

Financing Programme for JCM Model Projects in FY2018 in Thailand

11th September 2018

Global Environment Centre Foundation (GEC)
as the implementing organization of the JCM Financing Programme



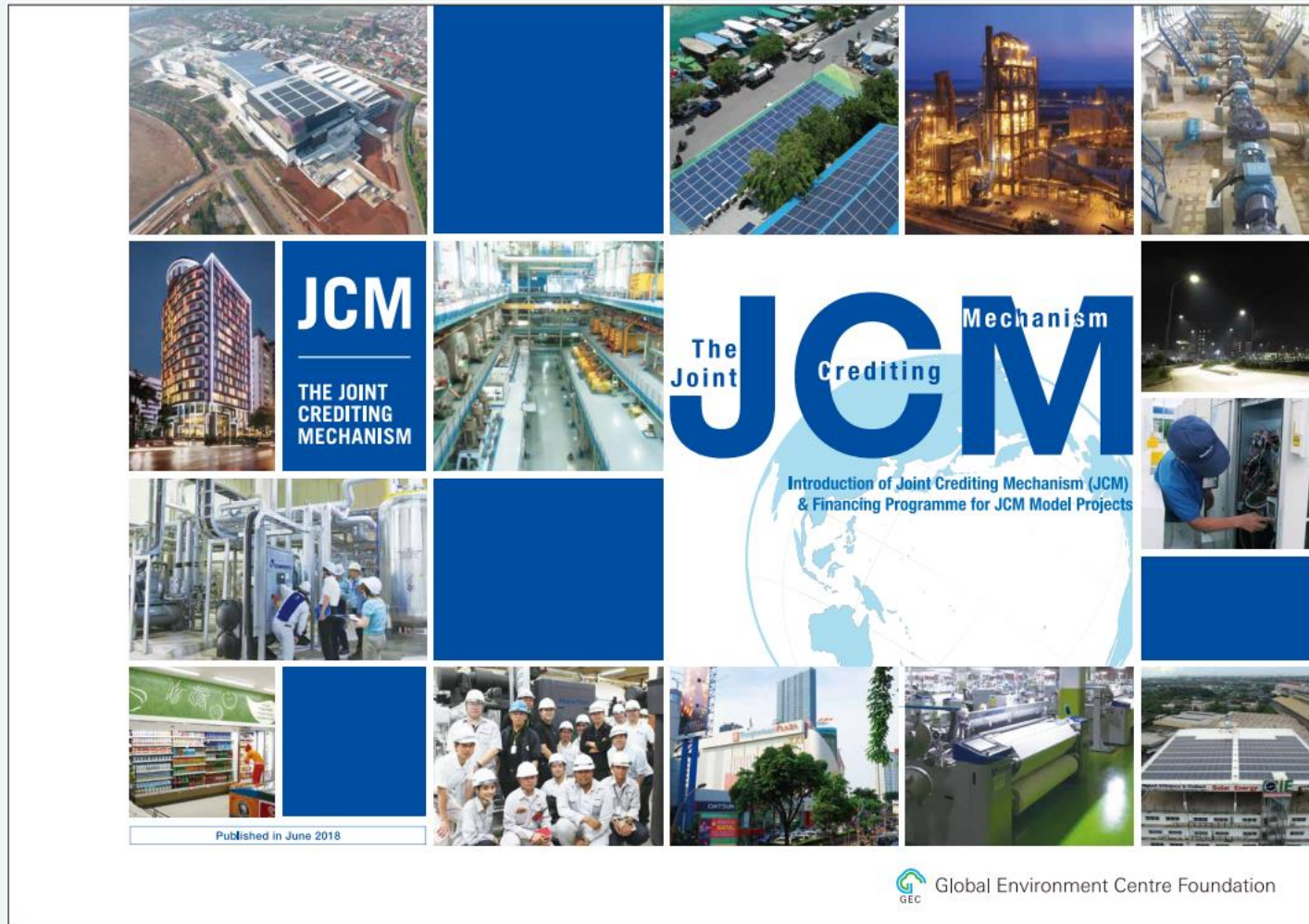
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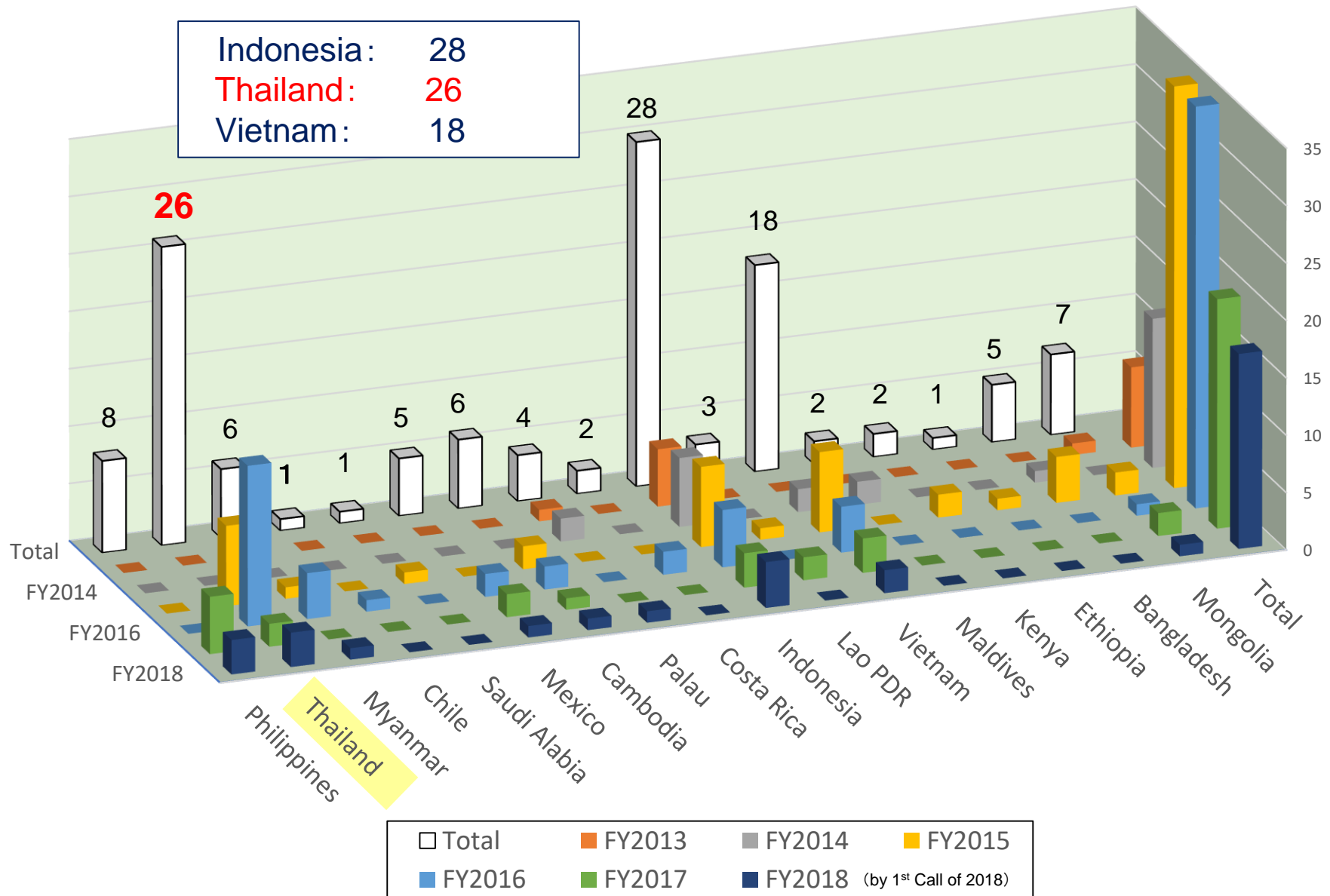
Reference Materials

1. Example JCM Model Projects along with Environmental Infrastructure Strategy proposed by MOEJ
2. Energy Efficiency in large infrastructure

1. Status of JCM Model Projects in FY2018 in Thailand



Thailand is the No.2 country by the number of projects



List of JCM Model Projects Selected in June 2018



Global Environment Centre Foundation

Partner Country	Entity	Project Title	Sector	Expected GHG Emission Reductions (tCO2/y)
Vietnam	Nihon Crant Co. Ltd.	Modal Shift from Truck to Cargo Ship with Freshness Preservation Reefer Container	Transport	11,025
Vietnam	Yokohama Water Co., Ltd.	Energy Saving by Introduction of Inverters for Raw Water Intake Pumps	Energy Efficiency	1,043
Thailand	The Kansai Electric Power Company, Incorporated	Introduction of Gas Co-generation System and Absorption Chiller to Fiber Factory	Energy Efficiency /Renewable Energy	17,851
Thailand	Tokyo Century Corporation	25MW Rooftop and Floating Solar Power Project in Industrial Park	Renewable Energy	10,620
Thailand	Toyota Motor Corporation	Introduction of 3.4 MW Rooftop Solar Power System in Technical Center and Office Buildings	Renewable Energy	1,617
Philippines	Chodai Co., Ltd.	2.5MW Rice Husk Power Generation Project in Butuan City, Mindanao	Renewable Energy	5,118
Philippines	Sharp Energy Solutions Corporation	Introduction of 4MW Rooftop Solar Power System in Tire Factory	Renewable Energy	2,858
Philippines	Chodai Co., Ltd.	0.16MW Micro Hydro Power System in Taguibo Water Supply Facility, Mindanao	Renewable Energy	682
Palau	Sharp Energy Solutions Corporation	Introduction of 0.4MW Rooftop Solar Power System in Supermarket	Renewable Energy	296
Myanmar	Global Engineering Co., Ltd.	Introduction of 8.8MW Power Generation System by Waste Heat Recovery for Cement Plant	Renewable Energy	19,241
Mongolia	Sharp Energy Solutions Corporation	21MW Solar Power Project in Bayanchandmani	Renewable Energy	27,008
Mexico	Sharp Energy Solutions Corporation	30MW Solar Park Project in Guanajuato	Renewable Energy	36,037
Indonesia	Takasago Thermal Engineering Co., Ltd.	Introduction of 2.8MW Solar Power System in Healthcare and Food Factories	Renewable Energy	2,446
Indonesia	Otsuka Pharmaceutical Factory, Inc.	Energy Saving by Introducing High Efficiency Autoclave to Infusion Manufacturing Factory	Energy Efficiency	1,950
Indonesia	Hokusan Co., Ltd.	Introduction of CNG-Diesel Hybrid Equipment to Public Bus in Semarang	Transport	1,870
Indonesia	iFORCOM Co.,Ltd.	Energy Saving for Air-conditioning System of Shopping Mall by High Efficiency Centrifugal Chiller and Air-conditioning Control System	Energy Efficiency	1,501
Cambodia	Asian Gateway Corporation	1.5MW Solar Power Project in Kampong Thom	Renewable Energy	831

