FY2020 Project for Ministry of the Environment Japan

FY2020
City-to-City Collaboration Programme for Zero-Carbon Society

Promotion of Zero-Emission Technology to Industrial and Public Sectors in Ho Chi Minh City

Report

March 2021

Nippon Koei Co., Ltd.
Osaka City

FY2020
City-to-City Collaboration Programme for Zero-Carbon Society

Promotion of Zero-Emission Technology to Industrial and Public Sectors in Ho Chi Minh City

Report

Table of Contents

Page

List of Tables

List of Figures

List of Attachments

Abbreviations

Abbreviations	Description
BaU	Business-as-Usual
BEMS	Building Energy Management System
CCAP	Climate Change Action Plan
CNG	Compressed Natural Gas
CO	Carbon monoxide
CO2	Carbon dioxide
DONRE	Department of Natural Resources and Environment
DOT	Department of Tourism
EMS	Energy Management System
EPC	Engineering Procurement Construction
FIT	Feed-in-Tariff
FY	Fiscal Year
GEC	Global Environment Centre Foundation
GDP	Gross Domestic Product
GHG	Greenhouse Gas
HCMC	Ho Chi Minh City
HEPZA	Ho Chi Minh City Export Processing and Industrial Zones Authority
IMF	International Monetary Fund
INDC	Intended Nationally Determined Contribution
JCH	Johnson Controls- Hitachi Air Conditioning.
JCM	Joint Crediting Mechanism
LED	Light-Emitting Diode
LPG	Liquefied Petroleum Gas
MICE	Meetings, Incentives, Conference and Exhibitions
MOU	Memorandum of Understanding
MRV	Measurement, Reporting and Verification
NDC	Nationally Determined Contribution
NKV	Nippon Koei Vietnam
NOx	Nitrogen Oxide
PV	Photovoltaic
SAWACO	Saigon Water Corporation
SOGEC	Sojitz Osaka Gas Energy Company Ltd.
SRHMC	South Regional Hydro Meteorological Center
USD	United States Dollar
VND	Vietnam Don
VRF	Variable Refrigeration Flow
WEO	World Economic Outlook
WtE	Waste to Energy

CHAPTER 1 BACKGROUND AND OBJECTIVE

1.1 BACKGROUND OF THE PROGRAMME

In November 2016, the Paris Agreement entered into force. This fiscal year (FY2020), the Paris Agreement finally entered its implementation stage. As it is expected that not only central governments but non-governmental bodies including regional municipalities and cities accelerate their climate change policies, cities and municipalities are key players to consider and implement concrete regional climate actions and projects. To realize zero-carbon society, it is important to accelerate actions to develop sustainable and zero-carbon society and low-carbon society as a passing point especially in Asia, the area of prominent economic growth. International supports for activities for zero-carbon and low-carbon society have been enforced in cities, the place for activities to support socio-economic development.

Osaka City and Ho Chi Minh City (HCMC) has been implementing collaboration of environmental sector since 2011 and concluded "Memorandum of Understanding on Collaboration toward Low Carbon Development between Ho Chi Minh City and Osaka City" for comprehensive cooperation on development of action plan to realize zero-carbon society in HCMC. Long-term cooperation has been carried out under the Memorandum of Understanding (MOU).

City-to-City Collaboration project in FY2020 is positioned as the second fiscal year in the three-year plan and aims to promote zero-emission technologies to industrial and public sectors in HCMC by carrying out the 4 study activities below.

1. Joint Crediting Mechanism (JCM) project formulation by introducing high-efficiency air-conditioning equipment
2. JCM project formulation by fuel conversion (introduction of high-efficiency gas once-through boiler)
3. Preparatory survey for formulation of large-scale JCM projects
4. Support for implementation of HCMC's Climate Change Action Plan (CCAP) 2021-2025

However, due to pandemic of COVID-19 around the world and physical limitation such as prohibition of a business trip, discussion and information sharing in this project was basically carried out online. Also, it was necessary to consider execution methods of this project such as utilization of local human resources for site study and information collection.

1.2 CITIES OF THE STUDY

1.2.1 Osaka City

Osaka City is an ordinance-designated city in Japan, and the central area of administration, economy, and culture in western Japan. Osaka City is the second biggest city in Japan following Tokyo and is the famous commercial city based on manufacturing industry heavy industry with the largest Gross Domestic Product (GDP) among ordinance-designated cities in Japan. In addition, Osaka City has a wide range of networks with foreign cities and has been implementing and promoting various activities with sister cities, friendship cities and business partner cities including HCMC in Vietnam.

Overview of Osaka City is as follows.

Table 1.1 Overview of Osaka City

#	Item	Overview
1	Area	225.30 km2
2	Population	2,753,476 (as of January 2021)
3	Population density	12,221 people/km2 (as of January 2021)
4	Number of households	1,463,041 (as of January 2021)
5	Number of industrial enterprises	5,026 (As of June 2018: Industrial census in 2018) * Number of enterprises with more than 4 workers
6	Value of shipments of manufactured goods	JPY 3,681 billion (As of June 2018: Industrial census in 2018)
7	Main industries	Metal materials manufacturing: 1017 enterprises (20.2% of total) Printing: 653 enterprises (13% of total) Production-use machinery and Business-use machinery: 490 (9.7%) (As of June 2018: Industrial census in 2018)

Sourse: Prepared by Nippon Koei based on Osaka City' s website

1.2.2 Ho Chi Minh City (HCMC)

HCMC located in south of the country is the biggest commercial city in Vietnam with population of approximately 9 million. Because of recent economic growth, population concentration and urban sprawl have been occurring, which has been leading to environmental issues such as air pollution and water pollution, as well as the need for waste management and forest management. HCMC belongs to tropical climate with rain season (May to November) and dry season (December to April), 1,800-1,900 of annual rainfall and 28 degree C of average temperature. Geographic character of HCMC with 20m of above sea level and location near rivers and coasts, land-use change by industrialization and effects of recent climate change lead to flooding in rain season, which has been recognized as one of urban issues. Furthermore, because of industrialization and population growth have influenced drastic increase of energy consumption, which naturally raise Green House Gas (GHG) emissions.

In the contexts, needs of urban decarbonization is gradually increasing by installation of energy-saving and renewable energy technologies which this project promotes.

The basic statistic data of HCMC is as follows.

Table 1.2 Overview of HCMC

#	Item	Overview
1	Area	2,095 km2
2	Population	8,993,082 (as of April 2019, 10% of national total and the largest in the country.)
3	Population density	4,300 people/km2 (As of 2019)
4	Number of households	2,558,912 (as of April 2019)
5	GDP per person	USD 6,584 (As of 2018, national average is USD 2,552)

Source: Prepared by Nippon Koei based on the relevant documents

View of HCMC

Transportation in HCMC

1.3 OBJECTIVE OF THE STUDY

The objective of FY2020 City-to-City Collaboration Programme for Zero-Carbon Society (hereafter "the Programme") is that Japanese research institutes, private companies, universities etc. conduct studies to support for development of zero-carbon and low-carbon society in overseas municipalities and installation of technologies which contributes to zero/low-carbon society development together with Japan's cities with experiences and know-how for development of zero-carbon and low-carbon society.

1.4 IMPREMENTATION STRUCTURE

In this project between HCMC People's Committee and Osaka City, Department of Natural Resources and Environment (DONRE) of HCMC and Environmental Bureau of Osaka City are departments in charge and develop the collaboration structure for solution of urban issues and formulation of zero-carbon society.

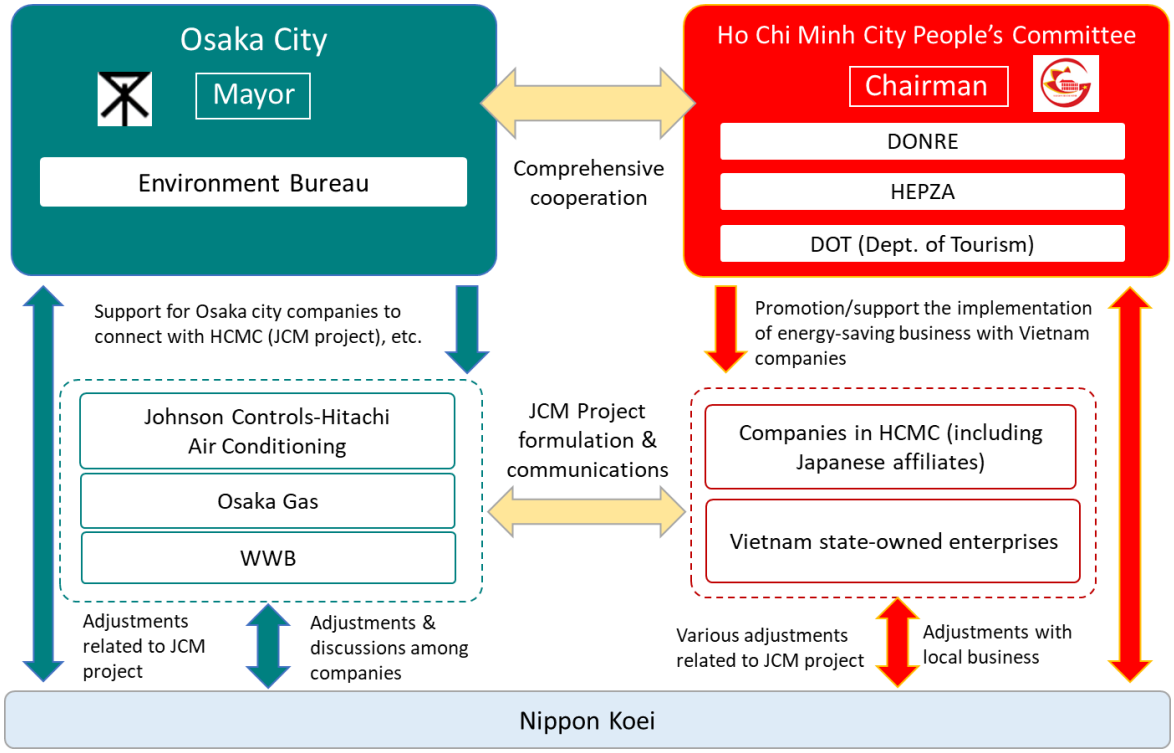
Also, in order to widen study for development of JCM model projects, information sharing and workshop with Ho Chi Minh City Export Processing and Industrial Zones Authority (HEPZA) and Department of Tourism (DOT) were carried out in this project.

Studies for development of JCM model projects were implemented by cooperating with companies with experiences of businesses in Vietnam, Johnson Controls-Hitachi Air

Conditioning Vietnam LLC (manufacturer of highly efficient air conditioning), Osaka Gas Co., Ltd. (gas supplier of fuel switching projects) and WWB Corporation (implementer of renewable energy projects in Vietnam).

As business trips were limited due to COVID-19 pandemic, information collection and consideration of target local companies were implemented through online meetings with Nippon Koei Vietnam (NKV, local subsidiary of Nippon Koei) and Japanese staff of local offices of Japanese companies.

The implementation structure of this project is as follows.



Source: Prepared by Nippon Koei

Figure 1-1 Implementation Structure

1.5 PROJECT SCHEDULE

The project period is from 20 August 2020 to 10 March 2021. The schedule is shown below.

#	Activities	2020					2021		
		Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
City-to-City Collaboration Activities									
1	Discussion on Coty-to-City Collaboration / Policy dialogue（Online meetings）		（Discussion and coordination by email/Online tools） ▼	▼		▼		▼	
2	Support for implementation of CCAP 2021-2025		（Discussion and coordination by email/Online tools）						
3	Discussion on MOU		（Discussion and coordination by email/Online tools）				▼（Both cities agreed）		
4	Support for development of meteorological prediction system（When HCMC requires）							▽	
5	Discussion on City-to-City Collaboration in FY2021								
JCM Model Project Formulation									
6	Disucssion with/supporting companies related to potential JCM model projects		（Discussion and coordination by email/Online tools						
7	Discussion/Studies for JCM Model Project Formulation								
8	Coordination of International Consortium								
9	Preparation for JCM Model Project formulation later than FY2020								
Others（reporting, events etc.）									
10	Monthly report to MOE		▽	▽	▽	▽	▽	▽	▽
11	Progress meeting with MOE		▽			▽			▽
12	Online workshop								▼
13	Japan Visit（not implemented in FY2020）								
Field study, Preparation of report etc.									
14	Field survey（HCMC）		（Information collection by cooperation with local subsidiary						
15	Domestic meetings（Osaka City）		▽(WEB)		▽(WEB)		▽(WEB)	▽(WEB)	
16	Final report								▽

※ Dotted line: Online activities ▽: Domestic activities ▼: Activities by cooperation with locals

Source: Prepared by Nippon Koei

Figure 1-2 Project Schedule

CHAPTER 2 ACTIONS TO CLIMATE CHANGE BY OSAKA CITY AND HO CHI MINH CITY

2.1 ACTIONS TO CLIMATE CHANGE BY OSAKA CITY

2.1.1 Osaka City Action Plan of Global Warming Countermeasures (Area Measures)

Mayor of Osaka City, Mr. Yoshimura announced to aim at realizing 2050 Zero-Carbon City in Osaka City Council of 27 November 2020 and reported it to the Ministry of the Environment (MOE) on 9 December 2020. Also, implementation of measures to achieve goal of FY2030 and a approaches and measures to realize "Zero-Carbon Osaka", that is, zero-carbon society leading to the maturity of Osaka City will be mentioned in "Osaka City Action Plan of Global Warming Countermeasures (Area Measures)" which is planned to be revised in FY2020.

