Feasibility Study Final Report on FY2014 JCM Large-scale Project for Achievement of a Low-carbon society in Asia

Feasibility Study on financing scheme development project for promoting energy efficiency equipment installation in Indonesia

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MITSUBISHI RESEARCH INSTITUTE, INC.
International Project Center
Environment and Energy Research Division

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1. Outline of the Study

1.1 Purpose of the Project

At the 36th session of the Intergovernmental Panel on Climate Change (IPCC) on September 26, 2015 in Stockholm, Sweden, the Summary for Policy Makers of Fifth Assessment Report (Natural Science Basis) by Working Group I was submitted and approved. The summary reassured the ongoing global warming trend and stated that human activities are most likely the main cause of the global warming, which was first observed in the mid-20th century.

Japan has shared with all other countries their commitment to at least halve global greenhouse gas emissions by 2050, while setting up a long-term 80% GHG reduction target (according to the Basic Environment Plan determined by the Cabinet on April 27, 2016).

In order to reduce greenhouse gas emissions by half by 2050 on a global basis, it is essential to formulate and carry out GHG reduction projects on a large scale in Asia-Pacific regions, which are undergoing fast economic growth, while accelerating moves toward establishment of sustainable low-carbon societies in Asia.

For that purpose, Japan is urged to establish a new mechanism (Joint Crediting Mechanism or JCM) for appropriately evaluating the contribution to energy-derived CO2 emission reduction.

We have implemented a feasibility study on large-scale JCM projects that are aimed at building low-carbon societies in Asia. These projects are expected to streamline and provide Japan's technologies and systems in a geographical package to include local cities and regions to match the local situations, as well as establishing an appropriate operation and maintenance system in order to obtain JCM credits.

1.2 Subject of Project

1.2.1 Study on an ESCO project in Indonesia

(1) Collection and review of existing energy-saving diagnostic results

Energy-saving diagnosis has been carried out extensively under financial assistance of Indonesia's Ministry of Energy and Mineral Resources (MEMR) on factories, commercial facilities, housing, and other facilities. In cooperation with the Indonesia ESCO Association (APKENINDO), we have collected and reviewed energy-saving diagnostic results and other relevant information on commercial facilities, private factories, and other buildings.

In addition, as another approach to identify properties to be discussed, we reviewed statistical materials on dilapidated buildings obtained from a public agency (Indonesia Central Statistics Bureau: Badan Pusat Statistik) and an industry group (Indonesia Builders Association: Asosiasi Kontraktor Indonesia). As we were unable to obtain information on individual properties, we further sought and collected property information with the help of Kanematsu Corporation, who have local offices in Indonesia.

(2) Review of energy-saving technologies and methodologies to be introduced

In this Study project, we focused on commercial buildings and factories. Air-conditioning systems, LED/CFL lighting, and energy management systems (EMS) were studied for hotels and office buildings. Meanwhile, for private factories, we conducted energy-saving diagnosis and presented an energy-saving proposal upon consultation with APKENINDO.

In future projects, Indonesia would see effective energy-saving effects by introducing Japan's proprietary technologies through ESCO.

(3) Review of MRV methodologies and estimation of GHG reduction potential

We reviewed MRV methodologies necessary for the Project. In addition, applicable MRV methodologies and PDD (proposal) were prepared for representative energy-saving proposals, through review of the existing energy-saving diagnostic results and the energy-saving apparatus verification results. Discussions were held with local operators on issues to be solved and actions to be taken in order to implement a JCM project. Further, we estimated GHG reduction potential that can be achieved when this Project is applied widely to cities under study.

(4) Policy recommendations on ESCO projects

For the purpose of building a JCM large-scale project, we will identify issues involving the promotion of ESCO projects in Indonesia and make policy recommendations in the ESCO projects.

1) Issues related to the promotion of ESCO projects in Indonesia

We identified issues involving the promotion ESCO project in Indonesia. Specifically, our study was carried out through cooperation with local law firms and lease companies, with a focus on the development of a legal system and an ESCO finance scheme and the establishment of an ESCO company.

2) Policy recommendations on the development of an ESCO finance scheme

Based on the current status of ESCO project activities and issues involved therein, policy recommendations were presented with respect to the development and organization of an ESCO company and an ESCO finance scheme.

3) Workshops

Workshops were held in Jakarta in order to communicate the concept of ESCO projects, and inform ESCO project stakeholders of the Study results, and present our proposal to them.

(5) Development of a project plan

Based on the above results, a project plan was formulated to be implemented in FY2015 and successive years.

Figure 1-1 shows the work flow of the Study project.

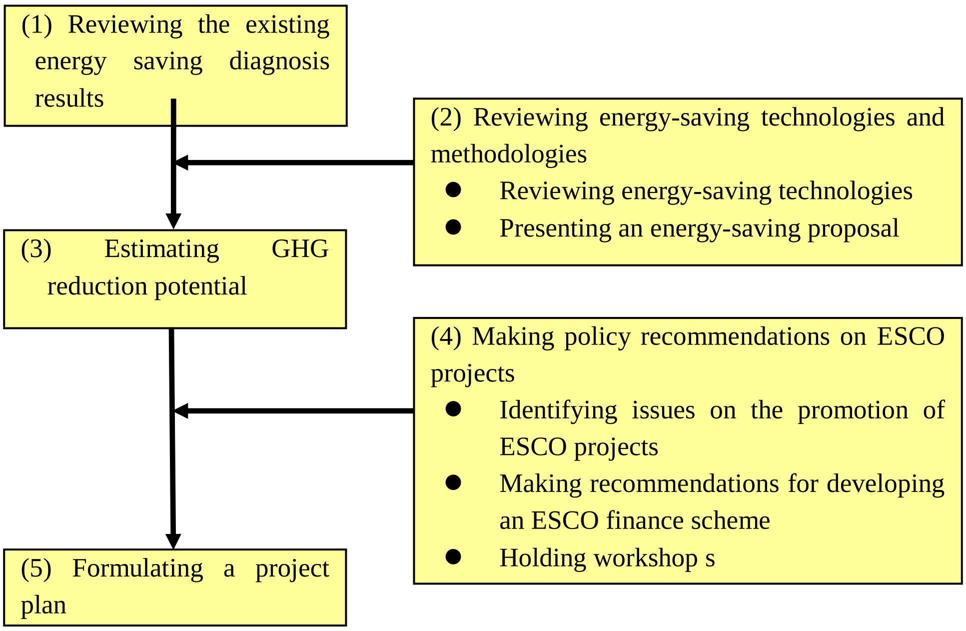


Figure 1-1 Work flow of the Study project

Source: Study Team

1. 2. 2 Domestic progress briefing session

As shown in Table 1-1, domestic progress briefing sessions were held to answer questions.

Table 1-1 Outline of domestic progress briefing session

Category	Date and time	Place	Subjects of the report and Q&A session
1st session	September 19, 2014 10: 00 - 12: 00	Ministry of the Environment Conference Room	◆Background and purpose of Study ◆Subjects of the Study ◆Study implementation system ◆Progress of the Study and the future Study schedule ◆Introduction of technologies ◆Outline of the ESCO project ◆Implementation system and schedule for commercialization ◆Financial assistance scheme for commercialization
2nd session	January 19 and 26, 2015	Ministry of the Environment Conference Room	◆Introduced technologies ◆Summary of MRV methodologies ◆Progress of the Study and the future Study schedule ◆Amount of capital investments and schedule ◆An implementation system and a schedule for commercialization

			◆A financial assistance scheme for commercialization

Source: Study Team

1. 2. 3 Local workshops

A local workshop was held on January 29, 2015. Refer to: 7. Workshop "Financing Options for Energy Efficiency Projects for Buildings and Industries in Indonesia"

1. 2. 4 Presentations at a meeting designated by the Ministry of the Environment

A presentation was made at a seminar sponsored by the Ministry of the Environment on February 11, 2015.

1. 3 Study system

Figure 1-2 shows the Study system. The Study is represented by Mitsubishi Research Institute, Inc., who works jointly with Mitsubishi UFJ Morgan Stanley Securities Co., Ltd. (MUMSS), NTT Facilities, Inc. (NTT-F), and Kyudenko Corporation. In addition, PT. Takasago Thermal Engineering (a local subsidiary of Takasago Thermal Engineering Co., Ltd.), Kanematsu Corporation, APKENINDO (Indonesian ESCO Association), and local consulting firm PT. PAMULA CIPTA MAHAKARYA participated in this Study as subcontractors. The progress of the JCM project will be reported to the Indonesia JCM Office.

