FY2018 Project for Ministry of the Environment Japan

FY2018
City-to-City Collaboration Programme for Low-carbon Society

City-to-City Collaboration between Batam and Yokohama
(Promotion of Green Building Regulation and Optimization of Renewable Energy Utilization in Industrial Parks)

Report

February 2019

Nippon Koei Co., Ltd.
Finetech Co., Ltd.
Macnica Inc.
City of Yokohama (Y-PORT center)

FY2018
City-to-City Collaboration Programme for Low-carbon Society

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Abbreviations

Abbreviation	Description
AEMS	Advanced Energy Management System
AOTS	Association for Overseas Technical Cooperation and Sustainable Partnership
BIFZA	Batam Indonesia Free Zone Authority
COP	Conference of Parties
CKTR	Dinas Cipta Karya dan Tata Ruang / Department of Residence and Spatial Planning
DR	Demand Response
DLH	Dinas Lingkung Hidup / Department of the Environment
EMS	Energy Management System
GB	Green Building
GBCI	Green Building Council Indonesia
GEC	Global Environment Centre Foundation
GHG	Greenhouse Gases
IDR	Indonesian Rupia
IoTGW	Internet of Things Gateway
JCM	Joint Crediting Mechanism
LOI	Letter of Intent
NDC	Nationally Determined Contributions
METI	Ministry of Economy, Trade and Industry
MOE	Ministry of the Environment
MOU	Memorandum of Understanding
MRV	Monitoring, Reporting and Verification
PID	Potential Induced Degradation
PGN	Perusahaan Gas Negara / State Gas Company
PLN	Perusahaan Listrik Negara / State Electricity Company
PV	Photovoltaics
USD	United States Dollars
VPP	Virtual Power Plant
YUSA	Yokohama Urban Solution Alliance
WGBC	World Green Building Council

CHAPTER 1 OVERVIEW OF THE PROJECT

1.1 PURPOSE OF THE PROJECT

In December 2015, all countries participated in 21st Conference of the Parties (COP21) in Paris, France. In the COP21, Paris Agreement was adopted as a legal framework of fair and practical countermeasures to address climate change after 2020. Paris Agreement aims at keeping global warming below 2 degrees Celsius above pre-industrial level, and, requires efforts to keep less than 1.5 degrees Celsius by promoting activities for decarbonization. In addition, it was decided that activities by non-state actors including cities and efforts by all non-governmental entities (cities and other local governments etc.) are acknowledged and encouraged to be scaled up in the COP21. Cities are the places to support social and economic growth since a lot of people live there. Although the total area of cities is only 2% of all land in the world, approximately half of world's population live in urban areas and the percentage is predicted to increase to 70%. Also, it is estimated that more than 70% of global CO2 emission were emitted from cities as of 2006, that is, cities have major roles for mitigation of climate change. Thus, implementation of countermeasures to climate change and greenhouse gas (GHG) emission reduction in cities are important for achievement of goal of Paris Agreement.

Indonesian Government has promised to reduce 29% of GHG emission compared to Business As Usual (BAU) according to their NDC, and in case international assistance such as JCM is introduced, their target is 41% in NDC. Therefore, Indonesia is expecting to implement JCM, which Indonesia and Japan signed for achievement of the target in NDC.

Population in Batam city is about 1.2 million (Census in 2015) and Batam city is located in Riau Island Province, about 20 km to the south coast of Singapore. The city is developing under Batam Island Development Agreement (1980) and Economic Cooperation Agreement for Development of the Riau Islands Province (1990) through collaborative development with Singapore and Johor Province in Malaysia. However, solid waste disposal and sewage treatment are still social and environmental problems. Efficient energy use is also an issue, since many factories have been constructed mainly in industrial complexes, Batam city is designated as a free trade zone. Also, a lot of large buildings such as shopping malls and residences are under construction or planning.

The City of Yokohama has developed Y-PORT Project (International cooperation project by utilizing resources and technologies in Yokohama) as a core project of 'Support for International Infrastructure Business by Local Companies in Yokohama' which is a one of

policies under 'New Mid-term Four-year Plan 2014-2017' in January 2011. It has been promoting international infrastructure businesses by public-private partnership. In May 2015, in order to proceed with public-private partnership, City of Yokohama established Y-PORT Center as a platform for promotion of collaboration project with local companies and international organizations. In July 2017, Yokohama Urban Solution Alliance (YUSA) was established for enlargement of opportunities of international infrastructure businesses and contribution to solution of urban problems in industrializing countries by local small and medium-size enterprises.

In this context, Batam city and City of Yokohama concluded Letter of Intent (LOI) regarding technical cooperation on 27 May 2015 when Mayor of Batam City visited Japan, and as one of the 1st City-to-City Collaboration Projects, FY 2015 JCM Project Formulation Study for Realizing Low Carbon Cities in Asia funded by the Ministry of the Environment', was implemented. In addition, feasibility study projects under the same scheme were implemented in FY 2016 and FY2017 with themes of: 'Introduction of high efficiency thermal desorption unit into industrial complexes', 'Installation of energy-saving technologies into large-scale buildings', 'Introduction of smart LED street lights and PV system' and 'Installation of energy saving equipment with consulting services for operation improvement'. Main activities carried out between FY2015-2017 are shown in Table 1-1.

Source: City of Yookohama

Figure 1-1 LOI between Batam City and City of Yokohama (May 2015)

Table 1-1 Activities between FY 2015 and FY2017 (Batam City - Yokohama City)

Month	Activities	Place
2015 April	Inception meeting	Batam
May	Visit to Yokohama by Mayor of Batam (Conclusion of LOI)	Yokohama
August	Business matching	Batam
October	JCM Workshop, Asia Smart City Conference, site visits, etc.	Yokohama
December	Small workshop with companies selected by BIFZA	Batam
2016 January	Final report meeting (including related companies)	Batam
July	Kick-off meeting for the City to City Collaboration Project in FY2016	Batam
August	Formation of the task force for the City to City collaboration	---
October	JCM seminar	Kitakyushu
November	Batam investment seminar	Yokohama
2017 January	Final seminar for the City to City Collaboration Project in FY2016	Batam
February	Completion of 6 pillars of the city-to-city collaboration between Batam and Yokohama (1st draft)	---
2017 October	Kick-off meeting for City to City Collaboration Project in FY2017	Batam
December	YUSA Technology introduction program	Yokohama
2018 January	Final workshop of City to City Collaboration Project in FY2017	Batam
	City to City Collaboration Seminar	Tokyo
	Finalization of draft assessment items for green building regulation in Batam	-----

Source: Nippon Koei

In addition to the project funded by MOE, the following 4 projects were simultaneously implemented in the framework of the city-to-city collaboration between Batam and Yokohama in FY2017.

Table 1-2 City-to-City Collaboration Projects (FY2017)

Project Title	Overview	Fund
Pre-feasibility Study on water and wastewater facility improvement in Batam	FS for introduction of Japanese technologies regarding water supply into Batam. The result of this study was presented in final workshop of FY2017 City to City Collaboration Project.	METI
Developing the Methodology for Measuring and Realizing the Sustainability of Cities in the APEC region (Guidebook for Development of Sustainable Cities -Resource Circulation and Waste Management -)	FS to conducting quantitative evaluation of the level of Batam city's waste management and propose solutions using Japanese technology. The result of this study was presented in the final workshop of FY2017 City to City Collaboration Project.	METI
Consideration of Urban Solutions using technologies and products of companies in Yokohama, to Development Business in Industrializing Countries	Implementation of group study with local entities regarding waste management, sewage system and energy saving etc. Also, business matching was carried out in FY2017 City to City Collaboration Project.	Yokohama City
The Study Tour Program on the Improvement of BATAM Island Water Supply and Sewerage Infrastructure Project for Indonesia	Invited 9 staff from BIFZA to Japan and implemented site visits to facilities related to water supply and sewage system including those in Yokohama. As one of sessions, invitees participated in a technology introduction seminar organised by YUSA.	AOTS

Source: Nippon Koei

1.2 PROJECT IMPLEMENTATION

This project was carried out for achievement of the purposes listed below in order to further proceed with the city-to-city collaboration from FY2015 to FY2017.

- Consideration of JCM model project formulation
  - Project for maximization of renewable energy by energy management and demand response in an industrial park
  - Project for optimization of renewable energy by electricity interchange among multiple facilities in Batam
- Activities for the city-to-city collaboration
  - Support for development of green building regulation

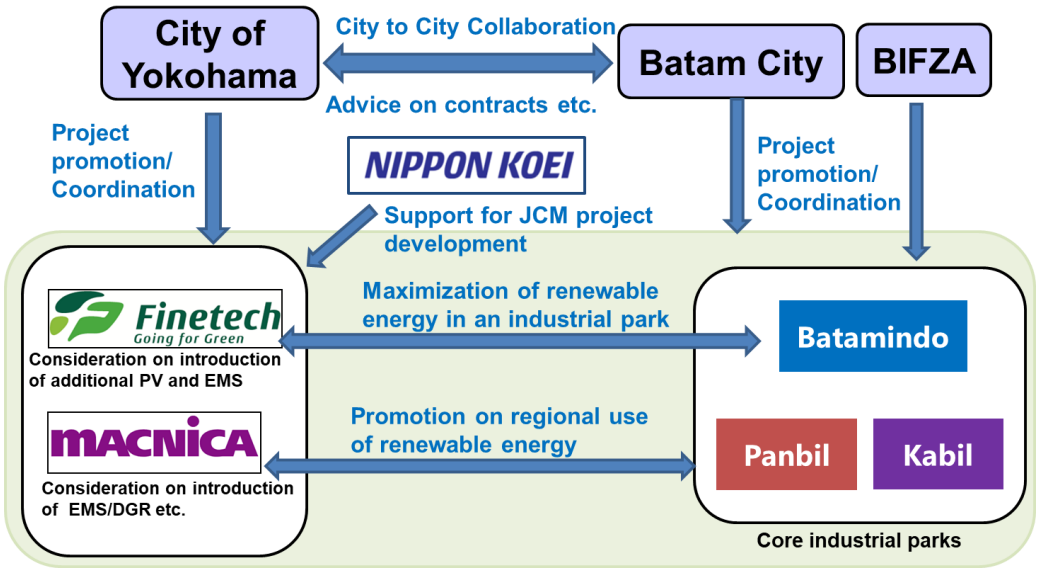
Main activities of this project are as follows.