Draft of "Osaka City Action Plan of Global Warming Countermeasures (Area Measures)", which was published for public comments, showed the target of the plan and vision for 2050 as follows.

Target of the Action Plan

To reduce 30% of GHG emission reduction by FY2030, compared with FY2013 to achieve net zero emission of GHG in 2050.

Vision for 2050

"Zero-Carbon Osaka -Realization of zero-carbon society leading to maturity of Osaka-"

"Zero Carbon Osaka" is defined as the situation that 5 kinds of "City" below has been formulated. Also, approaches to each City is illustrated in the Action Plan.

- City with low-carbon energy
- City disseminated low-carbon actions with full of zero-carbon mind.
- Sustainable City integrated low-carbon methods
- City leading decarbonization by utilizing various connections
- City well-prepared for climate change

2.1.2 Team Osaka Network

In June 2016, Osaka City established "Team Osaka Network" as a platform that private companies located in Osaka or Kansai area collaborate with Osaka City and Universities and the Network support for formulating projects that can contribute to development of zero-carbon society of cities in Asia.

As of February 2021, 148 companies in a wide range of sectors are participating the Network. Characteristics of the member companies are sorted out in the table below.

Table 2.1 Sectors and technologies and services of members of Team Osaka Network

#	Sectors	Technologies and services
1	Plant engineering/sales	Environmental plant (Water treatment, Waste treatment Biogas etc.)
2	Energy business	Gas production/supply/sales, power generation business, renewable energy projects etc.
3	Consultant	Construction consulting (study, engineering, supervision etc.), Energy-saving consulting, Business consulting etc.
4	Manufacturing	Boiler, Air conditioning, pump etc.
5	Financing	Bank, Leasing, Financing
6	Think-tank	Study, research of policies, research & development
7	Others	Materials, Sales, Real estate, Tourism, Trading, Telecommunication, construction, education etc.

Source: Prepared by Nippon Koei based on Osaka City' s website
https://www.city.osaka.lg.jp/kankyo/cmsfiles/contents/0000366/366046/list2.pdf

2.1.3 Osaka Plan for Production and Consumption of Local Energy

Osaka City developed "Osaka Plan for Production and Consumption of Local Energy" together with Osaka Prefecture in 2014 and has been proceeding dissemination of renewable energy and efficient use of energy suitable for local characteristics. Overview of the plan and progress as of FY2018 are shown in Table 2-2 and Table 2-3, respectively.

Table 2.2 Overview of Osaka Plan for Production and Consumption of Local Energy

Target Period	Date of development of the plan (March 2014) to FY2020
Goals and approaches	(1) Dissemination and extension of renewable energy Approach: To promote activities for dissemination of Photovoltaic (PV) power generation by utilizing Feed-in-Tariff (FIT) and to proceed activities for dissemination and extension of other renewable energy. (2) Reduction of energy consumption (Transformation to energy-saving lifestyle) Approach: To proceed transformation to energy-saving lifestyle and business style by promoting visualization of energy consumption and to promote activities for installation of energy-saving technologies and for energy saving of buildings and houses. (3) Levelling of electricity demand and stabilization of electricity supply Approach: To promote activities for levelling peak demand and stabilization of electricity supply by disseminating of demand response and distributed power supply (Co-generation etc.) and by encourage business entry of various power producers
Quantitative targets by FY2020)	・Energy supply by PV: 900,000 kW ・Distributed power supply (Co-generation etc.) : 300,000 kW ・Energy supply by waste to energy (WtE) etc.: 50,000 kW ・Reduction of demand by gas air conditioning etc.: 200,000 kW ・Reduction of demand by Building Energy Management System (BEMS) etc.: 50,000 kW
Concrete policies and projects	Individual policies and projects are annually published as Action Program after budget discussion of each fiscal year.

Source: Prepared by Nippon Koei based on Osaka Plan for Production and Consumption of Local Energy

Table 2.3 Progress of Osaka Plan for Production and Consumption of Local Energy

Targets	Targets by FY2020	Achievement by FY2018	Achievement rate
PV	+900,000kW	+723,000kW	80.3%
Distributed energy supply	+300,000kW	+42,000kW	14.0%
WtE etc.	+50,000kW	+44,000kW	87.8%
Gas Air conditioning etc.	-200,000kW	-241,000kW	120.5%
BEMS etc.	-50,000kW	-52,000kW	103.5%
Total	+1,500,000kW	+1,101,000kW	73.4%

Source: Prepared by Nippon Koei based on Osaka Plan for Production and Consumption of Local Energy

2.2 ACTIONS TO CLIMATE CAHNGE BY VIETNAM AND HCMC

2.2.1 Actions to climate change by Vietnam

Vietnamese Government firstly submitted Nationally Determined Contribution (NDC) in 2015 and then revised it in July 2020. While NDC of 2015 targeted 8% of GHG emission reduction unconditionally and 25% with enough international cooperation by 2030 compared with Business-as-Usual (BaU) scenario, the target of revised NDC is unconditionally 9% reduction and 27% reduction with international cooperation. Reduction targets by sector are listed below.

Table 2.4 Reduction targets by sector in revised NDC

Sector	Contribution with domestic resources		Contribution with international support		Total contribution with both domestic resources and international support	
	Compared to BAU scenario (%)	Reduction amount (Mil. tonnes of CO_{2eq})	Compared to BAU scenario (%)	Reduction amount (Mil. tonnes of CO_{2eq})	Compared to BAU scenario (%)	Reduction amount (Mil. tonnes of CO_{2eq})
Energy	5.5	51.5	11.2	104.3	16.7	155.8
Agriculture	0.7	6.8	2.8	25.8	3.5	32.6
LULUCF*	1.0	9.3	1.3	11.9	2.3	21.2
Waste	1.0	9.1	2.6	24.0	3.6	33.1
IP	0.8	7.2	0.1	0.8	0.9	8.0
Total	**9.0**	**83.9**	**18.0**	**166.8**	**27.0**	**250.8**

Note (*): increase in GHGs sequestration

Source: UPDATED NATIONALLY DETERMINED CONTRIBUTION (NDC), The Socialist public of Vietnam

Based on the targets of NDC, Vietnamese Government has been implementing various policies and under the national policies, each municipality is carrying out individual policies. Main national policies are as shown below.

Table 2.5 National policies for climate change and energy use in Vietnam

Name of regulation (Date of enforcement)	Objectives
National Strategies on Climate Change (Decision 2139/QD-TTg of the Prime Minister) 05 December, 2011	Specific objectives - To raise national capacity and to carry out simultaneously measures of climate change adaptation and GHG emission reduction to assure safety for people and properties for the sustainable development goals. - To strengthen human and natural system resilience to climate change, develop a low-carbon economy to protect and enhance quality of life, ensure national security and sustainable development in the context of global climate change, and actively join the international community to protect the earth's climate system.
National Target Program to Respond to Climate Change period 2012-2015 (Decision 1183/QD-TTg of the Prime Minister) 30 August, 2012	Specific objectives - To gradually realize the National Strategy on climate change, - To increase awareness and capacity to adapt to climate change - To orient to reduce greenhouse gas emissions - To develop low-carbon economy, - To actively cooperate with international communities to protect the global climate system
Action Plan for Implementation of Paris Agreement on Climate Change **(**Decision 2053/QD-TTg of the Prime Minister) 28 October, 2016	Overall objectives To Identify and implement appropriate activities and solutions until 2020 and 2030 to gradually carry out all the provisions in the Paris Agreement applicable to Viet Nam. Specific objectives - To fulfil commitments in the Intended Nationally Determined Contribution (INDC) to mitigate GHG emissions - To fulfil commitments in the Intended Nationally Determined Contribution to adapt to climate change - To prepare human, technical and financial resources to fulfil commitments in the Intended Nationally Determined Contribution and contribute to the transition to a low-carbon, highly resilient economy - To establish and operate the transparency system (MRV system) to monitor and assess the implementation of adaptation, mitigation, and resource preparation - To revise institutions and policies to establish a favourable environment and focus national efforts to respond to climate change;
National Strategies on Green Growth 2011-2020 with a vision by 2050 (Decision 1393/QD-TTg of the Prime Minister) 25 September, 2012	Overall objectives Green growth, towards the low-carbon economy, natural capital enrichment has become a decisive tendency in sustainable economic development; reduction in emissions and increase in the possibility to absorb greenhouse gases is becoming mandatory and important targets in socio-economic development.
National Program on Economical and Efficient Use of Energy for the period 2019 – 2030 (Decision 280/QD-TTg of the Prime Minister) 13 March, 2019	Overall objectives "National program on economical and efficient use of energy in the period of 2019 - 2030" is the implementation step to concretize the energy development strategy, an important element in the National Sustainable Development Strategy, with the aim to turn Vietnam into a country using energy saving and efficiency. Specific objectives - To mobilize all the national and international resources for stimulating economical and efficient use of energy through the synchronous implementation of assignments and solutions of State management, technical assistance, science and technology research and product

Name of regulation (Date of enforcement)	Objectives
	development, market transition, human resource training and development, and also utilization of support from the international community in the field of economical and efficient use of energy; - To formulate the habit of using energy economically and effectively in all social activities; to reduce intensive use of energy in a variety of economic sectors and industries; energy efficiency becomes a regular activity in key energy users and key economic sectors that consume a lot of energy, with an aim at green growth and sustainable development.

Source: Prepared by Nippon Koei based on each policy.

2.2.2 Actions to climate change by HCMC

(1) Climate Change Action Plan (CCAP)

In 2013, HCMC regulated Climate Change Action Plan until 2015 (CCAP 2013-2015). Then, Climate Change Action Plan 2017-2020 with vision to 2030 for 2017 (CCAP 2017-2020) was published in 2017 and at present, draft of CCAP targeting 2021-2025 has been prepared for announcement soon.

CCAP declare that HCMC improves efficient use of energy and other resources under socio-economic development to contribute to national GHG reduction target and aims at development of low-carbon society. Important sectors for promotion of climate change countermeasures, designated in CCAP are “Urban Planning, Energy”, “Transportation”, ”Industry”, “Water management”, “Waste management”, “Construction”, “Safety”, “Agriculture, Tourism/Culture/Public awareness”.

Table 2.6 Overview of CCAP

Name of Plan	Climate Change Action Plan until 2015	Climate Change Action Plan 2017-2020 with vision to 2030
Date of enforcement	15 May, 2013	17 March, 2017
Objectives	- To upgrade mechanisms and policies to manage, administer and guide the implementation of CCAP - To consolidate and strengthen management capacity and strengthen linkages among departments and branches in HCMC to respond to climate change - To evaluate the level and impacts of climate change in Ho Chi Minh City and the degree of climate change impacts on the fields and industries - To raise public awareness about climate change	- To develop solutions to strengthen the capacity to respond to climate change of Ho Chi Minh City when implementing socio-economic development plannings and plans - To contribute to the national goal of reducing greenhouse gas emissions by improving the efficiency of energy and resource use in socio-economic development activities of Ho Chi Minh City, towards low-carbon social development - To improve the efficiency of the state management system in response to climate change, contributing to promoting sustainable socio-economic development.

	- To identify tasks and projects that prioritize climate change adaptation and mitigation.	
Target sectors	Urban Planning, Energy, Transportation, Industry, Water management, Waste management, Construction, Safety, Agriculture, Tourism/Culture/Public awareness"	

Source: Prepared by Nippon Koei based on Climate Change Action Plan until 2013 and Climate Change Action Plan 2017-2020 with vision to 2030

(2) Electricity Saving Program in Ho Chi Minh City

HCMC developed "Electricity Saving Program in Ho Chi Minh City" in March 2019. This program regulated reduction target of 1.5-2.0% of annual commercial electricity and measures to achieve installation of 200 MW of roof-top PV system onto public facilities in HCMC by 2025 which was decided as target in a national policy. Overview of the program is shown in Table 2-7.

