FY2018 Project for Ministry of the Environment Japan

# FY2018 City-to-City Collaboration Programme for Low-Carbon Society

# City-to-City Collaboration between Kawasaki City and DKI-JKT Promotion on Green Innovation in DKI-JKT (Green Building/ Green Industry)

# Report

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Nippon Koei Co., Ltd. Kawasaki City

### FY2018 City-to-City Collaboration Programme for Low-Carbon Society City-to-City Collaboration between Kawasaki City and DKI-JKT Promotion on Green Innovation in DKI-JKT (Green Building/ Green Industry)

### Report

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## **Abbreviations**

| Abbreviation | Description                                                |  |  |
|--------------|------------------------------------------------------------|--|--|
| AHU          | Air Handling Unit                                          |  |  |
| BAPPEDA      | Regional Development Planning Agency                       |  |  |
| BAS          | Building Automation System                                 |  |  |
| BAU          | Business-as-usual                                          |  |  |
| BEMS         | Building Energy Management System                          |  |  |
| DKI-JKT      | Special Capital Region of Jakarta                          |  |  |
| EPC          | Engineering, Procurement, Construction                     |  |  |
| FCU          | Fun Coil Unit                                              |  |  |
| FIT          | Feed in Tariff                                             |  |  |
| GBCI         | Green Building Council Indonesia                           |  |  |
| GHG          | Greenhouse Gases                                           |  |  |
| HVAC         | Heating, Ventilation, and Air Conditioning                 |  |  |
| IDR          | Indonesian Rupia                                           |  |  |
| INDC         | Intended Nationally Determined Contributions               |  |  |
| JCM          | Joint Crediting Mechanism                                  |  |  |
| MOEJ         | Ministry of the Environment Japan                          |  |  |
| MRT          | Mass Rapid Transit                                         |  |  |
| MW           | Mega Watt                                                  |  |  |
| PDD          | Project Design Document                                    |  |  |
| PLN          | State Electric Power Company                               |  |  |
| PV           | Photovoltaics                                              |  |  |
| RAN-GRK      | National Action Plan for Reducing Greenhouse Gas Emissions |  |  |
| RAD-GRK      | Regional Action Plan for Reducing Greenhouse Gas Emissions |  |  |
| RPJMD        | Med-term Development Plan                                  |  |  |
| RUEN         | Grand National Energy Plan                                 |  |  |
| SDGs         | Sustainable Development Goals                              |  |  |
| SDIP         | Sustainable Development Implementation Plan                |  |  |
| UNFCCC       | United Nations Framework Convention on Climate Change      |  |  |
| VAV          | Variable Air Volume                                        |  |  |
| VSD          | Variable Speed Drive                                       |  |  |
| VWV          | Variable Water Volume                                      |  |  |

### CHAPTER 1 BACKGROUND AND OBJECTIVE

#### 1.1 BACKGROUND OF THE STUDY

In December 2015, all countries participated in United Nations Framework Convention on Climate Change (UNFCCC)'s 21st Conference of the Parties (COP21) which was held in Paris, France. In the COP21, Paris Agreement was adopted as a legal framework of fair and practical countermeasure to climate change after 2020. Paris Agreement aims at keeping global warming below 2 degrees Celsius above pre-industrial level, and it requires efforts to keep it below 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 COP21. Cities are the places to support social and economic growth since a lot of people live there. Although the total of urban areas is only 2% of all land in the world, approximately half of world population live in urban areas and the percentage is predicted to increase to 70% by 2050. Also, it is estimated that more than 70% of global CO2 emissions are emitted from cities as of 2006, that is, cities have important 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 the goal of Paris Agreement.

In the Republic of Indonesia (hereinafter called "Indonesia"), the Government of Indonesia established National Action Plan for Reducing Greenhouse Gas Emissions (RAN-GRK), and each regional government enacted Regional Action Plan for Reducing Greenhouse Gas Emissions (RAD-GRK) in 2013. In addition, Grand National Energy Plan 2015-2050 (RUEN) formulated in January 2017, particularly considers promoting energy saving and utilization of natural gas in Indonesia as priority countermeasures.

RAN-GRK, issued as President Decree No. 61 in September 2011, is set to reduce GHG emission by 26% in 2020 from the BAU (Business-as-usual) level with its own efforts and reaching 41% reduction if the country secures international support. In RAN-GRK, sector-wise goal (Forestry and Peat, Agriculture, Industry, Energy and Transportation, Waste), responsible ministries, and major mitigation measures are described and summarized in the table below.

| Sector       | Emission<br>Target (Gig | a Reduction<br>(a ton CO <sub>2</sub> e) | Major Mitigation Activities                     |  |  |  |  |
|--------------|-------------------------|------------------------------------------|-------------------------------------------------|--|--|--|--|
|              | 26%                     | 41%                                      |                                                 |  |  |  |  |
| Forestry and | 0.672                   | 1.039                                    | Forest fire management, watershed               |  |  |  |  |
| Peat         | (87.6%)                 | (87.4%)                                  | management, forest/land recovery, industrial    |  |  |  |  |
|              |                         |                                          | plantation, community forestry, illegal         |  |  |  |  |
|              |                         |                                          | harvesting control, forestry degradation        |  |  |  |  |
|              |                         |                                          | prevention, community capacity development,     |  |  |  |  |
|              |                         |                                          | etc.                                            |  |  |  |  |
| Agriculture  | 0.008 (1.0%)            | 0.011 (0.9%)                             | Low carbon emission paddy introduction, high-   |  |  |  |  |
|              |                         |                                          | efficient irrigation, organic fertilizers, etc. |  |  |  |  |
| Industry     | 0.001 (0.1%)            | 0.005 (0.4%)                             | Usage of energy efficient technology,           |  |  |  |  |

Table 1.1 Sector-wise Goal in RAN-GRK

|                |              |              | renewable energy                                  |
|----------------|--------------|--------------|---------------------------------------------------|
| Energy and     | 0.038 (5.0%) | 0.056 (4.7%) | Introduction of bio-fuel, high-efficient engine,  |
| Transportation |              |              | improved transportation system, improved          |
| -              |              |              | public transportation system, energy efficient    |
|                |              |              | technology, renewable energy, etc.                |
| Waste          | 0.048 (6.3%) | 0.078 (6.6%) | Appropriate usage of final disposal sites, 3R     |
|                |              |              | activities, drainage control in urban areas, etc. |
| Total          | 0.767        | 1.189        |                                                   |

Source: Compiled by Nippon Koei based on various secondary data

The Intended Nationally Determined Contributions (INDC), which was submitted to UNFCCC in 2015 as Indonesia's target of countermeasures to climate change, mentions that the country will reduce GHG emission by 29% in 2030 from the BAU level with its own efforts and reaching 41% reduction if the country secures international support. Also, it describes that at least 23% of power generation in Indonesia will be generated from renewable energy by 2025.

#### **1.2** CITIES OF THE STUDY

The Spatial Capital Region of Jakarta (Daerah Khusus Ibukota Jakarta : DKI-JKT) is the capital city of Indonesia with a population of approximately 9.60 million which makes it the largest city in the country. DKI-JKT is also the center of the country's government, economics, culture, industries, and with surrounding cities forming the Jakarta metropolitan area. The Jakarta metropolitan area has been developed with remarkable economic growth through both domestic and foreign investments since the latter half of the 20<sup>th</sup> century. During the Asian monetary crisis in 1997, investment to the area temporary stagnated, but currently the situation has recovered and its development is further expanding. On the other hand, DKI-JKT is now facing serious environmental issues caused by increasing energy demand, serious traffic jams, tons of solid waste, air pollution, and water pollution with rapid economic development

Kawasaki City, in Kanagawa prefecture. is located next to Tokyo. Kawasaki City serves as one of the hub cities for the Keihin Industrial zone, and the city has experience and expertise in pollution control at citizen level, company level and government level. Many companies in the city use superior environmental technologies. To utilize such experience, expertise, and technologies for developing sustainable cities, Kawasaki City promotes "Green Innovation". Also, the city organized "Kawasaki Green Innovation Cluster" in 2015 which is a platform of industry-academia-government-citizen collaboration for contributing to environmental improvement and industrial development.

Kawasaki City has been conducting "City-to-City Collaboration Programme for Low-Carbon Society" with other cities since 2015 by utilizing its knowledge and experience. DKI-JKT expressed an interest in these activities, so City-to-City Collaboration between Kawasaki City and DKI-JKT was proposed and has started since September 2017.

#### **1.3 OBJECTIVE OF THE STUDY**

"City-to-City Collaboration Programme for Low-Carbon Society between Kawasaki City and DKI-JKT" (hereinafter called "the Study") aims to implement investigations for developing a low carbon society in foreign cities by Japanese cities who have valuable knowledge and experience. Japanese cities also collaborate with Japanese research institutes, private companies, and universities in order to conduct the surveys in an effective and efficient manner. In the Study, Kawasaki City and DKI-JKT conduct a survey and discussion for realization a low carbon society.

#### **1.4 IMPREMENTATION STRUCTURE**

The International Economic Affairs Office of Kawasaki City and the Regional Development Planning Agency (BAPPEDA) of DKI-JKT mainly implemented the Study. The international Economic Affairs of Kawasaki City has the experience of conducting City-to-City Collaboration with Yangon city in the Union Republic of Myanmar since 2015. In addition, the Environment Agency and the Industrial & Energy Agency of DKI-JKT also joined discussions of the Study to find potentials of GHG emission reduction in DKI-JKT. Nippon Koei Co., Ltd. supported all activities of the City-to-City Collaboration, and feasibility studies for JCM Model Project formulation.



Source: Prepared by Nippon Koei



#### **1.5 STUDY SCHEDULE**

The Study schedule is as follows.

| Survey tem |                                                                          | 2018 |     |     |     |     |     |     | 20  | 19  |     |     |
|------------|--------------------------------------------------------------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|            | Survey item                                                              |      | Мау | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb |
| (1)        | : JCM model project formulation                                          |      |     |     |     |     |     |     |     |     |     |     |
| 1)         | Confirmation of existing condition                                       |      |     |     |     |     |     |     |     |     |     |     |
| 2)         | Creation of monitoring plan                                              |      |     |     |     |     |     |     |     |     |     |     |
| 3)         | Confirmation of environmental approval etc.                              |      |     |     |     |     |     |     |     |     |     |     |
| 4)         | Preparation of International Consortium                                  |      |     |     |     |     |     |     |     |     |     |     |
| 5)         | Confirmation of project cost, contract, project schedule                 |      |     |     |     |     |     |     |     |     |     |     |
| 6)         | Invitation DKI-JKT officers to Japan                                     |      |     |     |     |     |     | *   |     |     |     |     |
| 7)         | Business matching between Kawasaki<br>companies and Indonesian companies |      |     |     |     |     |     |     |     | *   |     |     |
| (2)        | ): The City-to-City Collaboration                                        |      |     |     |     |     |     |     |     |     |     |     |
| 1)         | Workshop                                                                 |      |     |     |     |     |     | *   |     |     |     |     |
| 2)         | JCM Seminar in Japan organized by MOEJ                                   |      |     |     |     |     |     | *   |     |     |     |     |
| 3)         | Field Survey                                                             |      |     |     | *   |     | *   | *   |     | *   | *   |     |
| 4)         | 4) Final Report                                                          |      |     |     |     |     |     |     |     |     |     | *   |

★:Indonesia ☆:Japan

Source: Prepared by Nippon Koei

#### Figure 1.2 Study Schedule in FY2018

### CHAPTER 2 CITY-TO-CITY COLLABORATION FOR LOW-CARBON SOCIETY

#### 2.1 OBJECTIVE OF THE CITY TO CITY COLLABORATION

The objectives of the Study in FY2018 were as follows.