Table 1-3 Main activities of this project

Month	Activity
2018 May	Kick-off meeting with MOE
June	1st site study
July	2nd site study (Participation in JCM seminar @Jakarta)
August	1st progress reporting meeting with MOE
September	3rd site study 1st GB regulation development meeting
October	City to City Collaboration Seminar @Yokohama 2nd GB regulation development meeting
November	2nd progress reporting meeting with MOE 3rd GB regulation development meeting
December	4th site study 4th - 6th GB regulation development meeting
2018 January	5th site study (GB Regulation Conference, Final Seminar and courtesy visit to Mayor of Batam City)
February	Final reporting meeting with MOE 6th site study Submission of final report

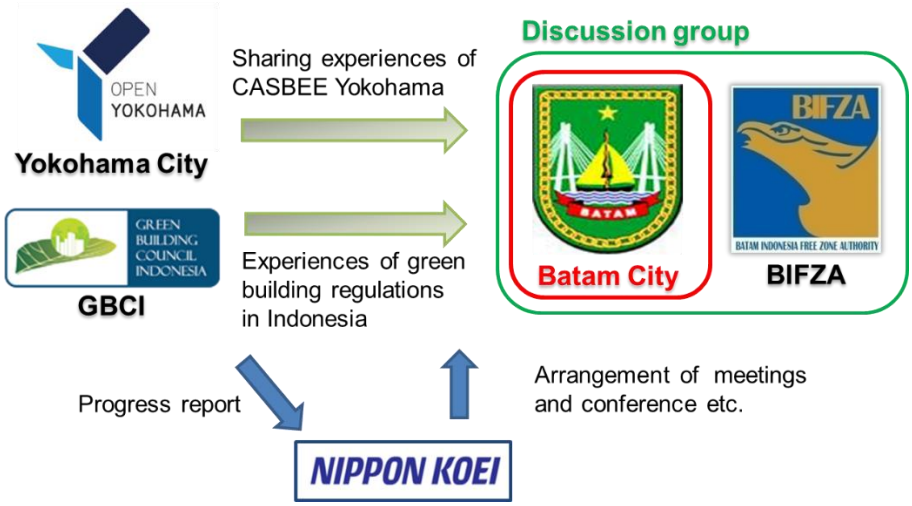
Source: Nippon Koei

1.3 IMPLEMENTATION STRUCTURE



Source: Nippon Koei

Figure 1-2 Implementation structure of this project



Source: Nippon Koei

Figure 1-3 Implementation structure of support for development of GB regulation

1.4 PROJECT SCHEDULE

Schedule of this project is as follows.

Study items	2018									2019	
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
1. Consideration of formulation of JCM model project											
1) Project for maximization of renewable energy in an industrial park											
a) Consideration of installded equipment											
b) Consideration of formulation of JCM model project											
c) Development of MRV plan											
d) Consideration and agreemaent on international consortium											
2) Project for optimaization of renewable enegy by power intercharge among multiple facilities											
a) Specification of issues regarding power interchage and pre-consideration of formulation of JCM model project											
2. Activities for city-to-city collaboration											
1) Support for development of green building regulation											
・Discussion among stakeholders of city-to-city collaboration			▲			▲				▲	
・Discussion among taskforce members							▲			▲	
3. Final report											
Documentaiton of final report											△
4. Others											
a) Site Study			▲	▲			▲		▲	▲	
b) Seminar for City-to-city collaboration							△				

▲: carried out at Indonesia
△: carried out at Japan

Source: Nippon Koei

Figure 1-4 Project schedule

CHAPTER 2 FORMULATION OF JCM MODEL PROJECT

2.1 PROJECT FOR MAXIMIZATION OF RENEWABLE ENERGY BY ENERGY MANAGEMENT AND DEMAND RESPONSE IN AN INDUSTRIAL PARK

In FY 2017, through the formulation of JCM model project through City-to-City collaboration project, Finetech CO., LTD (hereinafter, Fintech), a private company from Yokohama city, with Batamindo Industrial Park (hereinafter, Batamindo) and Kabil Industrial Estate (hereinafter, Kabil) discussed the feasibility of introducing renewable energy (solar power generation) using JCM scheme.

In FY 2018, Batamindo, which has own gas power plant, was selected as the main counterpart of the project, and Finetech conducted to study for the maximization/efficiency of renewable energy in Batamindo.

Batamindo as a power company was concerned that solar power generation had the risk of instability of power generation. Therefore, Finetech considered introducing advanced technology for equalization of the solar power such as Energy Management System (EMS) and battery storage.

Panbil Industrial Park, which was one of target organizations at beginning of the project, was not targeted because it did not confirm the detailed demand of power during the project.

2.2 OUTLINE OF MAJOR INDUSTRIAL PARKS AND ENERGY SITUATION

1）Batamindo Industrial Park

Batamindo, established in 1990, is in the inland of Batam. It is one of the biggest industrial parks in Batam with 320 ha of land and around 70 tenants with related facilities. Batamindo has own policy that all the demand of electricity within the industrial park would be covered by private power generation. Hence, Batamindo has managed natural gas power plant (maximum energy generation:115MW) and spare diesel generator(10MW) to supply stable energy to tenants and related facilities.

Based on previous City-to-City collaboration projects, Batamindo has for a long time been interested in introducing renewable energy; however the decision of Batamindo was not taken because they doubted the stability of electricity supply using solar power generation.

In mid-December of 2018, there was chronic economic downturn in industries, the withdrawal of tenants and remarkable decrease of working rate of factories on the weekend. It

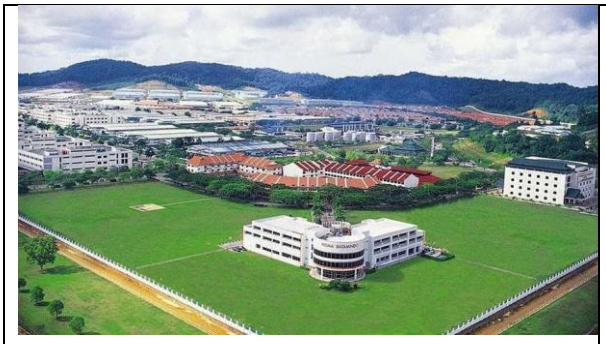
was reported that the average of electricity consumption was decreasing from 60MW to 40 MW. On the other hand, Batamindo was still interested in introducing renewable energy.

At the end of December 2018, new factories (around 9 or 10 tenants) related to smart phone which use a lot of electricity have moved in Batamindo and there was shortage of electricity from its own power generation.

Therefore, Batamindo made a power supply agreement (10MW) with PLN Batam as an emergency measure in January 2019.

Additionally, Indonesian state gas company (Perusahaan Gas Negara:PGN) has decided on a new price of gas since the 30% of fuel cost was increased in November 2018. Thus, Batamindo recognized a new benefit of solar power generation which was not affected by fuel price and had a reasonable investment cost compared with new gas power plant.

From FY 2019, Batamindo started to consider the feasibility of solar power generation using JCM model project.



Office building of Batamindo

Gas power plant in Batamindo

Layout of Tenants and Facilities in Batamindo

Source : A part of meeting materials of Batamindo Industrial Park

Figure 2-1 Overall View of Batamindo Industrial Park

2）Kabil Industrial Estate

Kabil is located in the eastern part of Batam island with 520ha of land. It has 44 tenants and is one of largest industrial parks in Batam city.

Kabil has 30 MW Gas power plant under joint management with PLN Batam. There is a shortage of electricity supplied by the grid of 489 MW in Batam.

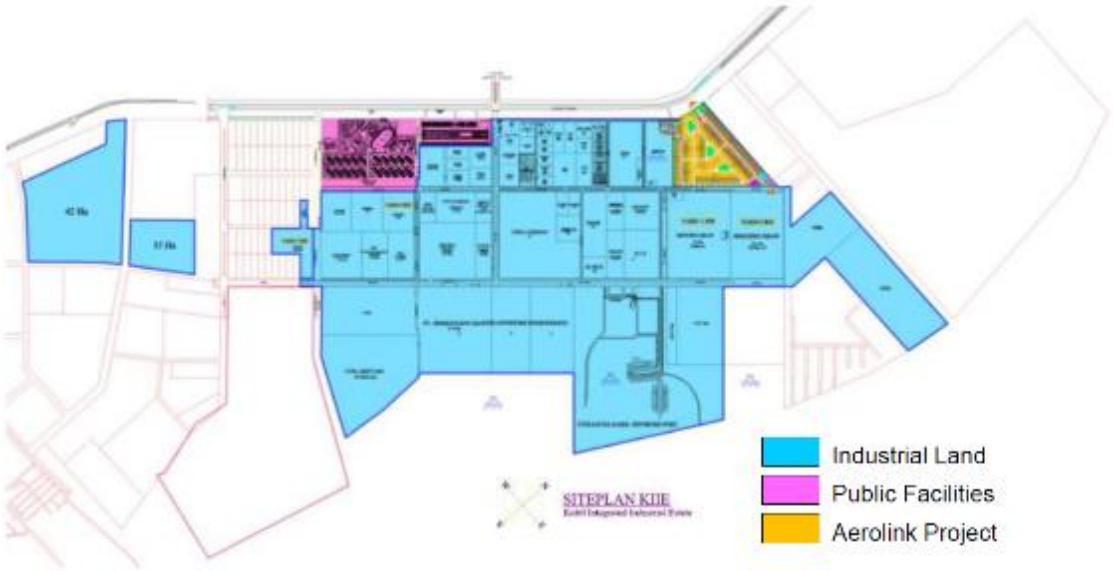
In the first quarter of 2019, two Japanese companies and one Indonesian company decided to move in Kabil. Therefore, it is expected that additional power from 60 to 80 MW will be necessary because the demand for electricity will increase.

To consider construction cost of additional power plant and increasing fuel cost/electricity price, the introduction of renewable energy in near future is recognized by Kabil to be indispensable.

Overviews of Kabil

Port facility in Kabil

Gas power plant



Site Plan for in Kabil Industial Estate

Source: A part of presentation material of Kabil Industrial Estate

Figure 2-2 Layout and Facilities of Kabil Industrial Estate

2.3 DEMAND AND PLAN OF RENEWABLE ENERGY IN INDUSTRIAL PARK

1）Batamindo Industrial Park

Batamindo has been interested in introducing renewable energy for a long time but has not prepared any plan for renewable energy. Batamindo management did not allow individual tenants to install solar panel by their own because of unclear affect to stabilization of existing electricity supply by Batamindo.

The consideration of stepwise introduction plan of solar power generation between Batamindo and Finetech started because Batamindo immediately needed to introduce solar

power generation because of the electricity shortage caused by additional new tenants, increasing fossil fuel cost and schedule for update a part of gas engine of power plan.

It is confirmed that Batamindo changed its policy on renewable energy so that installation of rooftop solar power system to tenants became accepted for reducing risk of electricity shortage during day time.