Table 2.7 Overview of Electricity Saving Program in Ho Chi Minh City

Date of enforcement	18 Mar, 2019
Program implementer	Department of Industry and Trade, Department of Finance), Department of Information and Communications, EVN HCMC, other departments, district Peeples' Committees
Objectives	- To implement effectively the Prime Minister's Directive No. 34/CT-TTg dated August 7, 2017 on enhancing electricity saving and other legal regulations related to the economical and efficient use of energy. - To raise awareness of all organizations and individuals in the city on economical and efficient use of electricity, striving to save 1.5% to 2% on average commercial electricity output each year. - To develop renewable energy sources, with priority given to rooftop solar power sources at headquarters of State agencies, hospitals, schools, enterprises, striving to reach the target (200 MW) set out under the Decision No. 4690/QD-BCT dated December 15, 2017 of the Ministry of Industry and Trade by 2025

Source: Prepared by Nippon Koei based on Electricity Saving Program in Ho Chi Minh City

CHAPTER 3 CITY-TO-CITY COLLABORATION FOR ZERO-CARBON SOCIETY

3.1 BACKGROUND AND OBJECTIVE

3.1.1 Background of the City-to-City Collaboration

Osaka City began a collaboration with HCMC with conclusion of MOU on technology exchange with Saigon Water Corporation (SAWACO) in 2009 and has been supporting various environmental activities of HCMC.

Especially in 2013, whereas HCMC developed the Action Plan for Formulation of Low-carbon Society in HCMC in October 2013, Osaka City and HCMC concluded "MOU on Formulation of Law-carbon City in HCMC" for comprehensive cooperation to realize steady urban development of HCMC. Based on the MOU, the two cities have been implementing City-to-City Collaboration Project since 2013.

A list of achievements of City-to-City Collaboration between Osaka City and HCMC are shown in the following table.

Table 3.1 Achievements of City-to-City Collaboration project in HCMC

#	Month/Year	Overview
1	December 2009	Conclusion of MOU on technology exchange with Saigon Water Corporation (SAWACO)
2	April 2011	Launched JCM City-to-City Collaboration Project (Ongoing)
3	October 2013	Conclusion of MOU on Formulation of Law-carbon City in HCMC
4	November 2015	Update of MOU on technology exchange with SAWACO
5	September 2016	Update of MOU on Formulation of Law-carbon City in HCMC
6	September 2016	HCMC Climate Change Action Plan 2017-2020 and Prospects until 2030
7	June 2018	Start to support on introducing a "hybrid rainfall forecasting system" for South Regional Hydro Meteorological Center (SRHMC) by Meteorological Engineering Center
8	December 2018	Update of MOU on technology exchange with SAWACO
9	September 2019-January 2020	Support for implementation of HCMC's CCAP through JCM model project formulation
10	November 2019	"Mayor-level Policy Dialogue for Low-carbon Society between Osaka City and HCMC" in HCMC
11	November 2019	"Introduction of high-efficiency air conditioner (Variable Refrigeration Flow, VRF) and air-cooled chiller to hotels and office buildings" was adopted as JCM model project
12	January 2020	"Project Collaboration Agreement toward Improving Accuracy of Rainfall Prediction for Ho Chi Minh City" was concluded between Osaka City and SRHMC

Source: Prepared by Nippon Koei

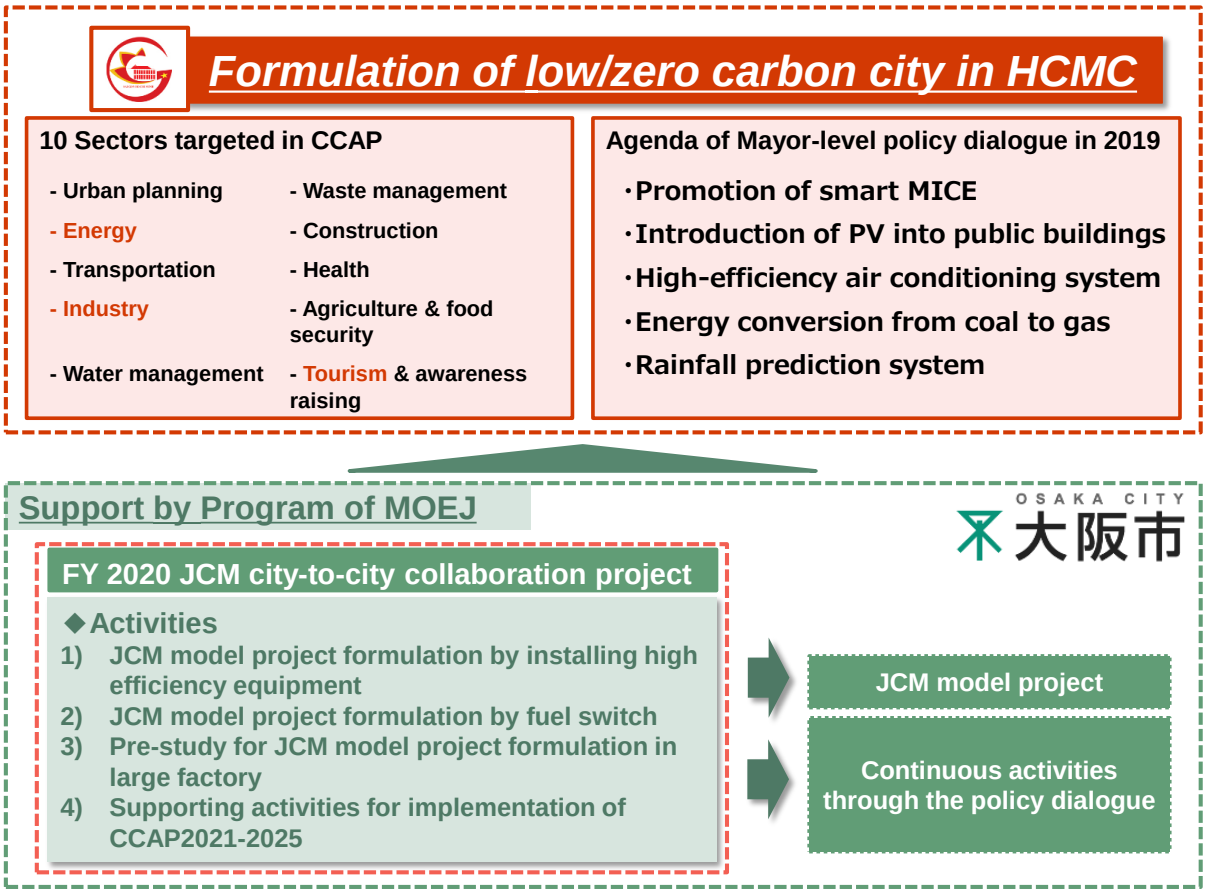
In this fiscal year, based on the good collaboration between HCMC and Osaka City, the MOU was extended and updated by reflecting previous achievements of City-to-City collaboration and the latest needs for decarbonization of HCMC.

3.1.2 Objective of the City-to-City Collaboration

As a second year of 3-year plan of the City-to-City Collaboration, JCM model project formulation was implemented to introduce energy-saving technology such as high-efficiency air-conditioning system or boilers for industrial and public sectors in HCMC in FY2020. In addition, this study aims to support implementation of CCAP 2021-2025, institutional development and JCM model project formulation.

3.2 APPROACH OF CITY-TO-CITY COLLABORATION

The image of approach of City-to-City Collaboration is shown below.



Source: Prepared by Nippon Koei

Figure 3-1 Image of approach of City-to-City Collaboration

3.3 STUDY RESULTS FOR CITY-TO-CITY COLLABORATION

3.3.1 Overview of the City-to-City Collaboration

Results of the City-to-City Collaboration activities conducted during the Project are presented in the following table. Meeting materials are attached as Attachment-1.

Table 3.2 Overview of the City-to-City Collaboration

Content	Schedule	Description
Online Kick-off Meeting (Osaka City-HCMC)	16 September 2020	Kick-off meeting with Osaka City, HCMC-DONRE and Nippon Koei was conducted online. Following items were discussed and it was agreed to continue collaboration/discussion for project formulation. 1) Confirmation of the updated contents of MOU 2) Confirmation of a schedule of policy dialogue 3) Proposal for installation of PV project to public facilities with leasing 4) Consultation with the related governmental agency for JCM model project formulation
Kick-off Meeting to Ministry of the Environment Japan	18 September 2020	Kick-off meeting with MOE, Osaka City and Nippon Koei was conducted by face-to-face (partially conducted online). Achievements from last fiscal year, and target facility/project and project schedule were confirmed. It is agreed to amend the contract because of increase of online activities.
Online Meeting between Osaka city and Japanese companies for JCM model project formulation	2 October 2020 14 October 2020	Online meeting with Osaka City and Osaka companies was conducted to exchange opinions to formulate energy-saving project in buildings for next fiscal year.
Online Meeting (Osaka City-HCMC)	7 October 2020	Online meeting with HCMC-DONRE, Osaka City and Nippon Koei was conducted to discuss following items. 1) Exchange opinions about schedule of Policy Dialog 2) Confirmation of installation experiences of PV and information of candidate facilities
Online Progress Reporting to Ministry of the Environment Japan	14 December 2020	- Progress until Dec. 2020 was reported and new potential projects to introduce air-conditioning system (by IT company) and dimmable Light-Emitting Diode (LED) lightings (by lighting manufacture) were explained. - Progress of preparation for online workshop was reported. - Information sharing regarding 1) remote survey (data collection and project formulation) in COVID-19 pandemic and 2) ingenuity such as effective utilization of national staff.
Online Meeting (Osaka City-HCMC)	23 December 2020	- It was agreed that an original MOU signed by Mayor of Osaka would be sent to HCMC for sign of Mayor. - Schedule, contents and participants of online workshop were almost agreed between two cities and preparations were started assuming to hold it at the end of February 2021 - HCMC proposed introduction of PV solar to new public buildings in new city (Thu Duc City) inside HCMC and Osaka City agreed to contact the related organizations for the promotion.
Online Meeting with Johnson Controls-Hitachi Air Conditioning (JCH) for JCM model project formulation	19 January 2021	- Current status of on-going JCM model projects was shared and partial cancelation of project caused by COVID-19 was confirmed. - It was confirmed the difficulty of identification of candidate project due to low investment for new construction and renovation caused by COVID-19.

Content	Schedule	Description
		- Schedule and agenda of online workshop was confirmed and JCH agreed to have a presentation. - Schedule and Plan for City-to-City collaboration in FY2021 and continue participation of JCH was agreed.
Online Meeting with Osaka Gas for JCM model project formulation	21 January 2021	- Current status of on-going JCM model projects was confirmed. The project has not been affected by COVID-19 pandemic. - In parallel with the project finding in private factories, approach to industrial parks under HEPZA for project formulation was agreed. - Schedule and agenda of online workshop were confirmed and a presentation of Osaka Gas was agreed. - Schedule and plans for City-to-City collaboration in FY2021 and continuous participation of Osaka Gas was agreed.
Participation in online City-to-City collaboration seminar	1 February 2021	"Seminar on City-to-City Collaboration for Creating a Zero-carbon Society" was held online by MOE. A total of over 100 representatives attended the meeting from Japanese and overseas cities carrying out City-to-City Collaboration Programme, and its representative entities and partner companies. Presentations on City-to-City Collaboration Programme and JCM Model Project trends and a panel discussion on how to execute projects in the COVID-19 pandemic.
Online Meeting between Osaka city and DOT	24 February 2021	Current status of City-to-City Collaboration project activities was explained by Osaka City and Nippon Koei. The current situation and issues of Tourism sector damaged by COVID-19 was discussed and opinions of future collaboration between DOT and Osaka City were exchanged.
Online Final Reporting to Ministry of the Environment Japan	1 March 2021	Achievement of City-to-City Collaboration project in FY2020 and progress of JCM model project formulation were reported to MOE. In addition, issues on the project in COVID-19 pandemic and action plan of FY2021 were explained.
Online workshop	5 March 2021	Technical information of renewable energy and energy saving were presented by Japanese companies to HCMC and Vietnamese companies for JCM model project formulation.

Source: Prepared by Nippon Koei

3.3.2 Activities related to Institutional support

There are following three activities related to institutional support under the City-to-City Collaboration in this fiscal year.

(1) Support on implementation of HCMC's CCAP 2021-2025

In FY2019, organization of information related to HCMC's CCAP 2021-2025 and support for the planning were conducted as a part of City-to-City collaboration activities.

In this fiscal year, although opportunities of discussion were physically limited by COVID-19 pandemic, MOU on "Formulation of Law/Zero-carbon City between HCMC and Osaka City" was updated in December 2020. Osaka City agreed to share experience and lesson learned

regarding climate change action and support implementation of HCMC's CCAP 2021-2025 through formulation of JCM model project.

According to the updated MOU, more specific low/zero-carbon activities and projects were described as follows,

- Proceeding with development of human resources, an organization and a system in order to manage the progress toward the steady implementation of the CCAP
- Sharing professional skills and knowledge in order to smoothly implement measures, research and assessment of greenhouse gas emissions toward the achievement of goals listed in the CCAP for 2020-2030
- Realizing a low/zero-carbon society by generating new projects including the installation of solar power generation system in public facilities, the promotion of smart MICE and the creation of large scale low/zero-carbon projects such as JCM
- Improving other environmental issues such as water treatment, waste management and public relations for climate change through sharing information and knowledge.

(2) Support on JCM model project formulation in public sector

As a support on JCM model project formulation in public sector, introduction of PV system to HCMC's public facilities has been considered since past years.