- 1) Project formulation aimed to apply for the JCM Model Project and promotion of energy serving technologies.
- 2) Promotion of green innovation activities in DKI-JKT by making use of experience of Kawasaki City.

The project aims to materialize a low carbon society in DKI-JKT through JCM Model Project formulation by utilizing energy saving technologies of the companies in Kawasaki City.

Kawasaki City is an industrial city located in Keihin industrial area which has supported the economic growth in Japan. The city has a history of overcoming industrial pollution such as air pollution and water pollution that occurred by rapid industrialization and urbanization in 1960s to 1970s by the superior technology in private companies and efforts of government and citizen. Currently, urban development is rapid in DKI-JKT and they have several environmental problems such as air pollution, water pollution and waste management problem. Therefore, the experience in Kawasaki City can help to solve the problems in DKI-JKT.

#### 2.2 CITY-TO-CITY COLLABORATION IMPLEMENTATION POLICY

The implementation policy for City-to-City Collaboration between Kawasaki City and DKI-JKI is presented in the figure below.



Prepared by Nippon Koei

Figure 2.1 Potential Cooperation Framework of City-to-City Collaboration

The discussion with both cities has focused on: 1) Feasibility study for JCM Model Project formulation to contribute to low carbon society, and 2) Promotion of green innovation actions by City-to-City Collaboration for which Kawasaki City can assist to solve the problems DKI-JKT has been facing.

The following items were identified as priority sectors in DKI-JKT based on the discussion in this FY. The current situations are described below by priority sector.

| Priority Sector   | Status                                                                           |
|-------------------|----------------------------------------------------------------------------------|
| (a) Green         | Due to recent drastic economic development, rapid urbanization, similarly        |
| Building          | to major cities in Japan, is going on in Jakarta. Especially the central Jakarta |
| 0                 | is crowded with high-story office buildings and apartments, and high energy      |
|                   | consumption by such buildings are becoming one of serious problems for           |
|                   | the city. In consideration of the situation, DKI-JKT formulated the Green        |
|                   | Building Policy to facilitate the construction of energy efficiency buildings    |
|                   | in collaboration with the Green Building Council Indonesia (GBCI), a NGO,        |
|                   | already promoting Green Building in Indonesia. However, since Green              |
|                   | Building is not well recognized by majority of building owners, its              |
|                   | construction and extension are not in well progress.                             |
| (b) Waste         | Jakarta metropolitan area has a population of approximately 20 million and       |
| Management        | daily average of 7,000 ton of waste is produced. To handle the situation, the    |
|                   | waste management of Jakarta is administered by the Environmental Agency          |
|                   | of DKI-JKT. In Jakarta, waste separation/ collection, intermediate treatment     |
|                   | and final disposal are already introduced in the waste management, but their     |
|                   | qualities have not yet systematized. Currently, the final disposal site for      |
|                   | Jakarta metropolitan area has only one final disposal site located away from     |
|                   | the urban areas, Bekasi. During the Study, the Environmental Agency              |
|                   | expressed high interests to waste separation/ collection system, participatory   |
|                   | waste management, final disposal measures adopted by Kawasaki City.              |
| (c) Renewable     | West Java, where DKI-JKT is located, already have a stable electricity grid      |
| Energy            | system maintained by a state-run electric power company, the national PLN        |
|                   | (Perusahaan Listrik Negara). Therefore, power cut seldom happens and             |
|                   | stable power supply is available in Jakarta area. However, island areas along    |
|                   | the Pacific Ocean, and a part of DKI-JKT do not have full connection to the      |
|                   | existing grid systems. DKI-JKT related facilities in such island areas require   |
|                   | to use their own power generators. From the facility operation and               |
|                   | maintenance point of views, introduction of renewable energy system is           |
|                   | getting one of key interests by DKI-JKT. In addition, since Indonesia has        |
|                   | established Feed in Tariff (FIT) system, DKI-JKT can benefit from FIT by         |
|                   | in introducing renewable energy projects                                         |
| (d) Energy Saving | Introduction of energy saving technologies and renewable energy into             |
| in Industry       | facilities are advanced under the Green Industry Policy supposed by Ministry     |
| Sector            | of Industry in Indonesia. Many factories have high consciousness of using        |
|                   | air conditioning well to make labor environment comfortable, and also to         |
|                   | manage and maintain product's quality. In addition, factories which have         |
|                   | receivers or cold storage facilities have high consciousness to save their       |
|                   | energy consumption because a burden of energy is bigger than factories           |
|                   | which don't have these facilities. DKI-JKI is a tropical climate and the         |
|                   | average temperature is almost 2/ degrees Celsius. Therefore, energy              |
|                   | consumption and energy burden by air conditioning is very big, especially        |

 Table 2.1
 Priority Sector in DKI-JKT

|     |                | in large factories                                                                          |  |  |
|-----|----------------|---------------------------------------------------------------------------------------------|--|--|
| (e) | Urban          | DKI-JKT is one of the worst traffic congested cities in Asia. Not only private              |  |  |
|     | Transportation | vehicles but also increasing number of bike taxi such as Grab, Uber, GOJEK,                 |  |  |
|     |                | etc. are major causes of heavy traffic congestion in the city. To tackle the                |  |  |
|     |                | problem, DKI-JKT is introducing vehicle license number-wise traffic                         |  |  |
|     |                | restriction <sup>1</sup> in the major traffic congestion areas of the city. Furthermore, to |  |  |
|     |                | ease the chronic traffic congestion in the city, DKI-JKT is introducing other               |  |  |
|     |                | measures such as operation of Trans-Jakarta and construction of MRT.                        |  |  |
|     |                | However, full-scale operation of MRT requires certain time, thus                            |  |  |
|     |                | fundamental solutions to solve the traffic congestion is currently not                      |  |  |
|     |                | available yet.                                                                              |  |  |

Source: Prepare by Nippon Koei

From the above priority sectors, the following activities were conducted: 1) Feasibility study for JCM Model Project formulation or 2) Promotion of green innovation by City-to-City Collaboration in FY 2018

|                          |                  | e/                                         |
|--------------------------|------------------|--------------------------------------------|
| Policy                   | Sector           | Summary                                    |
| 1) Feasibility study for | Green Building   | Feasibility study was conducted in several |
| JCM Model Project        | _                | buildings at Sudirman Street in central of |
| formulation              |                  | DKI-JKT to consider introducing            |
|                          |                  | technologies for air conditioning energy   |
|                          |                  | saving, and to apply JCM Model Project.    |
|                          | Energy Saving in | Survey at several factories located near   |
|                          | Industry Sector  | DKI-JKT were implemented to consider       |
|                          |                  | introducing new equipment for energy       |
|                          |                  | saving and heat exchange                   |
| 2) Promotion of Green    | Waste Management | Kawasaki City shared their knowledge       |
| Innovation by the City-  |                  | with DKI-JKT staff about waste separated   |
| to-City Collaboration    |                  | collection and environmental education.    |
|                          |                  | Also, DKI-JKT staff were invited to        |
|                          |                  | Kawasaki City and visited their waste      |
|                          |                  | management facility.                       |
|                          | Renewable Energy | The efforts of introducing and spreading   |
|                          |                  | PV system in Kawasaki City were shared     |
|                          |                  | with DKI-JKT staff.                        |
|                          |                  | DKI-JKT staffs were invited to Kawasaki    |
|                          |                  | City and visited the mega solar system     |
|                          |                  | facility (20MW) in Kawasaki City.          |

Table 2.2Main activity in FY2018

Source: Prepared by Nippon Koei

<sup>&</sup>lt;sup>1</sup> At the designated areas of central Jakarta, vehicles allowed to enter the areas are determined based even-number days and odd-number days. For example, for even number dates, only vehicles having even numbers at the last-digit of their license plates are allowed to enter the designated areas.

The results of feasibility study for JCM Model Project formulation related to Green Building and Energy Saving are described in Chapter 3.

#### 2.3 **UTILIZATION OF SUSTAINABLE DEVELOPMENT GOALS (SDGS)**

Kawasaki City announced "Draft of Kawasaki City Promotion Policy on Sustainable Development Goals (hereinafter called "SDGs")" in FY 2018 and has just started their actions to achieve them. At the same time, DKI-JKT also announced "Draft of SDGs Action Plan from 2017 to 2022" under the leadership of BAPPEDA.

Kawasaki City and DKI-JKT already agreed that SDGs can be utilized in the Study to implement City-to-City Collaboration with more beneficial and clear discussion. It is mentioned that Kawasaki City and DKI-JKT contribute to the achievement of SDGs through the Study in "Letter of Intent for City-to-City Collaboration on Zero Carbon Development" which was signed by both cities in February 2019. The actual activity for SDGs will be conducted in FY 2019.