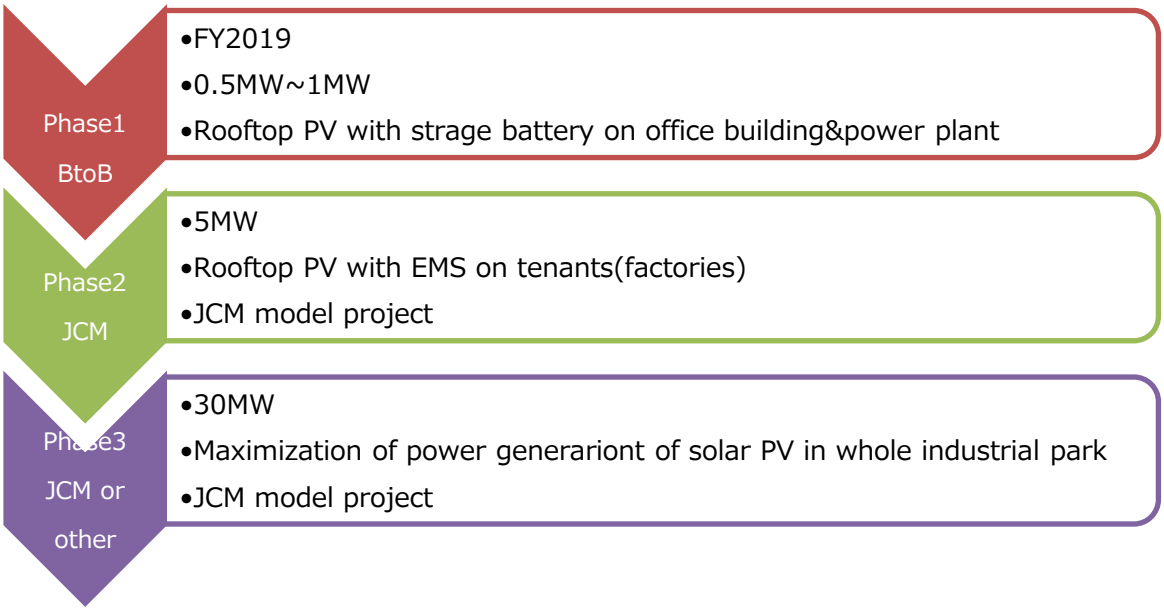
2) Kabil Industrial Estate

Through discussion between Kabil and Finetech in January 2019, it was recognized that Kabil has interest in the floating solar power generation at 6 ha reservoir and ground-type solar power generation of 15 ha using JCM scheme; however detailed plan for introduction of renewable energy of Kabil was not confirmed by February 2019.

2.4 FORMULATION OF RENEWABLE ENERGY PROJECT IN INDUSTRIAL PARK

1) Batamindo Industrial Park

Through the discussion between Batamindo and Finetech, it was decided that the project would be divided into three phases as follows. The renewable energy (solar power generation) would be expanded gradually in each phase. The optimal technology such as storage battery and Energy Management System (EMS) would also be considered based on the scale of power generation.



Source:Finetech

Figure 2-3 Phases of Project of Introducing Solar PV in Batamindo

Table 2-1 Plan for project of introducing solar PV in Batamindo

Phase	Project Scale and Candidate Area	Scheme
Phase1	Small-scale(0.5MW~1.0MW) of solar power generation project which plans to be installed on the rooftop of office building and power plant in Batamindo. This phase aims to verily the possibility of large-scale solar power generation as demonstration, collecting real data of fluctuation of power generation effected by weather condition will be conducted. For further expansion of scale of solar power generation, introduction of small- scale storage battery will be considered.	Business to Business
Phase2	Middle-scale (5MW) of solar power generation project will be implemented as JCM model project. PV panels will be installed on the rooftop of each tenant and on the ground of vacant space in Batamindo. EMS will be introduced to efficiency power control both existing power plant and solar power system.	JCM model project FY2019
Phase3	Large-scale(30MW）of solar power generation project will be considered. In this phase, storage battery and EMS have been expectably installed by previous phase, so the investment cost, scale of project, location of installation are not confirmed at present. The JCM model project which collaborates with optimization of energy usage project in Batam city can also be considered.	JCM model project

Source:Finetech

2）Kabil Industrial Estate

Before February 2019, Kabil did not prepare the detail plan for application of JCM model project FY2019, but there is potential for the project maybe in the 2nd call;, for example, floating solar power generation of 6 ha reservoirs and ground-based solar power generation of 15 ha.

2.4.1 Specifications of Proposed Technology and Facilities

The technology to be introduced into Batamindo is shown below.

【Solar panel】(phases1 and 2)

Solar panel TA72P320WB/K of TOSHIBA was selected because the module is suitable for large volume of power generation and has high quality of Potential Induced Degradation (PID).

*Note: PID：When a high voltage flows in a high temperature and humidity environment, current leakage occurs in the module circuit, and the output drops. It is generated by the interaction of tempered glass, cell, back sheet, aluminum frame etc. on the surface of solar cells.

【Storage battery】(phase1）

Origisource as Multi Power supply system (50kVA) of Origin Electric Co., Ltd. is introduced to Batamindo in phase 1. This battery has both a grid interconnection device and rechargeable device of storage battery. Additionally, it is excellent battery with high efficiency, light weight and small size by adopting the latest power semiconductors and by bidirectionalizing the power supply part. It plans to consider equalization of prediction electricity and a linkage of future weather information using this battery.

It is necessary to at least install storage battery for equalization of electricity supply from solar power generation which is affected by the weather. It is easy to store electricity from solar power generation using large storage battery, but the price is very expensive at present. The judgement of introducing storage battery in phase 2 will be based on the result of study in phase 1.

【Energy Management System(EMS)】

Batamindo has introduced EMS of Schneider for power control of power plant. After the phase 2, it is necessary to build comprehensive EMS covering existing power supply, introduced solar power generation/storage battery, and regional grid provided by PLN Batam.

Finetech plans to introduce "Advanced Energy Management System（AEMS）" which is a part of smart green platform developed by Finetech in Japan. It is expected to introduce the JCM model project in phase 2 because AEMS can respond flexibly to other application.

The main functions are as follows.

1. Power generation monitoring function
   (1) Power generation monitoring (total power generation, PCS units, string units)
   (2) Maximum Power Point Tracking Function (MPPT)
   (3) Reverse Power Flow Preventing Function
   (4) Autonomous operation function at power failure
   (5) Detecting function of failure panel (under development of string unit, panel module)
   (6) Collecting environment data / storage function (temperature, humidity, solar radiation)
2. Surplus power reduction function
3. Collecting and storage function for total amount of photovoltaic power generation and total solar power consumption
4. Data collection and storage function for MRV
5. Security monitoring function (camera monitoring, sensor monitoring)

6. Remote data monitoring function (to collect, store and verify all data in Japan)

2.4.2 Candidate area for installation of equipment

1） Phase-1 (BtoB)

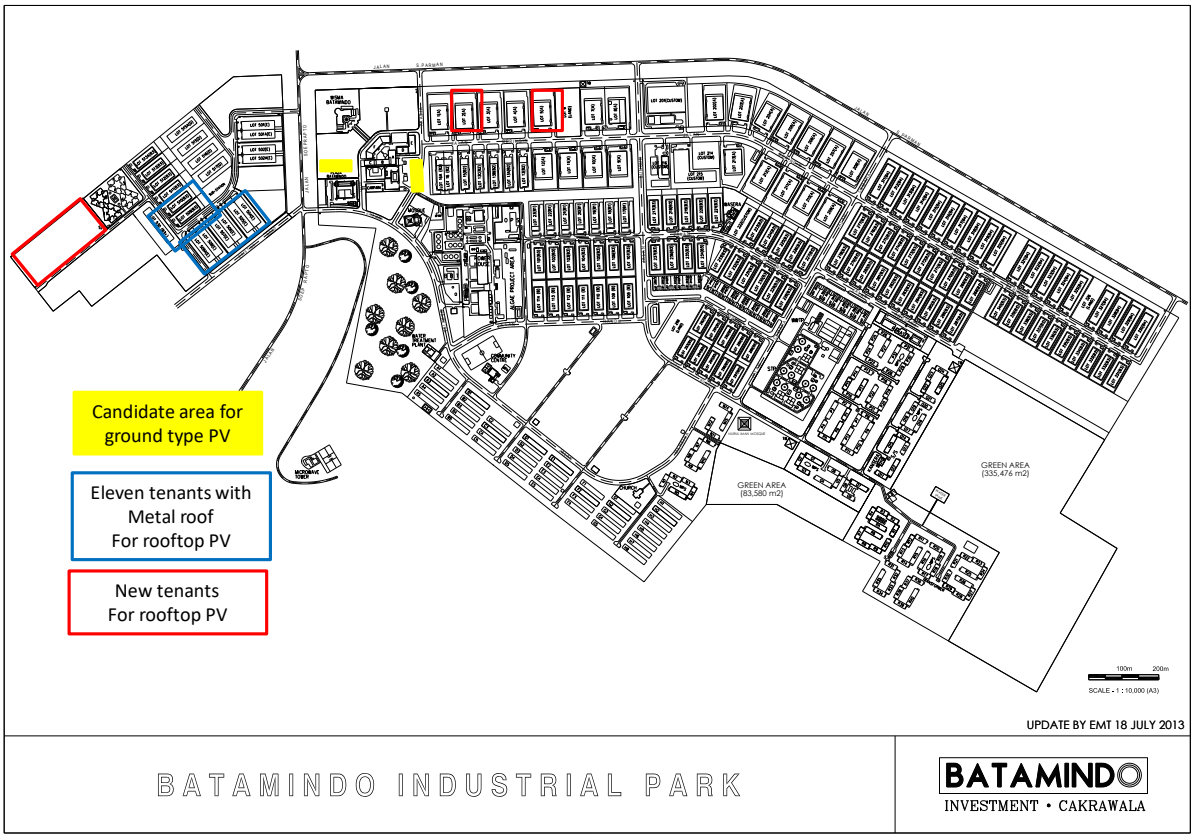
The area for installation of rooftop PV panel system (around 0.5-1.0MW) was selected on office building of Batamindo (WISMA) and a part of power plant as shown below.

Source:Finetech

Figure 2-4 Candidate area for installation of Rooftop PV by phase-1 (power plant)

2） Phase 2 (FY2019, JCM model project)

Based on the result of Phase 1 project, the installation site of phase 2 will be decided, but Batamindo intends to introduce solar power generation of maximum 5 MW (equivalent to 5 ha) using rooftop of each tenants, vacant space among buildings and site of old sewage treatment plant as shown in the following layout.