In addition to continuous support for JCM model project formulation in a candidate facility under HCMC, the discussed a potential of JCM model project to new public facilities in Thu Duc City where three wards will be integrated inside HCMC was discussed.

Public tender is necessary in all projects that require initial investment, which is a large constraint for financing and scheduling of JCM model project formulation. Therefore, the possibility of leasing with JCM was considered with Japanese leasing company and it was proposed to HCMC.

Including selection of candidate facilities in HCMC, JCM model project formulation will be supported in FY2021 through continuous discussion.

(3) Support on JCM model project formulation in industrial sector

There is a potential of large-scale JCM model project in industrial sector such as industrial park and factories because of large consumption of energy. There are 18 industrial parks in HCMC including many factories of Japanese company. In this fiscal year, providing information to target facilities in HCMC was done with a support of HEPZA.

In next fiscal year, it is scheduled to continue discussion for identification of potential industrial park and factories and to support JCM model project formulation.

3.3.3 JCM Seminar on City-to-city Collaboration

On February 1, 2021, Japan's Ministry of the Environment organized the "Seminar on City-to-City Collaboration for Creating a Zero-carbon Society" online, with over 100 participants from

Japanese and overseas cities carrying out City-to-City Collaboration Programme, and its representative entities and partner companies

After the organizer gave an opening speech, International Cooperation and Sustainable Infrastructure Office of MOE, Office of Market Mechanisms of MOE, and Asian Development Bank gave presentations entitled "Overview of support menus for development of zero-carbon society", on developments and trends of City-to-City Collaboration Programme, JCM Model Project, and Japan Fund for the Joint Crediting Mechanism. In the following panel discussion, City of Kitakyushu, Oriental Consultants Co., Ltd. and Nippon Koei discussed how to carry out the City-to-City Collaboration Programme during COVID-19 pandemic, and on the approaches and means required for overseas business development.

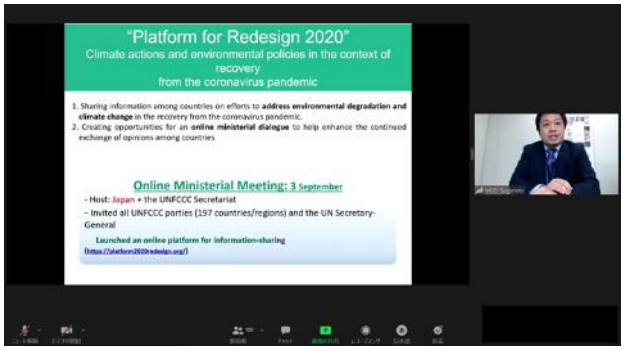
Principal Deputy Director of International Cooperation and Sustainable Infrastructure Office of MOE made a closing speech, saying that Japan will enhance its alliances and support the new needs arising from green recovery activities, and how it is important for Japan and other countries to share each other's experiences.

The overview of the seminar is shown in the table below.

Table 3.3 Outline of the City-to-City Collaboration Seminar

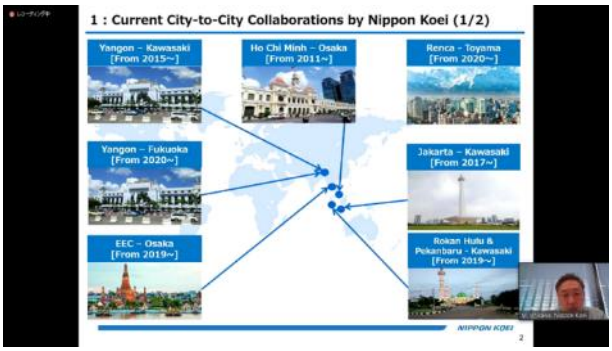
#	Date & Time	Contents	Participants (Viewers)
1	January 27 (Wed) - February 3 (Wed)	1. Introduction of the 20 collaboration projects for FY2020 ■On-demand video viewing	Project members & Public (registered people only)
2	February 1 (Mon), 14:00-16:00	2. Closed online seminar (Zoom meeting) ■Information sharing on the Japanese government support and open call for the next fiscal year ■[Panel discussion] How can we proceed projects in the corona era?	Project members only

Source: Quoted from a material created by IGES

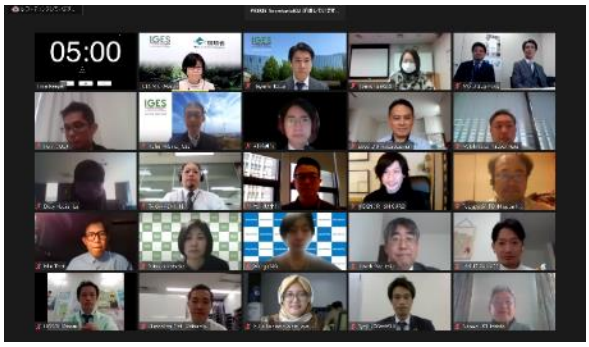


Presentation by MOE

Panel discussion



Presentation by Nippon Koei



Participants in the seminar

3.3.4 Online Technical Workshop

The Technical Workshop was implemented online on March 5th, 2021 in consideration of difficulty of visit to Vietnam and prohibited period of face-to-face meetings in Vietnam due to COVID-19 pandemic.

DONRE and HEPZA invited industrial parks in HCMC including target companies of large-scale JCM model project formulation. Nippon Koei presented achievements of the City-to-City Collaboration project in FY2020 while Osaka City had a presentation regarding activity plans in FH2021. In addition, four companies participating in and cooperating for this project, introduced their energy-saving and renewable technologies.

Agenda of the workshop is as follows. Presentation materials are attached as Attachment-3.

Table 3.4 Agenda of Online Technical Workshop

#	Time(*)	Agenda	Speaker
1.	15:00-15:05	Opening remarks	HCMC
2.	15:05-15:10	Opening remarks	Manager for International Cooperation Osaka City
3.	15:10-15:25	Introduction of City-to-City collaboration and JCM project formulation	Team leader Nippon Koei
4.	15:25-15:40	Explanation of plan of City-to-City Collaboration project in FY2021	Senior Operations Officer for International Cooperation Osaka City
5.	15:40-16:20 (10min*4)	Technical proposals from Japanese companies (about energy saving, renewable energy and fuel switch in Industrial park) 1. Fuel switch 2. Air conditioning system 3. LED lighting 4. PV Solar power generation	Japanese private companies
6.	16:20-16:50	Q&A session	---
7.	16:50-17:00	Closing remarks	HCMC and/or Osaka City

(*) Vietnam time
Source: Prepared by Nippon Koei

CHAPTER 4 JCM MODEL PROJECT FORMULATION STUDY

4.1 ACHIEVEMENTS OF JCM MODEL PROJECT FORMULATION THROUGH CITY-TO-CITY COLLABORATION IN FY2020

4.1.1 Introduction of High-efficiency Air-conditioning System

In FY2020, JCH, who is a partner company of City-to-City collaboration project, applied for JCM model project "Introduction of High Efficiency Air-conditioning System to Hotel in Ho Chi Minh City" and it was adopted by MOE.

This was the second JCM model project for JCH from last fiscal year, and a roll-out JCM model project, expected in this City-to-City Collaboration project, was achieved.

According to Global Environment Centre Foundation (GEC) official web site, this project reduces GHG emissions by introducing a high efficiency air-conditioning system into a new hotel in Ho Chi Minh City to save power consumption.

Hotel Outline:

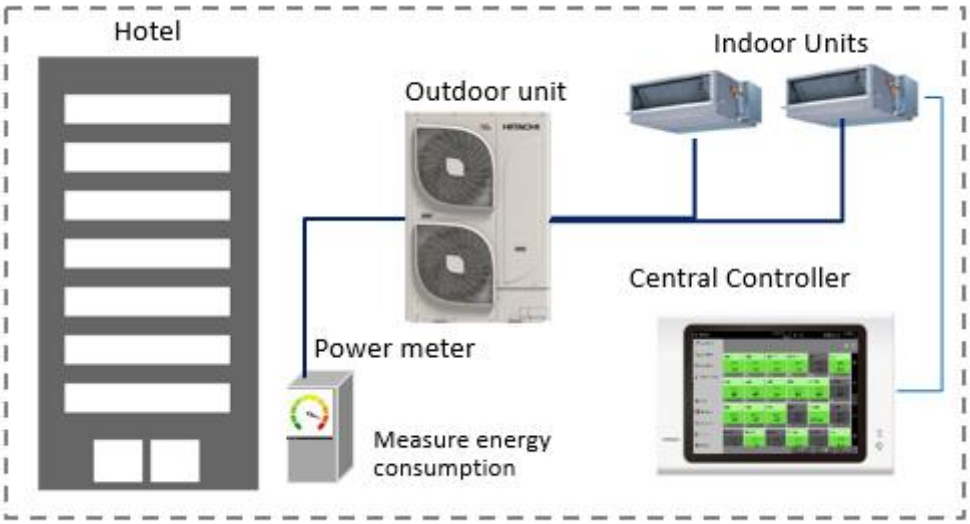
19 floors above ground, 3 floors underground, 125 rooms

Introduced facilities:

54 Outdoor units, 169 Indoor units, 24 All flesh units.

Expected GHG Emission Reductions:

184tCO_2/year



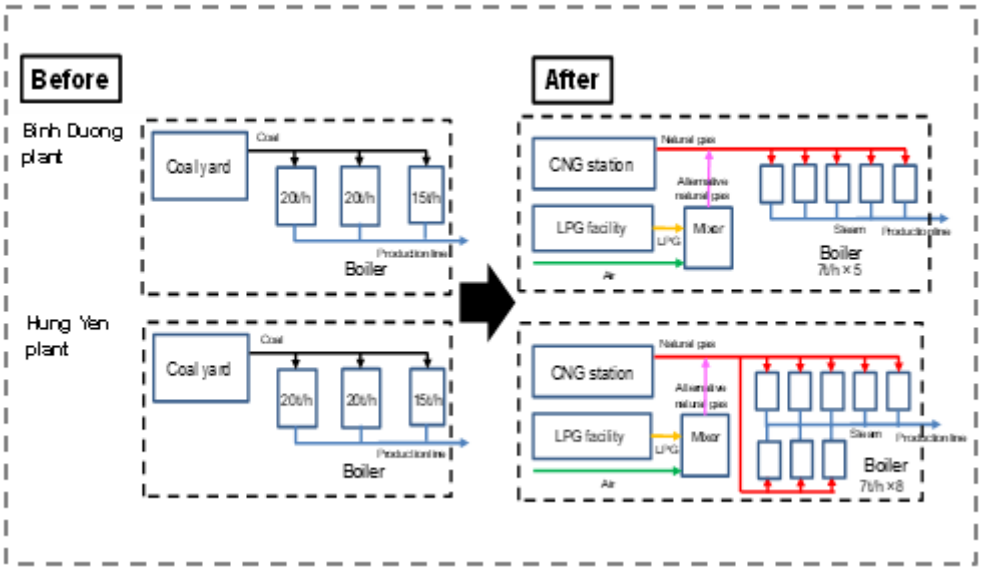
Soruce: GEC web site(https://gec.jp/jcm/projects/20pro_vnm_05/)

Figure 4-1 Image of the system and technlogy introduced in the JCM model project (High efficiency Air-conditioning System)

4.1.2 JCM model project for introduction of Gas Once-through Boiler

In FY2020, Sojitz Osaka Gas Energy Co., Ltd. (SOGEC), which is a partner company of City-to-City collaboration project and a company invested by Osaka Gas Co., Ltd., applied for JCM model project ” Introduction of High Efficiency Boiler System to Food Factory” and it was adopted by MOE.

According to GEC official web site, this project replaces existing coal boilers at the Binh Duong plant and Hung Yen plant operated by Acecook Co., Ltd. with high-efficiency once-through boilers and also converts fuel from coal to Compressed Natural Gas (CNG) and Liquefied Petroleum Gas (LPG). The boiler system flexibly responds to fuel market trends and reduces GHG emissions. Annual GHG emission reduction is estimated 7,631 tCO2/year.



Soruce: GEC web site(https://gec.jp/jcm/projects/20pro_vnm_04/)

Figure 4-2 Image of the system and technlogy introduced in the JCM model project (High efficiency Once-through Boiler)

4.2 JCM MODEL PROJECT FORMULATION FOR INTRODUCTION OF HIGH EFFICIENCY EQUIPMENT (AIR-CONDITIONING SYSTEM)

4.2.1 Outline of the study

In the industrial sector in HCMC, energy consumption is increasing year by year. Some companies are becoming aware that their daily power costs need to be improved and reduced. HCMC is a city in the tropical monsoon region, with air conditioning being used throughout the year and widely deployed in various buildings in the city. Therefore, energy saving of the air conditioning equipment is effective for reducing energy consumption and environmental load.

This year, in cooperation with JCH, a JCM Model Project formation study was conducted on the introduction of high-efficiency air conditioning equipment in HCMC. JCH is a Japanese

subsidiary of a joint venture which was established by Johnson Controls and Hitachi Global Life Solutions in October 2015. JCH manufactures and sells air conditioning equipment.