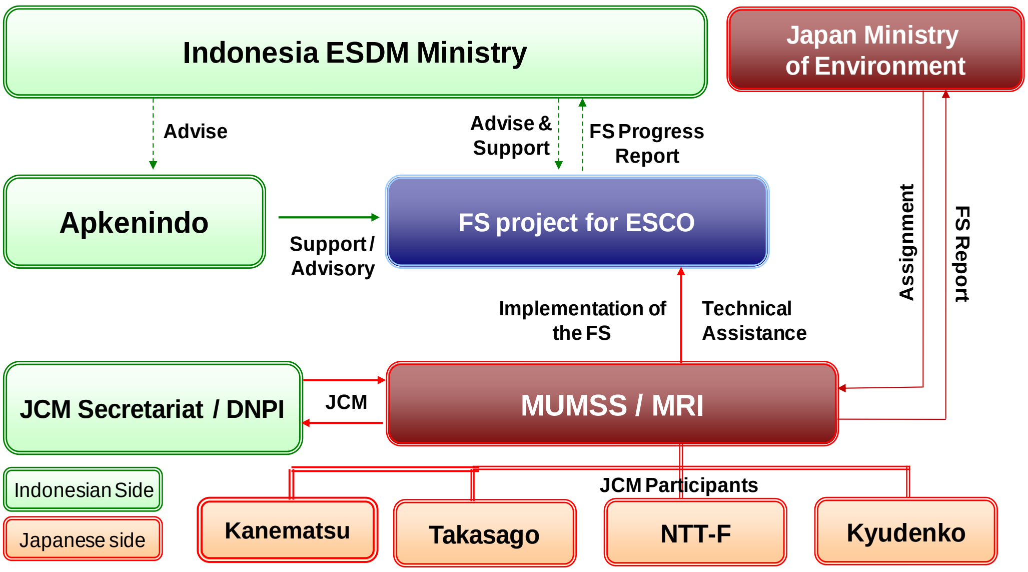


Figure 1-2 Study system

Source: Study Team

Table 1-2 shows the companies responsible for Study tasks.

Table 1-2 Companies responsible for Study tasks

Task		Company in charge
1. Reviewing the existing energy-saving diagnostic results		MRI
2. Reviewing energy-saving technologies and methodologies to be introduced	Reviewing energy-saving technologies	NTT-F, Kyudenko, PT. Takasago Thermal Engineering
3. Developing an MRV methodology and estimating GHG reduction potential		MUMSS
4. Making policy recommendations	Identifying issues involving the promotion of an ESCO project	MRI
	Making policy recommendations on the development of an ESCO finance scheme	MRI, MUMSS
	Holding a workshop to provide relevant information	MUMSS, MRI
5. Developing a project plan		MRI, MUMSS, NTT-F, Kyudenko, PT. Takasago Thermal Engineering, Kanematsu

Source: Study Team

1.4 Implementation period

The Study project will be implemented from April 2014 to March 2015 (Table 1-3).

Table 1-3 Study schedule

Category	2014									2015		
	4	5	6	7	8	9	10	11	12	1	2	3
Local study	△		△			△	△	△		△	△	
Energy-saving diagnosis and proposal	← Review	→	←	—	Survey/review/ Proposal	—	—	→	← Deliberation on	commercialization	→	
Development of MRV methodology		←	—	—	—	—	—	—	—	→		
Preparation of PDD (proposal)								←	—	—	→	
Policy recommendation		←	—	—	—	—	—	—	—	—	→	
Workshop										△	△	
Preparation of reports							←	—	—	—	→ Delivery	▲

Source: Study Team

1.5 Deliverables

Table 1-4 shows our deliverables.

Table 1-4 Deliverables

Category		Number of copies	Number of pages
Paper medium	Japanese report	7	About 100 pages in A4 size
	English report	7	About 100 pages in A4 size
	Indonesian report	7	About 40 pages in A4 size
Electronic medium (DVD-R)		1 unit	Report data recorded digitally

Source. Study Team

2. Collection and review of existing energy-saving diagnostic results

In order to identify properties appropriate for a JCM project, we collected and reviewed energy-saving diagnostic results and other necessary information in cooperation with Indonesia ESCO Association (APKENINDO), with a main focus on commercial buildings and private factories.

In addition, as another approach to specify relevant property, we previously considered examining statistical materials on dilapidated buildings obtained from a public agency (Indonesia Central Statistics Bureau: Badan Pusat Statistik) and an industry group (Indonesia Constructors Association: Asosiasi Kontraktor Indonesia). However, we instead collected information on individual properties with the help of Kanematsu Corporation, who has local offices in Indonesia.

2.1 Outline of APKENINDO activities

The Indonesia ESCO Association (APKENINDO) is a group of Indonesian ESCO operators organized on April 21, 2011 to perform the following roles[1]:

- Mediating among agencies, companies, and groups engaged in ESCO project activities:

  Specifically involving ESCO operators and their potential customers (end energy users), financial agencies, energy-saving apparatus manufacturers and distributors, and public agencies.

- Encouraging ESCO operators to make project proposals:

  Establishing a special fund for clean energy financing; and helping establish a finance mechanism to enable ESCO to combine multiple projects in a single deal to cut transactions costs.

- Member operators assisting in the development of energy-saving projects assistance:

  Technical assistance, assistance in negotiations and in forming connections, using project experience, developing capacities, and implementing training and seminars.

- Assisting in the development of laws and regulations and in framework decisions:

  Contributing to framework decisions on laws and regulations for the purpose of developing energy-saving projects.

2.1.1 APKENINDO system

As of July 2014, this system consists of 14 members--four state-owned companies and 14 private businesses.

Table 2-1 APKENINDO member companies (as of July 2014)

APKENINDO Chairman : Mr. Judianto Hasan Executive Director : Mr. Banu Anang Priyanto	
State-owned enterprise	Private enterprise
PT Energy Management Indonesia (Persero) PT Sucofindo (Persero) PT Indra Karya (Persero) PT Surveyor Indonesia (Persero)	PT Asia Paragon Energy PT Enercon Equipment Company PT Inresh Consulting Indonesia PT Kaltimex Energy PT Metropolitan Bayutama

[1] APKENINDO Presentation "ESCO in Indonesia Opportunities and Constrains on Energy Efficiency Investment Potential", 2013

	PT Miura Indonesia (Miura Boiler) PT Pura Mayungan (PM electric) PT RBB Alpha Energy PT Schneider Indonesia PT Trakond Indonesia PT Fuji Electric Indonesia PT Indo Prima Solusi (Indosolution) PT Rekayasa Industri PT Takasago Thermal Engineering

Source: Study Team

2. 1. 2 APKENINDO activities to date

The official number of projects is yet to be released. APKENINDO has been promoting ESCO projects in Indonesia in cooperation with governments, regulatory authorities, international agencies, and other stakeholders. APKENINDO has participated in several energy-saving projects for buildings, including an EMS installation project on buildings for the Department of New Renewable Energy and Conservation of Energy (EBTKE) of the Ministry of Mineral Resources and a project for installation HVAC units in Jakarta supermarkets. In addition, APKENINDO has been aggressively carrying out seminar workshops on technical assistance and capacity building for energy-saving.

2. 1. 3 Cooperation with overseas organizations

As shown in Table 2-2, APKENINDO maintains collaborative relationships with international agencies and public organizations in foreign countries.

Table 2-2 APKENINDO cooperation with overseas organizations

Organization	Cooperation activities
Japanese Business Alliance for Smart Energy Worldwide (JASE-World)	Conducting a fact-finding study for the feasibility of ESCO projects in Indonesia (EECJ joined the study in August 2013)
Japan Association of Energy Service Companies (JAESCO, Japan)	An exchange agreement was executed on March 24, 2014.[2] Replacing technical information with market information; Developing training programs; Distributing ESCO information to Indonesia's industries; Establishing a joint team for launching ESCO projects in Indonesia; Exchange and dispatching technical and management experts; Issuing titles to projects to show that they are joint projects; Discussing the allocation of expenses and gains generated under the agreement.
Energy Efficiency Center of Japan (EECJ)	The center cooperates in the above JASE-World projects. In addition, acting on behalf of Ministry of Economy, Trade and Industry of Japan, it is engaged in the development of human resources for ASEAN countries under a Japan-ASEAN cooperation framework. Further, the organization is implementing a project "**Promotion** on **Energy Efficiency** and Conservation" in ASEAN countries, as also commissioned by the ministry.[3]

[2] JAESCO website, http://www.jaesco.or.jp/news/news/; obtained October 14, 2014.