Source: Edited by Finetech based on the layout map provided by Batamindo Industrial Park

Figure 2-5 Candidate area for PV panel in Phase 2

2.4.3 Implementation plan and evaluation of the project performance

GHG emission reduction of Phase 2 (5MW PV) project was calculated as shown below. The calculation does not include the performance from EMS and other items at this time.

Annual power generation：6,300 MWh (simulated by Finetech)
Emission factor：0.533 tCO2/year
Life of PV module :17 years
Annual GHG emission reduction:6,300 (MWh)x 0.533（tCO2/y）=3,360(tCO2/y)
Total GHG emission reduction：3,360x17(y) = 57,120 (tCO2)
Cost efficiency: 1,444 JPY/tCO2 where half of the total investment expenses and assume rate subsidy is 30%.

Regarding the profitability of phase 2 project, there is increased business potential due to increasing cost of fossil fuel and increasing power demand caused by new tenants. Basically,

Batamindo had its own funds for the introduction of renewable energy before, so it is assumed the project as a business can be funded.

In addition, the following effects are expected by implementing the project.

1) Realization of maximization of solar power generation and stabile operation in industrial park
2) Reduction of fuel cost by peak cut of power plant in industrial park
3) Benefit through energy supply (or electricity sales business) for other facility of surrounding industrial park
4) Appeal for promotion of smart industrial park for attracting factories from domestic and overseas
5) Ripple effect to other industrial parks in/out Batam city

2.4.4 MRV Plan

Eligibility of MRV methodology in JCM model project is considered below. The technology of reference project is supposed to be standard technology and maintainability should be confirmed.

(1) Introduction of Rooftop PV system and small-scale storage battery

If both Rooftop PV system and small-scale storage battery are introduced in phase 2, "ID_AM017：Installation of Solar PV System and Storage Battery System" will be applied.

The result of consideration of Eligibility criteria in JCM methodologies is as follows.

Figure 2-6 Consideration of Eligibility criteria in JCM methodologies

Eligibility Criteria (ID_AM017)	**Result**
The solar PV system(s) and storage battery system(s) are newly installed.	Soler PV system and storage battery will be introduced.
The PV modules are certified for design qualifications (IEC 61215, IEC 61646 or IEC 62108) and safety qualification (IEC 61730-1 and IEC 61730-2).	Planed PV modules are certified IEC standard
The equipment to monitor output power of the solar PV system(s) and irradiance is installed at the project site.	Monitoring facility will be introduced.
In the case of replacing the existing storage battery system (s), a plan is prepared in which mercury used in the existing storage battery system (s) is not released to the environment. Execution of the prevention plan is checked at the time of verification, in order to confirm that mercury used for the existing one replaced by the project is not released to the environment.	No applicable due to new introduction.

Source:Finetech

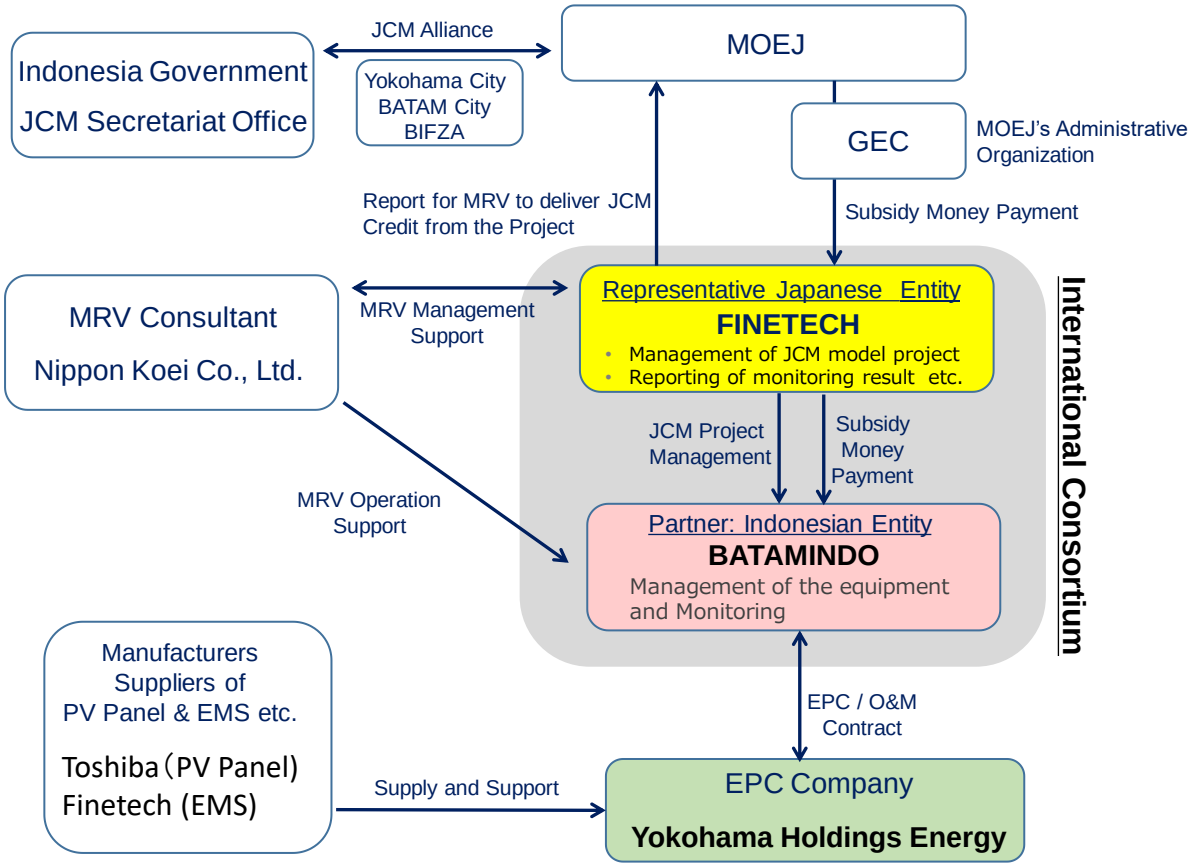
(2) Introduction of Energy Management System (EMS)

The effect of GHG emission reduction by EMS is under confirmation and review between Fintech and The National Institute of Advanced Industrial Science and Technology. When there is a prospect of quantifying the amount of GHG emission reduction, a new MRV methodology will be considered. Therefore, it is not included in calculation of the current cost effectiveness.

2.4.5 Formulation of International Consortium

In March 2018, the Memorandum of Understanding (MoU) of the international consortium between Finetech as a representative Japanese company and Batamindo as a local partner was signed for participation in the project.

Although it was not applied to the second call for JCM model project in FY2018, Finetech and Batamindo agreed on an International Consortium as shown below.



Source: Finetech

Figure 2-7 Proposed International Consortium

2.4.6 Future Issues

In this project, solar power generation and introduction of EMS to Batamindo will be carried out in three stages. In phase1(less than 1MW of power generation) which is not applicable for JCM model project considering the scale of the project, rooftop solar PV will be introduced by B to B. Even the storage battery and EMS are not suitable size for Phase 1, but the storage battery is included in phase1 because of necessity of large-scale project in phase 2.

In February 2019, EPC engineer is going to prepare detailed quotation of the equipment after actual measurement in Batam. If it is difficult to introduce storage battery in Phase 1, it will be introduced in Phase 2.

The EMS will be introduced in Phase 2. It is necessary design system to stabilize power generation from renewable energy for use with the existing thermal power generation and to use all expanded renewable energy without affecting existing power generation.

2.4.7 Schedule

The schedules for both phases 1 and 2 for maximization of renewable energy in Batamindo are shown below.

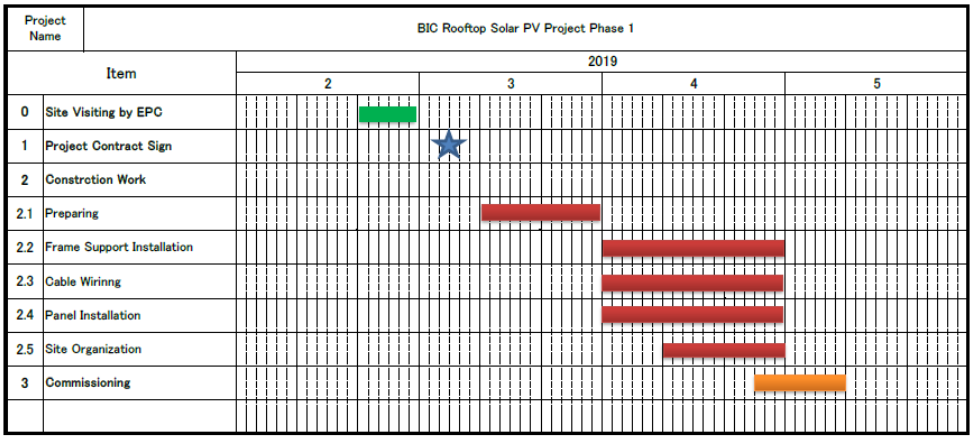


Figure 2-8 Schedule of Phase 1 (BtoB)

Source: Finetech

Phase 2 of the project will be applied the second call for JCM model project FY2019 after completion of phase 1 of small-scale renewable energy project. If the project is adopted in January 2020, the expected schedules of EPC and JCM procedures are as follows.

Table 2-2 Schedule of EPC (Phase 2：JCM model project)

Schedule	Activity
Early January 2020 -Mid-January2020	Design and Procurement
Mid-January 2020-Mid-February 2020	Constriction
Mid-February 2020-Late February 2020	Commissioning
Late February 2020	Starting operation

Source: Finetech

Table 2-3 Schedule of JCM Application (Phase 2：JCM model project)

Schedule	Activity
Early June 2020-Mid-August2020	Preparation of the methodology(if necessary)
Mid-August2020 -Late Novemeber2020	Submitting proposed methodology, public comment, validation of the methodology, Apply of the methodology
Early December2020-Mid-January 2021	Preparation of PDD and monitoring plan
Mid-January 2021-Late March 2021	Validation, public comment, integrity check, registration
Late February 2020 -Late March 2037	Monitoring, Verification, Credit issuance

Source: Finetech

2.5 IDENTIFICATION OF ISSUES FOR POWER INTERCHANGE AND PRELIMINALY STUDY FOR FORMULATION OF JCM PROJECT

2.5.1 Background

The population of Batam city is expected to reach 1.3 million people by 2020 and population growth is continually expected in the future. Recently, development of resort area and new construction of commercial facilities in Batam are predicted.

