of 7MW gas turbine and heat recovery steam generator equipped with duct burner.

Natural gas fuel used for duct burner is reduced by approx. 4%, by increasing the temperature of boiler feed water by approx. 20 degrees Celsius.

Expected GHG Emission Reductions

359tCO₂/year

GHG Emission Reductions = Reference CO₂ Emission - Project CO₂ Emission

Reference CO₂ Emission = [(BFW* temp. after heat recovery) - (BFW temp. before heat recovery)] x (BFW amount) x (Specific heat of water) / (Boiler efficiency) x (CO₂ emission coefficient of fuel)

Project CO₂ Emission = 0

Project site

- Project site is located in Samutprakan province, adjacent to Bangkok.
- Project site is located 30 km south from Suvarnabhumi International Airport.
In this project, biogas derived from pineapple residue is utilized as fuel for gas engines and boilers to generate power and steam at the two pineapple canning factories (Surallah and Polomolok) of Dole Philippines, Inc.

This project aims to produce renewable energy by utilizing the pineapple waste which has been discarded. It contributes to reducing greenhouse gases emissions as well as lowering electricity cost for Dole Philippines, Inc.

**Expected GHG Emission Reduction**

- **52,156 tCO₂/year**
  - **Power Generation**: 2,640 tCO₂/year (Surallah)
    - 9,241 tCO₂/year (Polomolok)
  - **Boilers**: 14,571 tCO₂/year (Surallah)
    - 25,704 tCO₂/year (Polomolok)

\[
\text{Expected Emission Reduction} = ((\text{Reference Power Consumption}) \times \text{Emission Factor}) - (\text{Project CO₂ Emissions})
\]

**Project Sites**

- **Surallah Biogas Ventures Corp.**
  - Pineapple fruit waste
  - 5.7MW equivalent of electricity and gas

- **Map Data ©2019Google**
  - [Surallah Factory]
    - 93.1km Northwest from General Santos Airport
  - [Polomolok Factory]
    - 27.2km North from General Santos Airport
18MW Solar Power Project in Collaboration with Power-supply Company


**Outline of GHG Mitigation Activity**

This project introduces 18MW Solar System in collaboration with Power-supply company to its clients’ rooftops of shopping malls and factories.

Reduction of GHG emission is made by replacing a portion of conventional fossil fuel electricity to renewable energy.

**Expected GHG Emission Reductions**

11,743 tCO₂/year

= (Reference CO₂ emissions) [tCO₂/year] - (Project CO₂ emissions) [tCO₂/year]

= ((Reference power consumption) [MWh/year] - 0 [MWh/year]) × Emission factor [tCO₂/MWh]
This project introduces turbine, generator, control system and auxiliary equipment at IPC1(19MW) hydro power plant located in Pinacauan de Ilaguen river, Isabela Province, Philippine. Machines can keep high efficiency even in variable head and variable loading condition, by adopting Kaplan turbine provided by Voith Hydro with the abundant experiences and latest technologies. This project is expected to have 95GWh generation capacity annually.

Outline of GHG Mitigation Activity

Expected GHG Emission Reductions

46,836 tCO₂/year
= (Reference CO₂ Emissions) [tCO₂/year] - (Project CO₂ Emissions) [tCO₂/year]

= ((Reference Power Consumption) [MWh/year] - 0 [MWh/year]) × Emission Factor [tCO₂/MWh]

Sites of Project

IPC1 Power plant is located approx. 30km to the east from Tuguegarao Airport, the northern part of Luzon.
Daiichi Jitsugyo Co., Ltd. and THUAN HAI CORPORATION jointly introduce biomass (Rice husk) -fueled steam boilers to supply steam to a chemical factory located in Phu My 3 Specialized Industrial Park in Ba Ria Vung Tau Province. The project contributes to the achievement of the country's Vision by 2030 and Green Growth Strategy through achieving decarbonization by introducing biomass-fueled steam boilers instead of fossil fuel-fired boilers.

Expected GHG Emission Reductions

16,882 tCO₂/year

= Reference CO₂ emission – Project CO₂ emission

• Reference CO₂ emission
  = Fuel consumption by reference boiler [ton/year] × Emission Factor [tCO₂/ton]

• Project CO₂ emission
  = 0 [tCO₂/year]
High efficiency water pumps with inverter control are installed in a new water treatment plant and two existing water treatment plants owned by THUA THIEN HUE WATER SUPPLY JOINT STOCK COMPANY (HueWACO).

To perform with high efficiency, the pumps are customized to specific conditions and requirements of the recipient plants.

Moreover, highly efficient operation is possible by adjusting the rotational speed of the motor according to the change in flow rate using an inverter.

Expected GHG Emission Reductions

4,060 tCO₂/year

= [(Reference Power Consumptions) – (Project Power Consumptions)] x Emission Factor (EF)

Sites of Project

Tu Ha WTP
Water distribution pump (Existing pump)

Outline of GHG Mitigation Activity
The objective of this project is to build and operate Waste to Energy plant for municipal solid waste from Hanoi City in the Xuan Son Waste treatment area in the northwestern part of Hanoi, Vietnam. Hitachi Zosen and T&T Group established SPC, which is responsible for the implementation of this project.

Under the contract with the Hanoi People's Committee, 1,000 tons per day of municipal solid waste generated from Hanoi city is incinerated at this plant. The waste heat will be used for power generation. Generated power will be used for internal consumption and the rest of power will be supplied to the state-owned power company EVN.

As a result, it reduces fossil fuel consumption and CH4 emissions from landfill disposal.

**Expected GHG Emission Reductions**

119,870 tCO₂eq/year

=(Reference GHG Emissions for 15 years - Project GHG Emissions for 15 years) / 15 years

=(3,393,355 tCO₂eq - 1,595,288 tCO₂eq) / 15 years

**Sites of Project**

Xuan Son Waste treatment area, Ba Vi district, Hanoi (About 80 km west from Noi Bai Airport)

Total area of the site is 4.06 ha.

Map Data ©2019 Google
A 30MW ground-mount solar PV system is installed in Baja California Sur, Mexico, to sell power through the grid. To maximize the power generation, solar trackers are used.

This project contributes to the achievement of Mexico’s policy for a Clean Energy ratio target of 35% by 2024.

**Expected GHG Emission Reductions**

36,724 CO₂/year

= (Reference CO₂ emissions) [tCO₂/year] - (Project CO₂ emissions) [tCO₂/year]

= ((Reference power consumption) [MWh/year] - 0 [MWh/year]) × Emission factor [tCO₂/MWh]
1MW solar power system is installed on the rooftop of a new supermarket to be built in Airai State, Republic of Palau, for self-consumption purposes. This is the first introduction of a mega solar system in Palau.

This project contributes to the achievement of Palau’s policy for a renewable energy ratio target of 45% in 2025.

**Expected GHG Emission Reductions**

842 tCO₂/year

= (Reference CO₂ Emissions) [tCO₂/year] - (Project CO₂ Emissions) [tCO₂/year]

= ((Reference Power Consumption) [MWh/year] - 0 [MWh/year]) × Emission Factor [tCO₂/MWh]

**Site of Project**

Installation Site: Approx. 4km west of Palau International airport

Map Data ©2019Google