Kawasaki City Source: Provided by both cities

Figure 2.2 Draft SDGs Policy in both cities

#### 2.4 STUDY RESULTS FOR CITY-TO-CITY COLLABORATION

#### 2.4.1 **Overview of the City-to-City Collaboration**

Results of the City-to-City Collaboration activities conducted during the Study are presented in the following table.

| ContentScheduleDescriptionKick-off meetingMay 11, 2018• Explanation of the activity purpose and contents of | -                           |              |                                                                                                                    |  |  |  |  |  |  |
|-------------------------------------------------------------------------------------------------------------|-----------------------------|--------------|--------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|
| Kick-off meeting May 11, 2018 · Explanation of the activity purpose and contents of                         | Content                     | Schedule     | Description                                                                                                        |  |  |  |  |  |  |
| (10kyo) the study, JCM Model Project candidate and schedule to MOEJ.                                        | Kick-off meeting<br>(Tokyo) | May 11, 2018 | • Explanation of the activity purpose and contents of the study, JCM Model Project candidate and schedule to MOEJ. |  |  |  |  |  |  |

Table 2.3 Overview of the City-to-City Collaboration

| Content                                                               | Schedule                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |  |  |
|-----------------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| The 1st Field<br>Survey (Jakarta                                      | July 23 - 27,<br>2018     | • Discussion with DKI-JKT about activity contents in FY 2015.                                                                                                                                                                                                                                                                                                                                                                                                                              |  |  |  |  |
|                                                                       |                           | • Collection of the information for JCM Model Project formulation.                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |  |  |
|                                                                       |                           | Participation in JCM Seminar organized by MOEJ                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |
| JCM Seminar<br>(Tokyo)                                                | July 24, 2018             | • Giving a presentation for activity results about City-<br>to-City Collaboration so far in JCM Seminar in<br>Jakarta.                                                                                                                                                                                                                                                                                                                                                                     |  |  |  |  |
|                                                                       |                           | Sharing the information about Green Building with<br>participants for JCM Model Project formulation.                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |
| 1st Progress<br>Reporting to<br>Ministry of<br>Environment<br>(Tokyo) | October 9, 2018           | • Explanation of the progress after Kick-off meeting, contents in conference with DKI-JKT and future plan.                                                                                                                                                                                                                                                                                                                                                                                 |  |  |  |  |
| The 2nd Field<br>Survey (Jakarta)                                     | September 8 -<br>13, 2018 | <ul> <li>Confirmation of the progress about LoI in City-to-<br/>City Collaboration and discussion about the JCM<br/>Seminar and Inspection in Kawasaki City in October<br/>with DKI-JKT.</li> <li>Note) It took a time to decide the person in charge of<br/>the Study because of the staff reassignment in DKI-<br/>JKT in June. Therefore, the Study assign structure was<br/>not organized until June and 2nd field survey is the<br/>first meeting with BAPPEDA in FY 2018.</li> </ul> |  |  |  |  |
| The 3rd Field<br>Survey (Jakarta)                                     | October 14 - 20,<br>2018  | • Kick-off meeting with DKI-JKT and Kawasaki City to confirm the activity contents in this FY and discuss about City-to-City Collaboration after FY 2019.                                                                                                                                                                                                                                                                                                                                  |  |  |  |  |
|                                                                       |                           | Workshop for DKI-JKT by Kawasaki City.                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |  |  |
| Work shop for<br>DKI-JKT staffs<br>(Jakarta)                          | October 19,<br>2018       | • Workshop for DKI JKT about the approach in Kawasaki City on waste management and renewable energy which DKI-JKT selected for the priority sector.                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |
| JCM Seminar and<br>Inspection in                                      | October 21 - 27,<br>2018  | • Participation to JCM Seminar in Yokohama by two staffs in DKI-JKT                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |
| Kawasaki City by<br>DKI-JKT staffs<br>(Yokohama and<br>Kawasaki)      |                           | • Giving the presentations about City-to-City Collaboration by DKI-JKT and Kawasaki City in JCM Seminar.                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |
| Kawasaki)                                                             |                           | <ul> <li>Inspection to the approach about waste management<br/>and renewable energy in Kawasaki City by two DKI-<br/>JKT staffs.</li> </ul>                                                                                                                                                                                                                                                                                                                                                |  |  |  |  |
| 2nd Progress<br>Reporting to<br>Ministry of<br>Environment<br>(Tokyo) | November 6,<br>2018       | • Explanation of the progress after 1st Progress<br>Reporting to MOEJ, the issue about JCM Model<br>Project formulation and future schedule.                                                                                                                                                                                                                                                                                                                                               |  |  |  |  |
| The 4th Field<br>Survey (Jakarta)                                     | December 17 -<br>22, 2018 | • Inspection to the industries which have possibility of contributing to energy saving and candidate of JCM Model Project formulation by MDI Co., Ltd.                                                                                                                                                                                                                                                                                                                                     |  |  |  |  |

| Content                           | Schedule                 | Description                                                                                                                                                 |  |  |  |  |
|-----------------------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
|                                   |                          | • Explanation of City-to-City Collaboration and JCM<br>Model Project formulation to DKI-JKT because the<br>person in charge of this project was reassigned. |  |  |  |  |
|                                   |                          | Discussion with DKI-JKT about contents of activity after FY 2019.                                                                                           |  |  |  |  |
| The 5th Field<br>Survey (Jakarta) | January 20 - 26,<br>2019 | • Wrap up meeting with DKI-JKT about City-to-City Collaboration in FY 2018.                                                                                 |  |  |  |  |
|                                   |                          | • Discussing with PT. Azbil Berca Indonesia about JCM Model Project formulation for Green Building in FY 2018.                                              |  |  |  |  |
| Wrap up meeting<br>(Jakarta)      | January 25, 2019         | • Reporting for the activity results of City-to-City Collaboration in FY 2018.                                                                              |  |  |  |  |
|                                   |                          | • Agreeing with continuing to City-to-City Collaboration in next FY and discussing with activity contents in FY 2019.                                       |  |  |  |  |

Source: Prepared by Nippon

#### 2.4.2 Workshop for DKI-JKT

The workshop for the capacity building of DKI-JKT staff was held on 19 October 2018 according to DKI-JKT's request. Information about Kawasaki City's waste management and renewable energy was shared by Kawasaki City officer. Many questions were asked by DKI-JKT staff, especially about attention to separate collection of domestic waste, environmental education about waste management for citizens, citizen volunteers for waste management and promotion of renewable energy. DKI-JKT also commented that they want to utilize City-to-City Collaboration to actualize targets on waste management and renewable energy.

Scenes of the workshop are shown in the photos below.



Workshop in DKI-JKT

Group Photo after workshop

#### 2.4.3 JCM Seminar in Yokohama and Inspection in Kawasaki City

Two delegates from DKI-JKT were invited to the JCM Seminar organized by Ministry of the Environment, Japan on 25 - 26 October 2018. During their stay in Japan, they also attended World Circular Economy Forum 2018 in Yokohama from 22 - 23 October and visited several facilities in Kawasaki City on 24th.

During the site visit in Kawasaki City, DKI-JKT delegates visited Kawasaki Nanbu Seikatsu Kankyo Center, the domestic waste collection site, Kureha Ecology Management Co., Ltd. and Kawasaki Eco Gurashi Mirai-kan. Especially, the explanation of the domestic waste collection by Kawasaki Nanbu Seikatsu Kankyo Center staff was much interested by DKI-JKT delegates.

As for the JCM seminar, DKI-JKT delegates and Kawasaki City staff attended and gave the presentation about the activities in the Study.

The following photos of the inspection during Kawasaki City and the JCM Seminar.



Domestic waste collection in Kawasaki City



Presentation by DKI-JKT



Kureha Ecology Management Co., Ltd.



Presentation by Kawasaki City

#### 2.4.4 Wrap-up Meeting with DKI-JKT

The wrap-up meeting was conducted with DKI-JKT on 25 January 2019. The main contents of this meeting were reporting of the result of the Study FY2018, and discussion of future plan for FY 2019.

Regarding to "Feasibility study for JCM Model Project formulation", the study results about Green Building and Green Industry which are DKI-JKT's priority sector were reported. Also reported were "Promotion of Green Innovation by City-to-City Collaboration", the activities such as the work shop in DKI-JKT, inspection in Kawasaki City, and the JCM seminar.

As for the future plan in FY 2019, "Renewable Energy" and "Waste Management" were requested as priority sectors by DKI-JKT. Specifically, DKI-JKT requested: (1) Installing of Renewable Energy such as PV system are conducted as feasibility study for JCM Model Project formulation, and (2) River Purification and Waste Management in traditional market are conducted as capacity building.

As a result, based on the idea proposed by DKI-JKT and the result of the Study in FY 2018, the following activities were agreed between both cities for activities in FY 2019.

- Feasibility study for JCM Model Project formulation: "Green Industry (Energy saving in industry sector)" and "Clean Energy (Promotion of renewable energy)"
- On demand discussion/ support: "Waste Management" for sustainable city

The details of proposed study for FY 2019 City-to-City Collaboration are described in section 4.1.2. The following photos are of the wrap-up meeting.



Wrap-up meeting with DKI-JKT

Group photo after Wrap-up meeting

#### 2.4.5 Letter of Intent between Kawasaki City and DKI-JKT

Kawasaki City and DKI-JKT agreed "Letter of Intent for City-to-City Collaboration for Low-Carbon Society" and signed in February 2019. The following three items are described in this Letter of Intent.

- 1) The implementation of cooperation will be conducted according to the scheme, rules and guidelines of the Joint Crediting Mechanism stipulated by the Joint Committee from Indonesia and Japan sides.
- 2) The City of Kawasaki on behalf of the Prefecture of Kanagawa will offer technical supports for the implementation of zero carbon development in the territory of the Province of the Special Capital Region of Jakarta.
- 3) The Parties will encourage participation of private sector, academic entities and the community.

It also mentions in the Letter of Intent that promotion of goodwill and understanding as well as that favorable cooperation between Kawasaki City and DKI-JKT to achieve Sustainable Development Goals are desired.

Through the Study, Kawasaki City and DKI-JKT will aim to actualize the low carbon society. This Letter of Intent will be valid for three years from the date of signing.

### **CHAPTER 3** FORMURATION OF JCM MODEL PROJECT

#### 3.1 FEASIBILITY STUDY ON GREEN BUILDING

#### 3.1.1 Overview of the Feasibility Study

Due to recent strong economic growth, the construction of office buildings, high-story apartment buildings, and luxury hotels is rapidly going on in the central of DKI-JKT, and this situation is to be expected to continue in the future. In addition, the energy consumption by such buildings is becoming huge and it is one of the serious problems for the city. In consideration of the situation, DKI-JKT formulated the Green Building Policy in 2012 and revised it in 2018 to encourage the construction of energy efficiency buildings. Also, DKI-JKT started to conduct events such as a seminar for private companies to promote the Green Building concept. However, since the Green Building is still not well recognized by the majority of building owners, and its construction and extension are not progressing well despite much potential of energy saving in the buildings.

In the feasibility study on Green Building, PT. Azbil Berca Indonesia, which is a group company of Azbil Cooperation, supported identifying candidate buildings for JCM Model Projects formulation. PT. Azbil Berca Indonesia and Azbil Cooperation have a lot of business experience for energy saving in buildings. The target buildings of this study are mainly located at the center of DKI-JKT called the "Golden Triangle". There are a great many office buildings and commercial buildings in this area (Figure 3.1).