3 out of 17 projects in Thailand

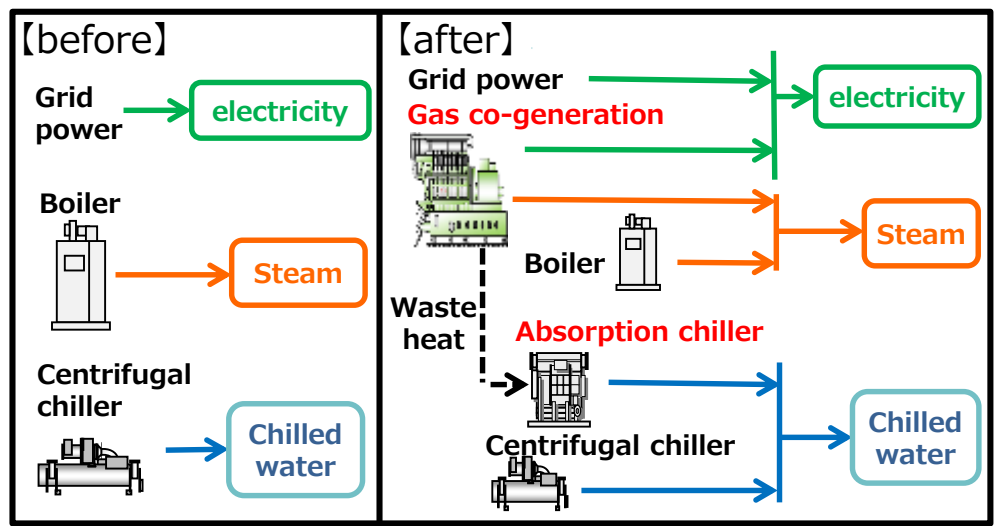
1. Kansai Electric Power Co., Inc.
2. Tokyo Century Corporation
3. Toyota Motor Corporation

Introduction of Gas Co-generation System and Absorption Chiller to Fiber Factory

PP (Japan): Kansai Electric Power Co., Inc., PP (Thailand): Kansai Energy Solutions (Thailand) Co., Ltd.

Outline of GHG Mitigation Activity

This project reduces CO2 emissions by introducing gas co-generation system (5 MW class x 2set) and absorption chiller (800 USRT class) to fiber factory. These gas co-generation system and absorption chiller contribute to energy saving and cost reduction, and can improve reliability for power supply.



Expected GHG Emission Reductions

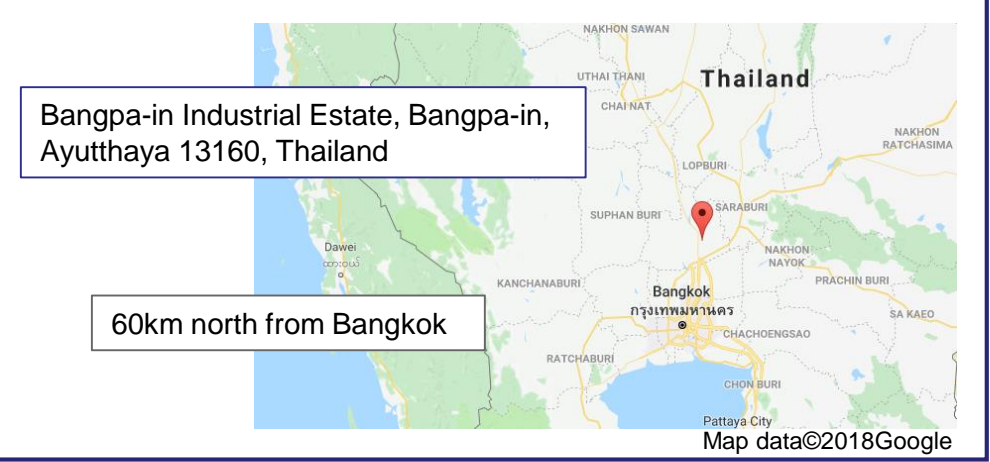
17,851 t CO₂ / year

=①Reference emissions – ②Project emissions

①Reference emissions = (Project electricity supply × CO2 emission factor of the grid) + (Project heat supply ÷ efficiency of reference boiler × CO2 emission factor of natural gas) + (Project removed heat ÷ COP of reference centrifugal chiller × CO2 emission factor of the grid)

②Project emissions = Project fuel consumption × CO2 emission factor of natural gas

Sites of Project



25MW Rooftop and Floating Solar Power Project in Industrial Park

PP (Japan): Tokyo Century Corporation, PP (Thailand): Tisco Tokyo Leasing Co., Ltd., Impact Solar Limited

Outline of GHG Mitigation Activity

This project is to install PV systems by lease financing on the rooftops of the factories and the reservoir in an industrial park operated by a conglomerate in Thailand. The project will consequently contribute to GHG reduction and spreading the concept of “Green Industrial Park” by the use of renewable energy sources.



【Industrial Park】



【Reservoir】

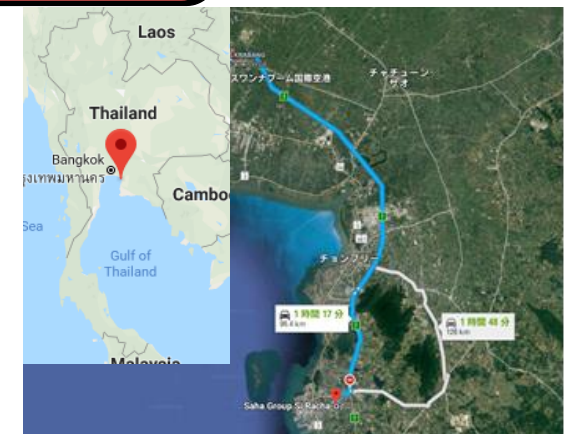
Expected GHG Emission Reductions

10,625 tCO₂/年

$$\begin{aligned}
 &= (\text{Reference CO}_2 \text{ emissions}) [\text{tCO}_2/\text{year}] \\
 &\quad - (\text{Project CO}_2 \text{ Emission}) [\text{tCO}_2/\text{year}] \\
 &= ((\text{Reference Power consumption}) [\text{MWh}/\text{year}] \\
 &\quad - 0 [\text{MWh}/\text{year}]) \times \text{Emission Factor} [\text{tCO}_2/\text{MWh}]
 \end{aligned}$$

Sites of Project

- Approx. 80minutes from Suvarnabhumi International Airport by car.



Map Data ©2018Google

Project Title : Introduction of 3.4 MW Rooftop Solar Power System in Technical Center and Office Buildings

PP (Japan) : Toyota Motor Corporation , PP (Thailand): Toyota Daihatsu Engineering & Manufacturing Co., Ltd.

Outline of GHG Mitigation Activity

This project aims the reduction of CO₂ emission by installing 3.4 MW solar power system on the rooftop of the technical center and office building of Toyota Daihatsu Engineering & Manufacturing Co., Ltd. located in Samutprakarn in eastern Bangkok.

Electricity generated by solar power system is consumed in-house and replaces part of grid electricity consumption.



Expected GHG Emission Reductions

1,617 tCO₂/year

- Project emission is assumed to be zero.