Although the field survey was limited because of COVID-19 pandemic, the main focus was on continuation of survey from the past year and data collection for finding new candidate company as a project partner.

Table 4.1 Study contents for Introducing Air-conditioning System

#	Study contents	Outline
1	Examination of specifications of introduced equipment	The specification of equipment was confirmed to be applicable for similar facilities because of the records of introduction in Vietnam.
2	Formulation of project plan and evaluation of project feasibility	The project cost was estimated based on the expected number of equipment. The energy saving effect, the payback period of the investment, and the amount of CO2 emission reduction were examined.
3	Review and finalize the International Consortium	The international consortium and the implementation system were examined for the application for JCM model project. JCH is supposed to be the representative operator.
4	Form MRV plan	An appropriate monitoring plan was examined for the purpose of the application for JCM model project.

Source: Prepared by Nippon Koei

4.2.2 Specification of installed technologies

In this study, the introduction of JCH made multi air-conditioner for buildings is being considered. The main advantages of VRF are summarized below.

- Energy loss is minimized by introducing advanced technology to compressors, heat exchangers and outlets.
- Power savings by properly calculating the cooling capacity which is required by each indoor unit.
- By standardizing the operation time of each unit, the burden can be dispersed.
- Easy installation of equipment due to small size and light weight.
- Various pipe connections are possible, even in complex buildings easily.

Souece: Hitachi-Johnson Controls Air Conditioning, Inc

Figure 4-3 Image of High-efficiency Air-conditioning System

4.2.3 Results of the Feasibility Study

For the aim to formulate JCM Model Project by the introduction of high-efficiency air-conditioning equipment, data collection was held regarding private companies in HCMC.

In case that face-to-face interviews were difficult due to COVID-19, information collection and opinion exchange was carried out through e-mail and online meetings.

Although it was outside of HCMC, outline of JCM and application procedure were explained to a Vietnamese company interested in JCM model project. It plans to conduct field survey from FY2021 to confirm in detail such as specification of target equipment and quantity.

4.2.4 Project Plan and Project Evaluation

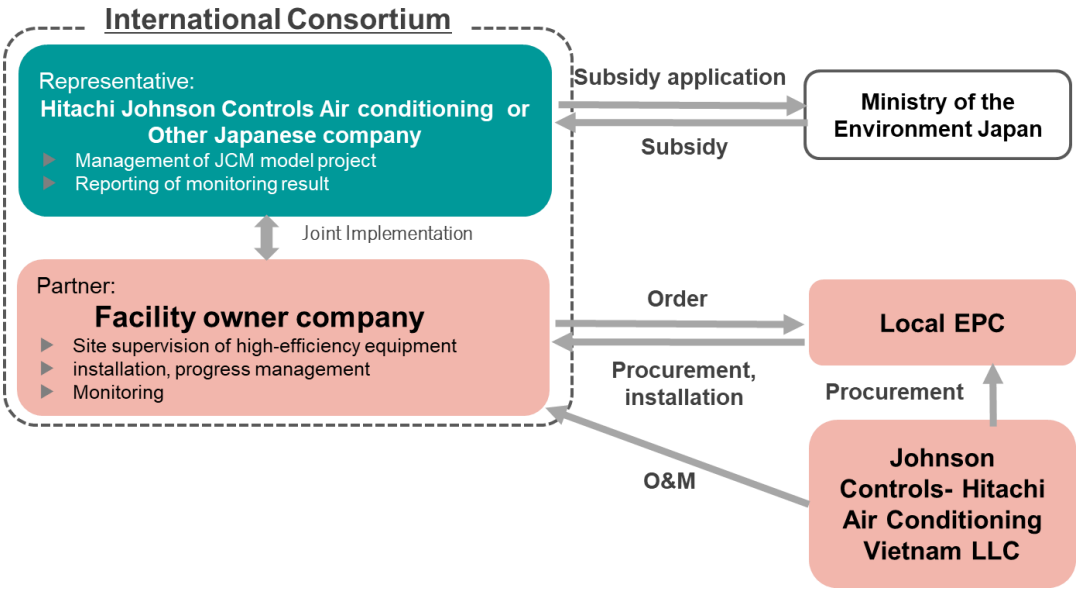
A JCM model project at a hotel was adopted in FY2020 so consideration of candidate project was started for application in FY2021. When similar scale hotel or office building were found, the existing methodology (VN_AM006) will be utilized for the estimation of GHG emission reduction. Annual GHG emission reductions of a standard building are expected to be around 200 tons/year. Based on the achievements of adopted JCM model project, both GHG reductions and cost-effectiveness satisfy the JCM application conditions.

4.2.5 Coordination for International Consortium

The representative company of the International Consortium is considered to be JCH or other Japanese company who has an experience of implementation of JCM model project.

Considering work efficiency of the JCM application, it is necessary to find multiple partner companies (Vietnamese company) because the reduction of GHG emission of one building is relatively small.

The expected implementation structure is as follows.



Source: Prepared by Nippon Koei

Figure 4-4 International consortium and implementation structure of JCM model project for introduction of High efficiency Air-conditioning System

4.2.6 MRV planning

In the implementation of the JCM Model Project, monitoring is assumed to be implemented as part of daily operation by operation manager in the facilities. Monitoring report will be submitted to MOE by a Representative company.

4.3 JCM MODEL PROJECT FORMULATION FOR INTRODUCTION OF HIGH EFFICIENCY EQUIPMENT（ONCE-THROUGH GAS BOILER）

4.3.1 Outline of the study

Since last fiscal year, in cooperation with Osaka Gas, a JCM model project formation study on the introduction of a high efficiency gas once-through boiler in HCMC have been conducted. Besides, Osaka Gas Singapore Pte. Ltd., an Osaka Gas 100% owned subsidiary company, established a joint venture company SOGEC in 2019 with Sojitz Corporation and Sojitz Vietnam. The company operates a natural gas supply business in Vietnam.

Once-through boiler from Japanese boiler manufacturer Miura Co., Ltd. is assumed to be installed in this project.

For JCM model project formulation in FY2021, mainly continuous discussion with Vietnamese companies, Japanese companies and industrial parks who provided information last year, were carried out. As a roll-out JCM model project, JCM model project formulation was conducted using the same procedure.

Table 4.2 Study contents for Introducing Once-through Gas Boiler

#	Study contents	Outline
1	Examination of specifications of introduced equipment	The specification of equipment was confirmed to be applicable for similar factories because of the records of introduction in Vietnam.
2	Formulation of business plan and evaluation of business feasibility	The project cost was estimated based on the expected number of equipment. The energy saving effect, the payback period of the investment, and the amount of CO2 emission reduction were examined.
3	Review and finalize the international consortium system	The international consortium and the implementation system were examined for the application for JCM model project.
4	Preparation of MRV plan	An appropriate monitoring plan was examined for the application for JCM equipment subsidy project.

Source: Prepared by Nippon Koei

4.3.2 Specification of installed technologies

In this study, the introduction of a high-efficiency gas once-through boiler manufactured by Miura is being considered as a roll out JCM project. High-efficiency once-through boilers push boiler water to one direction of the water tubes and convert it to steam without circulation. It keeps a small amount of water, which leads to easy start-up. Also, as its size is small, it can be said that the boiler is space-saving. Besides, the once-through boiler is a technology has been developed and introduced mainly in Japan, which has features such as low noise and low NOx emission.

The following table shows the advantages of once-through boiler over other boilers.

Table 4.3 Advanced Performance of Once-through Gas Boiler

Advantage	Overview
Once-through boiler with high mobility, load following, and advanced control	Different from water tube boiler, once-through boiler produces steam in a pile. By this, starting and response to load variation is fast. High-level control for stable steam production amount and temperature control is conducted.
Space saving	Only 60% of space is necessary compared with other boilers.
High efficiency in low load operation	It controls in response to load variation. High efficiency operation is possible in broad range of load.
Recovery of exhaust combustion gas by economizer	High-efficiency is enabled by an economizer that recovers remaining heat in exhaust gas and pre-heating the water pressurized by feed-in pump.
Low NOx, low CO emissions	Emission of NOx and CO is low, which was enabled by lowering combustion temperature and arrangement of nozzle location.

Source: Prepared by Nippon Koei

Source: MIURA

Figure 4-5 Image of High-efficiency Once-through Gas Boiler

4.3.3 Results of the study

To formulate JCM model project to introduce high efficiency equipment, interview survey to HCMC companies mainly, which had discussion from past fiscal year, was continued. In addition, for industrial parks, which had not been approached before, preparation work of promoting JCM model project and introduction of applicable technologies were conducted for face-to-face discussion and field survey in FY2021.

4.3.4 Project Plan and Project Evaluation

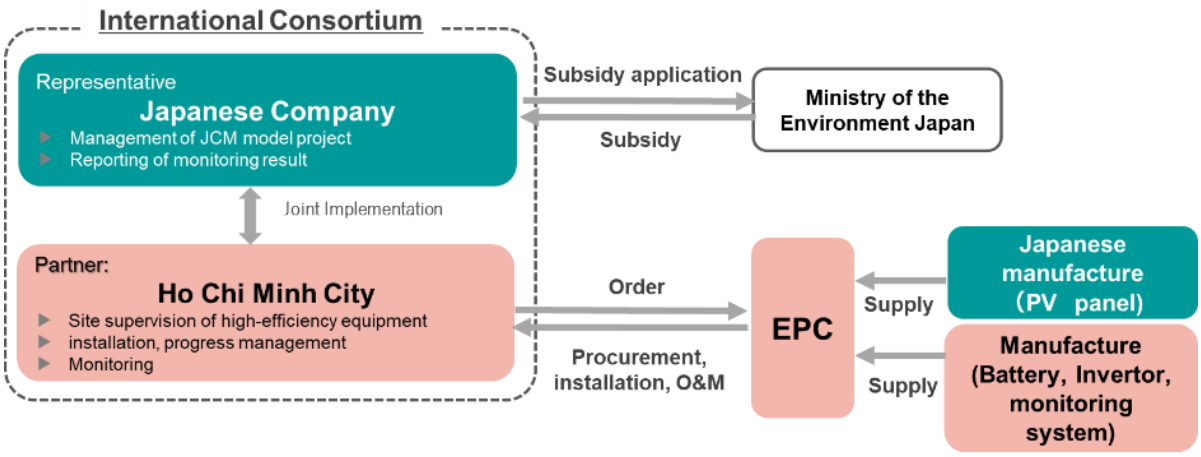
Based on the achievement of adopted JCM model project in FY2020, the project plan and evaluation were roughly assumed, and the same methodology of estimation for GHG emission reductions and cost-effectiveness would be used for JCM application.

4.3.5 Coordination for International Consortium

The international consortium for JCM model project is assumed as follows. It is ideal that factory's parent company is a representative company in terms of smooth management of the JCM model project and confirmation and reporting of the monitoring results.

If a partner company is a Vietnamese company, it would be necessary to request a company, who has rich experiences of implementation of JCM model project, to be a representative company.

Then, a Japanese boiler manufacturer would supply a high efficiency gas once-through boiler to the local EPC and install boilers in the Factory. Sojitz Osaka Gas Energy Company Ltd. would supply natural gas for once-through boilers.



Source: Prepared by Nippon Koei

Figure 4-6 International consortium and implementation structure of JCM model project for introduction of Once-through Gas Boiler

4.3.6 MRV Planning

In the implementation of the JCM Model Project, monitoring is assumed to be implemented as part of daily operation by the Partner company. The data required for MRV will be measured and recorded mainly by the equipment manager of the Partner company, with the support of the Japanese subsidiary of boiler manufacturer in Vietnam. The results will be reported to the Representative company. The measurement data required for estimation of GHG emission reduction is the fuel consumption of introduced high efficiency gas once-through boiler. And it is expected that monitoring will be carried out under the above structure.

4.4 JCM MODEL PROJECT FORMULATION FOR INSTALLATION OF ENERGY-SAVING EQUIPMENT (DIMMABLE LED LIGHTING)

4.4.1 Outline of the study

Since Japanese office building management company, Company S is planning to update interior lightings of their building in Vietnam, JCM model project formulation for dimmable LED lightings to the building was carried out.

Studied technology is dimmable and highly efficient LED lighting sold by Company B who is Vietnamese subsidiary of lighting equipment manufacturer A based in Osaka City.

Study contents are as follows.

Table 4.4 Study contents for installation of dimmable and highly efficient LED lighting

#	Study contents	Outline
1	Information collection of LED lightings in Vietnam	Information collection regarding dissemination status of LED lightings in Vietnam and products sold in HCMC.
2	Consideration of specification of installed technologies	Study of existing equipment and consideration of installed technologies were implemented. The installed technologies were proposed to Company S.
3	Project evaluation	Project cost, energy-saving effect, payback period and CO2 emission reduction were considered.
4	Consideration of international consortium and implementation structure	International consortium and implementation structure were considered for application for JCM model project

Source: Prepared by Nippon Koei

4.4.2 Information collection of LED lighting in Vietnam

In order to confirm dissemination status of LED lighting in Vietnam, information of lighting market in Vietnam was collected as well as information of Japanese LED lighting technologies which has been spreading in Vietnam (see attachment 4).