Source: Prepared by PT. Azbil Berca Indonesia based on Google Map

#### Figure 3.1 Target Area of Green Building Project

Materials about PT. Azbil Berca Indonesia's technologies and JCM scheme were distributed to 73 high-story buildings located in the above target area, and 35 buildings responded to it. Then, in consideration of the building scale and their interest level to JCM, 8 buildings were selected as target buildings for further investigation. The 8 target buildings are described in the following table.

|   | Table 5.1 Dasie mormation of the Target Dunungs |        |            |        |                        |  |  |  |  |
|---|-------------------------------------------------|--------|------------|--------|------------------------|--|--|--|--|
| # | Building                                        | Туре   | Foundation | Floors | Area [m <sup>2</sup> ] |  |  |  |  |
| 1 | Building A                                      | Office | 1980       | 31     | N/A                    |  |  |  |  |
| 2 | Building B                                      | Hotel  | 1975       | 27     | N/A                    |  |  |  |  |
| 3 | Building C                                      | Office | 1993       | 22     | 11.198                 |  |  |  |  |
| 4 | Building D                                      | Hotel  | 1962       | 17     | 25.082                 |  |  |  |  |
| 5 | Building E                                      | Office | 1992       | 22     | 27.000                 |  |  |  |  |
| 6 | Building F                                      | Hotel  | 1969       | 10     | N/A                    |  |  |  |  |
| 7 | Building G                                      | Office | 1993       | 21     | 21.526                 |  |  |  |  |
| 8 | Building H                                      | Hotel  | 1963       | 18     | 70,000                 |  |  |  |  |

 Table 3.1
 Basic Information of the Target Buildings

Source: Prepared by PT. Azbil Berca Indonesia and revised by Nippon Koei

The feasibility study was implemented according to the following study items to formulate JCM Model Project at the target buildings.

| # | Study Item                                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | Confirmation of the current situation                      | The existing facilities were checked in each target                                                                                                                                                                                                                                                                                                                                                                                                            |
| 1 | of existing facilities and consideration                   | building, and introduced technologies have been                                                                                                                                                                                                                                                                                                                                                                                                                |
| 1 | of specification of introduced                             | considered. These introduced technologies were already                                                                                                                                                                                                                                                                                                                                                                                                         |
|   | technology                                                 | proposed to the buildings.                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 2 | Monitoring Plan                                            | Monitoring Plan for JCM Model Project was considered.                                                                                                                                                                                                                                                                                                                                                                                                          |
| 3 | Confirmation of necessary approvals                        | Environmental approval and other necessary licenses were<br>confirmed. The proposed project on Green Building is just<br>to install an equipment into the buildings, so contaminated<br>material such as waste water will not occur to outside the<br>buildings. So, it was confirmed that there was no necessary<br>approval for the project. Also, SDIP (Sustainable<br>Development Implementation Plan) was confirmed. The<br>detail is described in 3.1.6. |
| 4 | Coordination for International<br>Consortium               | International consortium and implementation structure<br>were considered. To cope with the building owner's<br>concerns about initial investment, it was considered to put<br>a leasing company as representative of International<br>Consortium.                                                                                                                                                                                                              |
| 5 | Confirmation of project cost, contract, project schedule   | Project cost, efficiency of energy saving, CO2 emission reduction were estimated.                                                                                                                                                                                                                                                                                                                                                                              |
| 6 | Invitation DKI-JKT officers to Japan for capacity building | 2 delegates from DKI-JKT were invited to the JCM seminar in October 2018 held in Japan, and they visited                                                                                                                                                                                                                                                                                                                                                       |

Table 3.2Outline of the Study Items on Green Building

|   |                                                                       | several facilities related to Green Building in Japan.                                                                                                                 |
|---|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7 | Business matching between Kawasaki companies and Indonesian companies | The potential of energy saving at high-story buildings in DKI-JKT was confirmed, and participation of Kawasaki companies to the Green Building project was considered. |

Source: Prepared by Nippon Koei

#### 3.1.2 Methodology of the Feasibility Study

As a primary investigation at the target buildings, interviews of the building's engineers and collecting the following basic data/information were conducted by PT. Azbil Berca Indonesia to estimate the potential of energy saving.

- Building Layout
- Schematic diagram of M&E Equipment
- Specification of M&E Equipment
- Operation schedule of HVAC Equipment
- Logsheet Temperature Inlet & Outlet on Chiller (last 1 year)
- Total consumption of kWh electricity/PLN billing information of the recent 3 years

As a secondary investigation, the following measurement equipment was put on existing facilities in the target buildings to collect actual data for confirmation of the accuracy estimation of energy saving.





Source: PT. Azbil Berca Indonesia



#### 3.1.3 Results of the Feasibility Study

The feasibility study was carried out to review the performance of energy saving facilities based on the technology provided by PT. Azbil Berca Indonesia. The review includes: Initial Investment Cost, Energy Saving Performance and CO2 Emission Reduction. According to a preliminary study by PT. Azbil Berca Indonesia on the energy consumption by buildings in DKI-JKT, most of the energy was consumed in air conditioning. Therefore, the feasibility study this time focuses on air conditioning. In general, a coolant pump runs in constant flow mode; however, introduction of Variable Water Volume (hereinafter called "VWV") Control may be able to enhance the energy saving performance. In addition, introduction of high efficiency chiller at Building D and Building G was also studied and included in part of this feasibility study. Study results are shown below.

| # | Building   | Target Equipment<br>for Energy Saving                              | Estimated<br>Initial<br>Investment<br>[Million IDR] | Estimated<br>Energy Saving<br>[MWh/Year] | Estimated<br>CO2 emission<br>reduction<br>[tCO2/year] |
|---|------------|--------------------------------------------------------------------|-----------------------------------------------------|------------------------------------------|-------------------------------------------------------|
| 1 | Building A | Primary Pump<br>Condensing Pump<br>Cooling Tower                   | 2,760                                               | 426                                      | 373.60                                                |
| 2 | Building B | Primary Pump<br>Condensing Pump<br>Cooling Tower                   | 1,945                                               | 148                                      | 129.77                                                |
| 3 | Building C | Primary Pump<br>Condensing Pump<br>Secondary Pump<br>Cooling Tower | 2,431                                               | 523                                      | 458.67                                                |
| 4 | Building D | Chiller<br>Primary Pump<br>Condensing Pump<br>Cooling Tower        | 33,000                                              | 3,899                                    | 3419.42                                               |
| 5 | Building E | Primary Pump<br>Condensing Pump<br>Cooling Tower                   | 2,347                                               | 432                                      | 378.86                                                |

 Table 3.3
 Results of the Feasibility Study in Target Buildings

| # | Building   | Target Equipment<br>for Energy Saving                              | Estimated<br>Initial<br>Investment<br>[Million IDR] | Estimated<br>Energy Saving<br>[MWh/Year] | Estimated<br>CO2 emission<br>reduction<br>[tCO2/year] |
|---|------------|--------------------------------------------------------------------|-----------------------------------------------------|------------------------------------------|-------------------------------------------------------|
| 6 | Building F | Primary Pump<br>Condensing Pump<br>Cooling Tower<br>AHU            | 2,185                                               | 281                                      | 246.44                                                |
| 7 | Building G | Chiller<br>Primary Pump                                            | 8,874                                               | 1,451                                    | 1272.53                                               |
| 8 | Building H | Primary Pump<br>Condensing Pump<br>Secondary Pump<br>Cooling Tower | 4,113                                               | 1,119                                    | 981.36                                                |

Source: Prepared by PT. Azbil Berca Indonesia and revised by Nippon Koei

Remarks: Calculation of Estimated CO2 emission reduction [tCO2/year]:0.877 [tCO2/MWh] x (Estimated Energy Saving [MWh/year]). Note that CO2 Emission Factor comes from a table in Attachment 4 for Power Sector and used 0.877 [tCO2/MWh] for Java Area given in Additional Table 2 of JCM Model Project Second Solicitation Application Form in 2019

Note that calculation for CO2 reduction was extrapolated based on BAU ratio.

Energy saving performance for Target Facilities is summarized below.

| # | Building   | Total<br>Estimated<br>Energy<br>Saving | Primary<br>Pump | Secondary<br>Pump | Condensing<br>Pump | AHU | Cooling<br>Tower | Chiller |
|---|------------|----------------------------------------|-----------------|-------------------|--------------------|-----|------------------|---------|
|   |            | [MWh/Year]                             | [MWh/Year]      |                   |                    |     |                  |         |
| 1 | Building A | 426                                    | 184             | -                 | 197                | -   | 45               | -       |
| 2 | Building B | 148                                    | 114             | -                 | 66                 | -   | (32)             | -       |
| 3 | Building C | 523                                    | 66              | 106               | 218                | -   | 134              | -       |
| 4 | Building D | 3,899                                  | 733             | -                 | (299)              | -   | (132)            | 3,588   |
| 5 | Building E | 432                                    | 141             | -                 | 236                | -   | 55               | -       |
| 6 | Building F | 281                                    | 128             | -                 | 86                 | 40  | 27               | -       |
| 7 | Building G | 1,451                                  | 237             | -                 | -                  | -   | -                | 1,251   |
| 8 | Building H | 1,119                                  | 431             | 91                | 337                | -   | 260              | -       |

 Table 3.4
 Estimated Energy Saving of Each Facility

Source: Prepared by PT. Azbil Berca Indonesia and revised by Nippon Koei

Note 1: VWV control system is used for Primary pump, secondary pump, condensing pump. VAV control is used for AHU and Cooling Tower. High Efficiency Model is used for Chiller.

Note 2: Component of VAV Control system is similar to that of VWV, i.e., BEMS+VSD, and therefore similar calculation approach is used for VAV.

Note 3: Estimated energy saving by using latest chiller model is calculated by the comparison of existing Chiller (COP2.9) and High efficiency Chiller (Water Cooled Screw Chiller (375USRt) or Water Cooled Screw Chiller (250 USRt)).

For the reference, calculation process of energy saving performance for Building C is summarized in the following Table.