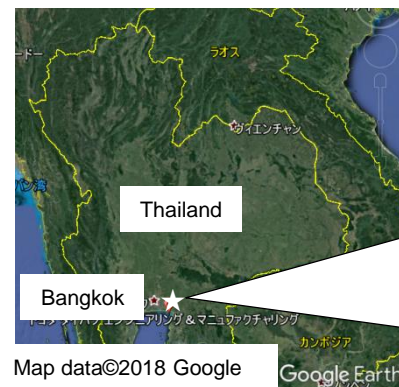
- Reference emission:

$$\begin{aligned} &\text{Annual electricity generation} \times \text{CO}_2 \text{ emission factor} \\ &= 5,069 \text{ MWh/year} \times 0.319 \text{ tCO}_2/\text{MWh} \\ &= 1,617 \text{ tCO}_2/\text{year} \end{aligned}$$

- GHG emission reductions:

$$\begin{aligned} &\text{Reference emission} - \text{Project emission} \\ &= 1,617 - 0 = 1,617 \text{ tCO}_2/\text{year} \end{aligned}$$


Sites of Project



Approx. 45 km east from Bangkok central



2. Trend and Suggestion for JCM Model Projects in Thailand

**JCM** THE JOINT CREDITING MECHANISM

Global Environment Centre Foundation

Search

Japanese ▾

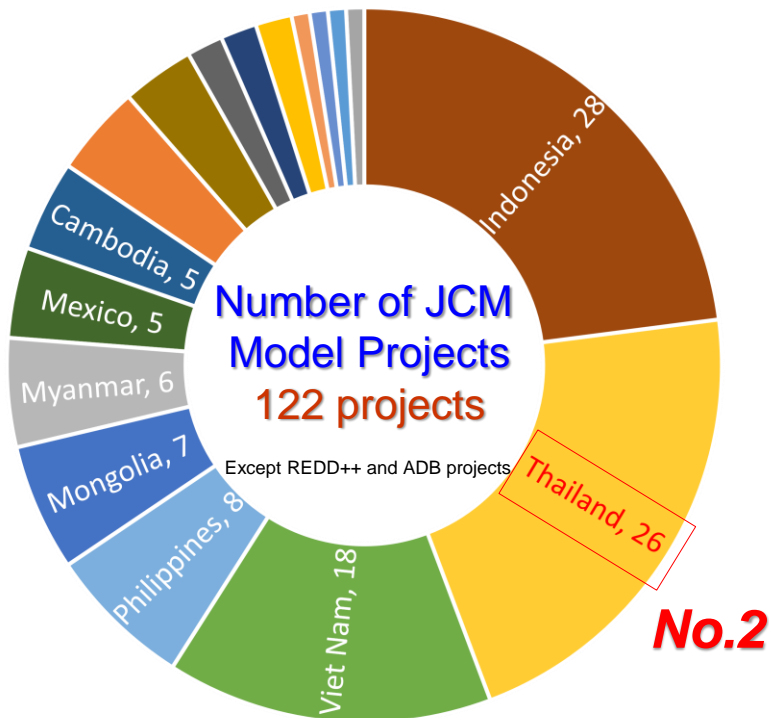
[Overview](#) [Call for Proposals](#) [Projects/ Studies](#) [News](#) [Publications](#) [Contact](#)

Projects/Studies

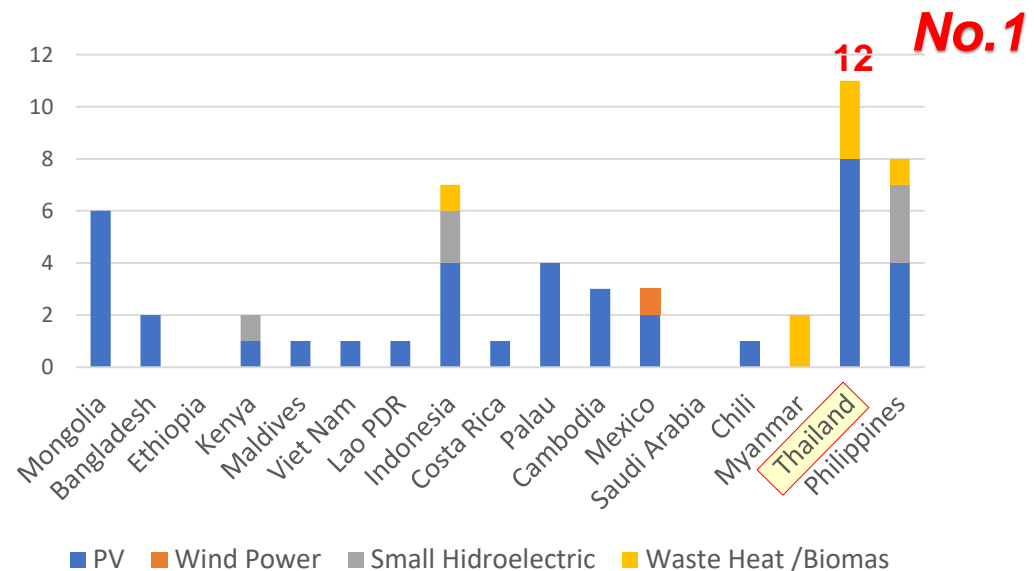
[Q Search for a project](#)

You can search by combining multiple items.

Partner Country	Bangladesh	Cambodia	Chile	Costa Rica	Ethiopia	Indonesia	Kenya	Lao PDR	Malaysia
	Maldives	Mexico	Mongolia	Myanmar	Palau	Philippines	Saudi Arabia	Sri Lanka	
	Thailand	Vietnam							
Type	JCM Model Project	REDD+	PS (Project Planning Study)	FS (Feasibility Study)					
	DS (Methodology Demonstration Study)								
Year	2013	2014	2015	2016	2017	2018			
Sector	Energy Efficiency Improvement	REDD+	Renewable Energy	Transport					
	Waste Management /Biomass Utilisation								
Keywords	<input type="text" value="Enter keyword"/>								
<div>Reset</div> <div>Search</div>									

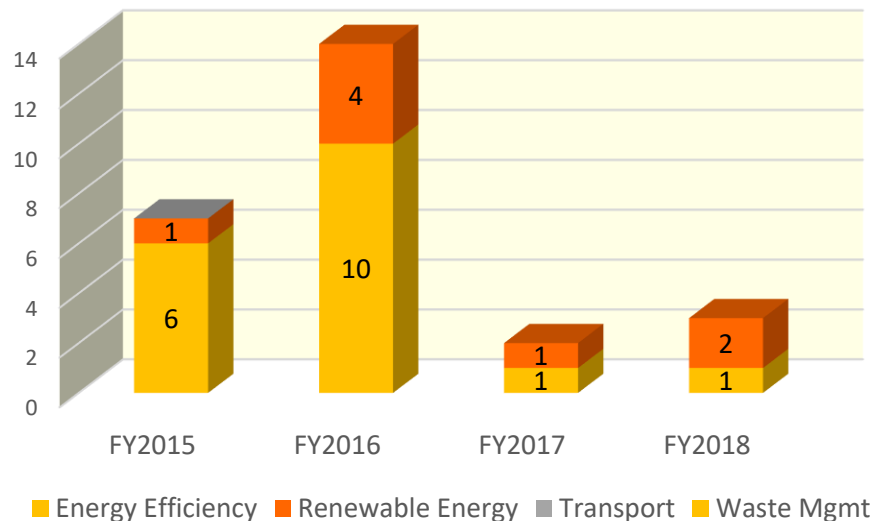


Number of Renewable Energy projects by Country

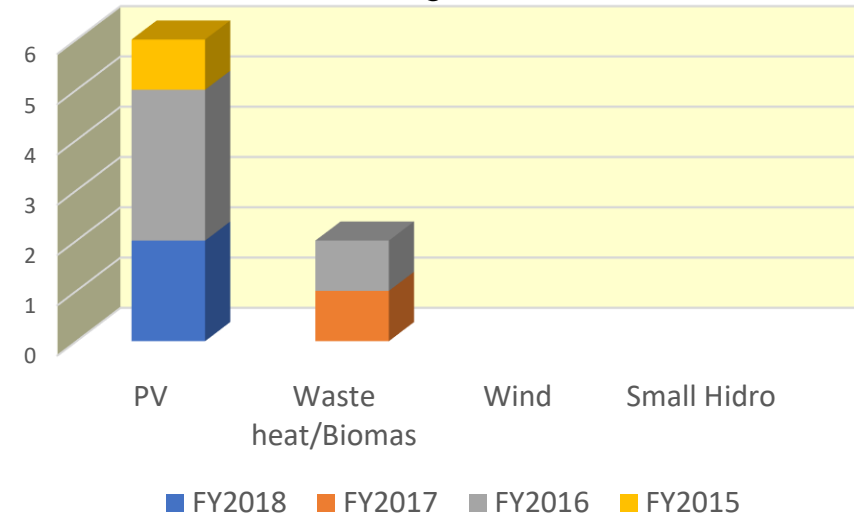


- After Thailand had established JCM with Japan in November 2015 as the 16th country, 26 JCM Model Projects have been developed within three and half years. JCM started in 2013.
- 12 Renewable Energy projects have been developed in Thailand and they consist of PV and Waste Heat. No Wind Power and Small Hydro projects have been developed yet.

Number of Projects by sector in Thailand



Number of Projects by Renewable Energy technologies in Thailand



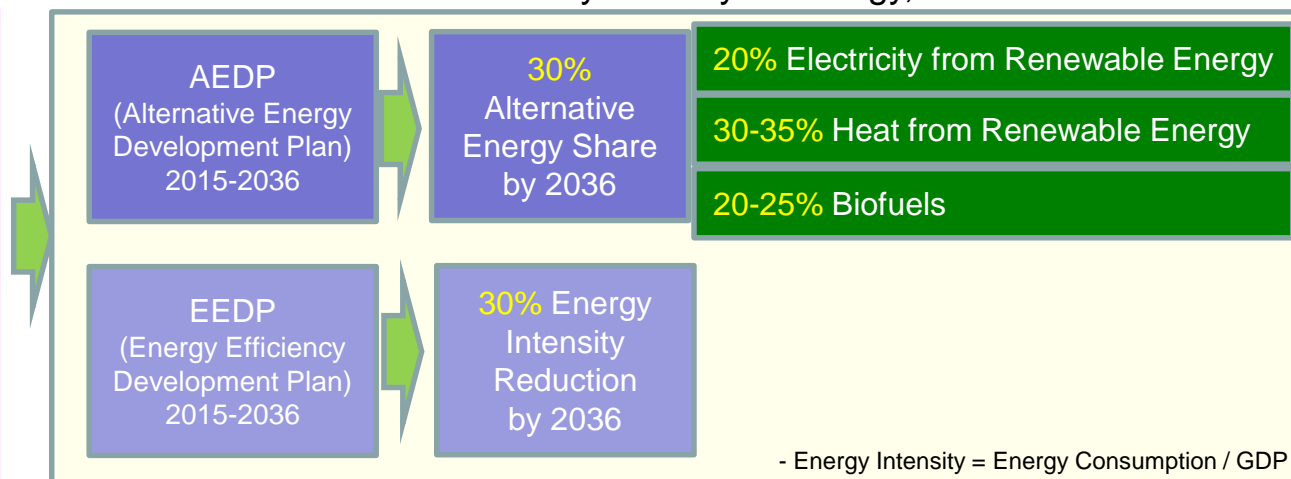
1. Number of projects in recent two years reduced because number of Energy Efficiency projects reduced, since the criteria of Cost-effectiveness of GHG emission reductions(4,000JPY/tCO₂ or less) is a challenge especially for Energy Efficiency projects.
2. Energy Efficiency and Renewable Energy projects are developed, and Transport or Waste Management projects have not been implemented so far.
3. Renewable Energy projects have concentrated on PV and Waste heat/Biomass.