[3] ECCJ website, http://www.aseanenergy.org/index.php/projects/2009/11/01/asean-japan-promotion-on-energy-efficiency-and-conservation-promeec, obtained October 15, 2014

British Embassy and IESR	British Embassy in Jakarta provides assistance, including energy-saving seminar activities, through the Institute for Essential Services Reform (IESR). For example, British Embassy in Jakarta organized a workshop “Unlocking the Investment Potentials for Energy Efficiency in Indonesia”[4].in January 2012 jointly with IESR and Indonesia Directorate General of New, Renewable Energy Conservation (DGNREE) and sponsored a conference “Opening the Energy Efficiency Investment Clog” in March 2013, jointly with IESR.
The National Association of Energy Service Companies (NAESCO)	NAESCO is promoting ESPC (Energy Service Performance Contract / Energy Performance Contract, or EP contracts) in accordance with an order of the Obama administration to improve the performance of federal buildings in environmental, energy, economic aspects, (Executive Order 13514). The organization answers inquiries from the Indonesian Ministry of Industry and APKENINDO[5].
Denmark	Promoting energy-saving in factories and commercial buildings and in the public sector (Energy Efficiency in Industrial, Commercial and Public Sector: EINCOPS)
Netherlands	Identifying energy potential
Japan	Conducting JICA and NEDO demand-side management
UNIDO	Developing energy management standards
ASEAN	Forming energy-saving subsector networks

Source: Reorganized by the Study Team from websites of groups and local study findings

In addition to the above, APKENINDO cooperates with Korea's Ecosian Co., Ltd., Korea Energy Management Corporation, and Thailand's Excellent Energy International Co., Ltd.

2. 2 Collected information on candidate properties

Properties selected by Apkenindo are shown below.

Table 2-3 List of Apkenindo-selected properties

Property Name	Type	Year	Overview
Senayan City	Integrated Complex	2006	48,000 m2, Shopping Mall, Offices (SCTV Tower; 21 storeys), Apartment (25 storeys)
Mediterania Garden Residences	Apartment	2004	4 towers, 30+ storeys
Mediterania Gajah Mada Residence	Apartment	2005	2 towers, 32 storeys
Mediterania Boulevard Residence	Apartment	2006	9,300 m2,74,612 m2 (building), 2 towers, 32 storeys, 2,232 units
Pakubuwono Residence	Luxury Apartment	2006	5 towers, 24 storeys
Mangga Dua Square	Shopping Center	2005	4000 units, 11 floors, 2 basement, and 1 lowerground

[4] IESR website, http://www.iesr.or.id/english/2013/03/seminar-opening-the-energy-efficiency-investment-clog-in-indonesia/, obtained October 14, 2014.

[5] NAESCO website, *Key Accomplishments*, http://www.naesco.org/accomplishments, obtained October 14, 2014.

CBD Pluit	Integrated Complex	2008	90,000 m2, Shopping mall, offices, apartment (5 towers, 20-25 storeys)
Lindeteves Trade Center	Shopping Center	2005	26,000 m2, 47,600 m2 (building), 2,302 units(Shophouses: 128 units)

Property data collected by Kanematsu Corporation were classified into four types of properties—office buildings, hotels, hospitals, high-rise apartments.

Table 2-4 List office buildings Jakarta

Property Name	Height[m]	Year	Floor
APL Tower	175	2011	38
Artha Graha Building	183	2000	30
Aston Hotel Jakarta	151		37
AXA Tower[19]	195	2012	45
Bakrie Tower[9][2]	215	2009	48
Central Park Residences[22]	188	2011	56
Citicon	150	2003	39
Equity Tower SCBD[5][6]	220	2008	44
First Capital Center	152	2003	39
Gedung utama Bank Indonesia	180	2005	45
Gedung utama Universitas Tarumanegara	197.5	2011	48
Graha Energi[8][2]	217	2008	40
Grand Hyatt Residence[13]	210	2009	46
Grand Slipi Tower	186	2000	48
H Tower	182	2000	30
Intercontinental Hotel Midplaza, Jakarta	167	2001	41
Jakarta Central Twin Tower 1 dan 2	190	2003	38
Kemang Tower	193	2000	50
Kempinski Residence[10][2]	215	2008	57
Keraton Residence	210	2009	48
Kuningan City[16]	203.2	2012	58
Mandiri Plaza	174	2011	40
Menara BCA[4][2]	230	2007	56
Menara Central Park Residences 1, 2, 3	199	2011	56
Menara Kadin	169	2009	37
Menara Taman Anggrek (1, 2, 3, 4, 5, 6, 7, 8)	152	1996	40
Menara Taman Thamrin	197	2011	50
Oakwood Premier Cozmo	170	2007	45
One Pacific Place[21]	193	2007	37
Ouran Tower	155	1996	39
Plaza BII	160	1987	39
Plaza Indonesia Extension[2]	210	2009	48
Residence 8 @Senopati Tower A dan B[15]	205	2012	50
Ritz-Carlton Twin Towers[2][12]	212	2005	48
Sampoerna Strategic	173	2010	37
Thamrin Center	185	2005	46
Thamrin One	187	2002	48
The Capital tower	207	2010	50

The City Center @Batavia City[14]	208	2012	47
The Icon Residences Tower 1 dan 2[2][17]	200	2008	47
The Peak Twin Towers[7][2]	218.5	2006	55
The Pinnacle[11]	213.1	2006	52
The Plaza	205	2009	47
The Sudirman Place	212.5	2006	52
UOB Plaza[20]	194.3	2007	45
Wisma 46[1][2][3]	262	1996	51
Wisma Mulia[2][18]	195.1	2003	54

Table 2-5 List of mauls in Jakarta

Property Name	Location
CityWalk Sudirman	Central Jakarta
Gajah Mada Plaza	Central Jakarta
ITC Cempaka Mas	Central Jakarta
Menteng Plaza	Central Jakarta
Plaza Indonesia	Central Jakarta
EX Plaza Indonesia	Central Jakarta
Sarinah Plaza	Central Jakarta
Grand Indonesia Shopping Town	Central Jakarta
Plaza Atrium	Central Jakarta
Lifestyle X'nter	Central Jakarta
Senayan City	Central Jakarta
Plaza Senayan	Central Jakarta
Mangga Dua Pasar Pagi	Central Jakarta
Mall Mangga Dua	Central Jakarta
Harco Mas Mangga Dua	Central Jakarta
Mangga Dua Square	Central Jakarta
ITC Roxy Mas	Central Jakarta
MGK Kemayoran	Central Jakarta
Thamrin City	Central Jakarta
Atrium Senen	Central Jakarta
Pasar Tanah Abang	Central Jakarta
Menteng Huis	Central Jakarta
Bintaro Xchange Mall	Central Jakarta
ITC Mangga Dua	North Jakarta
Mall Kelapa Gading I - III & V	North Jakarta
Mall Sunter	North Jakarta
Pluit Village	North Jakarta
Baywalk Pluit	North Jakarta
Pasar Pagi Mangga Dua	North Jakarta
WTC Mangga Dua	North Jakarta
Pluit Junction	North Jakarta
Mall Artha Gading	North Jakarta
Sports Mall Kelapa Gading	North Jakarta
Kelapa Gading Trade Center	North Jakarta
Mall of Indonesia	North Jakarta
Emporium Pluit	North Jakarta

La Piazza	North Jakarta
Mangga Dua Square	North Jakarta
Koja Trade Mall	North Jakarta
Cipinang Indah Mall	East Jakarta
Kramat Jati Indah Plaza	East Jakarta
Ramayana Kramat Jati Indah	East Jakarta
Cibubur Junction	East Jakarta
Cibubur Square	East Jakarta
Pusat Grosir Cililitan	East Jakarta
Pusat Grosir Jatinegara	East Jakarta
Tamini Square	East Jakarta
MT Haryono Square	East Jakarta
Pulogadung Trade Center	East Jakarta
Mal Graha Cijantung	East Jakarta
Arion Mall	East Jakarta
Buaran Plaza	East Jakarta
Rawamangun Square	East Jakarta
Arion Plaza	East Jakarta
Ramayana Perumnas Klender (Dibuka Tahun 2013)	East Jakarta
Mall CitraGran	East Jakarta
Lindeteves Trade Center	West Jakarta
Glodok Plaza	West Jakarta
Harco Glodok	West Jakarta
Lokasari Plaza	West Jakarta
Mall Ciputra (d/h Citraland Mall)	West Jakarta
Mall Daan Mogot	West Jakarta
Mall Puri Indah	West Jakarta
Mall Taman Anggrek	West Jakarta
Slipi Jaya Plaza	West Jakarta
Mall Taman Palem	West Jakarta
Lippo Mall Puri	West Jakarta
Central Park Jakarta	West Jakarta
Seasons City	West Jakarta
PX Pavillion @ St. Moritz	West Jakarta
Mal Kalibata	South Jakarta
Kalibata City Square	South Jakarta
Cilandak Town Square	South Jakarta
Mal Cilandak	South Jakarta
Bintaro Plaza	South Jakarta
Blok M Plaza	South Jakarta
Blok M Square	South Jakarta
Ciputra World Jakarta	South Jakarta
Pasaraya Grande	South Jakarta
ITC Fatmawati	South Jakarta
ITC Kuningan	South Jakarta
Mal Ambassador	South Jakarta
Mall Blok M	South Jakarta
Pondok Indah Mall I & II	South Jakarta