|                            |                  |                     |                   |                               | - 8, .                          |                                                |                        |                              |                                               |                                |                        |
|----------------------------|------------------|---------------------|-------------------|-------------------------------|---------------------------------|------------------------------------------------|------------------------|------------------------------|-----------------------------------------------|--------------------------------|------------------------|
|                            | Capacity<br>(kW) | Load<br>Rate<br>(%) | Exist Inv<br>(Hz) | Capacity<br>Before ES<br>(kW) | Running<br>Time/Year<br>(hr/yr) | Power<br>Conumption<br>before ES<br>(kWh/Year) | Cooling<br>Load<br>(%) | Capacity<br>After ES<br>(kW) | Power<br>Conumption<br>After ES<br>(kWh/Year) | Energy<br>Saving<br>(kWh/Year) | Enegy<br>Saving<br>(%) |
| PCHWP-1 (Mon-Tue)          | 11               | 90%                 | 50                | 9.9                           | 1,260                           | 12,474                                         | 75%                    | 4.8                          | 6,077                                         | 6,397                          | 51%                    |
| PCHWP-3 (Mon-Tue)          | 22               | 90%                 | 50                | 19.8                          | 1,260                           | 24,948                                         | 75%                    | 9.6                          | 12,153                                        | 12,795                         | 51%                    |
| PCHWP-3 (Wed-Sat)          | 22               | 90%                 | 50                | 19.8                          | 3,120                           | 61,776                                         | 75%                    | 9.6                          | 30,094                                        | 31,682                         | 51%                    |
| PCHWP-2 (Mon-Sat) Overtime | 11               | 90%                 | 50                | 9.9                           | 1,040                           | 10,296                                         | 75%                    | 4.8                          | 5,016                                         | 5,280                          | 51%                    |
| Primary Pump               |                  |                     |                   |                               |                                 | 140,567                                        |                        |                              | 74,290                                        | 66,277                         | 47%                    |
| CWP-1 (Mon-Tue)            | 11               | 90%                 | 40                | 5.7                           | 1,260                           | 7,141                                          | 75%                    | 2.8                          | 3,478                                         | 3,662                          | 51%                    |
| CWP-3 (Mon-Tue)            | 22               | 90%                 | 40                | 11.3                          | 1,260                           | 14,281                                         | 75%                    | 5.5                          | 6,957                                         | 7,324                          | 51%                    |
| CWP-3 (Wed-Sat)            | 22               | 90%                 | 40                | 11.3                          | 2,496                           | 28,290                                         | 75%                    | 5.5                          | 13,781                                        | 14,509                         | 51%                    |
| CWP-2 (Mon-Sat) Overtime   | 11               | 90%                 | 40                | 5.7                           | 832                             | 4,715                                          | 75%                    | 2.8                          | 2,297                                         | 2,418                          | 51%                    |
| Condensing Pump            |                  |                     |                   |                               |                                 | 461,821                                        |                        |                              | 244,069                                       | 217,752                        | 47%                    |
| SCHWP-1 (Mon-Sat)          | 22               | 90%                 | 40                | 11.3                          | 4,382                           | 49,666                                         | 75%                    | 5.5                          | 24,194                                        | 25,472                         | 51%                    |
| SCHWP-2 (Mon-Sat)          | 22               | 90%                 | 40                | 11.3                          | 4,382                           | 49,666                                         | 75%                    | 5.5                          | 24,194                                        | 25,472                         | 51%                    |
| SCHWP-3 (Mon-Sat)          | 22               | 90%                 | 40                | 11.3                          | 4,382                           | 49,666                                         | 75%                    | 5.5                          | 24,194                                        | 25,472                         | 51%                    |
| SCHWP-4 (Mon-Sat)          | 22               | 90%                 | 40                | 11.3                          | 4,382                           | 49,666                                         | 75%                    | 5.5                          | 24,194                                        | 25,472                         | 51%                    |
| Secondary Pump             |                  |                     |                   |                               |                                 | 224,329                                        |                        |                              | 118,553                                       | 105,776                        | 47%                    |
| CT-1 (Mon-Sat)             | 11               | 70%                 | 50                | 7.7                           | 3,756                           | 28,921                                         | 75%                    | 3.8                          | 14,089                                        | 14,833                         | 51%                    |
| CT-2 (Mon-Sat)             | 11               | 70%                 | 50                | 7.7                           | 3,756                           | 28,921                                         | 75%                    | 3.8                          | 14,089                                        | 14,833                         | 51%                    |
| CT-3 (Mon-Sat)             | 11               | 70%                 | 50                | 7.7                           | 3,756                           | 28,921                                         | 75%                    | 3.8                          | 14,089                                        | 14,833                         | 51%                    |
| CT-1 (Mon-Sat) Overtime    | 11               | 70%                 | 50                | 7.7                           | 1,252                           | 9,640                                          | 75%                    | 3.8                          | 4,696                                         | 4,944                          | 51%                    |
| CT-2 (Mon-Sat) Overtime    | 11               | 70%                 | 50                | 7.7                           | 1,252                           | 9,640                                          | 75%                    | 3.8                          | 4,696                                         | 4,944                          | 51%                    |
| Cooling Fan                |                  |                     |                   |                               |                                 | 283,419                                        |                        |                              | 149,751                                       | 133,668                        | 47%                    |
|                            |                  |                     |                   |                               | Total                           | 1,110,136                                      |                        |                              | 586,663                                       | 523,473                        | 47%                    |

 Table 3.5
 Example of Energy Saving by VWV Control

Source: PT. Azbil Berca Indonesia

The concept of energy saving performance using VWV control is to control the flow rate of the coolant to meet the actual coolant requirement in the air conditioning system by using inverter. Power requirement differential between pre-measuring power [kW] and actual power [kW] can be saved. The following calculation and figure illustrate the concept.

[Energy savings calculation formula]

Energy saving amount = (1) Baseline power consumption

-(2) Actual power consumption after energy saving implementation

$$= \sum (P_n \times T_n) - \sum E_n$$

(1) Baseline power consumption =  $\sum (P_n \times T_n)$ 

(2) Actual power consumption after energy saving implementation =  $\sum E_n$ 

Note)  $P_n$ : Electrical power of pump for each pump (pre-measuring item before energy saving implementation),  $T_n$ : Operation time of pump for each pump (Agreed condition after detail investigation (Definite value),  $E_n$ : Electrical power consumption of pump for each pump (Continually-measured item after energy saving implementation)



Source: PT. Azbil Berca Indonesia

#### Figure 3.3 Concept of Energy Saving by VWV Control

The result was reported to the building owners. They considered that Building B and Building H can be candidates of JCM Model Project and are interested in preparing for application for the Project. The Study team will continue to support the building owners for preparation of JCM application submission.

#### **3.1.4** Technology to be Introduced

#### (1) VWV Control System

VWV control will be performed by use of "savic-net<sup>TM</sup>G5" as part of Building Automation System (BAS) provided by PT. Azbil Berca Indonesia, and serve to save energy and CO2 emission. Overview of "savic-net<sup>TM</sup>G5" is shown below.

| =                   |                                                                            |
|---------------------|----------------------------------------------------------------------------|
| Features            | Description                                                                |
| User Friendly       | Developed by maximizing the usability by various level of operators easily |
|                     | regardless of experiences and occupational roles.                          |
| Centralized Control | All the data from various equipment are integrated and used for operation  |
| System              | and energy consumption analysis.                                           |
| Energy Saving       | Azbil is one of the most experienced energy solution providers and have    |
|                     | provided system for various building energy management and optimization,   |
|                     | and attain energy saving and CO2. Especially in the area of VWV Control    |
|                     | System and VAV control system. Also, power on and off scheduling of        |
|                     | office lighting and overall running cost.                                  |
| Reliability         | Designed, Developed in Japan, and expandable system structure for back     |
|                     | up and long term spare parts provision.                                    |
|                     |                                                                            |

Table 3.6Outline of Introduced Technology "savic-net™G5"

Source: Prepared by PT. Azbil Berca Indonesia and revised by Nippon Koei



Source: PT. Azbil Berca Indonesia

#### Figure 3.4 Image of Introduced Technology

System Configuration of savic-net<sup>TM</sup>G5 is illustrated below.



\*1 The Supervisory Controller can be additionally added or configured as redundant depending on the size and application of the building.

\*2 Also the Advanced Controller for pump unit and the Advanced Controller (for air conditioning) are available.

Source: PT. Azbil Berca Indonesia



The following is a list of components used in the above-mentioned system.

| #  | Device                                                                  |
|----|-------------------------------------------------------------------------|
| 1  | Supervisory Controller                                                  |
| 2  | Network Attached Storage                                                |
| 3  | Client PC                                                               |
| 4  | General Controller                                                      |
| 5  | Direct Mount I/O Module, SAnet Interface Module                         |
| 6  | Compact Remote I/O Module                                               |
| 7  | Advanced Controller for chiller unit, Advanced Controller for pump unit |
| 8  | Advanced Remote I/O Module                                              |
| 9  | Infilex VC                                                              |
| 10 | FCU Controller                                                          |

 Table 3.7
 List of Devices in the System Configuration

Source: Prepared by PT. Azbil Berca Indonesia and revised by Nippon Koei

Specification of Supervisory Controller is shown below.

|                   | Basic specifications                  |  |  |
|-------------------|---------------------------------------|--|--|
| Number of points  | Up to 30000 per system                |  |  |
|                   | Up to 5000 per Supervisory Controller |  |  |
| Power supply      | Rated voltage: 100–240 V AC, 50/60 Hz |  |  |
|                   | Power consumption: 60 VA max. (240 V  |  |  |
|                   | AC)                                   |  |  |
| CPU               | 64-bit                                |  |  |
| Main memory       | SDRAM 2 GB                            |  |  |
| Auxiliary storage | SATA SSD 32 GB                        |  |  |
| device            |                                       |  |  |
| Communication     | BACnet/IP, Modbus TCP                 |  |  |
| Communication     | 100/1000 Mbps                         |  |  |
| speed             |                                       |  |  |
| Dimensions        | 230 mm (W) × 140 mm (H) × 80 mm       |  |  |
|                   | (D)                                   |  |  |
| Weight            | 1.4 kg                                |  |  |

 Table 3.8
 Specification of Supervisory Controller

Source: PT. Azbil Berca Indonesia

Savic-net<sup>TM</sup>G5, provided by PT. Azbil Berca Indonesia will be able to monitor all the facilities in the building and serves to save energy and attain daily operational efficiency. Snapshot of its screens are given below.



Source: PT. Azbil Berca Indonesia Figure 3.6 Examples of Screens of Introduced Technology

In conventional system, coolant pumps operate at constant flow. Coolant valves at Air Handling Unit (AHU) control the flowrate which create pressure differential ( $\Delta P$ ).

Once the valve is slotted, the coolant surplus will be returned back to suction of the secondary pump. Once savic-net<sup>TM</sup>G5 (Controller) system is introduced, signal of  $\Delta P$  at AHU is transmitted to Controller, and the Controller transmit signal to VSD at secondary pump to slow down the load and save energy.





Note) VSD: Variable Speed Drive, AHU: Air Handling Unit, FCU: Fun Coil Unit, ΔP: differential pressure Figure 3.7 Image of VWV Control by Introduced Technology

#### (2) VSD for the Pump

VSD is variable speed drive for pumps. It is used for VWV control, as part of savic-net<sup>TM</sup>G. Specification of VSD is shown below.