Thailand Integrated Energy Blueprint (TIEB)

by Ministry of Energy, Thailand

Thailand Energy Circumstances

- 50% domestic production
50% importing in 2013.
- 90% of electricity supply is covered by natural gas(67%) and coal(20%) in 2013.
- Electricity demand is expanding by 4% every year.
- Electricity price in 2015 is 45% up compared with 2000.



Alternative Energy Target (MW)

From Ministry of Energy, Thailand

Type	PV	Wind	Hydro	Mini Hydro (<12MW)	MSW	Biogas	Energy Crops	Biomass	Total
Installed Capacity 2014	1,299	225	2,906	142	66	312	-	2,542	7,490
Installed Capacity 2036	6,000	3,002	2,906	376	500	600	680	5,570	19,634

There could be a chance to utilize the JCM Model Projects to support TIEB target in Thailand using various technologies.

2. 4. Expected GHG Emission Reductions of JCM



Expected GHG Emission Reductions of JCM Model Projects over 10,000 tCO₂/year

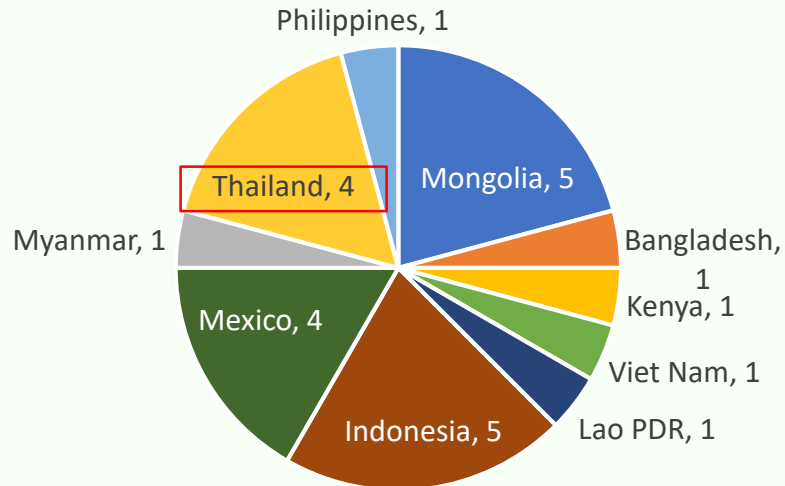
No.	Year	Partner Country	Entity	Project Title	Sector	Expected GHG Emission Reductions (tCO ₂ /year)
1	2014	Indonesia	JFE Engineering Corporation	Power Generation by Waste-heat Recovery in Cement Industry	Waste Heat	122,000
2	2017	Mexico	Kyuden International Corporation	Los Altos II Wind Farm Project	Wind	66,351
3	2017	Philippines	Toyota Tsusho Corporation	15MW Mini Hydro Power Plant Project in Siguil River in Mindanao	Small Hidro	49,073
4	2016	Indonesia	Toyo Energy Farm Co., Ltd.,	10MW Mini Hydro Power Plant Project in North Sumatra	Small Hidro	42,711
5	2015	Bangladesh	Pacific Consultants Co., Ltd.	50MW Solar PV Power Plant Project	PV	40,527
6	2018	Mexico	Sharp Energy Solutions Corporation	30MW Solar Park Project in Guanajuato	PV	36,037
7	2017	Indonesia	CHODAI Co.,Ltd,	10MW Mini Hydro Power Plant Project in Lae Ordi River in North Sumatra	Small Hidro	35,712
8	2016	Thailand	NTT DATA INSTITUTE OF MANAGEMENT CONSULTANTS	Introduction of 12MW Power Generation System by Waste Heat Recovery for Cement Plant	Waste Heat	31,180
9	2018	Mongolia	Sharp Energy Solutions Corporation	21MW Solar Power Project in Bayanchandmani	PV	27,008
10	2017	Mongolia	Sharp Energy Solutions Corporation	Introduction of 20MW Solar Power System in Darkhan City	PV	22,927
11	2015	Indonesia	Toyota Tsusho Corporation	Installation of Gas Co-generation System for Automobile Manufacturing Plant	Energy Efficiency	20,439
12	2018	Myanmar	Global Engineering Co., Ltd.	Introduction of 8.8MW Power Generation System by Waste Heat Recovery for Cement Plant	Waste Heat	19,241
13	2017	Mongolia	Sharp Energy Solutions Corporation	Introduction of 15MW Solar Power System near New Airport	PV	18,438
14	2018	Thailand	The Kansai Electric Power Company, Incorporated	Introduction of Gas Co-generation System and Absorption Chiller to Fiber Factory	Energy Efficiency	17,851
15	2016	Mexico	NTT DATA INSTITUTE OF MANAGEMENT CONSULTANTS	Introduction of 4.8MW Power Generation with Methane Gas Recovery System	Waste Management	17,180
16	2015	Kenya	Pacific Consultants Co., Ltd.	6MW Small Hydropower Generation Project in Rupingazi	Small Hidro	16,528
17	2014	Indonesia	Kanematsu Corporation	Introduction of High Efficient Old Corrugated Cartons Process at Paper Factory	Energy Efficiency	14,885
18	2017	Mexico	Sharp Energy Solutions Corporation	Introduction of 20MW Solar Power System in San Luis Potosi	PV	12,457
19	2017	Lao PDR	TSB Co., Ltd	Introduction of 14MW floating solar power system in Vientiane	PV	11,450
20	2015	Mongolia	Sharp Energy Solutions Corporation	10MW Solar Power Project in Darkhan City	PV	11,221
21	2016	Thailand	Sharp Energy Solutions Corporation	Introduction of 27MW Rooftop Solar Power System to Large Supermarkets	PV	11,194
22	2018	Vietnam	Nihon Crant Co. Ltd.	Modal Shift from Truck to Cargo Ship with Freshness Preservation Reefer Container	Transport	11,025
23	2018	Thailand	Tokyo Century Corporation	25MW Rooftop and Floating Solar Power Project in Industrial Park	PV	10,620
24	2016	Mongolia	Farmdo Co., Ltd.	Installation of 8.3MW Solar Power Plant in Ulaanbaatar suburb Farm	PV	10,580

- There are 24 projects where Expected GHG Emission Reductions is over 10,000 tCO₂/year in 17 countries, and 4 projects are developed in Thailand.

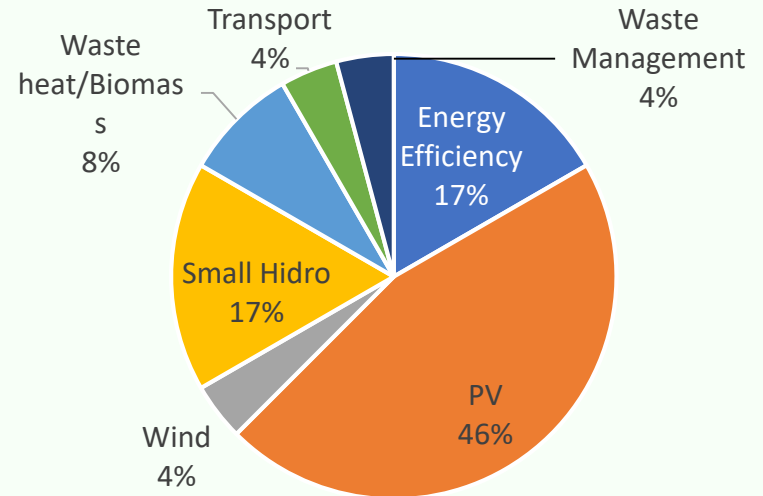
2. 4. Expected GHG Emission Reductions of JCM



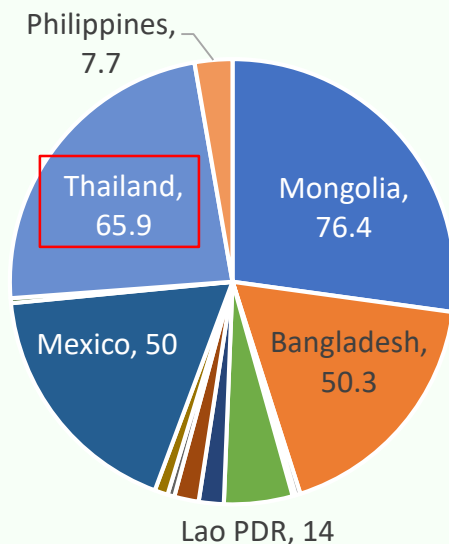
Number of Projects by Country over 10,000 tCO₂/year Expected GHG Emission Reductions