In accordance with collected data, overall lighting market in Vietnam drastically increased from VND 5,275 billion in 2015 to VND 9,066 billion in 2020 and share of LED lighting sharply rose from 27.7% in 2015 to 64.4% in 2020. Market scale of “Commercial and service facility” including candidate building of the study is VND 3,626 billion in 2020 and 65% of total is occupied by LED lighting. The detail of lighting market in Vietnam is shown below.

Table 4.5 Trend of lighting market scale in Vietnam

List of lighting equipment	2015	2020	List of LED lighting equipment	2015		2020	
	Billion VND	Billion VND		Billion VND	%	Billion VND	%
Household lighting equipment	1952	3354	LED household lighting products	772	39.5	2012	60.0
Commercial and service lighting equipment	2110	3626	LED commercial & service lighting products	844	40.0	2357	65.0
Industrial lighting equipment	316	544	LED industrial lighting products	79	25.0	217	39.9
Exterior lighting equipment	897	1542	LED exterior lighting products	296	33.0	1164	75.5
Total	**5275**	**9066**	**Total**	**1991**	**37.7**	**5750**	**63.4**

Source: Prepared by NKV based on "Local Development and Promotion of LED Technologies for Advanced General Lighting in Viet Nam"

4.4.3 Specification of installed technologies

Advantages of dimmable and highly efficient LED lighting of Company A are their high efficiency and functionality.

Table 4-6 below shows comparison of LED lighting sold in Vietnam by three manufacturers. Efficiency of Company A is 160 lm/W which is much better than around 110 lm/W of products of a local manufacturer, Company C and of European manufacturer, Company D.

Source: Company A

Figure 4-7 Dimmable LED lighting of Company A

Table 4.6 Comparison of LED lighting

Supplier (Base country)	A (Japanese)	C (Vietnamese)	D(Dutch)
Length (mm)	1,200	1,210	1,195
Color temperature (K)	5,000	3,000	4,000
Luminous (lm)	6025	7600	3370
Power consumption (W)	37.8	72	30
Efficiency (lm/W)	159.4	105.5	112.3

Source: Prepared by Nippon Koei based on infomation of the three manufacturers

Furthermore, LED lighting of Company A is dimmable with scheduling operation and manual operation. By comparing with existing lighting in office building of Company S, approximately 40% of lighting rate can be cut, as a result of study by Company B.

																	(C)	(D) = B x C
Qty (B)	1-6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21-24	Lighting time 1unit	Lighting time All unit
2800	0	50	100	100	100	100	100	100	100	100	100	100	100	100	50	0	13	36,400
2800																	TTL	36,400

																	(C)	(D) = B x C
Qty (B)	1-6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21-24	Lighting time 1unit	Lighting time All unit
2800	0	40	55	100	85	70	10	55	55	55	55	55	50	50	40	0	7.75	21,700
2800																	TTL	21,700

Top: Existing lighting **Bottom**: After replacement with LED of Company A

Dimming effect -40.4%

Source: Company B

Figure 4-8 Reduction of lighting rate by scheduling operation

LED lighting of Company A can be controlled one by one with different dimming rate even if they are installed in the same space, enables keeping the same brightness in the space without difference of dark and bright positions. This leads to improvement of value of the office because this point is important for office workers from the perspective of indoor working environment.

4.4.4 Project evaluation

To apply for JCM model project in FY2021, GHG emission reduction, subsidy amount, cost-effectiveness and payback period were calculated. The result of the trial calculation is shown in Table 4-7 and Table 4-8. Since JCM methodology of interior LED lighting has not been developed in Vietnam, calculation was carried out based on approved methodology in Indonesia "AM_ID005: Installation of LED Lighting for Grocery Store". However, this methodology cannot take dimming effects into account, thus formula below was utilized to calculate annual electricity consumption and GHG reduction.

(PRJ annual GHG reduction) = (PRJ annual electricity consumption) x (Emission factor)
(REF annual GHG reduction)
= (REF annual electricity consumption) x (Emission factor) x (PRJ efficiency) / (REF efficiency)

(PRJ annual electricity consumption) = (Operation hour) x (No. of LED) x (Lighting input) x (Lighting rate)
(REF annual electricity consumption) = (Operation hour) x (No. of LED) x (Lighting input)

PRJ: Project ***REF: Reference***

Table 4.7 Trial calculation of GHG reduction and cost-effectiveness

#	Item	Figure	Unit	Remarks
a)	Operation hour	3,120	h/year	=13h/day x 240day (Condition)
b)	Number of lighting	2,800		Condition
c)	Input	37.8	W	Figure from catalogue
d)	Lighting rate	60	%	Study by Company B
e)	PJT annual electricity consumption	198	MWh	=a) x b) x c) x d)
f)	REF annual electricity consumption	330	MWh	=a) x b) x c)
g)	Luminous flux	6,025	lm	Figure from catalogue
h)	PJT efficiency	159.4	lm/w	= g) / c)
i)	REF efficiency	110.0	lm/w	AM_ID005
j)	Emission Factor	0.913	tCO2/MWh	GEC guideline for FY2020 JCM model project
k)	PJT GHG emission	180.9	tCO2/year	= d) x h) (AM_ID005)
l)	REF GHG emission	436.9	tCO2/year	＝f) x h) / i) x j) (AM_ID005)
m)	Annual GHG reduction	256	tCO2/year	= j) - i)
n)	Project period	12	year	legal lifetime
o)	Total GHG reduction	3,072	tCO2	= k) x l)
p)	Subsidy amount	[redacted]	JPY	Subsidy rate [redacted]%
q)	Cost-effectiveness	3,999	JPY/tCO2	= n) / m)

Source: Prepared by Nippon Koei

Table 4.8 Project evaluation

Item	Figure	Unit
Project cost	[redacted]	JPY million
Subsidized expense	[redacted]	JPY million
Assumed subsidy amount	[redacted]	JPY million
Reduction of electricity cost	[redacted]	JPY million/year
Payback period (without subsidy)	6.9	year
Payback period (with subsidy)	5.2	year

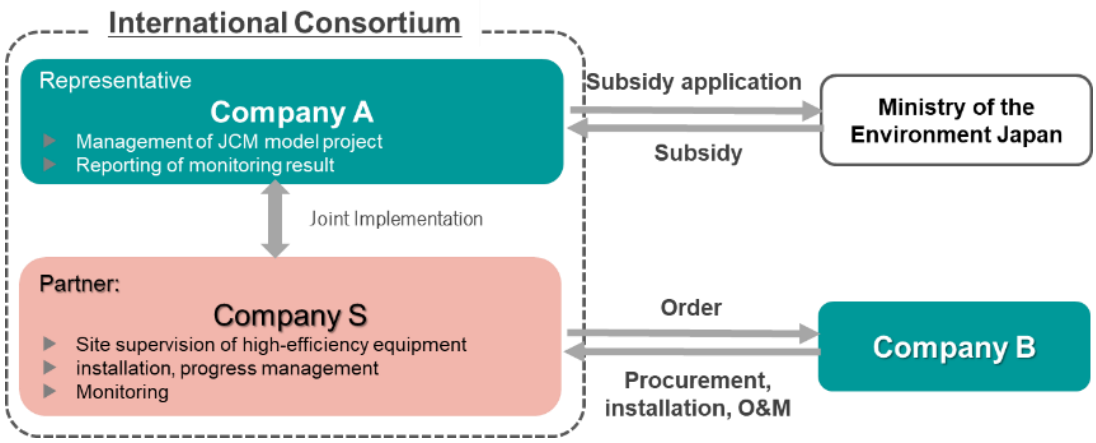
Source: Prepared by Nippon Koei

As a result of the trial calculation above, it was found that project for installation of LED lighting manufactured by Company A and sold by Company B has high potential as JCM model project. Thus, representative company (Company A), partner company (Company S) and supplier (Company B) has agreed to apply for FY2021 JCM Model Project.

In December 2020, Company A and Company B implemented interview to GEC, operating body of JCM model project. GEC showed their interest in this potential project and gave advice of points required to be confirmed and discussed for application.

4.4.5 Consideration of International consortium and implementation structure

International consortium and implementation structure below were assumed for applpocation for JCM model project. Company A, as a representative company, manages this poject comprehensively and implemet checking and reporting of monitoring results while Company S, as a partner company, order the LED lighting to Company B and owns them. Company B is in cahrge of procurement, installation and operation and maintenance.



Source: Prepared by Nippon Koei

Figure 4-9 International consortium and implementation structure of JCM model project for introduction of dimmable and highly efficient LED lighting

4.5 JCM MODEL PROJECT FORMULATION IN PUBLIC SECTOR (RENEWABLE ENERGY)

4.5.1 Outline of the study

To formulate JCM model project in public sector, information regarding candidate facilities and necessary technologies were collected through the interview to HCMC-DONRE.

As a result of previous study in FY2019, it was identified that HCMC have a high interest in renewable energy which contributes to decarbonization. Especially, installation of the roof-top PV system to public facilities were recognized as a high potential in HCMC. However, the project in public facilities owned by HCMC with initial investment, requires a public tender. If public tender is required, it is difficult to apply for JCM model project due to schedule, finance, implementation structure etc. Therefore, the possibility of leasing was considered as a method of introducing equipment without a tender.

In FY2020, the following items were studied.

Table 4.9 Study contents for JCM model project in public sector

#	Study contents	Outline
1	Consideration and analysis of condition of public tender	Based on the condition of public tender, financial scheme with low initial investment was considered.
2	Promotion of understanding of JCM subsidy scheme	To promote the understanding of HCMC, outline of JCM scheme and example of JCM for public facility in other country were introduced.
3	Examination of specifications of introduced equipment	The technical specifications suitable for JCM model project application conditions were examined.
4	Project evaluation	In case of 1MW PV solar generation, project cost, amount of power generation, the payback period of the investment, and the amount of GHG emission reduction were examined.

Source: Prepared by Nippon Koei

4.5.2 Specification of installed technologies

Although technologies to be installed in public facilities is decided depending on the purpose and scale, the following equipment (PV panel, inverter, battery, and monitoring system) is assumed to be introduced.

Table 4.10 Specification of target equipment

#	Equipment	Outline
1	PV panel	The PV panel is made by Japanese manufacturer and the specification needs to be suitable for public facility such as shape and weight and to have better power generation efficiency and durability.
2	Inverter	The specifications of inverter will be decided according to the compatibility with the solar panel.
3	Battery	Battery is introduced depending on the necessity. Manufacturers and standards depend on the scale and application of power generation. Specifications are selected

#	Equipment	Outline
		based on efficiency, size, price, ease of procurement, etc.
4	Monitoring system	The system needs to measure the amount of generated power for the calculation of GHG emission reduction and to control remotely for getting monitoring data. Optimal specifications for PV panels and other equipment are required.

Source: Prepared by Nippon Koei

4.5.3 Results of the study

In the case of introducing PV system (1MW), draft project plan with leasing was proposed to HCMC-DONRE. By participation of leasing company, it has advantages that there is no maintenance work/cost of HCMC during leasing period and that it is cheaper than the normal leasing fee because of JCM subsidy. Annual expense is only the leasing fee without initial cost. Therefore, it was decided that DONRE confirms whether public tender was necessary, with People's Committee.

According to DONRE, there was no specific candidate facilities owned by HCMC, but new public facilities and city hall of Thu Duc City which would be newly established inside HCMC was listed as candidate. The new facility has the advantage that it is easier to introduce PV system because engineering in consideration of the load capacity of the roof is available. Collection of information and consideration of project formulation will continue in the next fiscal year.

4.5.4 Project evaluation

With the aim of JCM application later than this fiscal year, project feasibility was evaluated. JCM methodology"VN_AM007_ver01.0 (Installation of Solar PV System)" was applied for the evaluation. Annual power generation, GHG emission reduction and cost-efficiently were estimated by assuming 1MW of PV system.