On the other hand, introduction of power interchange systems with renewable energy are proceeding in various cities, mainly in Europe and the United States. The benefit of that kind of energy supply business is that it is possible to adjust energy supply by demand response of the regional level. Additionally, by introducing distributed power sources such as solar power generation and storage battery, it is possible to eliminate power shortage and peak shift.

The efforts of RE100 of companies, which covers power consumption by 100% renewable energy is becoming a trend in the world. It is expected that it will become an indispensable subject for the introduction of renewable energy in Batam city which has core industrial parks including foreign companies.

Thus, study for the introduction and maximization of renewable energy in core industrial parks and preliminary study for power interchange systems using “Auto Grid” provided by Macnica, Inc. was conducted in this project.

The proposed system is considered large-scale project, so the study on such technology is expected to require two years. FY 2018 is the preliminary examination stage for confirming demand and discussion for stakeholders.

2.5.2 Current situation of Energy Supply by PLN Batam

Batam city differs from other cities in Indonesia in that PLN Batam as independent power company manages and operates power generation and power supply business.

At the beginning of the project FY2018, the target organization for power interchange project was expected to be core industrial parks in Batam; however, it was decided PLN Batam should be a main counterpart regarding the introduction of the proposed technology because of scale merit compared with scale of industrial parks.

PLN Batam has not introduced renewable energy yet, but there are more than 20 industrial parks and large commercial facilities in Batam which has big potential to reduce the energy consumption from fossil fuel in the whole Batam island by collaboration with the project.

2.5.3 Characteristics of Optimization of Energy Utilization and Sample Projects

1) Characteristics of Optimization of Energy Utilization

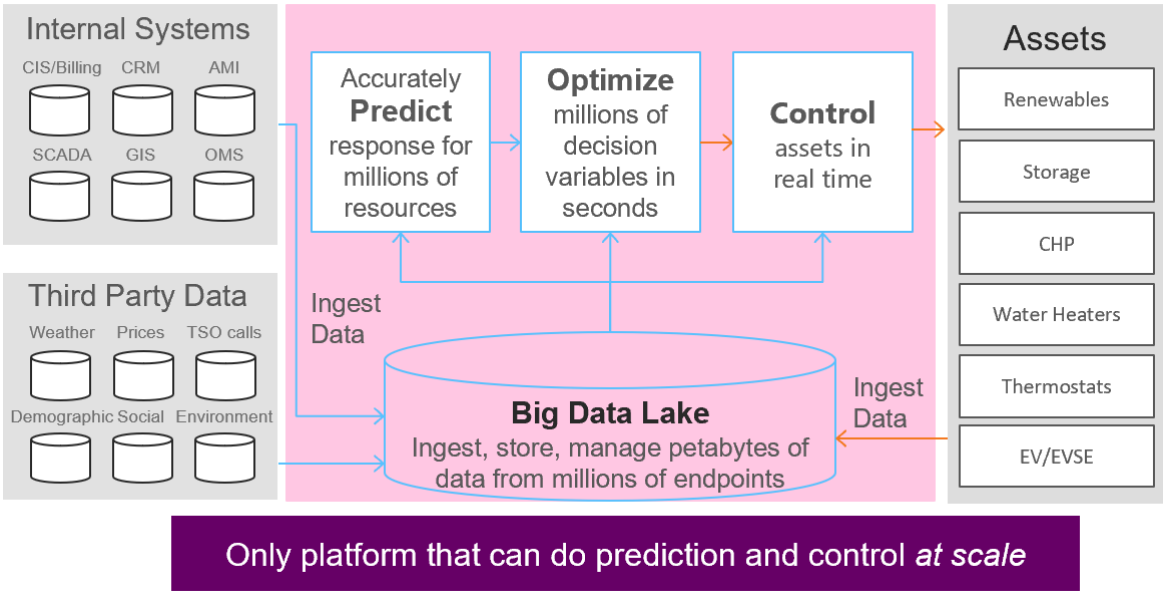
Auto Grid proposed by Macnica, Inc. is one of the major power interchange/control systems using prediction of power consumption. Auto Grid contributes stabilization of the electric power system and would control the active introduction of renewable energy in Batam. By introducing the technology to large industrial parks and commercial facilities, it is expected to lead to the promotion of solar power generation in Batam.

Source: Macnica

Figure 2-9 Image of Optimization of Energy Usage

Auto Grid is also a technology that integrates and optimizes distributed energy resources, specifically by optimizing and managing them. It can realize the enhancement of functions of adjustment of power supply/demand by virtual power plant, energy storage management system, distributed energy resource management system, demand response.

Additionally, it is a technology for optimizing operation by analyzing big data (such as supply/demand prediction, power generation cost etc.) using its AI platform. The image of an actual installation of AutoGrid is shown below.



Source: Macnica

Figure 2-10 Image of predictive control by AutoGrid

2) Effectiveness of prediction and control by AutoGrid in Batam

When PLN Batam introduces Auto Grid system in the future, the effects expected are as follows:

- Visualize various energy assets within the area
- Performing optimum utilization of individual energy assets
- Automatic realization of peak cut control based on prediction analysis
- Efficient and effective use of energy is realized at low cost
- Realized service for businesses such as RE-100

Additionally, the introduced system will be connected to Batamindo as JCM model project which includes renewable energy and EMS in the future.

3) Example of optimization of energy usage in Japan and other country

Examples of overseas optimization of energy usage projects are summarized below. Demonstration experiments are also being conducted in some areas in Japan, and the verification effectiveness of the project are in progress.

Table 2-4 Example of optimization of energy usage

	Project	Country and Area	Description
1	Xcel energy	For eight states in the United States	Energy control of 2GW, Realization of VPP and nine Demand Response program, efficiently control and operate energy in one mechanism
2	National Grid	For three states in the United States (3.3milion people)	Realization of VPP and Demand Response program
3	Virtual Power Plant	Kansai Electric power	Integrated predictive control of multiple storage batteries of different vendors

Source: Macnica

2.5.4 Summary of Project

This project aims at optimization of operation control of renewable energy and existing power supply and establishing infrastructure of virtual power plant (VPP) throughout Batam city. Although it is still under consideration, it will, for example, give prioritized electricity supply to users who request recharge power supply by identifying the area covered in the city and introducing 9 MW of existing power and 1 MW of renewable energy (Soler power).

In addition, we are planning to control the energy within individual grid by installing storage batteries that are installed individually at multiple bases and the energy assets to be separated. The project will contribute to:

- Promote appropriate energy usage of user by grasp of data of energy consumption

- Realize efficient energy interchange and contribute to low carbon by peak shift of power plant.
- Maximize energy use by grasp the characteristics of renewable energy and the necessary area of power generation
- Contribute to the realization of smart grid (smart city) by energy prediction and control.
- Realize efficient energy utilization and to reduce the operational cost of transmission and distribution networks.
- Further reduce power generation cost by visualization and realtime control.

2.5.5 Proposed technology and specifications

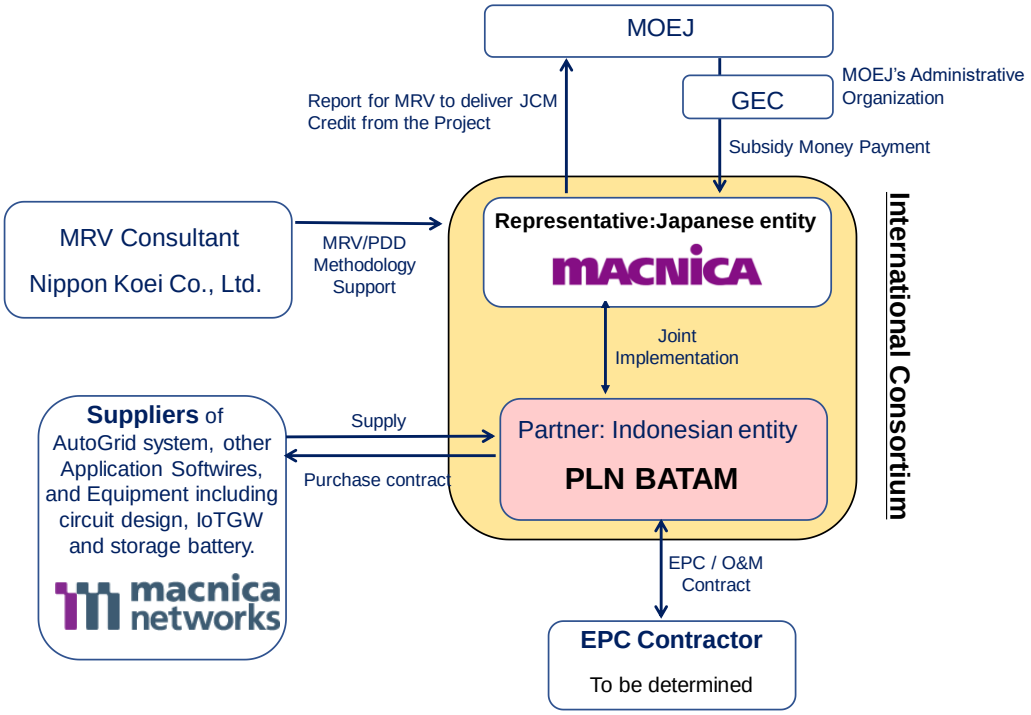
Table 2-5 Proposed technology and specifications

	Name of technology	Description
1	AutoGrid FLEX Energy prediction / control platform	Work seamlessly with existing demand and supply management system Cloud software that performs individual control based on prediction of various energy assets
2	NF IoT platform	IoT Gateway and Cloud service for interface control

Source: Macnica

2.5.6 Formulation of International Consortium

The proposed international consortium for optimization of energy usage project is shown below.



Source: Nippon Koei

Figure 2-11 Proposed International Consortium

2.5.7 Schedule

The feasibility study for optimization of energy usage in Batam city will be done under the city to city collaboration in FY2020 and it is planned to apply JCM model project in FY2021.

Table 2-6 Schedule of JCM Application from FY2019

Year	Month	Application process
2019	June	Briefing of proposed project, Field survey
	August	Field survey for target facility
	November	Discussion of Technical Proposal/project cost
	January	Seminar in Japan
2020	February	Discussion for contract agreement with PLN Batam
	March	Explanation of project to Indonesian JCM Secretariat
	April	Opening of application of JCM model project
	May	Closing of application of JCM model project
	June-October	Adoption of JCM model project, EPC contract agreement
	December	Start Procurement order
2021	October	Completion of installation of facilities/systems
	December	Commissioning and inspection
	December	Starting operation

Source: Macnica

2.6 PROPOSAL FOR NEXT FISCAL YEAR

In December 2018, the significance of introducing future renewable energy and introducing optimization of energy usage was discussed at the first meeting with PLN Batam.