Rate of Projects by sectors over 10,000 tCO₂/year Expected GHG Emission Reductions



PV Capacity(MW) total of Country



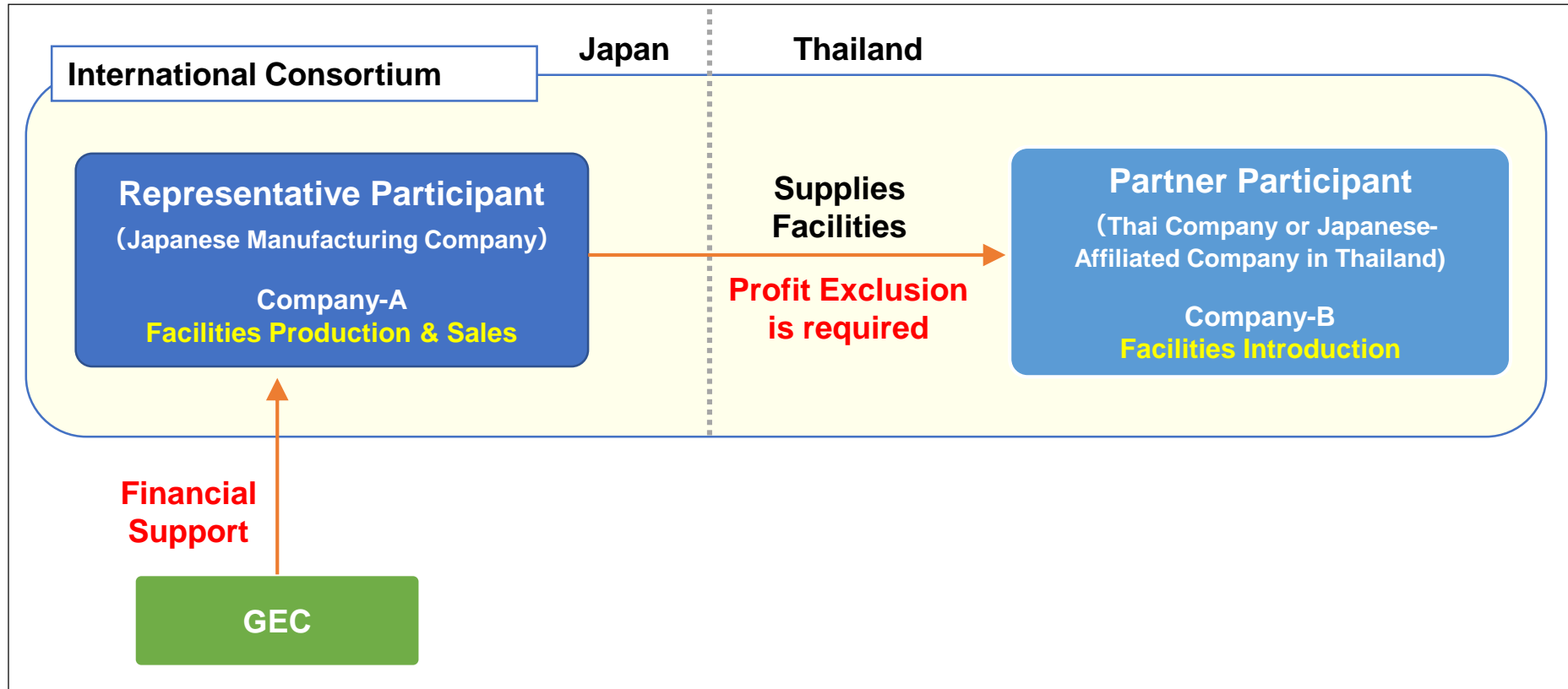
- Thailand has 4 large emission reduction projects of Renewable Energy sector.
- Renewable Energy projects(PV, Small Hydro, Waste heat etc.) generate large emission reduction compared with Energy Efficiency projects so far.
- PV generates relatively large emission reduction in Thailand so far.

Purpose of Business Form Model

1. Typical Business Forms Model will be a good references to formalize International Consortium for JCM Model Project.
2. Suitable Business Forms Model will reduce risk of Representative Participants
In terms of the responsibility of Representative Participants and Partner Participants, refer to [Guidelines for Submitting Proposals](#))
3. Suitable Business Forms will reduce the financial risks
 - Reduce Initial Cost (Leasing model)
 - Avoid Profit Exclusion
 - etc.

Models	Type
Model.1	Manufacturing
Model.2	Trading Co. / Engineering Co.
Model.3	Parent and Subsidiary
Model.4	SPC
Model.5	Leasing

Model 1. Manufacturer

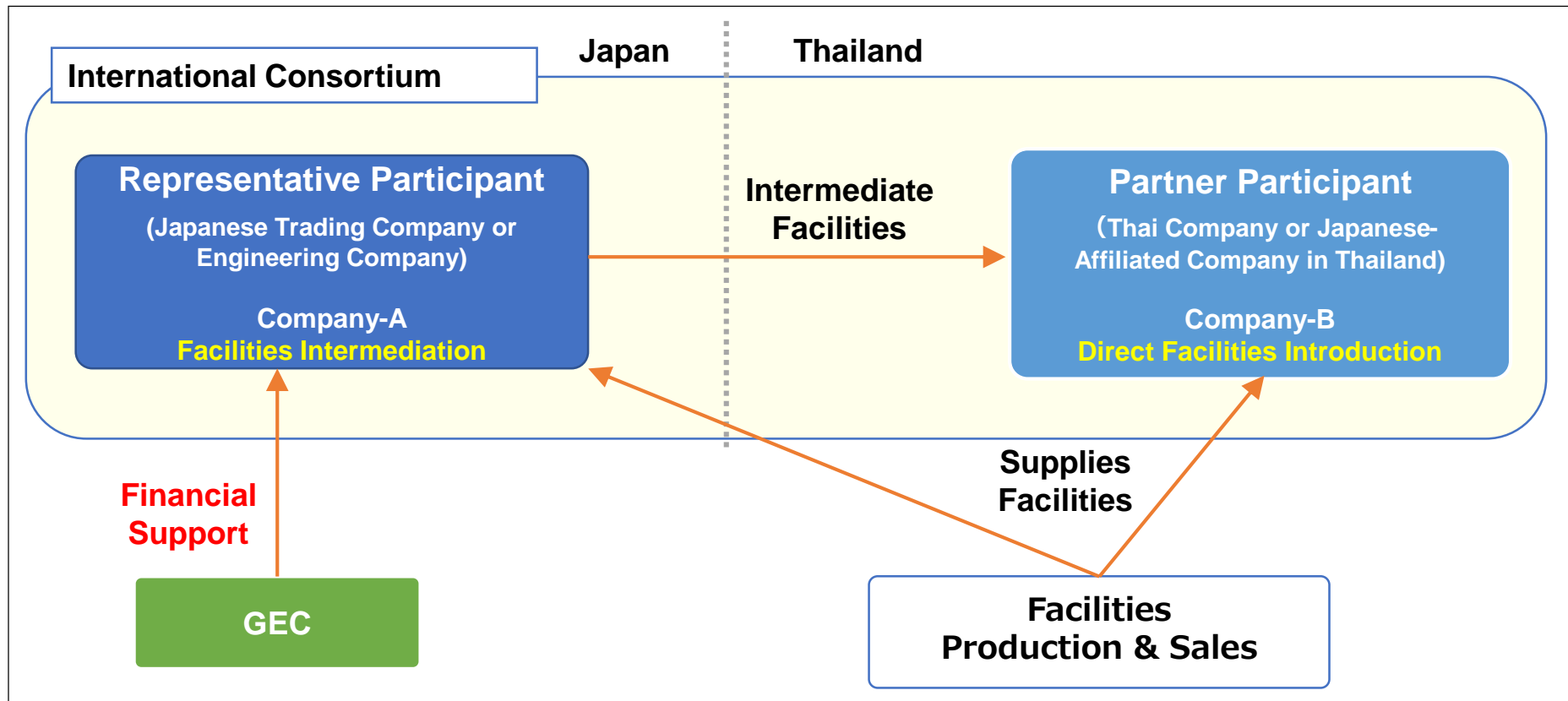


A Japanese manufacturer acts as the Representative Participant (RP) and supplies its own products to the Thailand Partner Participant (PP).

Example project in Thailand:

- 2016 Sharp Energy Solutions Co. : Introduction of 27MW Rooftop Solar Power System to Large Supermarkets

Model 2. Trading Co./Engineering Co.