Melawai Plaza	South Jakarta
Pasaraya Manggarai	South Jakarta
Pacific Place	South Jakarta
Plaza Semanggi	South Jakarta
Setiabudi One	South Jakarta
ITC Permata Hijau	South Jakarta
Pejaten Village	South Jakarta
Gandaria City	South Jakarta
Epicentrum Walk Rasuna	South Jakarta
Ciputra World Jakarta	South Jakarta
Kota Kasablanka	South Jakarta
Kuningan City	South Jakarta
Poins Square	South Jakarta
Lotte Shopping Avenue	South Jakarta

Table 2-6 List of hotels in Jakarta

NO	HOTEL NAME	ADDRESS
1	The Sultan Hotel	Jl. Jend. Gatot Subroto
2	The Ritz-Carlton Jakarta	Jl. Lingkar Mega Kuningan Kav. E1 No. 1
3	The Park Lane	Jl. Casablanca Kav. 18,
4	The Dharmawangsa	Jl. Brawijaya Raya No. 26,
5	The Aryaduta Suite Hotel Semanggi	Jl. Garnisun Dalam 8,
6	Sheraton Media	Jl. Gunung Sahari Raya No. 3,
7	Shangri-La Jakarta	Kota BNI, Jl. Jend Sudirman Kav. 1,
8	Sari Pan Pacific	Jl. MH. Thamrin,
9	Santika Jakarta	Jl KS. Tubun No. 7 – Slipi,
10	Sahid Jaya Jakarta	Jl. Jend. Sudirman No. 86,
11	Nikko Jakarta	Jl. MH. Thamrin No. 59,
12	Mulia	Jl. Asia Afrika,
13	Millennium Sirih	Jl. KH. Fakhrudin No. 3,
14	Mercure Slipi	Jl. Letjend. S. Parman,
15	Manhattan Hotel	Jl. Prof. Dr. Satrio Kav. 19
16	Le Meridien	Jl. Jend. Sudirman Kav. 18 – 20,
17	JW Marriott Hotel	Jl. Lingkar Mega Kuningan Kav. E 1.2, No. 1 & 2,
18	Inter-Continental MidPlaza	Jl. Jend. Sudirman Kav. 10 – 11,
19	Hotel Indonesia Kempinski Jakarta	Jl. MH. Thamrin No. 1,
20	Grand Hyatt	Jl. MH. Thamrin Kav. 28 – 30,
21	Gran Melia Jakarta	Jl. HR. Rasuna Said Kav. X-O,
22	Four Seasons	Jl. HR. Rasuna Said,
23	Crowne Plaza	Jl. Gatot Subroto Kav. 2 – 3,
24	Borobudur Hotel	Jl. Lapangan Banteng Selatan,
25	Alila Jakarta	Jl. Pecenongan Kav. 7 – 17,
26	Alila Jakarta	Jl. Prapatan 44 – 48,
27	Puri Denpasar Hotel – Jakarta	Jl. Denpasar Selatan No.1, Kuningan – Jakarta Selatan
28	Mercure Rekso	Jl. Hayam Wuruk No. 123,
29	Mercure Convention Center	Taman Impian – Ancol,
30	Menara Peninsula	Jl. Letjend. S. Parman Kav. 78,
31	Le Grandeur	Jl. Mangga Dua Raya,

32	Kartika Chandra	Jl. Gatot Subroto Kav. 18 − 20,
33	Kaisar	Jl. PLN − Duren Tiga Raya,
34	Jayakarta Hotel	Jl Hayam Wuruk No. 126,
35	Gran Mahakam	Jl. Mahakam I No. 6,
36	Golden	Jl. Gunung Sahari No. 46,
37	Ciputra	Jl. Letjend. S. Parman,
38	Cempaka	Jl. Letjend. Suprapto,
39	Batavia Hotel	Jl. Kalibesar Barat No. 44 − 46,
40	Atlet Century Park	Jl. Pintu Satu Senayan,
41	Aston Rasuna Residence	Taman Rasuna - Jl. HR. Rasuna Said,
42	Aston Atrium Hotel	Jl. Senen Raya No. 135,
43	Ambhara	Jl. Iskandarsyah Raya,
44	Acacia	Jl. Kramat Raya No. 73 − 81,
45	Wisata International	Jl. MH. Thamrin,
46	Willtop	Jl. P. Jayakarta No. 44,
47	Twin Plaza	Jl. Letjend. S. Parman,
48	Treva International	Jl. Menteng Raya No. 33,
49	Sentral	Jl. Pramuka Raya Kav. 63 − 64,
50	Patra jasa	Jl. Jend. A. Yani No. 2,
51	Pardede	Jl. Raden Saleh I No. 9,
52	Paragon	Jl. KH. Wahid Hasyim No. 29,
53	Marcopolo	Jl. Teuku Cik Ditiro No. 19,
54	Maharani	Jl. Mampang Prapatan − Buncit Raya.,
55	Sabang Metropolitan	Jl. H. Agus Salim No. 11,
56	Quality Hotel Jakarta	Jl. P. Jayakarta No. 70,
57	Putri Duyung	Taman Impian − Ancol,Jl. Lodan Timur No. 7,
58	Ibis Slipi	Jl. Letjend. S. Parman Kav. 59,
59	Ibis Mangga Dua	Jl. P. Jayakarta No. 73,
60	Ibis Kemayoran	Jl. Bungur Besar Raya 79 − 81,
61	Grand Ancol	Jl. RE. Martadinata No. 1,
62	Graha Menteng	Jl. Matraman Raya 21,
63	Gading Indah	Jl. Pegangsaan Dua No. 10 - K,
64	Emeralda	Jl. Kebon Jeruk XVIII/6,
65	Danau Sunter	Jl. D. Permai Raya Blok C-1,
66	Classic	Jl. H. Samanhudi 43 - 45,
67	Maharadja	Jl. Kapten P. Tendean No. 1,
68	Kemang Hotel	Jl. Kemang Raya No. 2 − H,
69	Kebayoran Hotel	Jl. Senayan 87 − Kebayoran Baru,
70	Ibis Tamarin	Jl. KH. Wahid Hasyim No. 77,
71	Cipta 2	Jl. Mampang Prapatan 1 A,
72	Cikini Sofyan	Jl. Cikini Raya,
73	Cemara	Jl. Cemara No. 1, Menteng,
74	Bumi Karsa Bidakara	Jl. Gatot Subroto Kav. 71 - 73,
75	Bintang Griyawisata	Jl. Raden Saleh No. 16,
76	Betawi Sofyan	Jl. Cut Mutiah,
77	Alpine	Jl. Gunung Sahari Raya 35,
78	Arcadia	Jl. KH. Wahid Hasyim 114,
79	Surya Baru	Jl. Batu Ceper No. 11A,

80	Surya	Jl. Batu Ceper No. 44 – 46,
81	Sriwijaya	Jl. Veteran Raya No. 1,
82	Setiabudi Hotel	Jl. Setiabudi Raya No. 24,
83	Sanno	Jl. Pluit Raya Selatan,
84	Royal Regal	Jl. Mangga Besar VII / 25 – 27,
85	Royal	Jl. Ir. H. Juanda,
86	Prinsen Park	Jl. Mangga Besar IX/ 83 – 85,
87	Pecenongan City	Jl. H. Samanhudi No. 2,
88	Nirwana	Jl. Otto Iskandardinata,
89	Metropole	Jl. Pintu Besar Selatan No. 38,
90	Menteng II	Jl. CIkini Raya 103,
91	Menteng I	Jl. RP. Suroso No. 28,
92	Melawai Hotel	Jl. Melawai Raya No. 18 – 20, Tel: 62-21 270 0408
93	Luxe Hotel	Jl. KH Wahid Hasyim No. 85 Jakarta Pusat 10350
94	Jatra Hotel	Jl. Bandengan Raya, Jakarta Utara.
95	Indra International	Jl. KH. Wahid Hasyim No. 63, Tel: 62-21 315 2858
96	Imperium Hotel	Jl. Pecenongan Raya, Jakarta Pusat, Tel: 62-21 344 8601
97	Gren Alia Cikini	Jl. Cikini Raya No. 46,
98	Djakarta	Jl. Hayam Wuruk No. 35,
99	Dias Hotel	Jl. Kran V / 20 Jakarta Pusat,
100	Bumi Johar	Jl. Johar No. 17 – 19,
101	Atlantik	Jl. Salemba Raya No. 26,
102	Astika	Jl. Mangga Besar Raya 76,
103	Alia Pasar Baru	Jl. Pasar Baru Selatan No. 13,
104	Alia Matraman	Jl. Matraman Raya No. 224,
105	Alia Cikini	Jl, Cikini Raya No. 32,
106	Yusenny	Jl. Senayan Kebayoran Baru,
107	Tugu Asri	Jl. Jatibaru No. 7 – 8,
108	Travel	Jl. Mangga Besar VIII / 21,
109	Titanius (Taurus)	Jl. Kebon Sirih Barat Dalam I / 11,
110	Tiga Enam (36)	Jl. Jaksa No. 36,
111	Tebet Sofyan	Jl. Prof. DR. Supomo No. 23,
112	Tator	Jl. Jaksa No. 37,
113	Senen Indah	Jl. Bungur Besar No. 157,
114	Salemba Indah	Jl. Paseban No. 20 A – B,
115	Rose Marla	Jl. Kb. Sirih Barat Dalam IX / 8,
116	Rifa	Jl. Kebon Sirih Barat Dalam, Jakarta Pusat.
117	Rico	Jl. Kebon Sirih Dalam 51,
118	Rensa Sofyan	Jl. Duren Sawit Raya No. 108,
119	Prapanca Indah	Jl. Prapanca Raya No. 30 – 31,
120	Pondok Wisata 16	Jl. Kebon Sirih Barat Dalam 16,
121	Petamburan II	Jl. KS Tubun No. 10A,
122	Petamburan Hotel	Jl. KS Tubun No. 15 – 17,
123	Peninsula	Jl. Mangga Besar Raya 60,
124	Pendawa	Jl. Kebon Sirih Dalam X / 16,
125	Pasar Baru Hotel	Jl. Pasar Baru Selatan No. 6,
126	Nusantara	Jl. KH. Mas Mansyur No. 36,
127	Norbek	Jl. Jaksa No. 14,