It is planned to prepare forward to formulation of JCM model project based on energy plan of PLN Batam through discussion regarding detailed technical specification and project amount.

Based on examples of pilot projects in other countries, project implementation will be planned on a stepwise scale as shown below, and the detailed schedule of implementation will be discussed in FY 2019.

Table 2-7 Schedule of Full-scale Implementation of Optimization of Energy Usage

	Proposed project name	Proposed Technology/system (estimated amount of project)
Phase 1 (FY2020)	virtual Power Plant (VPP) and Solar PV Project	AutoGrid 、 IoTGW, Storage battery(1MW), Solar PV(1MW) (3 million USD)
Phase 2	Multiple grid connection and VPP project	AutoGrid 、 IoTGW, storage battery(3WM), Solar PV(10MW) (15 million USD)
Phase 3	VPP and optimization of renewable energy project	AutoGrid 、 IoTGW, storage battery(20WM), Solar PV(50MW) (75 million USD)
Phase 4	VPP and Demand Response project	AutoGrid 、 IoTGW, storage battery(20WM), Solar PV(50MW) (75 million USD)

Source: Macnica

CHAPTER 3 ACTIVITIES OF CITY-TO-CITY COLLBORATION

3.1 SUPPORT FOR DEVELOPMENT OF GREEN BUILDING REGULATION

Because Batam City is on a small island, efficient use of water and energy and reduction of waste are necessary to realize sustainable development. However, there are many projects of large-scale buildings being planned or implemented in the city center, which creates urgency for the city. Considering this background, support for development of green building (GB) regulation was generated by taking advantage of knowledges and experiences of Yokohama City in this project.

Support activities in FY2017 were implemented by cooperation among Housing & Architecture Bureau of City of Yokohama, Green Building Council Indonesia (GBCI) and AGC Asia Pacific. As a result, draft evaluation items which prioritizes efficiency of water use, energy efficiency and waste management, was developed.

Table 3-1 Draft assessment items of green building regulation in Batam

Planning Phase

1. Site Management	1-a. Green open space 1-b. Pedestrian walk
2. Energy efficiency	2-a. Building cover system (OTTV 45 watt/m2) 2-b. Air conditioning system 2-c. Lighting system (use of energy-saving lightbulb such as LED, CFL, T5 fluorescent, others with 75 lumen/watt and natural lighting) 2-d. Conducting energy saving assessment 2-e. Application of energy management system 2-f. Preparation of energy management plan / manual
3. Efficiency of water use	3-a. Planning for water sources (rainwater harvesting and recycling water) 3-b. Planning for water utilization 3-c. Planning for water-saving sanitary equipment 3-d. Planning of Water recycling
4. Indoor air quality (Indoor Environment)	4-a. Control of CO2 at certain spaces (monitoring device with alarm & mechanical ventilation) 4-b. Control of CO at closed parking area (monitoring device with alarm & mechanical ventilation) 4-c. VOC monitoring 4-d. Noise
5. Environmentally friendly materials	5-a. The use of certified environmentally friendly materials (Eco-labelling) 5-b. The use of recycled material 5-c. The use of durable materials in tropical climate (considering lifecycle cost) 5-d. Ease of maintenance
6. Waste management	6-a. 3R concept (especially segregation of Solid waste)

7. Innovation (Bonus)	7-a. Innovative technology 7-b. ZEB (Net Zero Emission Building)

Operation Phase

8. Operation	8-a. Monitoring (Planned performance) 8-b. Maintenance

Source: Nippon Koei

Housing and Architecture Bureau of City of Yokohama has experiences of development and operation of Yokohama City Environmental Consideration System for Buildings and CASBEE Yokohama while GBCI has experience to support for development of GB regulation in DKI Jakarta and Bandung City. As well as activities in FY2017, support for development of GB regulation were implemented under collaboration between Housing and Architecture Bureau of City of Yokohama and GBCI in this project (Figure 1-2 shows the support structure). GBCI comprehensively supported for the regulation development as facilitators and advisors in six GB regulation development meetings. On the other hand, Housing and Architecture Bureau of City of Yokohama gave advices to discussion points in the GB regulation development meetings and contents of the regulation in terms of dissemination and operation.

Main support activities in this project are shown below.

Table 3-2 Major activities of support for development of green building regulation

Month	Activities
2018 September	1st GB Regulation Development Meeting
October	2nd GB Regulation Development Meeting
November	Establishment of GB development committee of Batam City 3rd GB Regulation Development Meeting
December	4th GB Regulation Development Meeting 5th GB Regulation Development Meeting 6th GB Regulation Development Meeting Development of draft GB regulation
2019 January	Start of approval process in Batam City Government GB Regulation Conference Announcement of development of draft GB regulation during Final Seminar

Source: Nippon Koei

The following organizations participated in the 1st GB Regulation Development Meeting: Dinas Cipta Karya dan Tata Ruang (CKTR, Department of Residence and Spatial Planning)、Dinas Lingkungan Hidup (DLH, Department of the Environment), Badan Perencanaan, Penelitian dan Pengembangan (BAPPEDA, Regional Development Planning Agency)、BIFZA、

GBCI、Nippon Koei. As a result of the meeting, it was decided that CKTR become the responsible department for development of GB regulation. In addition, after the 2nd meeting, committee for development of the regulation, which consists of staff from CKTR and related departments, was established with Mayor's approval. The members of the committee are as follows.

Table 3-3 Members of committee for development of GB regulation of Batam City

No	Name	Position/Department
1	Suhar	Head of Department, CKTR (Department of Residence and Spatial Planning)
2	Syaiful Bahri	Secretary, CKTR (Department of Residence and Spatial Planning)
3	Agus Suyatno	Division Head, CKTR (Department of Residence and Spatial Planning)
4	Etek Yusril	Division Head, CKTR (Department of Residence and Spatial Planning)
5	Arasmi Lubis	Division Head, CKTR (Department of Residence and Spatial Planning)
6	Yanivizal Dwiyanti	Section Head, CKTR (Department of Residence and Spatial Planning)
7	Rahmat Hidayat	Section Head, CKTR (Department of Residence and Spatial Planning)
8	Decky Diar	Section Head, CKTR (Department of Residence and Spatial Planning)
9	Darmawan	Section Head, CKTR (Department of Residence and Spatial Planning)
10	Muskaharuddin	Division Head, DLH (Department of the Environment)
11	Syamsuri	Division Head, Dinas Penanaman Model dan PTSP (Department of Investment & One-stop Integrated Service)
12	Tongam Regianto	Head of Division, Dinas Pamadam Kebakaran (Department of Fire Engineering)

Source：Mayor's approval No.KPTS.310/HK/XI/2018

As a result of six GB regulation development meetings (see Attachment 1 for Minutes of the meetings), draft GB regulation was developed in December 2019 (Attachment.2). Currently, the draft regulation is in approval process in the City Government. Considering the development of the draft regulation, GB Regulation Conference was held in January 2019 and the development of the draft regulation was announced during Final Seminar of this project (For more details, see Chapter 4).

3.2 CHARACTERISTICS AND OVERVIEW OF DRAFT GREEN BUILDING REGURATION

The draft regulation was formulated based on evaluation items developed in FY2017, opinions from the committee for development of GB regulation in consideration of current situation of Batam City, advice from GBCI and Housing and Architecture Bureau of City of Yokohama.

Because Batam is a small island and has unique characteristics as mentioned above, the draft regulation well considers water, energy, waste and open space.

Dissemination is a problem with GB regulations in other cities in Indonesia. Mandatory requirements and recommendations are set in the draft regulation in Batam, which enables to grade buildings. Also, in accordance with grade of a building, incentives such as additional land coverage rate are gave to its owner. It is expected that incentives would be able to motivate building owners to construct buildings with higher grade.

Also, during development process of the draft regulation, it was discussed that review and revise of the regulation is carried out after certain period of operation (2-3 years). Environmental Consideration System for Buildings in Yokohama was also revised several times. Review of the regulation enables to enlarge targeted buildings and to add new incentives in response to situation of economic growth of Batam.

Finally, evaluation standards and processes under the GB regulation are regulated in a guideline which will be differently developed after approval of the regulation.

Overview of the draft GB regulation is as follows.

Table 3-4 Overview of draft GB regulation

Chapter I	**GENERAL PROVISION**
Chapter II	**PURPOSE AND OBJECTIVES**
Article 2	(1) This Mayor Regulation is intended as a requirement in the execution of green buildings implementation. (2) The arrangement of green buildings aims to maintain the quality of the environment by creating sustainable building construction.
Chapter III	**IMPLEMENTED BUILDINGS BY REQUIREMENTS** **GREEN BUILDING**
Article 5	(2) The requirements are imposed on the functions: a. residence function b. business function c. socio-cultural functions d. religious function e. mixed functions between functions as referred to in item a, , b, c and/or d. (3) The requirements for green buildings in buildings with functions as referred to in paragraph (2) include: a. new buildings or addition to buildings, with an area of at least 5,000 m² (five thousand square meters) including basements. b. buildings that change function.
Chapter IV	**GREEN BUILDING REQUIREMENTS**
Article 6	(1) Requirements for green building include: a. mandatory requirements b. recommended requirements
Chapter V	**MANDATORY REQUIREMENTS FOR GREEN BUILDINGS**
Article 7	(1) Mandatory requirements for new green building or addition of buildings in the technical and operational planning stages of green buildings consist of: a. site management b. efficiency of energy use c. efficient use of water d. indoor air quality e. waste management.
Article 8	Site management includes: a. provision of Green Open Space b. provision of supporting facilities
Article 11	Energy efficiency criteria include: a. building envelope system b. ventilation system c. air conditioning system d. lighting system e. in-building transportation system f. energy management system

Article 18	Water efficiency includes: a. water source planning b. planning for water use c. planning of water-saving sanitary equipment d. planning for handling wastewater
Article 25	Management of indoor air quality includes: a. mechanical ventilation system b. application of air conditioning refrigerants.
Article 28	Provision of waste management facilities, including: a. sorting and providing trash bins according to the type of waste b. provision of temporary waste storage c. seeking 3R programs (reduce, reuse and recycle)
Chapter VI	**RECOMMENDED REQUIREMENTS FOR GREEN BUILDINGS**
Article 29	The recommended requirements of green building include: a. Green open space b. Pedestrian lane c. Sensor on the lighting system d. Energy management e. CO2 control f. CO Control g. Environmentally friendly material.
Chapter VII	**GREEN BUILDING ASSESSMENT**
Article 34	(2) Assessment of technical requirements fulfillment, includes: a. self-examination b. inspection by the Green Building Team
Chapter VIII	**REPORTING**
Article 37	(3) Reporting includes: a. electricity use b. water use from all sources c. the quality of waste water released in the water body for those required d. volume of garbage. (4) Reporting is a monthly record for a period of 12 (twelve) months, starting from January to December of the previous year.
Chapter IX	**GREEN BUILDING INCENTIVES**
Article 38	(2) The provision of incentives can be in the form of: a. Additional KLB (Building coverage ratio) b. Acceleration of the green building permit process
Chapter X	**SUPERVISION AND DEVELOPMENT**
Chapter XI	**FINAL PROVISION**

Source: Nippon Koei based on draft GB regulation

CHAPTER 4 SEMINAR AND PRESENTATION

4.1 JCM SEMINAR HELD BY GEC (JULY 2018)

JCM seminar was held by Global Environment Center (GEC) in Jakarta on July 24, 2018. In this seminar, GEC and MOE introduced the scheme and achievements of JCM to governmental bodies and private companies in both Japan and Indonesia while related entities to ongoing JCM model projects and city-to-city collaboration projects in Indonesia had a presentation regarding progress of the projects and participated in panel discussion.