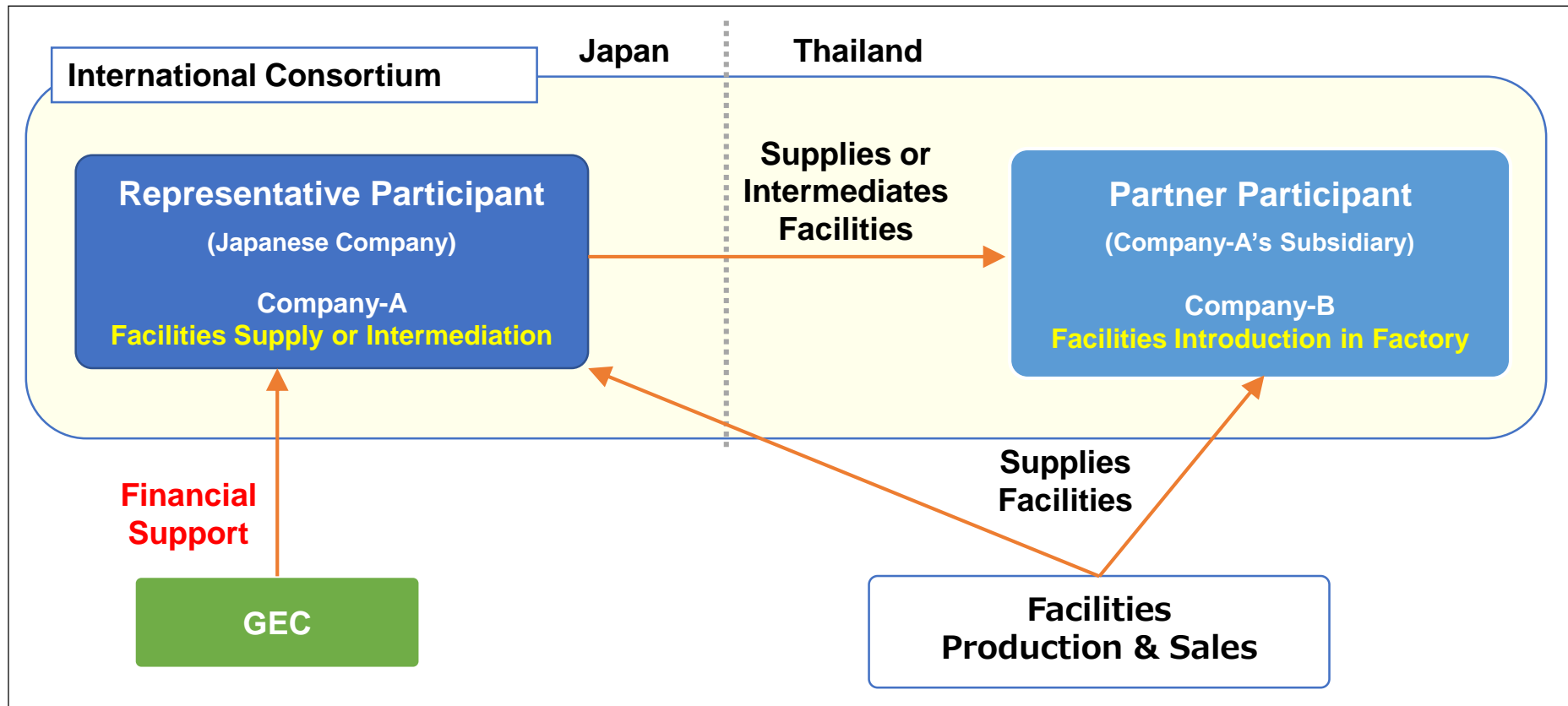


A Japanese trading company or engineering company acts as the RP.
The Thai PP procures through the RP or directly from a third party.

Example projects in Thailand in today's session:

- 2015 Nippon Steel & Sumikin Engineering : Installation of Co-Generation Plant for On-Site Energy Supply in Motorcycle Factory
- 2016 KANEMATSU CO.: Introduction of Energy Efficient Refrigeration System in Industrial Cold Storage

Model 3. Parent and Subsidiary

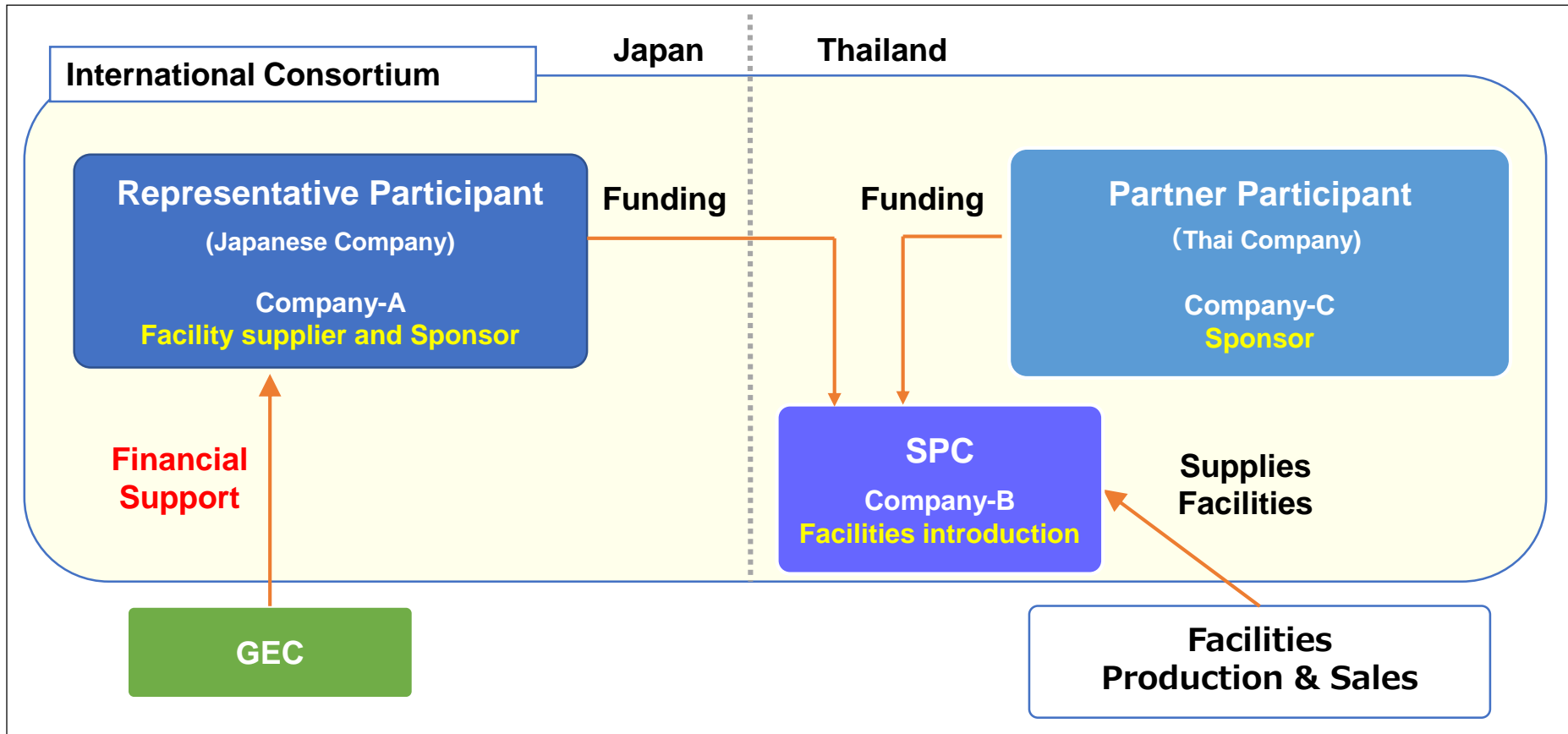


The Japanese parent company (that is RP) procures facilities and supplies to its Thai subsidiary (that is PP), or intermediates facilities.

Example projects in Thailand in Today's session:

- 2016 CPF JAPAN CO. : Introduction of Heat Recovery Heat Pumps to Food Processing Factory
- 2017 Fuji Foods CO. : Introduction of Biomass Co-Generation System to Food Factory