128	Nick Corner	Jl. Jaksa No. 16,
129	New Melati Harmoni	Jl. Hayam Wuruk No. 1,
130	Mirah	Jl. Gunung Sahari XII / 18,
131	Megah International	Jl. Bungur Besar Raya 31,
132	Mega Matra	Jl. Matraman Raya No. 115,
133	Margot	Jl. Jaksa No. 15 C,
134	Lia	Jl. Kebon Sirih Barat VIII / 47,
135	Kresna	Jl. Kebon Sirih Timur No. 175,
136	Kebon Sirih	Jl. Kebon Sirih Barat I / 10,
137	Karya Bahana	Jl. Jaksa No. 32 – 34,
138	Grand Paripurna	Jl. Hayam Wuruk No. 25,
139	GRAHA WISATA TMII, Komp. TMII	Komp. Taman Mini Indonesia Indah
140	GRAHA WISATA RAGUNAN	Komp. Olahraga Jaya Raya Ragunan
141	GRAHA WISATA KUNINGAN	Jl. HR. Rasuna Said Kuningan
142	Esha	Jl. Kebon Sirih Barat X / 4,
143	Djody	Jl. Jaksa No. 27 – 29,
144	Destania	Jl. Kebon Sirih Barat IX / 19,
145	Delima	Jl. Jaksa No. 5,
146	Borneo	Jl. Kebon Sirih Barat Dalam 37,
147	Bloom Steen	Jl. Kebon Sirih Timur Dalam 174,
148	Bintang Kejora	Jl. Kebon Sirih Barat No 52,
149	Bintang Baru	Jl. Dr. Sutomo No. 9,
150	Banyuwangi Sintera	Jl. H. Samanhudi No. 30 – 40,

Table 2-7 List of apartments in Jakarta

NO	Property Name	Address
1	Sahid Sudirman Residence	Sahid Jaya Hotel Complex Jl. Jend. Sudirman 86 Jakarta
2	The Summit Apartment	Jl. Boulevard Sentra Kelapa Gading, Jakarta Utara
3	The residence at Sultan hotel	Jl. Jend. Gatot Soebroto Jakarta
4	The Plaza Residences	Hotel Intercontinental Midplaza Lower Ground fl Jl. Jend Sudirman kav. 10-11 Jakarta
5	The Peak residence	Jl. Setiabudi Raya No. 9 Jakarta
6	The Pakubuwono View	Jl. Pakubuwono VI. No. 70 Kebayoran Baru, Jakarta
7	The Pakubuwono Residence	Jl. Pakubuwono VI No. 68 Kebayoran Baru, Jakarta Selatan
8	The Mayflower jakarta	Marriot Executive Apartment Jl. Jend Sudirman Kav. 76-78 Jakarta
9	The Kuningan Suites	Jl. Setiabudi utara Jakarta Selatan
10	The Capital Residence	SCBD lot 24 Jl. Jend. Sudirman Kav.52-53 Jakarta
11	The Belleza Permata Hijau	Arteri Permata Hijau Jl. Letjend Soepono No. 34 Jakarta
12	The Bellagio Parkway residence	Kawasan Mega Kuningan Kav. E4 no.3 Kuningan Timur Jl. Prof. Dr. Satrio Jakarta Selatan
13	The Ascott jakarta	The Golden Triangle Jl. Kebon Kacang Raya No. 2 Jakarta Pusat
14	Taman Puri Permata Hijau Town House	Jl. Biduri No. 1 Blok P Komp. Permata Hijau, Jakarta Selatan
15	Taman Anggrek Condominium	Mall Taman Anggrek Lt. 6 Jl. Letjend S. Parman Kav.21 Jakarta Barat
16	Sommerset Berlian Jakarta	Jl. Permata Belian V, Permata hijau Jakarta

17	Spring Hill Golf Redidence	Jl. Benyamin Suaeb Blok D7 Kemayoran, Jakarta
18	Slipi Apartment	Jl . Letjend S. Parman Kav. 22-24 Jakarta
19	Simprug Indah	Jl. Teuku Nyak Arif, Arteri Simprug, Jakarta
20	Shangri-La Residence	Jl. Jend. Sudirman Kav.1 Jakarta
21	Setiabudi Residence	Jl. HR. Rasuna Said Kav. 62 Jakarta
22	Setiabudi Apartment	Jl. RS. Aini Karet Setiabudi Jakarta
23	Puri Casablanca Apartment	Jl. Puri Casablanca No. 1 Kuningan, Jakarta
24	Puri Botanical Residence	Jl. Raya joglo no. 48 Jakarta
25	Pondok club Villa	Jl. TB. Simatupang Cilandak, Lebak Bulus, Jakarta
26	Plaza Senayan Apartment	Jl. Tinju No. 1 Pintu I, Gelora Bung Karno, jakarta
27	Permata Gandaria Apartment	Jl. Taman Gandaria No. 88 Jakarta
28	Pavilion Executive Residence Apartment	Jl. KH Mas Mansyur Kav. 24 Karet Tengsin, Jakarta
29	Park Royal Executive Suites	Jl. Jend. Gatot Soebroto Kav. 35-39 Jakarta
30	Park Avenue Suites Setiabudi Apartment	Jl. RS. Aini karet Setiabudi Jakarta
31	Pasadenia Apartment	Jl. Pacuan Kuda Raya No. 27 Pulomas, Jakarta
32	Palm Court Apartment	Jl. Jend. Gatot Soebroto Kav. 26-27 Jakarta
33	Oakwood Premier Cozmo Apartment	Jl. Lingkar Mega Kuningan Blok E4.2 no.1 Jakarta Selatan
34	Menteng Regency Apartment	Jl. RP. Soeroso No. 10-12 Gondangdia Lama, Jakarta Pusat
35	Menteng Prada Apartment	Jl. Pegangsaan Timur 15A Jakarta
36	Hampton's Park	Jl. Terogong Raya Jakarta Selatan
37	Marbela Kemang Residence	Kemang Apartement Jl. Bangka Raya No. 7 Jakarta Selatan
38	Mampang Arcadia	Jl. Loka Indah Kav.1 Warung Buncit Raya
39	Kintamani Kondominium	Jl. Prapanca Raya No.1 Jakarta
40	Kempinski Apartment	Jl. MH. Thamrin No. 1 Jakarta
41	Kemang jaya Apartment	Jl. Kemang Selatan VIII Jakarta
42	Kemang Club Villas	Jl. Kemang Selatan I, Jakarta
43	Istana Sahid Apartment	Jl. Jend. Sudirman No. 86 Mezzaine fl
44	Golfhill Terrace Apartment	Jl. Metro Kencana IV No. 7 Pondok Indah, Jakarta Selatan
45	Garden Wing Service Apartment	(Hotel Borobudur, Jakarta) Jl. Lapangan Banteng Selatan No. 1
46	Four Seasons Residences	Jl. Setiabudi Tengah Jakarta
47	Eksekutif Menteng Apartment	Jl. Pegangsaan Barat Kav. 6-12 Menteng, Jakarta
48	Executive Paradise	Jl. Pangeran Antasari Cilandak, Jakarta
49	Essence of Dharmawangsa Residence	Jl. Dharmawangsa X No. 86 Kebayoran Baru, Jakarta
50	Emerald Apartment	Jl. TB Simatupang Kav. 20 Cilandak, Jakarta
51	Cilandak Apartment	Jl. TB Simatupang Cilandak Barat, Jakarta
52	Casablanca Apartment	Jl. Casablanca kav. 12 Jakarta
53	Casa Royal Town House	Jl. Asem II, Cipete Selatan Jakarta
54	Bumimas Jakarta Apartment	Jl. Terogong Raya No. 18 Jakarta
55	Brawijaya Apartment	Jl. Brawijaya XII/1 Blok P Jakarta
56	Batavia Apartment	Jl.KH. Mas Mansyur Kav. 126 Jakarta
57	Aston International	Wisma Staco Lt. 3 Suite 100 Jl. Casablanca Kav. 18 Jakarta
58	Aston Rasuna Residence	Tower A, Lower Ground Komp. Apartment Taman Rasuna Jl. HR. Rasuna Said