Regarding this city-to-city collaboration project between Batam and Yokohama, Mr.Saito of Nippon Koei presented the progress of JCM model project formulation and activities of support for development of GB regulation which would lead to development of low-carbon society in Batam.

	
Presentation regarding this project (Mr.Saito (Nippon Koei))	Panel discussion by MOE, GEC and related local governments

Source: Nippon Koei

Figure 4-1 JCM Seminar (Jakarta)

4.2 CITY-TO-CITY COLLABORATION SEMINAR (OCTOBER 2018)

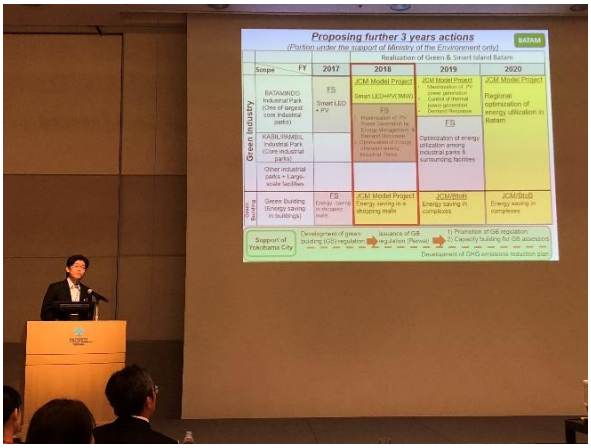
On October 25 - 26, 2018, Seminar on City-to-City Collaboration for Creating Low-carbon Society was held by MOE in Yokohama and Mr. Rudy Satriawansyah of DLH of Batam City was invited to the seminar.

In this seminar on 25 October, invitees from local governments carrying out city-to-city collaboration projects, had a presentation about their activities and results. Regarding this project, Mr.Nakamura of International Affairs Bureau of City of Yokohama presented overview of activities and future prospects of this city-to-city collaboration project whereas Mr.Rudy presented overview of Batam and activities of GB regulation development. In addition, Mr.Okuno of International Affairs Bureau of City of Yokohama presented their way

to proceed three city-to-city collaboration projects including Batam by taking advantage of their experience.

Also, in site visit session on 26 of October, overview and revision of Yokohama City Action Plan for Global Warming were explained first. Then, the invitees visited to the Minami Ward Office Building which achieved S Rank by CASBEE Yokohama and installed technologies for energy saving and rooftop garden were explained.

Presentation by Mr.Okuno
(City of Yokohama)



Presentation of Mr.Nakamura
(City of Yokohama)

Presentation by Mr.Rudy (Batam City)

Site Visit

Source: Nippon Koei

Figure 4-2 City-to-City Collaboration Seminar (Yokohama)

4.3 GREEN BUILDING REGULATION CONFERENCE (JANUARY 2019)

On January 16, 2019, GB Regulation Conference was held at Batam as one of activities of this project. International Affairs Bureau and Housing and Architecture Bureau of City of Yokohama, Committee for development GB Regulation (CKTR, DLH etc.), BIFZA, Indonesian Institute of Architects (Ikatan Arsitek Indonesia, IAI), TOTO, AGC and Nippon

Koei participated in the conference and had presentations and discussions in regard to dissemination of GB regulation, evaluation standards and capacity building of assessors.

Dissemination of the regulation was focused in the morning session and GBCI presented importance of GB regulation and expected benefits of GB regulation in Batam while IAI presented understanding of GB from the perspective of architects and applicable design techniques. Also, TOTO and AGC had a presentation regarding the national (Indonesian) and global trends of GB with explanation of their products. Then, Housing and Architecture Bureau of City of Yokohama explained about Yokohama City Environmental Consideration System for Buildings and CASBEE Yokohama.

In the afternoon session, GBCI and Housing and Architecture Bureau of City of Yokohama had presentations in regard to evaluation measure and capacity building of assessors. Following them, discussion session was carried out and CKTR asked the Housing and Architecture Bureau some questions such as how to formulate the structure for proper evaluation.

Agenda of the conference is as follows.

Table 4-1 Agenda of GB Regulation Conference

Date: 16 January 2019
Venue: Turi Beach Resort Hotel
MC: Nippon Koei

Time	Program	Speaker
8:30-9:00	Registration	-
9:00-9:10	Introduction of participants	
9:10-9:20	Opening Remarks	Assistant of Batam City
9:20-9:30	Promotion of green building under city to city collaboration	Nippon Koei
9:30-9:50	GB Regulation in other cities in Indonesia	Green Building Council Indonesia (GBCI)
9:50-10:10	Importance of architect in GB promotion	IAI National
10:10-10:20	Experience and benefit of GB regulation 1	TOTO (Member of GBCI)
10:20-10:30	Trend of GB in the world / Experience and benefit of GB regulation 2	AGC (Member of WGBC)
10:30-11:00	Overview of GB regulation in Batam	Team for Development of GB Regulation
11:00-11:30	Experience of CASBEE Yokohama: Potential benefits for building owners	Housing & Architecture Bureau, Yokohama City
11:30-12:10	Discussion Theme: How to promote GB regulation	facilitated by Nippon Koei
12:10-13:30	Lunch	-

Time	Program	Speaker
13:30-13:45	Evaluation system and capacity building of CASBEE Yokohama	Housing & Architecture Bureau, Yokohama City
13:45-14:05	Evaluation system of GB regulation in Batam and capacity building in other cities	GBCI
14:05-14:50	Discussion Theme: Evaluation system and capacity building	facilitated by Nippon Koei
14:50-15:00	Break	-
15:00-15:40	Expectation and comments from all participants	-
15:40-15:50	Potential continuation of city to city collaboration	International Affairs Bureau, Yokohama City
15:50-16:00	Closing remarks	CKTR

Source: Nippon Koei

Presentation by Mr.Surendro（GBCI）

Presentation by Ms.Yanivirzal (CKTR)

Presentation by Mr. Prasetyoadi（IAI）

Presentation by Ms. Onasie（AGC）

Presentation by Ms.Yamada
(City of Yokohama)

Discussion Session

Discussion Session

Venue

Source: Nippon Koei

Figure 4-3 GB Regulation Conference

4.4 FINAL SEMINAR (JANUARY 2019)

On January 17, 2019, Final Seminar of this project was held at Batam and progress of support for development of GB regulation and JCM model project formulation was reported.

In regard to support for the regulation development, Housing and Architecture Bureau of City of Yokohama presented about Yokohama City Environmental Consideration System for Buildings and CASBEE Yokohama. After presentation about overview of draft GB regulation by CKTR, Mr.Syaiful of CKTR announced the development of draft GB regulation.

Following the announcement, Fintech and Macnica reported progress of their study for JCM model project formulation and the progress of study by iForcom, who had implemented project formulation until FY2017, was also reported.

In the afternoon of January 17, business matching seminar was implemented by City of Yokohama and Batam City. In the seminar, AGC, Tokyo Electron Device, Hitachi Zosen,

Toshiba Infrastructure Systems & Solutions and Finetech presented their technologies and installation experiences, then panel discussion among Mr.Syaiful of CKTR, Mr.Herman of Batam Chamber of Commerce and Industry, Mr.Saito of Nippon Koei and presenters were carried out. Presented technologies will continue to be discussed as candidate technologies for future study of this city-to-city collaboration between Batam and Yokohama.

Agenda of final seminar is shown below.

Table 4-2 Agenda of Final Seminar

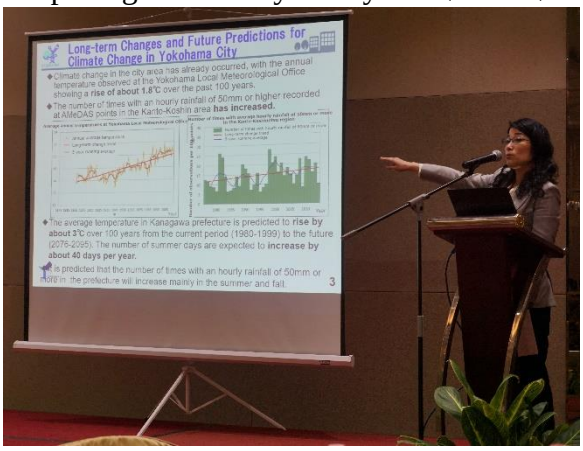
Date: 17 January 2019
Venue: Best Western Premier Panbil
MC: Dinas Cipta Karya dan Tata Ruang (CKTR)

Time	Program	Speaker
9:30-10:00	Registration	-
10:00-10:10	Introduction of participants	Nippon Koei
10:10-10:20	Opening remarks	Secretary of Dinas CKTR
10:20-11:00	Progress of city-to-city collaboration project / Experience of CASBEE Yokohama and cooperation with Batam	Nippon Koei / Housing & Architecture Bureau, Yokohama City
11:00-11:10	Announcement of GB regulation	Secretary of Dinas CKTR
11:10-11:30	Progress of development of GB regulation	Team for Development of GB Regulation
11:30-11:40	Importance of engineers in GB promotion	PII
11:40-11:50	Study for renewable energy maximization project	Finetech
11:50-12:00	Study for smart energy utilization project	Macnica
12:00-12:10	Study for energy saving project	iForcom (Nippon Koei)
12:10-13:10	Lunch	-
13:10-14:40	Business Matching 13:10 Orientation and Introduction of Yokohama companies (Yokohama) 13:20 Introduction of Batam companies (KADIN) 13:30 Solution for Energy Efficiency, Indoor Air Quality, Use of Green Material (AGC) 13:45 Solution for Energy Efficiency, Waste Water Management (Tokyo Electron Device) 14:00 Solution for Waste Water Management (Hitachi Zosen) 14:15 Solution for Waste Water Management (Toshiba Infrastructure Systems & Solutions) 14:30 Solution for Waste Management, Energy Efficiency (Finetech) 14:45 Wrap up	MC: Yokohama City Commentator1: KADIN Commentator2: Team for Development of GB Regulation Commentator3: Nippon Koei