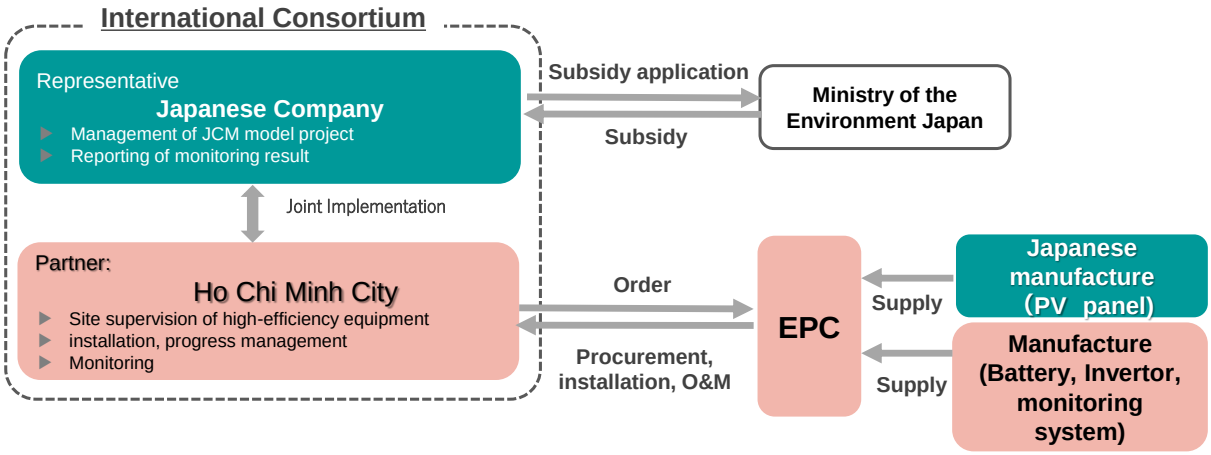
In addition, there are already four JCM model projects to install PV system in Vietnam, so subsidy rate is assumed to be maximally 30%.

Table 4.11 Trial calculation of project for installation of PV solar system

Items	Figure	Unit	Remarks
Project cost (rough calculation)	[redacted]	JPY million	Including PV panels, inverters, batteries, Monitoring system etc.
Annual power generation by renewable energy	1,444	MWh/year	Estimated by a calculation model
Annual GHG emission reduction	991	tCO2/year	EF (Renewable energy): 0.533 (tCO2/MWh)
Cost efficiency	Around 3,000	JPY/tCO2	Assumed condition

Source: Prepared by Nippon Koei

4.5.5 Consideration of international consortium and implementation structure



Source: Prepared by Nippon Koei

Figure 4-10 International consortium and implementation structure of JCM model project in public sector

4.6 JCM MODEL PROJECT FORMULATION OF PROJECT FOR INSTALLATION OF ENERGY-SAVING/RENEWABLE ENERGY TECHNOLOGIES TO INDUSTRIAL PARK

4.6.1 Outline of the study

Since Company W, a partner of this Project, has been considering a project for installation of a package of roof-top PV system, Energy Management System (EMS), electric motorcycles to industrial park in Vietnam, studies for formulation as JCM model project were implemented.

Study contents are as follows.

Table 4.12 Study contents and outline for installation of energy-saving and renewable energy technologies

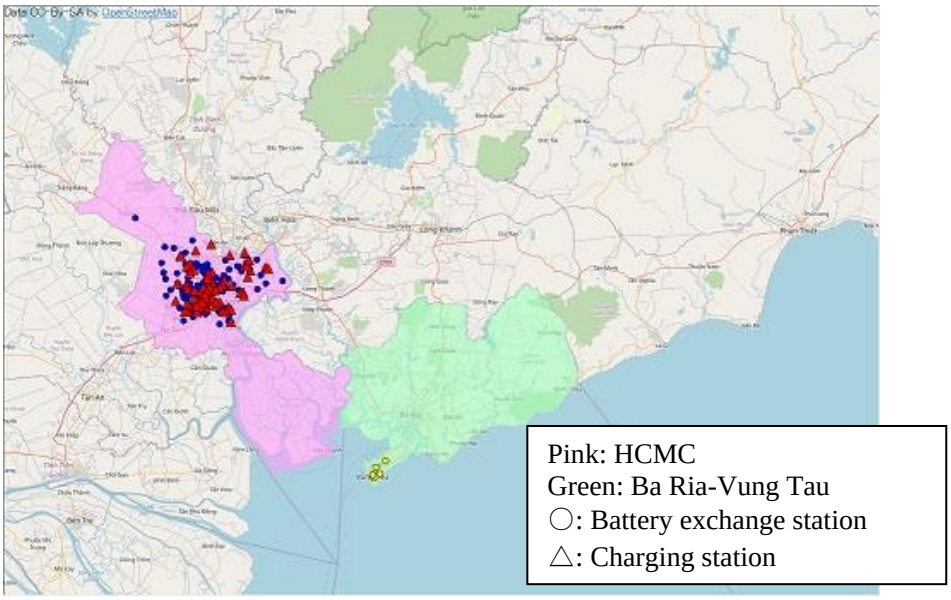
#	Study contents	Outline
1	Information collection regarding electric motorcycles in Vietnam	Dissemination status of electric motorcycles and information collection of products sold in Vietnam were carried out.
2	Consideration of specification of installed technologies	Study of existing equipment and consideration of installed technologies were implemented. The installed technologies were proposed to candidate industrial park.
3	Project evaluation	Project cost, energy-saving effect and CO2 emission reduction were calculated.
4	Consideration of international consortium and implementation structure	International consortium and implementation structure were considered for application for JCM model project

Source: Prepared by Nippon Koei

4.6.2 Information collection regarding electric motorcycles in Vietnam

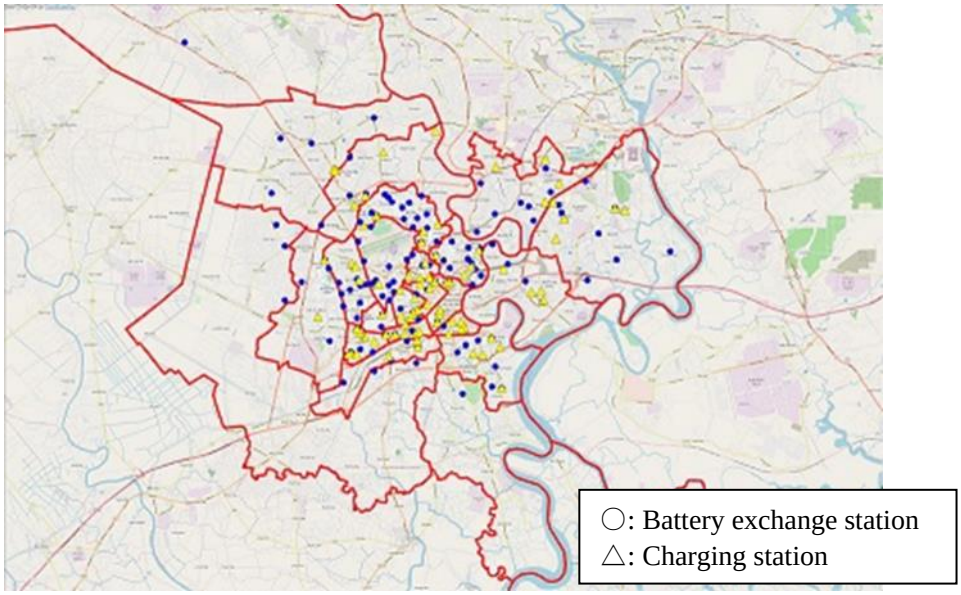
Motorcycles is the most popular transportation means for Vietnamese. According to National Transportation Safety Board, 45 million motorcycles was registered in the country by 2016 and whereas households with cars are only 2%, 86% of total households own a motorcycle (2014, Pew Research Center). On the other hand, gases emitted from motorcycles are recognized as one of main causes of air pollution in urban areas. Thus, dissemination of electric motorcycles is expected as a measure to overcome the pollution.

According to study by Ministry of Industry and Trade, 3 million electric motorcycles and scooters are being utilized in the nation and more than 200 products manufactured by companies from Vietnam, Taiwan Japan etc. are being sold. Company V, local company with the biggest share of electric motorcycle, has been developing charging stations and battery exchange stations actively for dissemination of electric motorcycles (Charging station: 98, Battery exchange station: 164). Location of facilities in HCMC and suburbs are illustrated in Figure 4-11 and Figure 4-12 below.



Source: Prepared by Nippon Koei based on website of Comapny V

Figure 4-11 Location of battery exchange stations and charging stations



Source: Prepared by Nippon Koei based on website of Comapny V

Figure 4-12 Location of battery exchange stations and charging stations in HCMC

4.6.3 Technologies to be studied

(1) PV panels

PV panels to be studied in the Project, is manufactured by local company, VSUN JSC. Panels of VSUN has been highly evaluated in the world and been listed in Tier 1 List of "2020 Global

PV Market Outlook" (Top 40 manufacturers in the world)[1] by Bloomberg Energy Finance. VSUN450-144MH, products studied in the Project are highly efficient with 450W maximum output and 20.37 % maximum efficiency.

Table 4.13 Specification of VSUN450-144MH

Module Type	VSUN450-144MH
Maximum Power - Pmax (W)	450
Open Circuit Voltage - Voc (V)	50
Short Circuit Current - Isc (A)	11.5
Maximum Power Voltage - Vmpp (V)	41.4
Maximum Power Current - Impp (A)	10.87
Module Efficiency	20.37%

Source: VSUN

(2) Energy Management System (EMS)

Functions of EMS was assumed as shown below.

Table 4.14 Function of EMS

Function	Overview
Output control command	To collect schedule files from power server and to command inverters to control output.
Monitoring services	To provide monitoring system for smooth operation, maintenance and management by sending emails at emergency, supervising conditions by PC and smartphones, creating output report etc.
EMS + batteries	To enable peak cut by supervising each measured data and equipment abnormality in offices, factories and hotels, and carrying out scheduling control and demand control of incidental facilities. To enable peak shift control and battery system for disaster preparedness by system structure with batteries

Source: Prepared by Nippon Koei

(3) Electric motorcycle

In order to select studied electric motorcycle, information collection from 4 companies selling electric motorcycles in Vietnam and comparison among their products were carried out. From the perspective of MRV, recording functions such as the driving distance were also taken into consideration.

[1] Indicator to show financial procurement capacity of PV project by nonrecourse loan. It is published through judgement with evaluation criteria such as bankability and financial security of PV module manufacturer.

Table 4.15 Comparison of electric motorcycles

Manufacturer (Country)	Advantages	Specification of main products	Price* (JPY)	Functions
1. Company V （Vietnam）	- Low price - Substantial charging stations and battery exchange stations	Lithium battery Output: 1,200 W Max speed: 48 km/h Max driving distance: 120km	60,000 - 250,000	➢ Recording driving record ➢ GPS ➢ Supervision of vehicle conditions ➢ Management of user ➢ Control via application
2. Company P （Vietnam）	- Low price	Lithium battery Output: 4,000 W Max speed: 65 km/h Max driving distance: 120km	70,000 - 160,000	Not confirmed
3. Company T （Japan）	- Local manufacturing	Lead-acid battery Output: 500 W Max speed: 50 km/h Max driving distance: 50km	Not confirmed	➢ GPS ➢ Recording driving distance and pattern ➢ Providing battery condition ➢ Providing transportation information
4. Company P （Italy）	- High-quality design	Lithium battery Output: 4,000 W Max speed: 45 km/h Max driving distance: 100km	Approx. 800,000	➢ Map function ➢ Recoding engine speed, engine output, max. speed, average speed, driving distance, fuel efficiency and battery voltage

*** Rate: VND 1 = JPY 0.0048**

Source: Prepared by Nippon Koei based on each company's website

As a result of the comparison above, electric motorcycles of Company V was selected as studied targets in terms of sufficienct charging facilities and recording functions. Lineup of Company V is as follows.

Table 4.16 Lineup of electric motorcycle of Company V

Name of product	KS	K	I	L
Output	1200 W	1200 W	1200 W	500 W
Max. speed	48 km/h	50 km/h	50 km/h	35 km/h
No. of batteries	**2**		**1**	**1**
Weight of battery	7.8 kg/ battery		7.8 kg/ battery	7.8 kg/ battery
Charger type	400 W		400 W	400 W
Time for fully charging	3h (90% SOC) or 4,8h (100% SOC)/ battery—		3h (90% SOC) or 4,8h (100% SOC)/ battery—	3h (90% SOC) or 4,8h (100% SOC)/ battery—
Battery capacity after 30 minutes of charging	15% (When the capacity before charging is less than 60%		15% (When the capacity before charging is less than 60%	15% (When the capacity before charging is less than 60%
Travel distance when battery is fully charged	120 km (at a speed of 30 km / h, using 2 batteries		70 km (at a speed of 30 km / h)	75 km (at a speed of 30 km / h)
Distance traveled by the vehicle when the battery is charged for 30 minutes	<18km (with 2 batteries)		<10km	<11km
Battery durability （No. of charging）	5 years （1,000 times）		5 years （1,000 times）	5 years （1,000 times）
Protection mode, waterproof	IP67 (Soak in water at a depth of 0.5m for 30 minutes)		IP67 (Soak in water at a depth of 0.5m for 30 minutes)	IP67 (Soak in water at a depth of 0.5m for 30 minutes)
Nominal capacity	22 Ah		22 Ah	22 Ah
Nominal voltage	50.4 V		50.4 V	50.4 V
Battery placement	Under the trunk		Under the footrest	Under the saddle

Source: Prepared by Nippon Koei based on website of Company V

4.6.4 Project evaluation

In this study, installation of roof-top PV system (700kW), batteries, electric vehicles for workers to an industrial park and optimal use by EMS were assumed. Electricity generated by PV system is supplied to charging station for electric motorcycles and the remain is supplied to factories in the industrial park, which leads to reduction of electricity consumption from grid.