Model 4. SPC

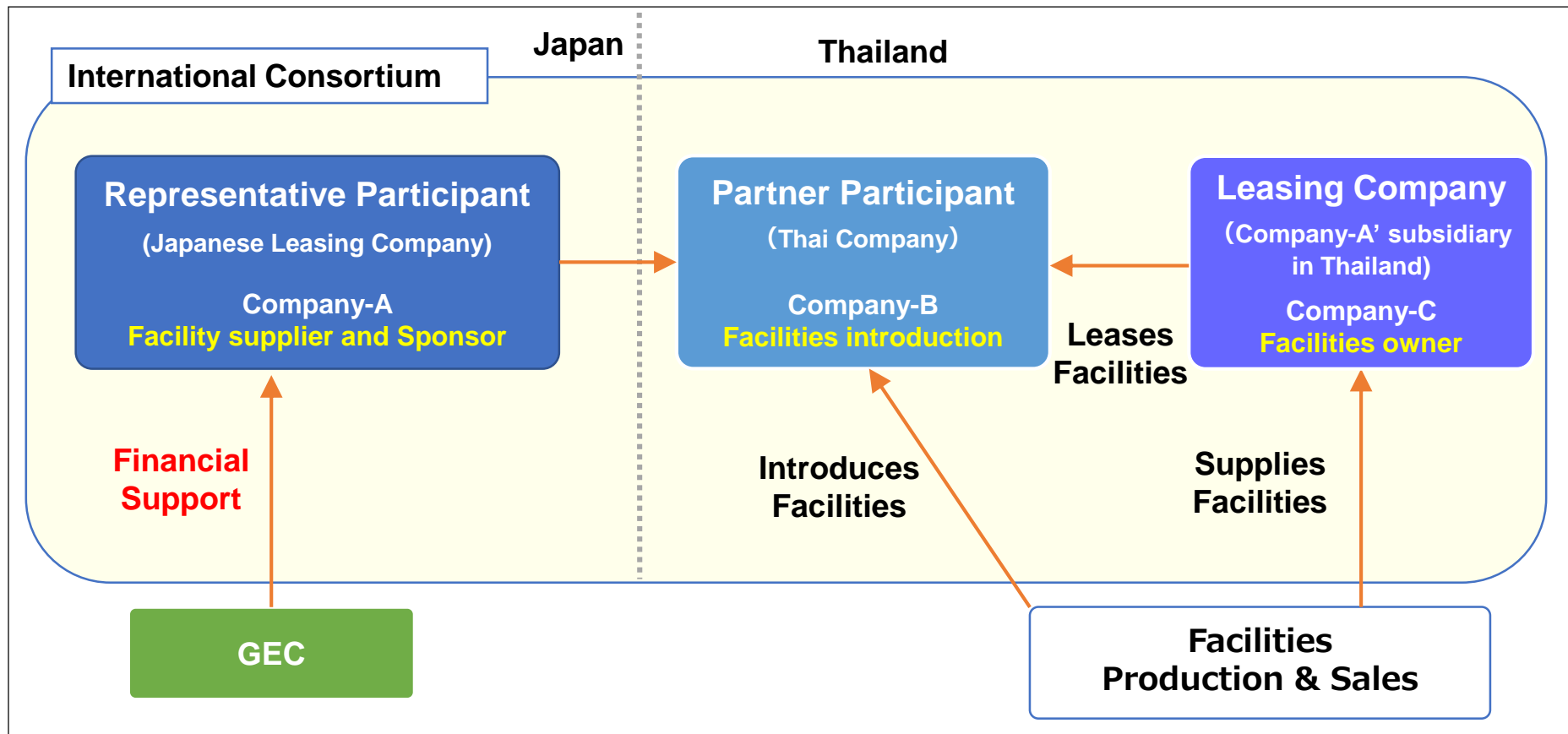


The Japanese RP and Thai PP make investment to establish a Special Purpose Company (SPC). SPC procures facilities and implements the project.

Example project in Thailand:

2016 TSB CO. : Introduction of 5MW Floating Solar Power System on Industrial Water Reservoir

Model 5. Leasing



A Japanese leasing company acts as RP, and its Thai subsidiary owns and leases facilities to the Thai PP, reducing the initial cost.

Example project in Thailand in today's session:

2018 Tokyo Century CO.: 25MW Rooftop and Floating Solar Power Project in Industrial Park

2. 5. Business Form Models in Thailand

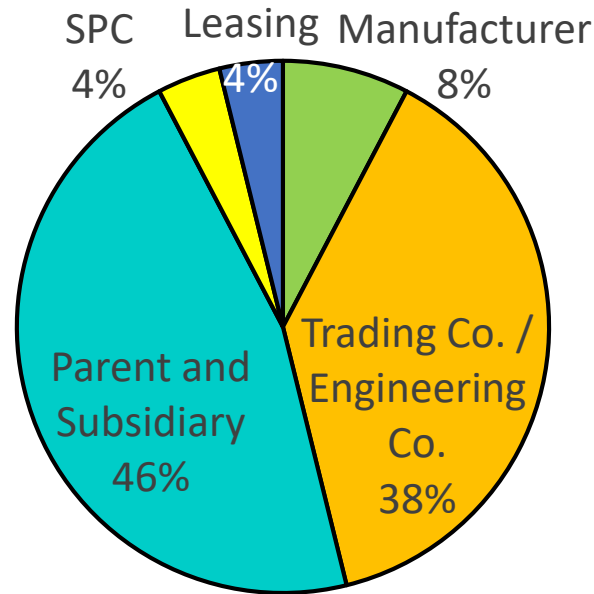


List of JCM Model Projects in Thailand and the Business Form Models (2013/11~2018/7: 26 projects)

As of September 11th, 2018

No.	Year	Project Title	Entity	Sector	Business Form Model No.
1	2016	Introduction of 27MW Rooftop Solar Power System to Large Supermarkets	Sharp Energy Solutions Corporation	Renewable Energy	1
2	2016	Introduction of 3.4MW Rooftop Solar Power System to Air-conditioning Parts Factories	Sharp Energy Solutions Corporation	Renewable Energy	1
3	2017	Introduction of Energy Efficient Equipment to Bangkok Port	Yokohama Port Corporation	Energy Efficiency Renewable Energy	2
4	2016	Energy Saving by Air-Conditioning Control System in Precision Parts Factories	YUASA TRADING Co., Ltd.	Energy Efficiency	2
5	2016	Introduction of Energy Efficient Refrigeration System in Industrial Cold Storage	KANEMATSU CORPORATON	Energy Efficiency	2
6	2016	Introduction of 1.5MW Rooftop Solar Power System and Advanced EMS for Power Supply in Paint Factory	Finetech Co.,Ltd.	Energy Efficiency	2
7	2016	Introduction of 12MW Power Generation System by Waste Heat Recovery for Cement Plant	NTT DATA INSTITUTE OF MANAGEMENT CONSULTING, Inc.	Renewable Energy	2
8	2016	Introduction of High Efficiency Chilled Water Supply System in Milk Factory	TEPIA Corporation Japan Co.,Ltd.	Energy Efficiency	2
9	2015	Energy Saving for Air-Conditioning in Tire Manufacturing Factory with High Efficiency Centrifugal Chiller	Inabata & Co., Ltd	Energy Efficiency	2
10	2015	Installation of Co-Generation Plant for On-Site Energy Supply in Motorcycle Factory	Nippon Steel & Sumikin Engineering Co., Ltd.	Energy Efficiency	2
11	2015	Reducing GHG emission at Textile Factory by Upgrading to Air-saving Loom (Samutprakarn)	Toray Industries, Inc.	Energy Efficiency	2
12	2015	Introduction of Solar PV System on Factory Rooftop	Pacific Consultants Co., Ltd.	Renewable Energy	2
13	2018	Introduction of 3.4 MW Rooftop Solar Power System in Technical Center and Office Buildings	Toyota Motor Corporation	Renewable Energy	3
14	2018	Introduction of Gas Co-generation System and Absorption Chiller to Fiber Factory	The Kansai Electric Power Company, Incorporated	Energy Efficiency Renewable Energy	3
15	2017	Introduction of Biomass Co-Generation System to Food Factory	Fuji Foods Corporation	Renewable Energy	3
16	2016	Introduction of High-efficiency Boiler System to Rubber Belt Plant	Bando Chemical Industries, Ltd.	Energy Efficiency	3
17	2016	Introduction of Heat Recovery Heat Pumps to Food Processing Factory	CPF JAPAN CO., LTD.	Energy Efficiency	3
18	2016	Introduction of Energy Saving Refrigerator and Evaporator with Mechanical Vapor Recompression in Amino Acid Producing Plant	KYOWA HAKKO BIO CO. LTD.	Energy Efficiency	3
19	2016	Introduction of Co-generation System to Motor Parts Factory	DENSO	Energy Efficiency	3
20	2016	Introduction of LED Lighting to Sales Stores	FAST RETAILING CO., LTD.	Energy Efficiency	3
21	2016	Introduction of High Efficiency Ion Exchange Membrane Electrolyzer in Caustic Soda Production Plant	Asahi Glass Co., Ltd.	Energy Efficiency	3
22	2015	Installation of High Efficiency Air Conditioning System and Chillers in Semiconductor Factory	Sony Semiconductor Manufacturing Corporation	Energy Efficiency	3
23	2015	Energy Saving for Semiconductor Factory with High Efficiency Centrifugal Chiller and Compressor	Sony Semiconductor Manufacturing Corporation	Energy Efficiency	3
24	2015	Energy Saving at Convenience Stores with High Efficiency Air-Conditioning and Refrigerated Showcase	FamilyMart Co., Ltd.	Energy Efficiency	3
25	2016	Introduction of 5MW Floating Solar Power System on Industrial Water Reservoir	TSB Co.,Ltd.	Renewable Energy	4
26	2018	25MW Rooftop and Floating Solar Power Project in Industrial Park	Tokyo Century Corporation	Renewable Energy	5

Trend of Business Form Models in Thailand



- “Parent and Subsidiary Model” and “Trading Co./Engineering Co. Model” are the major models in Thailand so far.
- Leasing Model projects are increasing in recently since the merits are :
 - Leasing company undertakes the Representative Participant role
 - Leasing reduces the initial cost of Partner Representative

Thailand could develop more JCM Model Projects by:

- Utilizing various technologies
- Planning larger Emission Reduction projects
- Selecting suitable Business Form Models along the TIEB target in Thailand.

And...

Utilizing today's business matching session and consulting session to realize new projects.

GEC would be delighted to support you in planning and implementation phases for your new JCM Model Projects.

ขอบคุณ ครับ/ค่ะ

Thank you for your attention!

Any questions or discussions are quite welcome anytime !!!