| Supply connection                |                                                                                                                             | Communication            |                                                                                                                      |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------|
| Voltage and power range          | 3-phase, 380 to 480 V, +10/-15%<br>(0.75 to 250 kW), auto-identification of input line                                      |                          | Protocols as standard (EIA-485): BACnet MS/TF<br>Modbus RTU and N2                                                   |
| Frequency                        | 48 to 63 Hz                                                                                                                 |                          | Available as plug-in options: BACnet/IP                                                                              |
| Fundamental power<br>factor      | 0.98                                                                                                                        |                          | LonWorks, Modbus TCP etc.<br>Available as an external option: Ethernet adapte                                        |
| Efficiency at rated power        | 98%                                                                                                                         | Application frontions    | for remote monitoring                                                                                                |
| Motor connection                 |                                                                                                                             | Application functions    | Plant about a solutions                                                                                              |
| Supported motor control          | Scalar and vector                                                                                                           |                          | Primary settings for HVAC applications                                                                               |
| Supported motor types            | Async or induction motor (what is the term?),<br>Permanent magnet motor (vector), SynRM (vector)                            |                          | Hand-Off-Auto operation mode<br>Start interlock (de-frost)                                                           |
| Voltage                          | 3-phase, from 0 to UN                                                                                                       |                          | Delayed start<br>Run nermissius (demost monitorina)                                                                  |
| Frequency                        | 0 to 500 Hz                                                                                                                 |                          | Override operation mode                                                                                              |
| Environmental limits             | M-                                                                                                                          |                          | Real time clock (scheduling)                                                                                         |
| Ambient temperature              |                                                                                                                             |                          | Loop controllers for motor and process                                                                               |
| Transportation and               |                                                                                                                             |                          | Motor flying start                                                                                                   |
| storage                          | -40 to 70 °C                                                                                                                |                          | Motor pre-heating                                                                                                    |
| Air temperature/relative         | -15 to +50 °C; 5 to 95% no condensation<br>allowed                                                                          | Protection functions     | Energy optimizer and calculators                                                                                     |
| humidity (operation)             | Reduced loadability above 40 °C.                                                                                            |                          | Overvoltage controller                                                                                               |
| Output current                   | Rated current available at 0 to 1000 m<br>reduced by 1% per 100 m over 1000 to 2000 m<br>2000 to 4000 m, please consult ABB |                          | Undervoltage controller<br>Motor Earth-leakage monitoring<br>Motor short-circuit protection                          |
| Degree of protection             | IP21 or IP55                                                                                                                |                          | Motor overtemperature protection                                                                                     |
| Inputs and outputs               |                                                                                                                             |                          | Output and input switch supervision                                                                                  |
| 2 analog inputs                  | Current/voltage input mode selected from<br>control panel                                                                   |                          | Motor overload protection<br>Phase-loss detection (both motor and supply)                                            |
| Voltage signal                   | 0 (2) to 10 V, Rin > 200 kQ                                                                                                 |                          | Under load supervision (belt loss detaction)                                                                         |
| Current signal                   | 0 (4) to 20 mA. Bin = 100 0                                                                                                 |                          | Stall protection                                                                                                     |
| Potentiometer reference<br>value | 10 V ±1% max. 20 mA                                                                                                         | Product compliance       | Loss of Al signal monitoring                                                                                         |
| 2 analog outputs                 | AO1 software configurable for current or voltage.<br>AO2 current                                                            | Product compliance       | Low Voltage Directive 2006/95/EC                                                                                     |
| Voltage signal                   | 0 to 10 V, Rload: > 100 kΩ                                                                                                  |                          | Quality assurance system ISO 9001 and                                                                                |
| Current signal                   | 0 to 20 mA, Rload: < 500 Ω                                                                                                  |                          | Environmental system ISO 14001                                                                                       |
| Internal auxiliary voltage       | 24 V DC ±10%, max. 250 mA                                                                                                   |                          | CE, UL, cUL, and EAC approvals                                                                                       |
|                                  | 12 to 24 V DC, 24 V AC, Connectivity of PTC                                                                                 | Standards and directives | Galvanicisolation according to PELV                                                                                  |
| 6 digital inputs                 | sensors supported by a single digital input. PNP or NPN connection (5 Dis with NPN connection).                             |                          | RoHS2 (Restriction of Hazardous Substances)<br>EN 61800-5-1:2007; IEC/EN 61000-3-12;                                 |
| 3 relay and outputs              | Maximum switching voltage 250 V AC/30 V DC<br>Maximum continuous current 2 A rms                                            |                          | EN61800-3: 2004 + A1: 2012 Category C2 (1st<br>environment restricted distribution);<br>Sole terms of CN \$1900.5.20 |
|                                  | Any of the 6 digital inputs or analog inputs can be                                                                         | EMC                      | Sale torque on (EN 61600-0-2)                                                                                        |
| PTC and PT 100                   | configured for PTC, with a limit of 6 sensors<br>Both analog outputs can be used to feed the                                | (according to EN61800-3) | Class C2 (1st environment restricted distribution                                                                    |
|                                  | PT100 sensor                                                                                                                | Harmonics                | 1EU/EN 01000-3-12                                                                                                    |
| Motor connection                 | T                                                                                                                           |                          |                                                                                                                      |
| Optional in frames R0<br>R5      | 1.04 A at 24 V AC/DC ±10%                                                                                                   |                          |                                                                                                                      |
| Standard in frames R6<br>R9      | 1.50 A at 24 V AC/DC ±10%                                                                                                   |                          |                                                                                                                      |

#### Table 3.9Specification of VSD

Source: Catalog of "ACH580 drives for HVAC" shared by PT. Azbil Berca Indonesia

#### 3.1.5 Monitoring Plan

Monitoring is assumed to be implemented as part of daily operation by each building. In addition, a manufacturer of BAS (PT. Azbil Berca Indonesia) or another company selected by the manufacturer are expected to support the monitoring for the buildings in order to contribute to promotion of Green Building in DKI-JKT.

Implementation structure of monitoring is proposed as shown in the figure below. Monitoring report will be submitted to MOEJ by a representative participant.



Figure 3.8 Monitoring Structure

#### 3.1.6 Confirmation about Environmental License and SDIP

In Indonesia, Sustainable Development Implementation Plan (SDIP) needs to be submitted and approved together with Project Design Document (PDD) at the time of JCM project registration. SDIP items were confirmed at the candidate buildings according to JCM form.

The confirmation of SDIP items is as shown in the table below.

| Items                                                                                                                                                                                                  | #  | Questions                                                                                                                                                                                              |    | If answer is Yes, please describe the action plans. |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----------------------------------------------------|
| EIA                                                                                                                                                                                                    | 1  | Does the proposed project require official/legal process of EIA?                                                                                                                                       | No |                                                     |
|                                                                                                                                                                                                        | 2  | Does the proposed project emit air pollutants?                                                                                                                                                         | No |                                                     |
| Pollution                                                                                                                                                                                              | 3  | Does the proposed project discharge water pollutants or substances which influence BOD, COD or ph, etc.?                                                                                               | No |                                                     |
| Control<br>(No need to                                                                                                                                                                                 | .4 | Does the proposed project generate waste?                                                                                                                                                              | No |                                                     |
| answer if EIA                                                                                                                                                                                          | 5  | Does the proposed project increase noise and/or vibration from the current level?                                                                                                                      | No |                                                     |
| is required)                                                                                                                                                                                           | 6  | Does the proposed project cause ground subsidence?                                                                                                                                                     | No |                                                     |
|                                                                                                                                                                                                        | 7  | Does the proposed project cause odor?                                                                                                                                                                  | No |                                                     |
| Safety and<br>health8Does the proposed project create dangerous condition for<br>local communities as well as individuals involved in the<br>project, during either its construction or its operation? |    |                                                                                                                                                                                                        | No |                                                     |
|                                                                                                                                                                                                        | 9  | Is the proposed project site located in protected areas designated by national laws or international treaties and conventions?                                                                         | No |                                                     |
| Natural<br>Environment<br>and                                                                                                                                                                          | 10 | Does the proposed project change land use of the community and protected habitats for endangered species designated by national laws or international treaties and conventions?                        | No |                                                     |
| biodiversity                                                                                                                                                                                           | 11 | Does the proposed project bring foreign species?                                                                                                                                                       | No |                                                     |
|                                                                                                                                                                                                        | 12 | Does the proposed project include construction activities<br>considered to affect natural environment and biodiversity<br>(e.g., noise, vibrations, turbid water, dust, exhaust gases,<br>and wastes)? | No |                                                     |

 Table 3.10
 Confirmation about Environmental License and SDIP

| Items                                                      | #  | Questions                                                                                                                                                                                                                                                                |    | If answer is Yes, please describe the action plans. |
|------------------------------------------------------------|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----------------------------------------------------|
|                                                            | 13 | Does the proposed project use surface water, ground water and/or deep ground water?                                                                                                                                                                                      | No |                                                     |
| Economy                                                    | 14 | Does the proposed project have negative impact on local workforce capacity?                                                                                                                                                                                              | No |                                                     |
| Economy                                                    | 15 | Does the proposed project have negative impact on local community's welfare?                                                                                                                                                                                             | No |                                                     |
|                                                            | 16 | Does the proposed project cause any resettlement or other types of conflict?                                                                                                                                                                                             | No |                                                     |
| Social<br>Environment<br>and<br>Community<br>Participation | 17 | Does the proposed project fail to involve activities to<br>respond to, and follow up, comments and complaints that<br>have been received from local communities, particularly<br>from the public consultation?                                                           | No |                                                     |
|                                                            | 18 | Do the project participants violate any laws and/or<br>ordinances associated with the working conditions of local<br>communities which the project participants should<br>observe in the project?                                                                        | No |                                                     |
|                                                            | 19 | Does the proposed project fail to involve activities to build<br>capacity of human resources through technology transfer<br>and technical assistance?                                                                                                                    | No |                                                     |
| Technology                                                 | 20 | Does the proposed project fail to describe information of<br>technology specification that consists of manual book and<br>ways to overcome the problems that may occur when<br>being operated on the site, at least in English and in<br>Bahasa Indonesia as applicable? | No |                                                     |

Source: Prepared by Nippon Koei according to JCM Sustainable Development Implementation Plan Form

#### 3.1.7 Coordination for International Consortium on Green Building

During the feasibility study on Green Building, it took more time than expected to identify the candidate buildings. As the result of study, there are potential of energy saving in Building C and Building H. To apply for JCM Model Project with these buildings, the following Indonesian specific challenges should be considered and solved.

There are mainly two reasons why it was challenging to identify the candidate buildings in DKI-JKT. First reason is regarding a financial statement. In Indonesia, it is normally difficult to obtain audited financial statement from Indonesian companies. However, the financial statement is one of necessary document to apply for JCM Model Project. So, it is needed to continue explaining the necessity of submission and get their understanding about it.

Second reason is that continuous monitoring during Japanese legal durable years (approx. 10 years) is one of the important obligations of JCM Model Project. Building owners had a negative image to have these obligations for long time, and they displayed an attitude of reluctance to apply JCM Model Project. As one of the approaches to solve this concern, it is beneficial for building owners to explain about life cycle cost. Continuous monitoring and maintenance can keep the introduced technologies in good condition for long time, and it can also contribute to reduction of life cycle cost. The explanations which show benefit especially of financial aspect are necessary for sweeping away their concerns.

In addition to the above two reasons, Green Building is still not well recognized by the majority of building owners in DKI-JKT. To promote Green Building concept and energy saving activities in buildings, DKI-JKT already started to take actions such as a seminar for private

companies. In FY 2019, the study for JCM Model Project formulation is expected to be conducted with cooperation by DKI-JKT to raise awareness of building owners about energy saving.

During the feasibility study in FY 2018, International Consortium has not been determined due to taking a time to identify candidate Partner Participant. A leasing company is expected to be the Representative Participant of International Consortium to solve building owner's concerns about initial investment of introduced technology. After confirmation that Building C and Building H can be the Partner Participant, the appropriate Representative Participant will be considered, and International Consortium and implementation structure will be determined. Nippon Koei Co., Ltd. will support the preparation of Project Design Document (PDD), validation, project registration, preparation of the monitoring report, and verification. International Consortium is proposed as shown in the figure below.



Source: Prepared by Nippon Koei

Figure 3.9 International Consortium on Green Building

#### 3.1.8 Issues for JCM Model Project Application

As the result of study, it was clear that the project scale in the candidate buildings are small. So, bundling of several projects might be necessary to apply for JCM Model Project in order to meet application conditions such as minimum requirement of GHG emission reduction or cost effectiveness. Concretely, this means that combining of the energy saving project of Building C and Building H is currently considered as one of the options. In this case, the problem is that the workload on the Representative Company of JCM Model Project will be quite heavy, since coordination and document preparation are required for application. Discussion with these buildings and relevant companies will be continued to consider applying JCM Model Project.