Source: Nippon Koei

Opening remarks by Mr.Syaiful（CKTR）

Presentation by Mr.Saito (Nippon Koei)



Presentation by Ms.Masaki
(City of Yokohama)

Announcement of development of draft GB regulation

Presentation by Mr.Okada (Finetech)

Presentation by Mr.Abe (Macnica)

Panel discussion

Group photo

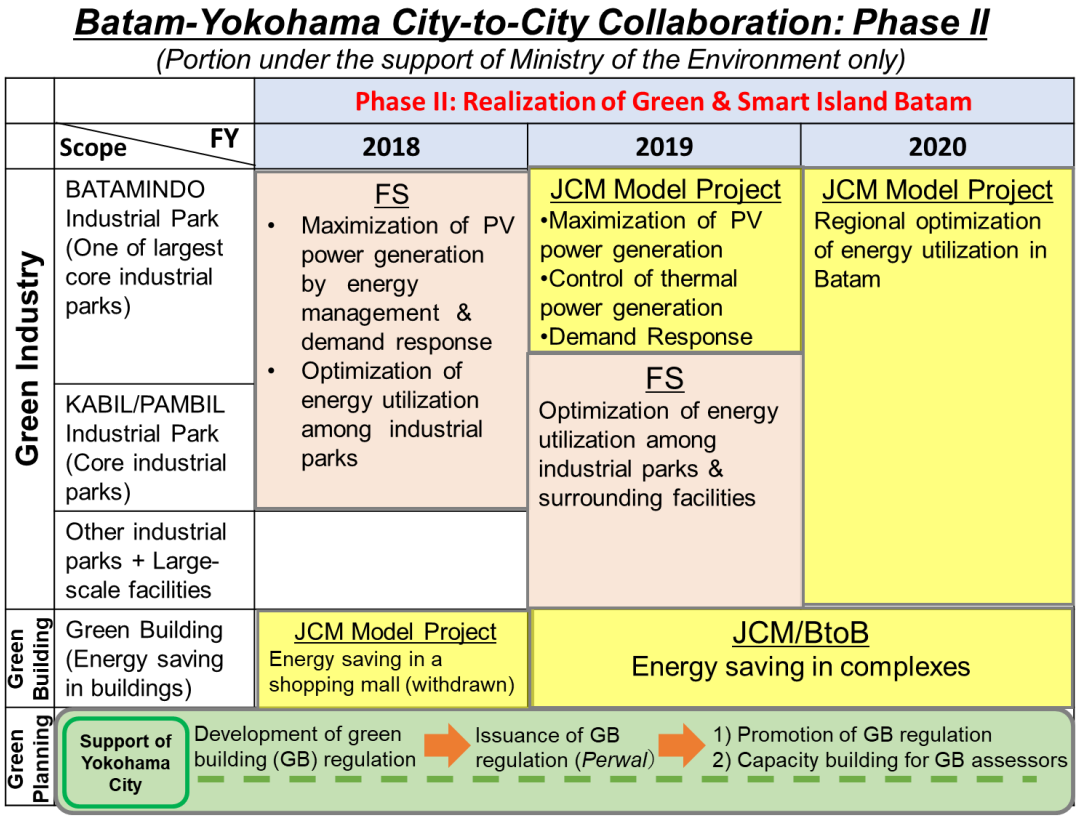
Source: Nippon Koei

Figure 4-4 Final Seminar

CHAPTER 5 FUTURE PLANS

FY2018 project is the fourth year of the city-to-city collaboration between Batam and Yokohama which commenced in 2015, and it is also the first year of three-year plan (Phase II) which was formulated last year with the focus on two important pillars (Green Industry and Green Building) among 6 pillars of the city-to-city collaboration (Attachment 5).

This year, as shown below, the study on "Project for maximization of renewable energy by energy management and demand response in an industrial park" and "Project for optimization of renewable energy utilization by electricity interchange among multiple facilities in Batam" was conducted as Green Industry activities. The support for development of the third local regulation on green building in Indonesia was also conducted.



Source: Nippon Koei

Figure 5-1 Three year plan (Phase II) for city-to-city collaboration between Batam and Yokohama

The implementation plan for the city-to-city collaboration as well as JCM model projects are described below.

5.1 APPLICATION FOR JCM MODEL PROJECT

In FY 2019, one project will be applied from the study of FY 2018. Finetech and Batamindo are planning to implement a small-scale PV project in B to B Scheme. With the successful implementation of the initial project, they agreed to go further to implement a larger scale renewable energy project (PV, battery and EMS) which is applicable for JCM model project scheme. Since the potential of battery and EMS is to be studied later, the following plan is only based on the planned capacity of PV to be installed, or 5MW.

Table 5-1 Concept of JCM Model Project to be applied in FY2019

Representative participant	Project	Cost	Emission Reduction (tCO2/year)
Finetetch	Maximization of renewable energy by energy management and demand response in an industrial park	PV: USD 5 million Battery and EMS: TBD	PV: 3,360 EMS: TBD

Source: Nippon Koei

Energy saving solution which was proposed upto FY2017 by iForcom is also pursued by meeting potential customers in FY2018, thus the application by iForcom in FY2019 is also expected.

5.2 PLAN FOR CITY-TO-CITY COLLABORATION PROJECT IN FY2019 (1): SMART ELECTRICITY MANAGEMENT

As planned, the preliminary study on electricity interchange reveled that it is required to deepen the study with PLN Batam on the potential of introduction of renewable energy and smart electricity management in the whole Batam island scale.

In FY1019, it is planned as follows.

- To study the strategy of introduction of renewable energy to reduce the grid emission factor of Batam, and to deepen the understanding of Batam side how Autogrid technology to realize the maximization of the renewable energy can develop new energy business.
- To develop a JCM model project plan which introduces PV and battery in a mini-grid in the network of PLN Batam to apply the smart electricity management technology.

5.3 PLAN FOR CITY-TO-CITY COLLABORATION PROJECT IN FY2019 (2): IMPLEMENTATION OF GREEN BUILDING REGULATION

In this FY2018 project, Batam city drafted Mayor's Regulation on Green Building with the support of the city of Yokohama and GBCI under the umbrella of city-to-city collaboration. This draft regulation was fully supported by the participants in the GB regulation conference (4.3) as well as in the final seminar (4.4) and the earliest application is expected.

In addition, there is discussion that the extension and application of the GB regulations in two pioneer cities in Indonesia. In consideration of this issue, FY 2019 project will target the first target building under this new GB regulation and support the development of assessment guideline and the capacity development of government staff.

5.3.1 Support for implementation structure for the implementation of GB regulation

Mayor of Batam formed a special team to draft the GB regulation which consists of several departments. Since cross-departmental structure is also important for the implementation of GB regulation, thus the project will support the formation of such implementation structure soon after the issuance of GB regulation.

5.3.2 Selection of Target Building

The first target building will be selected through discussion of the implementation structure as above. If required, public information activities will be conducted through mass media, the chamber of commerce etc. to invite voluntary participation from owners of the potential buildings.

5.3.3 Development of GB assessment guideline

The architecture bureau of the city of Yokohama explained that "evaluation criteria which every assessor will give the same result" and "evaluation criteria which will not be a burden for either assessor or building owner" are very important. To achieve effective application of GB regulation, the development of a GB assessment guideline which describe the evaluation criteria and methodology will be supported in FY2019.

The quantitative evaluation criteria will be prepared based on the current condition of buildings in Batam, through discussion with GBCI, the City of Yokohama, TOTO (a member of GBCI), AGC (a member of WGBC) etc. Simple evaluation method will be set referring to

the experience and regulations of Yokohama so that the staff of CKTR and the building owners can understand it easily.

This guideline should be finalized after the trial application on the building selected in 5.3.2, while the schedule of development of it needs to be discussed well with CKTR in accordance with the progress of the project activities.

5.3.4 Capacity Development of Administration

To implement GB regulation, the capacity of administrative staff and the appropriate evaluation of buildings by assessors is a prerequisite, thus the capacity development activities are inevitable. In FY2019, the following two activities are planned.

(1) Sending personnel to Yokohama and pioneer regions in Indonesia

By utilizing the opportunities of JCM seminar and others, 1 or 2 staff of CKTR who are in charge of GB regulation will be sent to Yokohama to learn the regulations, organization and methodologies of Yokohama for its building environmental consideration and Comprehensive Assessment System for Built Environment Efficiency (CASBEE). It is also important to generate opportunities to visit the building highly evaluated (S-rank) and the companies who has high technologies of GB to see how CASBEE Yokohama is extended as well as to see the application of GB technologies for the capacity building of the staff of Batam.

Besides, several CTKR staff may be sent to the pioneer regions for GB in Indonesia, namely DKI Jakarta and Bandung city to learn from them, to exchange the opinions and to observe the certified buildings so that the appropriate implementation structure for Batam and the necessary continuous capacity building for the staff of Batam city can be well considered.

By inviting the staff of DKI or Bandung in the occasion such as the final seminar for FY2019, it is expected that this project can bridge these pioneer local governments in GB in the regular basis.

(2) Application of Greenship Association Program

GBCI is promoting Greenship Association Program to conduct capacity building of assessor and public information for building owners who are interested in GB certification with regard to “Greenship”, or GBCI’s own evaluation system of GB. The program is composed of following 15 themes.

1. Understanding Climate Change
2. Sustainable Concept
3. Why Green Building
4. Appropriate Site Development
5. Energy Efficiency and Conservation
6. Water Conservation
7. Material Resources and Cycle
8. Indoor Health and Comfort
9. Building Environment Management + Green team + BIM
10. Rules and Regulation
11. Green Ambassador
12. Green Procurement
13. Green Cleaning
14. Green Building Certification
15. Greenship Rating tools & EDGE

The draft of Mayor's regulation on GB in Batam was prepared in line with the circumstances and characteristics of Batam city, with the emphasis on water, energy and waste.

It is noted that "Greenship" is more complex and detail compared with draft GB regulation in Batam, thus it is not expected that the assessors in Batam should understand all of the contents of Greenship.

The program has been implemented and improved by GBCI for a few years, and its introductory session will be one of the best training which is expected to be continued in the future. The project is expected to support this introductory session training for Batam staff. The contents of the introductory session may accommodate the characteristics of Batam GB regulation after the due discussion with GBCI.