GEC members in this seminar

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Ms. Konomi JIKIHARA (直原 好) jikihara@gec.jp

Mr. Satoru TANGO (反後 暁) tango@gec.jp



Reference Materials

1. Example JCM Model Projects along with Environmental Infrastructure Strategy proposed by MOEJ

1. Transport projects in FY2018

(1) CNG-Diesel Hybrid:

Indonesia/Hokusan CO.: Introduction of CNG-Diesel Hybrid Equipment to Public Bus
City-to-City Collaboration: Toyama City(Japan) to Semarang City(Indonesia) Indonesia

(2) Modal Shift

Vietnam/Nihon Crant Co.: Modal Shift from Truck to Cargo Ship with Freshness
Preservation Reefer Container

2. Energy Efficiency in large infrastructure

(1) Port Energy Efficiency

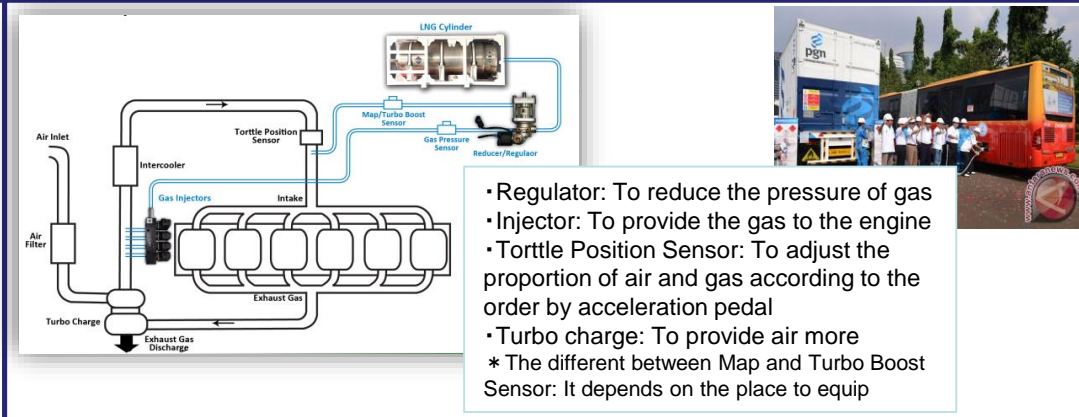
Thailand/Yokohama Port CO.: Introduction of Energy Efficient Equipment to
Bangkok Port

Introduction of CNG-Diesel Hybrid Equipment to Public Bus in Semarang

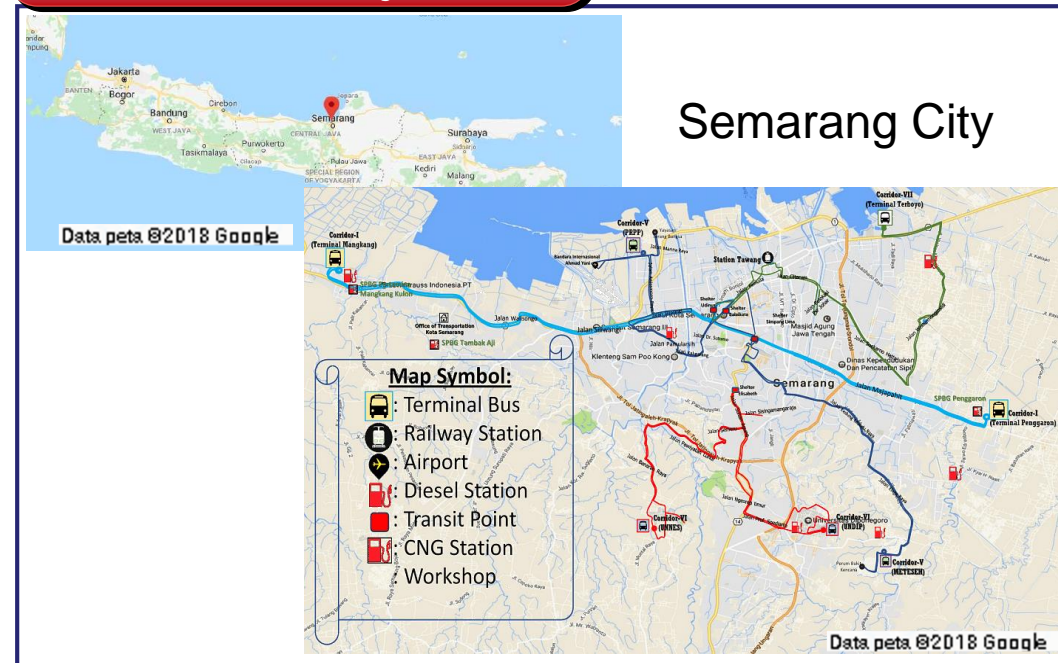
PP from Japan: Hokusan Co.,Ltd. / PP from Indonesia: BLU UPTD Trans Semarang

Outline of GHG Mitigation Activity

Toyama City has concluded a cooperation agreement between Semarang City to realize low carbon society under inter-city cooperation. Based on the cooperation agreement, this project aims to reduce GHG emissions through fuel switch from diesel to CNG. In the project, 72 diesel buses owned by Trans Semarang, including 25 large-sized buses and 47 mid-sized buses, are retrofitted from diesel engine to hybrid engine with CNG system available. These buses are considered more cost-effective through fuel switching.



Sites of Project



Expected GHG emission reduction

1,870 tCO₂/year

← Reference GHG emission – Project GHG emission
 = Reference fuel consumption x Fuel-based emission factor -
 Project fuel consumption x Fuel-based emission factor

Reference fuel consumption

= Diesel fuel consumption based for bus operation x emission factor of Diesel fuel

Project fuel consumption

= CNG fuel consumption for bus operation x emission factor of CNG + Diesel fuel consumption for bus operation x emission factor of Diesel fuel

Modal Shift from Truck to Cargo Ship with Freshness Preservation Reefer Container

PP (Japan): Nihon Crant Co. Ltd., PP (Vietnam): Vietnam National Shipping Lines

Outline of GHG Mitigation Activity

A freshness preservation reefer container “Hyokan Soko” forms static electric field with high voltage and low current in the chilled container, and enables long storage of foodstuff.

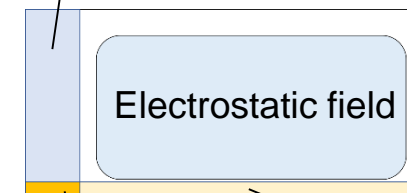
Introduction of freshness preservation reefer containers enables to transport foodstuff by sea route that needs long storage, and leads to realize CO₂ emission reduction by modal shift from trucks to cargo ships.

Appearance of freshness preservation reefer container



How containers work

Refrigerator



Electrostatic field

Electrostatic field formation system Aluminum panel

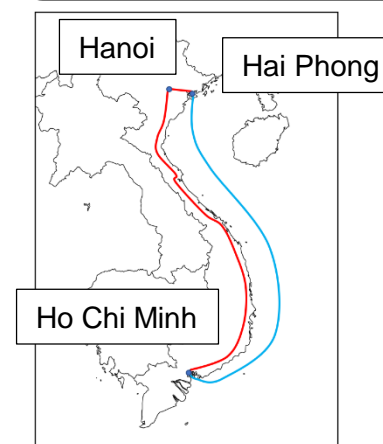
Expected GHG Emission Reductions

11,025tCO₂/year

Reference Emission – Project Emission

- Reference Emission
 - = Emission from land transport fuel consumption
- Project Emission
 - = Emission from sea transport fuel consumption
 - + Emission from land transport fuel consumption (between the distribution base and the port)
 - + Emission from container electricity consumption
 - + Emission from cargo loading/unloading at the port

Sites of Project



Modal shift from trucks to cargo ships between Hai Phong and Ho Chi Minh (sea route approx. 1,500km)



Introduction of Energy Efficient Equipment to Bangkok Port

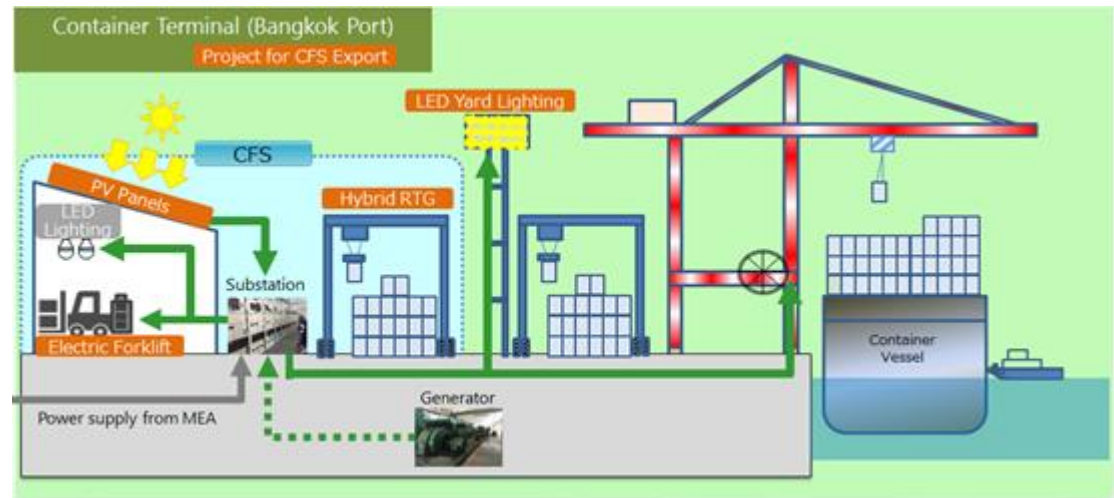
PP (Japan): Yokohama Port Corporation / PP (Thailand): Port Authority of Thailand

Outline of GHG Mitigation Activity

This project introduces the following equipment to newly built container freight station (CFS) and container yards at Bangkok Port.

- (1) Electric Forklifts,
- (2) Hybrid Rubber Tired Gantry Crane (RTG),
- (3) LED yard lighting
- (4) Photovoltaic power generation equipment

These low carbon technologies reduce GHG emissions from the port.



Expected GHG Emission Reductions

5,491 tCO₂/year

$$= (\text{Reference CO}_2 \text{ emissions}) [\text{tCO}_2/\text{year}] \\ - (\text{Project CO}_2 \text{ Emission}) [\text{tCO}_2/\text{year}]$$

- Electric Forklift : 3,694 [tCO₂/year]
- Hybrid RTG : 723 [tCO₂/year]
- LED Lighting : 364 [tCO₂/year]
- PV Panels : 710 [tCO₂/year]

Sites of Project

Bangkok Port