#### **3.2** FEASIBILITY STUDY ON ENERGY SAVING IN INDUSTRY SECTOR

#### 3.2.1 Overview of the Feasibility Study

DKI-JKT, is the capital city of Indonesia, and one of the biggest industrial bases in Southeast Area. The Jakarta metropolitan area has been developed under remarkable economic growth through both domestic and foreign investments since the latter half of the 20th century, and many Japanese companies are located in this area. On the other hand, the supply capacity of power generation facilities in Indonesia is not enough due to recent rapid economic growth. To meet the current increased power demand, more power generation is needed. In addition, introduction of energy saving technologies and renewable energy into facilities are advanced under the Green Industry Policy supported by Ministry of Industry in Indonesia. DKI-JKT is a tropical climate and the average temperature is almost 27 degrees Celsius. Therefore, energy consumption and energy burden by air conditioning is very large, especially in big factories.

In the feasibility study on Energy Saving in Industry Sector, MDI Corporation (hereinafter called "MDI") in Kawasaki City, which has heat exchange technologies, supported identifying the potential of energy saving in industry sector. MDI is a member company of "Kawasaki Green Innovation Cluster" organized by the International Economic Affairs Office of Kawasaki City.

The feasibility study in FY 2018 was conducted at the industrial parks near DKI-JKT where many Japanese companies are in. The main purpose of this study in FY 2018 is confirm the potential of energy saving in factories in DKI-JKT and the surrounding area, and detail investigation for JCM Model Project formulation will be implemented in FY 2019. So, consideration of application for JCM Model Project will be also done in FY 2019.

#### **3.2.2** Selection of Target Factories for the Study

Interview investigation was conducted in the following 5 factories in FY 2018. Factory A has high interest in energy saving and has been monitoring their energy consumption in the factory. As for Factory B, C, D, and E, an Indonesian engineering company which has experience with JCM mode project introduced these factories as potential factories where MDI can install their own technologies.

| # | Factory   | Main Product                   | Location | Possibility of<br>JCM project formulation                                              |
|---|-----------|--------------------------------|----------|----------------------------------------------------------------------------------------|
| 1 | Factory A | Decorative Panels              | Bekasi   | <high> They are interested<br/>in JCM, and effect of energy<br/>saving is high.</high> |
| 2 | Factory B | Pottery                        | Cikarang | <high> They are interested<br/>in JCM, and effect of energy<br/>saving is high.</high> |
| 3 | Factory C | Aluminum alloy<br>ground metal | Karawan  | < <b>Low</b> > They don't have a plan<br>for energy saving at this<br>moment.          |

 Table 3.11
 Basic Information of the Target Factories

| # | Factory   | Main Product | Location | Possibility of<br>JCM project formulation                                                       |
|---|-----------|--------------|----------|-------------------------------------------------------------------------------------------------|
| 4 | Factory D | Paper diaper | Bekasi   | < <b>Low</b> > They don't have a plan<br>for energy saving, and energy<br>consumption is small. |
| 5 | Factory E | Carton Box   | Cikarang | < <b>Low</b> > They don't have a plan<br>for energy saving at this<br>moment.                   |

Source: Prepared by Nippon Koei

The feasibility study was implemented according to the following study items to formulate JCM Model Project at the target factories.

| #        | Study Items                              | Description                                                    |
|----------|------------------------------------------|----------------------------------------------------------------|
|          | Confirmation of the current situation    | The existing facilities were checked in the target factories,  |
| 1        | of existing facilities and consideration | and introduced technologies have been considered.              |
| 1        | of specification of introduced           |                                                                |
|          | technology                               |                                                                |
|          | Monitoring Plan                          | Monitoring Plan for JCM Model Project will be considered       |
| 2        |                                          | after selecting candidate factories by detail investigation in |
|          |                                          | FY 2019.                                                       |
|          | Confirmation of necessary approvals      | Environmental approval and other necessary licenses were       |
| 3        |                                          | confirmed. It was confirmed that there was no necessary        |
| 5        |                                          | approval for the project, but it will be confirmed again after |
|          |                                          | identifying candidate project.                                 |
| 4        | Coordination for International           | Possible international consortium and implementation           |
| -        | Consortium                               | structure were considered.                                     |
| 5        | Confirmation of project cost, contract,  | Necessary information to consider energy saving amount         |
| 5        | project schedule                         | and GHG emission reduction was collected.                      |
|          | Invitation DKI-JKT officers to Japan     | 2 delegates from DKI-JKT were invited to the JCM seminar       |
| 6        | for capacity building                    | in October 2018 held in Japan, and they visited several        |
|          |                                          | facilities related to industrial waste management in Japan.    |
|          | Business matching between Kawasaki       | The potential of energy saving in factories in DKI-JKT was     |
| 7        | companies and Indonesian companies       | confirmed, and participation of Kawasaki companies             |
| <i>'</i> |                                          | inclusive of MDI to the energy saving project was              |
|          |                                          | considered.                                                    |

| Table 3.12  | <b>Outline</b> of the Stud | v Items on En | ergy Saving in | Industry Sector |
|-------------|----------------------------|---------------|----------------|-----------------|
| 1 abic 3.12 | Outline of the Stud        | y nums on En  | cigy baving m  | muusii y Sector |

Source: Prepared by Nippon Koei

#### **3.2.3** Study Results at Candidate Factories

Performance of five facilities was reviewed. Two facilities (Factory A and Factory B) out of five are interested in JCM Model Project. Factory B is still in the planning stage and not ready for the implementation, and therefore Factory A was investigated further and potential of energy saving for compressors and driers were investigated. Results of the investigation are as follows.

| # | Target Facilities         | Applicable<br>Technologies | Monitoring Result of Energy<br>Consumption <sup>*1</sup> [kWh]<br>(Working hour/ Out-of-work hour) | Potential Energy<br>Saving [%]<br>(Working hour/<br>Out-of-work hour) |
|---|---------------------------|----------------------------|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| 1 | Compressors (2 units)     | Inverter                   | 13,126                                                                                             | 30                                                                    |
| 1 | 1 Compressors (2 units)   | Compressor                 |                                                                                                    |                                                                       |
| 2 | Dryor (A unite)           | Visualization +            | 27,603                                                                                             | 10                                                                    |
| 2 | 2 Diver (4 units)         | Control system             | 678                                                                                                | 30                                                                    |
| 2 | 2 Set magner (AC   Light) | Visualization +            | 8,055                                                                                              | 10                                                                    |
| 3 | Set Iooni (AC+Light)      | Control system             | 1,085                                                                                              | 30                                                                    |

#### Table 3.13 Energy Saving Potential of Factory A

Source: Provided by Nippon Koei, based on the data by Factory A

\*1) Monitoring of energy consumption was conducted for 6 days. Working hour is "24h\*6days/week", and Outof-work hour is "24h/week".

Overview of the Energy Saving Potential of Factory A, including initial investment cost, energy saving enhancement, and CO2 Emission Reduction is as follows.

| I i | Table 3.14 Calculated Energy Saving Fotential of Factory A |                                |  |  |
|-----|------------------------------------------------------------|--------------------------------|--|--|
| #   | Item                                                       | Result                         |  |  |
| 1   | Estimated initial investment                               | 26,000,000 [JPY]               |  |  |
| 2   | Estimated energy saving                                    | 330 [MWh/Year]                 |  |  |
| 3   | Estimated GHG emission reduction                           | 3,473 [tCO2] <sup>1)</sup>     |  |  |
| 4   | Cost efficiency                                            | 3,743 [JPY/tCO2] <sup>2)</sup> |  |  |

| Table 3 14  | Calcurated | Fnergy | Saving | Potential | of Factory | Δ |
|-------------|------------|--------|--------|-----------|------------|---|
| 1 able 3.14 | Calculateu | Energy | Saving | rotentiai | of Factory | Α |

Source: Provided by Nippon Koei, based on the data by factory A

Note1) 330 [MWh/y] x 0.877 [tCO2/MWh] = 289.41 [tCO2/y] 289.41 [tCO2/y] x 12 years (for paper processing) = 3,473 [tCO2] Note2) (JPY 26 mil x 50%)/ 3,473 [tCO2] = 3,743 [JPY/tCO2]

The result shows that energy saving performance is JPY 4,000/tCO2 and lower, and meeting the criteria of JCM Project; however, annual CO2 Emission is only 289.41 tCO2 and so needs to be combined with other energy saving project.

#### 3.2.4 Study for Considering Additional Energy Saving Technology

MDI, manufacturer of Waste Heat Recovery Facility and Heat Exchanger, investigated additional potential.



Inspection of Factory A



Discussion with Factory A

Currently two Once-through boilers with economizer, one flue and smoke tube boiler and one thermal medium boiler are installed in Factory A. Steam generated in the boiler is used in the Factory and the majority of the steam is released into the atmosphere. There is some room for energy saving in the system. After the investigation, it was found that Once-through boilers with economizer can be a candidate for energy saving.

- Further heat recovery of economizer Further heat recovery at economizer and use the heat for hot water
- Heat recovery of blow water Heat recovery from blow water for heating boiler feed water

As of February 2019, further data collection to confirm the energy saving potential is underway at the Factory A. Plan for further study to Promote the Green Industry campaign in DKI-JKT is down the road. Factory A is planning to investigate flue gas temperature, moisture, flowrate, corrosion risk and CO2 Emission Reduction to be ready for preparing application for JCM Model Project.

#### 3.2.5 Technology to be Introduced

In this study during FY 2018, there are two technologies proposed for Factory A, as follows:

#### 1) Heat Exchanger at the Economizer of once through boiler

Plate Heat Exchanger with cross flow type provided by MDI, i.e, "AIREC CROSS30" is considered to serve the purpose to maximize the heat recovery at economizer. Over view of the "AIREC CROSS30" is as follows:

| Feature                                                                                                                                                                                                                                            | Image                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| <ul> <li>Stainless Steel Product (corrosion resistant)</li> <li>Slow Fouling design due to a wider flue gas passage</li> <li>Low pressure loss and pressure resistant up to 6MPa</li> <li>Modular construction and easy for maintenance</li> </ul> |                                    |
|                                                                                                                                                                                                                                                    | Figure 3.10 Photo of AIREC CROSS30 |

 Table 3.15
 Heat Exchanger for Waste Heat Recovery (AIREC CROSS30)

Source: Provided by MDI

Installed image of AIREC CROSS30 is shown below. The image uses two stacked configuration, first stack serves as boiler feed water pre-heating and second stack is used for heating medium of heat pump. Flue gas temperature of 150 deg C can be down to 20 deg C but subject to condensing of water in the flue gas.