59	Ampera Town houses	Jl. Kemang Raya no. 2A Jakarta
60	Allson residences at Mitra Oasis	Jl. Senen Raya no. 135 - 137 Jakarta Pusat
61	Aditya mansions	Jl. Adityawarman Raya no. 38A Kebayoran Baru Jakarta Selatan

Table 2-8 List of hotels in Jakarta

	Property Name	Address
1	RS Royal Taruma	Jl. Daan Mogot No.34 Grogol
2	RS. Siloam Graha Medika	Jl. Raya Perjuangan Kav. 8 Kebon Jeruk Jakarta Barat 11530
3	RS. Pelni Petamburan	Jl. K. S. Tubun No. 92 - 94
4	RSIA. Hermina Daan Mogot	Jl. Kintamani Raya No. 2 Perumahan Daan Mogot Baru Jakarta Barat
5	RS. MH. Thamrin Cengkareng	Jl. Daan Mogot Km. 17 Cengkareng
6	RS. Medika Permata Hijau	Jl. Raya Kebayoran Lama No. 64 Jakarta
7	RS. Sumber Waras	Jl. Kyai Tapa No. 1 Grogol Jakarta Barat 11440
8	RS. Kanker "DHARMAIS" *	Jl. Let. Jend. S. Parman Kav. 84 - 86, Jakarta Barat 11420
9	RS Puri Mandiri Kedoya	Jl. Kedoya Raya No.2 Kebun Jeruk
10	MH Thamrin UPK SERDANG	Jl. H. Ung E 71 No. 2, Kemayoran
11	RS Bunda Menteng	Jl. Teuku Cik Ditiro No.28 Menteng
12	RS Islam Jakarta	Jl. Cempaka Putih Tengah I/II
13	RS. Abdi Waluyo	Jl. HOS. Tjokroaminoto No. 31-33 Menteng
14	RS. Husada	Jl. Raya Mangga Besar No. 137 - 139
15	RS. Khusus THT - Bedah PROKLAMASI	Jl. Proklamasi No. 43 Jakarta Pusat 10320
16	RS. Kramat 128	Jl. Kramat Raya No. 128
17	RS. Menteng Mitra Afia	Jl. Kalipasir No. 9 Cikini
18	RS. MH. Thamrin Internasional Salemba	Jl. Salemba Tengah No. 26 -28
19	RS. Pertamina Jaya	Jl. A. Yani No. 2
20	RS. PGI Cikini	Jl. Raden Saleh No. 40
21	RS. Saint Carolus	Jl. Salemba Raya No. 41
22	RSB. Budi Kemuliaan	Jl. Budi Kemuliaan No. 25 Jakarta 10110
23	RSIA. "TAMBAK"	Jl. Tambak No. 18
24	RSPAD Gatot Soebroto "Pav Anak"	Jl. Abdul Rachman Saleh No 24
25	RSPAD Gatot Soebroto "Pav Darmawan"	Jl. Abdul Rachman Saleh No.24
26	RSPAD Gatot Soebroto "Pav Iman Sudjudi"	Jl. Abdul Rachman Saleh No 24
27	RSPAD Gatot Soebroto "Pav Kartika"	Jl. Abdul Rachman Saleh No 24
28	RS. Medistra	Jl. Jen. Gatot Soebroto Kav. 49 Jakarta Selatan
29	RS Tebet	Jl. MT Haryono No.8 Tebet
30	RS Budhi Jaya	Jl. Dr Saharjo No 120 Jakarta Selatan
31	RS Jakarta	Jl. Jend. Sudirman Kav 49 Jakarta
32	RS. Tria Dipa	Jl. Raya Pasar Minggu No. 3 A Pancoran
33	RS. Pusat Pertamina	Jl. Kyai Maja No. 43, Kebayoran Baru
34	Sudirman Medical Center	Jl. Jend. Sudirman Kav. 25 Jak - Sel
35	Pertamina Medical Center	Jl. Kyai Maja No. 43, Gedung H Lantai I, Kebayoran Baru

36	RS. Siaga Raya	Pejaten Barat Kav. 4 - 8, Pasar Minggu
37	RS. Pondok Indah	Jl. Metro Duta Kav. UE Pondok Indah
38	RS. "AGUNG" Manggarai	Jl. Sultan Agung No. 67, Pasar Rumput, Manggarai, Jakarta Selatan
39	RSB. "ASIH"	Jl. Panglima Polim No. 34 Jakarta Selatan
40	RS. MMC	Jl. H. R. Rasuna Said, Kav. C-21, Jakarta
41	RS. "ZAHIRAH"	Jl. Sirsak No. 21, Jagakarsa, Jakarta Selatan
42	RS. MATA Prof. DR. Isak Salim "AINI"	Jl. H. R. Rasuna Said, Kuningan, Jakarta Selatan
43	RSIA. "YADIKA" Kebayoran Lama	Jl. Ciputat Raya No. 5, Kebayoran Lama, Jakarta Selatan 12240
44	RS. PRIKASIH	Jl. Raya RS. Fastmawati No. 74, Pondok Labu, Cilandak
45	RS. Hospital Cinere	Jl. Maribaya No. 1 Puri Cinere
46	RS. Gandaria	Jl. Gandaria Tengah II, No 12 - 14 Kebayoran Baru
47	RS. Setia Mitra	Jl. RS. Fatmawati No. 80-82
48	RS. Marinir Cilandak	Jl. Cilandak KKO
49	RS Khusus THT Ciranjang	Jl. Ciranjang No 22-22 Kebayoran Baru
50	Brawijaya Women and Children Hospital	Jl. Taman Brawijaya No. 1 Cipete Utara
51	RS Muhammadiyah Taman Puring	Jl. Gandaria 1/20 Kebayoran Baru
52	RSPAD Gatot Soebroto Askes dan Non Pav	Jl. Abdul Rachman Saleh 24
53	RSIA. Hermina Jatinegara	Jl. Jatinegara Barat No. 126 Jakarta Timur
54	RS. Omni Medical Center	Jl. Pulomas Barat VI No. 20 Jakarta 13210
55	RS. Islam Pondok Kopi	Jl. Raya Pondok Kopi
56	RS. F. K. UKI Cawang	Jl. May. Jen Soetoyo Cawang Jakarta Timur
57	RS. Mediros	Jl. Perintis Kemerdekaan Kav. 149, Jakarta Timur
58	RS. Harapan Jayakarta	Jl. Bekasi Timur Raya Km. 18 No. 6, Pulogadung Jakarta Timur
59	RS. Kartika Pulo Mas	Jl. Pulomas Timur K No. 2, Jakarta Timur 13210
60	RS. Dharma Nugraha	Jl. Balai Pustaka Baru No. 19, Rawamangun, Jakarta Timur 13220
61	RS. MH. Thamrin Pondok Gede	Jl. Raya Pondok Gede No. 23 - 25, Kramat Jati
62	RS. Mitra Internasional Jatinegara	Jl. Raya Jatinegara Timur No. 87, Jakarta Timur
63	RS. Harapan Bunda	Jl. Raya Bogor Km. 22 No. 44, Jakarta Timur
64	RS. "HARUM"	Jl. Tarum barat, Kalimalang, Jakarta Timur
65	RS. "YADIKA" Pondok Bambu	Jl. Pahlawan Revolusi No. 47, Pondok Bambu, Jakarta Timur
66	RS. Haji Jakarta	Jl. Raya Pondok Gede. Jakarta Timur
67	RSIA. Evasari	Jl. Rawamangun No. 47
68	RS Harapan Bunda	Jl. Balai Pustaka Baru No. 29-31 Rawamangun
69	RS Bina Waluya	Jl. TB Simatupang No. 71 Jakarta Timur
70	RS Bunda Aliyah	Jl. Pahlawan Revolusi No.100 Pondok Bambu, Jakarta Timur
71	RS Polri dr. Sukamto	Jl. Raya Bogor Kramat Jati Jakarta Timur
72	RUSPAU Antariksa	Jl. Merpati No.2 Lanud Halim Perdana Kusuma
73	RSIA. Hermina Podomoro	Jl. Danau Agung 2 Blok E3
74	RS. Pluit	Jl. Raya Pluit Selatan No. 2
75	RS. Satya Negara Sunter	Jl. Sunter Agung Utara Raya Blok A No. 1
76	RS. Mitra Keluarga Kemayoran	Jl. Landas Pacu Timur Kemayoran Jakarta 10630
77	RS. Medika Griya Sunter Podomoro	Jl. Danau Sunter Utara, Perumahan Nirwana Sunter

		Asri
78	RS. Gading Pluit	Jl. Boulevard Timur Raya, Kelapa Gading
79	RS. Pantai Indah Kapuk	Jl. Pantai Indah Utara No. 3, Pantai Indah Kapuk, 14460
80	RS. Mitra Keluarga Kelapa Gading	Jl. Bukit Gading Raya Kav. 2, Kelapa Gading Permai
81	RS. Sukmul	Jl. Tawes No. 18-20 Tanjung Priok
82	RS Port Medical Center	Jl. Enggano No.10 Tanjung Priok
83	RS Family	Jl. Pluit Mas I No. 2A - 5A

2.3 List of this properties under the Study

This Study focused on four types of buildings—complex commercial facilities, hotels, office buildings, and industrial facilities (factories).