Assuming the system structure above, project cost, energy-saving effect, GHG emission reduction were calculated as shown below.

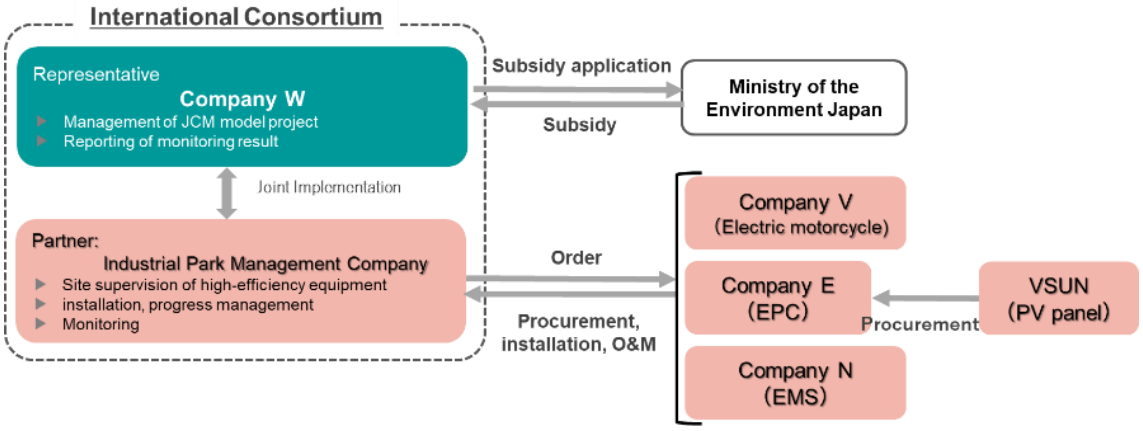
Table 4.17 Trial calculation of project for installation of energy-saving and renewable energy technologies

Items	Figure	Unit	Remarks
Project cost （rough calculation）	[redacted]	JPY million	Including PV panels, inverters, batteries, EMS, electric motorcycles, EPC cost
Annual power generation by renewable energy	1,011	MWh/year	Trial calculation by PVsyst
Fuel reduction of electric motorcycles	27.9	kL/year	Assumed condition
Annual GHG emission reduction	600	tCO2/year	EF (Renewable energy): 0.533 (tCO2/MWh) EF (Diesel） : 2.221 (tCO2/kL)

Source: Prepared by Nippon Koei

4.6.5 Consideration of international consortium and implementation structure

For application for JCM model project, international consortium and implementation structure were considered. It is assumed that international consortium is composed of Company W and industrial park management company and each supplier and EPC implement procurement, installation, maintenance etc. Whereas all of installed equipment is owned by the industrial park management company as a partner company, electric motorcycle is assumed to be used by workers in the industrial park.



Source: Prepared by Nippon Koei

Figure 4-13 International consortium and implementation structure of JCM model project for introduction of energy-saving and renewable energy technologies

CHAPTER 5 ISSUES AND INGENUITY IN CONDUCTING SURVEYS AGAINST THE BACKDROP OF THE COVID-19 PANDEMIC

The field surveys, consultations between the two cities, local workshops, city-to-city collaboration seminars, etc., which should have been major activities if 2020 were a normal year, were held completely online and conducted under physical restrictions due to the impact of the spread of the novel coronavirus after January 2019 in the city-to-city collaboration programme of fiscal 2020. However, some of the activities were carried out with ingenuity or replaced by alternative activities even against the backdrop of the COVID-19 pandemic. Or some activities were postponed until a future date. Those activities are summarized below for reference in the next fiscal year.

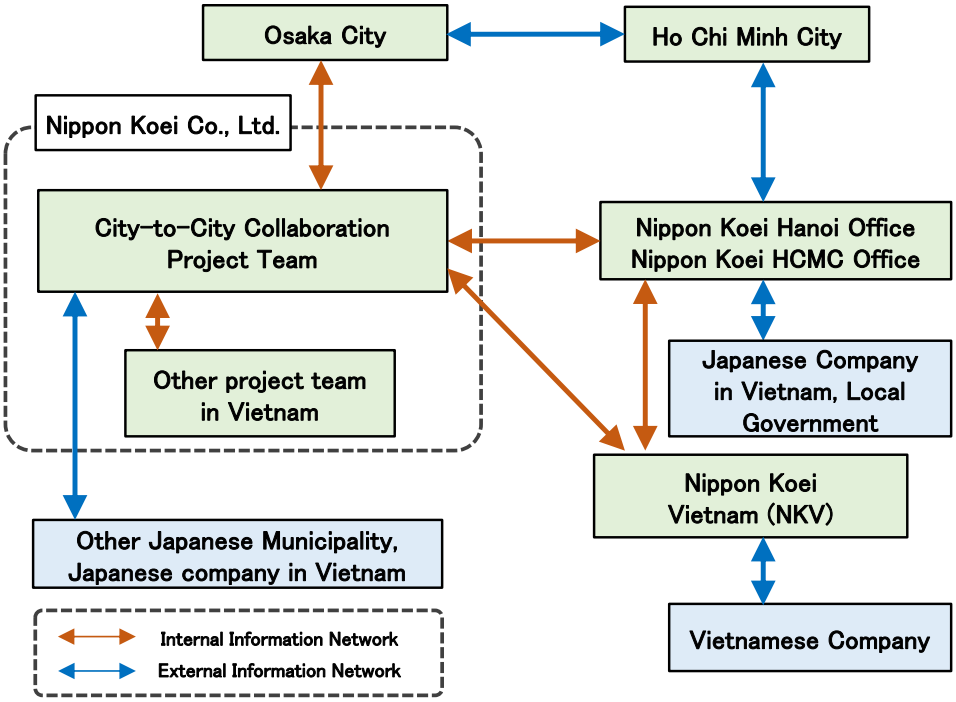
5.1 AFFECTION TO WORLD ECONOMY BY COVID-19 PANDEMIC

According to a report of the International Monetary Fund (IMF) in June 2020, the worldwide spread of the COVID-19 novel coronavirus will lead to global growth rate of -4.9 % in 2020,which was 1.9 point lower than estimation of World Economic Outlook (WEO) in April 2020. In addition, the aggregate annual growth rate of the East Asia and Pacific region is projected to be slower from 5.8 percent in 2019 to 0.5 percent in 2020.

On the other hand, GDP growth in Vietnam is one of the highest in the world. The reasons are i) the economic damage was small because the number of infected people were limited with early measures against COVID-19 and ii) export value related to IT technology increased because the expansion of demands of telecommuting and online meetings has grown dramatically because of the pandemic.

5.2 INGENUITY FOR SMOOTH IMPLEMENTATION OF SURVEY

The communication with HCMC was implemented by email and via local staff in Vietnam. Although there was some limitation caused by internet connection, online meeting was conducted, similar to face-to-face meeting. To be more effective activities, Nippon Koei Hanoi/HCMC offices and Nippon Koei Vietnam(NKV) as Nippon Koei's subsidiary company had supported data collection related to activities on City-to-City collaboration and JCM model project formulation by the following organization structure. In the field study and online meeting, attachment 5 were used to introduce Nippon Koei's achievements and activities related to JCM.



Source：Prepared by Nippon Koei

Figure 5-1　Internal/External information collection network and division of roles in the COVID-19 Pandemic

CHAPTER 6 FUTURE PLAN

Considering the results of studies for development of JCM model project and city-to-city collaboration activities in this project, plans for FY2021 and later are discussed below.

6.1 DEVELOPMENT AND APPLICATION OF JCM MODEL PROJECTS

In FY2020, JCM model project studies for five technology themes below were carried out.

6.1.1 Project for installation of highly efficient air-conditioning equipment

Project for installation of air-conditioning equipment system of JCH to office building in HCMC owned by a Japanese company, which had been studied continuously since FY2019, was selected as a JCM model project in 2020 and is being implemented. Although consideration of candidate partners for scale-out project is planned in FY2021, partners have not been identified to date since capital investment of local companies are less due to COVID-19 pandemic.

It was found that there are some factories and industrial parks whose businesses are going well during COVID-19 pandemic although it depends on their products and services. In FY2021, project formulation will be carried out with checking business situation of potential local partner.

6.1.2 Project for installation of gas one-through boiler

Project for installation of highly efficient gas once-through boiler to two factories of Acecook, which had been studied continuously since FY2019, was selected as a JCM model project in 2020. Although consideration of candidate partners for scale-out project is planned in FY2021, partners have not been identified to date since capital investment of local companies are less due to COVID-19 pandemic.

Through the study for large-scale project development, it was found that there are some companies whose businesses are going well during COVID-19 pandemic although it depends on their products and services. In FY2021, project formulation will be carried out with checking business situation of potential local partner.

6.1.3 Project for installation of highly efficient LED lighting

In FY2020, introduction of Japanese LED lighting to office building in HCMC owned by Japanese company was studied. Trial calculation of GHG emission reduction was conducted on the basis of assumed specification and numbers of product and at present discussion of international consortium and preparation for application materials are carried out for application in FY2021.

There are a wide range of LED lighting products of the manufacture not only for office buildings but commercial buildings and factories and those are much more efficient than other products in Vietnamese market and have high potential for scaling-out project development.

6.1.4 Project for installation of PV system

In accordance with approach of Vietnamese Government to decarbonization, HCMC is also considering and promoting renewable energy such as PV as a policy. Therefore, it can be said that the needs of JCM model project formulation is increasing both in public and industrial sectors.

In FY2020, utilization of leasing was considered as a measure to avoid a bidding, which had been requested by HCMC since FY2019. Searching Japanese leasing company and proposal to DONRE based on concreate calculation was implemented. In FY2021, project formulation of PV system installation to public facilities will be planned continuously.

In addition, project for introduction of PV system to Binh Dien Market, which have been supported in City-to-City Collaboration Project, are being prepared for application for JCM model project in FY2021. Currently, discussion with Japanese company with representative company of JCM model project is being conducted and application schedule and project scale will be fixed in the next months.

6.1.5 Project for installation of technology package of energy saving and renewable energy to industrial park

Consideration of project for introduction of technology package of PV, battery, EMS, Electric motorcycles etc. to industrial park in HCMC suburb, will continue in FY2021 for development as JCM model project.

It is planned to implement site study at target facility to consider specification of each technology and scale together with Japanese manufacturers and local companies. Through the site study, concrete contents of the project will be fixed. This project has high potential for scaling out since there are many industrial parks in HCMC.

6.2 APPLICATION FOR FY2021 CITY-TO-CITY COLLABORATION PROJECT

Osaka City and HCMC has been implementing studies and discussions in mayor level policy dialogue and meetings between officials of both cities to date, on the basis of “Memorandum of Understanding on Collaboration toward Low Carbon Development between Ho Chi Minh City and Osaka City” updated in in 2016. Since the MOU was expired on 31 December 2020, discussions for update of the MOU was carried out and the update has been completed with singing by both mayors in FY2020.

Although policy dialogue of FY2020 was postponed to June 2021 due to COVID-19 pandemic, updated MOU include implementation of policy dialogue basically once a year. Also, as a

support for formulation of JCM model projects based on CCAP, concrete target sectors, technologies, goals were included in the updated MOU, which is a huge achievement for both cities.

In FY2021, it is planned to implement support for realization of zero-carbon society in HCMC and for project formulation based on the updated MOU, as carried out to date. Draft activities in FY2021 is as follows.

Table 6.1 Draft of activities in FY2021

Approach	Sector	Overview
Formulation of JCM model project	**Study for installation of highly efficient air-conditioning equipment**	To consider scale-out project for installation of highly efficient air-conditioning equipment to office buildings and hotels in HCMC and suburbs To consider installation of energy-saving technologies to public facilities by cooperation with DOT.
	Study for installation of highly efficient gas one-through boiler	To consider scale-out project for installation of gas once-through boiler to factories and industrial parks in HCMC and suburbs. To implement project formulation efficiently by identifying target company through collaboration with HEPZA who controls multiple industrial parks in HCMC.
	Study for installation of highly efficient LED lighting and support for scaling out	To support for application of project for installation of LED lighting to an office building in HCMC for JCM model project and scale-out projects in industrial parks and commercial buildings
	Pre-study for formulation of large-scale JCM model project	To formulate project for installation of renewable energy to large facility with large energy consumption such as industrial park, as a large-scale JCM mode project.
	Study for installation of technology package of energy saving and renewable energy to industrial park	To continuously implement a study of project for installation of technology package of PV, battery, EMS, E-bike etc. to industrial park
City-to-City collaboration activities for realization of zero-carbon society	**Collaboration between Osaka City and HCMC for climate change countermeasures**	To hold mayor level policy dialogue in HCMC and to carry out discussion regarding climate change countermeasures and support for JCM model project formulation based on the revised MOU.

Source: Prepared by Nippon Koei