Source: Provided by MDI

Figure 3.11 Heat Recovery from Flue Gas using two stacked AIREC CROSS30

#### 2) Heat Recovery from Blow Water

Shell and tube heat exchanger type MDI-DRS manufactured by MDI can be used to recover heat form blow water. Specification of the Heat Exchanger Type MDI-DRS is as follows.

|   | Feature                                                                                             | Image                    |  |  |  |
|---|-----------------------------------------------------------------------------------------------------|--------------------------|--|--|--|
| • | Colgate tube with 9.5mm OD and 0.3mmWT is used                                                      |                          |  |  |  |
| • | Turbulent flow created in the tube and<br>enhance the heat transfer efficiency                      |                          |  |  |  |
| • | Higher heat exchanging performance<br>compared with straight pipe Shell and<br>Tube Heat Evaluation |                          |  |  |  |
|   | Tube Heat Exchanger                                                                                 | Figure 3.12 Type MDI-DRS |  |  |  |

#### Table 3.16Outline of MDL-DRS

Source: Provided by MDI

Image of MDI-DRS Installation is show below. Recovered heat can be used for heating boiler feed water.



Source: Provided by MDI

Figure 3.13 Heat Recovery from Blow Water

#### 3.2.6 Coordination for International Consortium on Energy Saving in Industry Sector

During the feasibility study in FY 2018, candidate factories which can apply for JCM Model Project could not be identified, so International Consortium is not fixed yet. However, Factory A and Factory B are interested in JCM Model Project. Then, the investigation in FY 2019 will be conducted preferentially at these two factories to confirm partner participants. Also, representative participant of International Consortium will be considered in FY 2019. As for the EPC contractor, it was already confirmed that the Indonesian engineering company which introduced target factories (Factory B-E in Table 3.5) can participate in the project.

Regarding the monitoring of the project, it is supposed to be implemented by partner participants as part of daily operation. Monitoring report will be submitted to MOEJ by a representative participant. Nippon Koei will support JCM procedures such as PDD preparation,

validation, project registration, preparation of monitoring report, verification, and CO2 credit issue.

International Consortium in case of applying to JCM Model Project is proposed as shown in the figure below.



Source: Prepared by Nippon Koei

Figure 3.14 International Consortium on Energy Saving in Industry Sector

## CHAPTER 4 ISSUES AND FUTURE PLAN

In the Study FY2018, "Feasibility study for JCM Model Project formulation" and "Promotion of Green Innovation by City-to-City Collaboration" were conducted between Kawasaki City and DKI-JKT. During the Study, several issues were identified and considered to solve them. The following sections describe the issues in FY2018 and future plan to of the Study in FY 2019.

#### 4.1 ISSUES AND PROPOSED APPROACH

#### 4.1.1 Proposal of Bundling of Several Projects for JCM Model Project Application

In DKI-JKT, there are few business owners who have large power and head demand in the private sector. This means that there are few projects which can reduce a lot of GHG emission reduction to the extent of minimum requirement of application for JCM Model Project. Accordingly, bundling of several projects might be necessary for application to JCM Model Project.

It is preferable for subsidy amount of JCM Model Project to be more than 50 million JPY. Assuming JCM subsidy is 40% of equipment cost, the project scale will be more than 125 million JPY. There are few private companies that can decide to make the investment for energy saving equipment at this scale. Project bundling will be necessary in this term too.

As for the feasibility study on Green Building in FY 2018, it was clear that the project scale in the candidate buildings is small. So, bundling of several projects is being considered to apply for JCM Model Project in order to meet application conditions such as minimum requirement of GHG emission reduction or cost effectiveness.

However, when the bundling is assumed, workload on the Representative Company of JCM Model Project will be quite heavy, since coordination and document preparation are required for application, such as international consortium agreement, material for financial status, business and fund procurement plan, document for intention of project participation, etc. Especially, it is difficult to obtain audited financial statement from local companies.

Hence, the opinion was obtained that it is desirable to ease and simplify the document requirements, when investment of a participant company is small, for example.

To promote formulation of JCM Model Projects with project bundling and cross development in City-to-City Collaboration, it is preferable to simplify the document requirements in JCM Model Project application.

### 4.1.2 Activation of the Study by Utilizing Sustainable Development Goals (SDGs)

DKI-JKT prepares a Mid-term Development Plan (Rencana Pembangunan Jangka Menengah Daerah 2017- 2022 (hereinafter called "RPJMD")) every five years and implements

government work according to RPJMD. The sectors which were picked up by DKI-JKT as the priority sectors in the Study FY2018 such as renewable energy and waste management are also included in RPJMD. So, it is very beneficial for DKI-JKT to collaborate with Kawasaki City since the Study can contribute to achievement of RPJMD. On the other hand, Kawasaki City willingly supports to expand Kawasaki companies' business to foreign countries, so the Study may become one of good opportunities to do so.

Thus, both cities have continued discussions to take full advantage of participation in the Study with each other, and to optimize each benefit of the Study. In the future, it is very important to find common incentives for both cities to activate City-to-City Collaboration more.

In the Study FY2018, when the discussion between both cities was conducted on "Feasibility study for JCM Model Project" and "Promotion of Green Innovation by City-to-City Collaboration", it was sometimes challenging to set same values to achieve the Study's goals. One reason of this situation might be that the motivations for participating in the Study and the achievements after commitment have not been clarified to each other.

As already described in section 2.3, Kawasaki City announced "Draft of Kawasaki City Promotion Policy on Sustainable Development Goals", and DKI-JKT also announced "Draft of SDGs Action Plan from 2017 to 2022". So, it seems that it became easier to implement activities and discussion through optimizing SDGs.

Accordingly, SDGs will be utilized as "common language" of both cities in the Study FY2019. It is along both cities' government policy and SDGs that can also provide common incentives for both cities to participate in the Study. Kawasaki City and DKI-JKT already agreed that SDGs can be utilized in the Study to activate City-to-City Collaboration with more beneficial and clear discussion.

### 4.2 WAY FORWARD

### 4.2.1 Application of JCM Model Project

As described in Chapter 3, the feasibility study on "Green Building" and "Energy Saving in Industry Sector" were conducted in the Study in FY2018.

Regarding Green Building, several high-story buildings in the central area of DKI-JKT were visited to identify potential of energy saving. As the result of study, two buildings were selected as candidate buildings for JCM Model Project formulation, in consideration of the building scale and their interest level to JCM. However, the project scale in these candidate buildings is small, and bundling of several projects might be necessary for application to JCM Model Project to meet application conditions such as minimum requirement of GHG emission reduction. In this case, the problem is that the workload on the Representative Company of JCM Model Project will be quite heavy, since coordination and document preparation are required for application. So, after confirmation that it should be possible to combine several projects to apply for JCM Model Project, preparation for the JCM Model Project application in FY 2019 will be started.

Regarding to Energy Saving in Industry Sector, several factories located in the industrial parks near DKI-JKT were visited and identified factories which have interest in JCM Model Project or energy saving. Only a few Japanese companies in Indonesia were the target of study in FY2018, but it is clear that there is big opportunity for energy saving in factories through the study and discussion with DKI-JKT. So, the feasibility study on Energy Saving in Industry Sector will be continued in FY2019 and expand the target factories more than FY2018. After identifying candidate factories of energy saving projects in the Study FY2019, preparation for applying JCM Model Project in FY2020 will be started.

#### 4.2.2 Proposed Study for FY2019 City-to-City Collaboration

Both Kawasaki City and DKI-JKT have already agreed to continue City-to-City Collaboration for low carbon society in FY2019. The cities will implement their activities according to "Letter of Intent for City-to-City Collaboration for Low-Carbon Society".

As the theme of continuous City-to-City Collaboration for low carbon society in FY2019, "Realization of Sustainable Green Innovation" is proposed.

Green Innovation aims to realize both economic growth and low-carbon urban development by utilizing and promoting advanced environmental technologies. In the Study, Kawasaki City's experiences and good technologies of Kawasaki companies such as a member of Kawasaki Green Innovation Cluster will be utilized to solve DKI-JKT's environmental issues due to their strong economic growth. Based on the discussion result between both cities, the Study in FY2019 will be conducted with 2 approach; "JCM Feasibility Study (Approach 1)", and "On Demand Discussion/Support for Sustainable City (Approach 2)".

DKI-JKT requested to include "Renewable Energy" and "Waste Management" as priority sector of the Study in FY2019. Specifically, DKI-JKT requested: (Approach 1) Installing of Renewable Energy such as PV system are conducted as feasibility study for JCM Model Project formulation, and (Approach 2) River Purification and Waste Management in traditional market are conducted as capacity building.

As a result, based on the idea proposed by DKI-JKT and the result of the Study in FY 2018, the following activities were agreed between both cities for FY 2019.

| Policy          | Sector           | Target Area              | Outline                            |
|-----------------|------------------|--------------------------|------------------------------------|
| Approach 1:     | Energy Saving in | Industrial Parks near    | Consideration of energy saving     |
| JCM Feasibility | Industry Sector  | DKI-JKT, and Factories   | solution/technologies at factories |
| Study           |                  | in DKI-JKT               | in DKI-JKT for JCM Model           |
|                 |                  |                          | Project formulation.               |
|                 | Renewable        | East/West Flood Canal    | Promotion of renewable energy      |
|                 | Energy           | are, Pulauseribu         | especially PV system through       |
|                 |                  | Islands, Public Schools, | collaboration with DKI-JKT.        |
|                 |                  | etc.                     |                                    |
| Approach 2:     | Waste            | River                    | Knowledge transfer from            |
| On Demand       | Management       |                          | Kawasaki City to DKI-JKT on        |
| Discussion/     | -                |                          | river purification.                |
| Support         |                  | Pasara Jaya Market       | Introduction of waste              |
|                 |                  |                          | management in Kawasaki City,       |
|                 |                  |                          | and shared about technologies for  |
|                 |                  |                          | waste treatment                    |

#### Table 4.1Proposed Activities for FY2019

Source: Prepared by Nippon Koei

The image of the City-to-City Collaboration between Kawasaki City and DKI-JKT in FY2019 is outlined in the following figure.

| y to City Collaboration between DKI-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | JKT and Kawasaki in FY2019                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|
| Approach 1>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <approach 2=""></approach>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |  |
| JCM Feasibility Study                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | On Demand Discussion/Support                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |  |  |  |
| 9 NULSTRY. NUMATION         Construction         Construction         Creen Industry             Sector 2            Sector 2           Sector 2            Sector 2            Sector 2            Sector 2            Sector 2            Sector 2            Sector 2            Sector 2            Sector 2            Sector 2            Sector 2            Sector 2            Sector 2 | 11 SUSTAINABLE CITES AND COMMUNITS         Sustainable City         Sustainable City         Sustainable City         City             AD Community           Sustainable City           Sustainable           Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainable         Sustainab |  |  |  |  |  |
| 7       AFTORNABLE AND<br>DECARDAGENCY         ✓       Promotion of Clean Energy>         ►       Unstable power supply and high<br>electricity bill are problem         ✓       Installation of solar PV system                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |

Source: Prepared by Nippon Koei