2.3.1 Complex commercial facilities

The buildings under study are outlined as follows:

Table 2-9 Outline complex commercial facilities

Total floor area	263,226 m^2 (rentable area: 141,930 m^2)
Intended use / number of stories	Commercial facilities / 3 stories below ground and 8 stories above ground
Year of completion	West Mall: April 2007; East Mall & Skybridge: August 2007
Power demand	14,874kW (monthly average for 2013)
Annual power consumption	55,579,200 kWh / year (2013)

2.3.2 Hotels

Hotel buildings are outlined as follows:

Table 2-10 Outline of hotel buildings

Total floor area	Not known
Intended use / number of stories	Hotels Ramayana Wing: 8 stories above ground; Ganesha Wing: 15 stories above ground Deluxe Room & Grand Deluxe Room: 159 rooms , Presidential Suite: 1 room, Diplomatic Suite: 4 rooms , Salon Suite: 6 rooms, Executive Grand Deluxe: 90 rooms , Grand Deluxe: 68 rooms, Deluxe Room: 120 rooms
Year of completion	Completed in 1962; Kempinski Hotel SA started operation upon re-development in 2004.
Power demand	-
Annual power consumption	-

2.3.3 Industrial facilities (e.g. factories)

Industrial facilities are outlined as follows:

Table 2-11　Outline of industrial facilities (factories)

Total floor area	600,000 m^2
Intended use　/　number of stories	Spinning mills with an integrated process for raw cotton to dyeing to final products processing
Year of completion	-
Power demand	-
Annual power consumption	-

2.3.4　Office buildings

(1)　Office building A

The office building is outlined as follows:

Table 2-12　Outline of office building A

Total floor area	Total floor area: 50,000 m^2 Air-conditioned area: 30,000 m^2 (tenant section: 25,000 m^2, public section: 5,000 m^2)
Intended use　/　number of stories	25 stories
Year of completion	1994
Electricity dem	-
Annual power consumption	10,282,896　kWh

(2)　Office buildings B

The buildings is outlines as follows:

Table 2-13　Outline of office building B

Total floor area	32,159 m^2 (parking lots: 19,898 m^2)
Intended use　/　number of stories	Offices: 19 stories above ground
Year of completion	January 1992
Electricity dem	2,633 kW (monthly average for 2013)
Annual power consumption	9,678,100 kWh / year (2013)

3. Energy-saving technologies and methodologies introduced

3.1 Complex commercial facilities

These facilities are located at Monumen Selamat Datang on Jakarta's main street Thamrin Street, facing a rotary. The premises are shared by offices, hotels, and apartments.

Commercial buildings are composed of three sections--West Mall, East Mall, and Skybridge. West Mall, East Mall, and Skybridge have 9-story, 8-story, and 5-story buildings, respectively.

The facilities are operated under the following time schedule:

- Operation Hours: 8: 00 - 22: 00
- Service Hours-: 10: 00 - 22: 00/0: 00/2: 00

For this Report, our on-site survey was targeted on the following points:

（1）Introduction of an LED system as parking-lot lighting; and

（2）Introduction of a solar power generation system.

（1）Outline of apparatuses

Figure 3-1 shows the share of apparatuses in total energy consumption. Tenants' equipment accounts for 43.7% of the total consumption, followed by chillers (31.9%). With tenants' equipment excluded, chillers represent about 57% . When VAC is included, air-conditioning apparatuses have a larger share in electricity consumption.

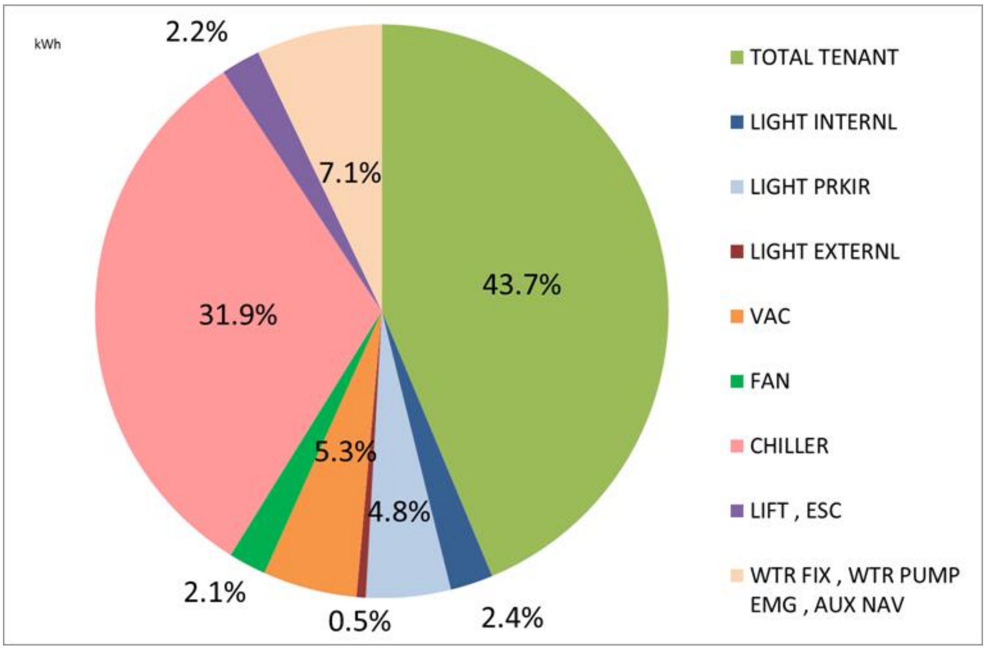


Figure 3-1 Share of apparatuses in the total amount of electricity used

Figure 3-2 shows provides monthly data on the amount of electricity purchased and generated during the 2011-2013 period. Power consumption decreased throughout this period. Since February 2011, cost reduction efforts have been made by running LNG-based electric generators during high-rate hours. On the whole, LNG consumption changes in line with power generation.

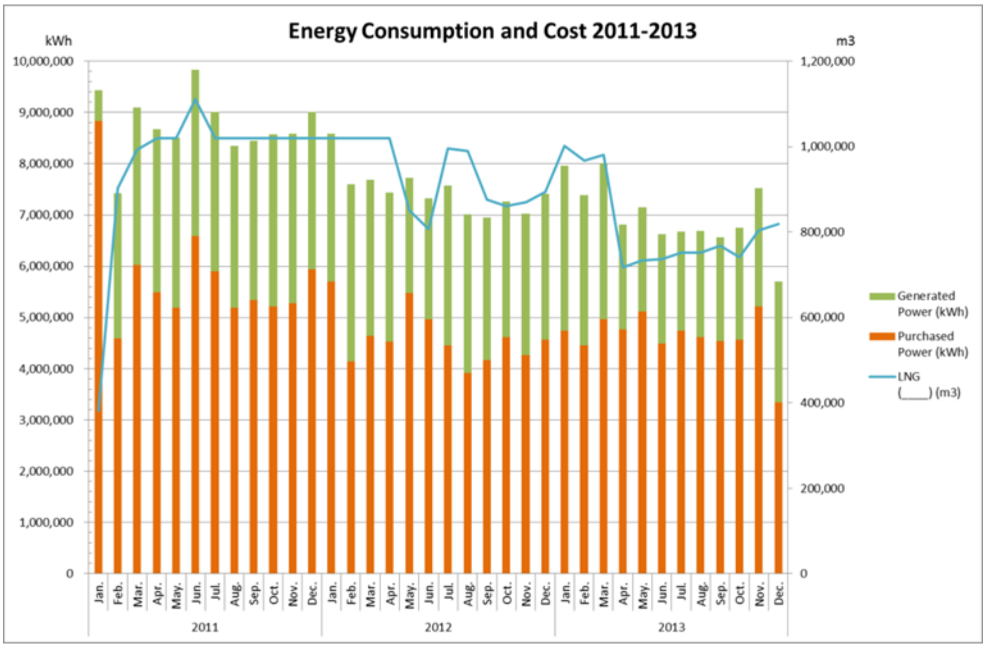


Figure 3-2 Monthly amount of electricity purchased, amount of electricity generated, and LNG consumption (2011-2013)

Figure 3-3 provides monthly data on energy cost during the 2011-2013 periods. Expenditures were relatively small in 2012 although they fluctuated from month to month. Expenditures were greater in 2013 than in 2011, probably due uto raised electricity rates.

Figure 3-4 monthly data on power consumption by apparatus during the 2011-2013 period. The figure shows a continuous decrease in power consumption during the period despite monthly fluctuations. This indicates that the energy-saving policy has been and will be effective unless lease contracts with tenants are terminated on a large scale in the future and that, specifically; tenants have contributed substantially to the reduction in electricity consumption. In addition, Figure 3-3 and Figure 3-4 show that energy cost rose during the 2011-2013 period despite a decrease in electricity consumption, indicating that users had to pay more due to a higher unit energy price. Under such situation, benefits of energy-saving efforts would be canceled by higher energy unit prices, which would be a real headache to property owners.

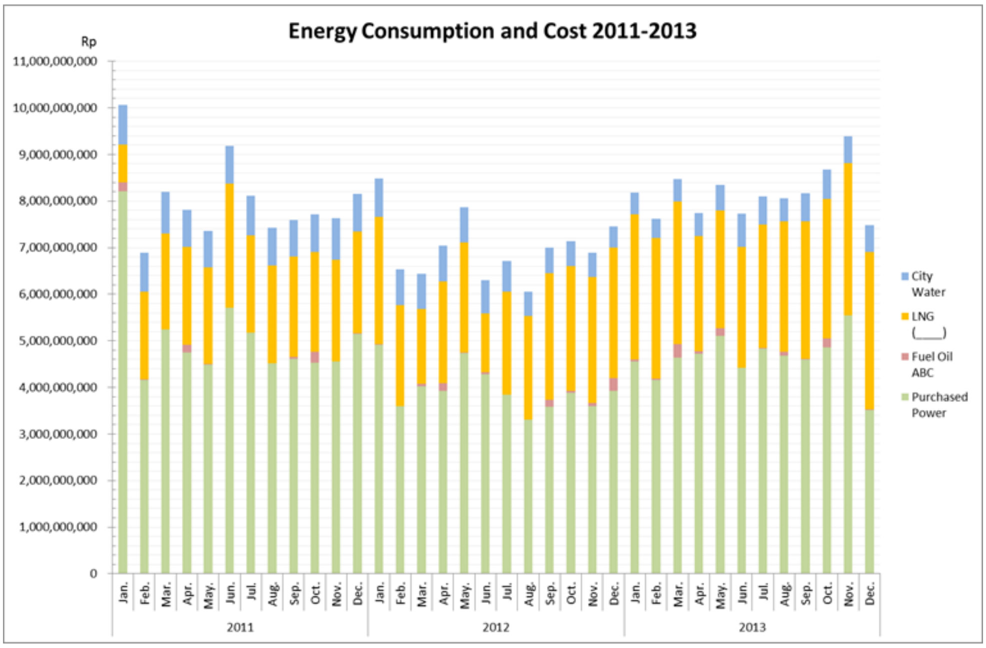


Figure 3-3 Monthly energy cost (2011-2013)

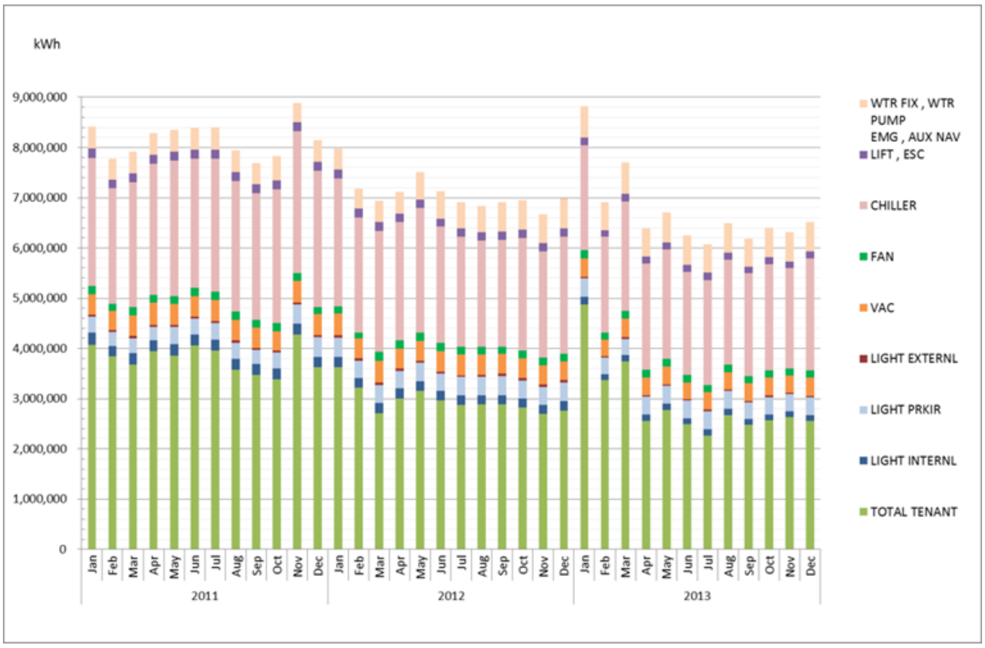


Figure 3-4 Monthly power consumption by apparatus (2011-2013)

Table 3-1 shows the composition of air-conditioning refrigerators (West Mall).

Both West Mall and East Mall are furnished with 2,000 refrigerator ton class apparatuses. The refrigerator efficiency is 0.589 kW/TR, sufficiently low compared to the latest models. The efficiency may be further decreasing as they degrade with age. Because air-conditioning refrigerators represent a substantial portion of power consumption by a building, the replacement with the lest models will significantly contribute to reduction in power consumption.

Table 3-1 Specifications for air-conditioning refrigerators in West Mall

DATA	UNIT	CHILLER 1		CHILLER 2		CHILLER3	
SYSTEM INFORMATION							
Refrigerant		R-134a		R-134a		R-134a	
Capacity	TR	2090		2090		2090	
Gear Code		EG		EG		EG	
Liquid Type		Water		Water		Water	
Starter Type		Auto Transformer Starter 65%		Auto Transformer Starter 65%		Auto Transformer Starter 65%	
Kilowatts Input	kW	1231		1231		1231	
NAME PLATE INFORMATION							
Motor Code		5DG		5DG		5DG	
Voltage	V	3300		3300		3300	
Phases		3		3		3	
Frequency	Hz	50		50		50	
LRA	A	1415		1415		1415	
FLA	A	245		245		245	
Inrush Ampere	A	599		599		599	
DESIGN LOAD		EVAP.	COND.	EVAP.	COND.	EVAP.	COND.
Passes		2		2		2	
Design Working Press.							
Fouling Factor		0.0176	0.0440	0.0176	0.0440	0.0176	0.0440
Pressure Drop		98.2	103.0	98.2	103.0	98.2	103.0
Nozzle Arrangement In		B	R	B	R	B	R
Nozzle Arrangement Out		C	S	C	S	C	S
Leaving Temperature	℃	6.7	35.2	6.7	35.2	6.7	35.2
Return Temperature	℃	12.2	30.0	12.2	30.0	12.2	30.0
Flow Rate	GPM	5016.0	6270.0	5016.0	6270.0	5016.0	6270.0
Number of Tube		1275.0	1544.0	1275.0	1544.0	1275.0	1544.0

Table 3-2 shows the composition of air-conditioning refrigerators (East Mall).

Table 3-2 Specifications for air-conditioning refrigerators in East Mall

DATA	UNIT	CHILLER 1		CHILLER 2		CHILLER 3	
SYSTEM INFORMATION							
Refrigerant		R134a/1481kg		R134a/1481kg		R134a/1481kg	
Capacity	TR	2000		2000		2000	
Gear Code		EG		EG		EG	
Liquid Type		Water		Water		Water	
Starter Type		Auto Transformer Starter 65%		Auto Transformer Starter 65%		Auto Transformer Starter 65%	
Kilowatts Input	kW	1178		1178		1178	
NAME PLATE INFORMATION							
Motor Code							
Voltage	V	3300		3300		3300	
Phases		3		3		3	
Frequency	Hz	50		50		50	
LRA	A	1415		1415		1415	
FLA	A	245		245		245	
Inrush Ampere	A	599		599		599	
DESIGN LOAD		EVAP.	COND.	EVAP.	COND.	EVAP.	COND.
Passes		2	2	2	2	2	2
Design Working Press.		2MPa	2MPa	2MPa	2MPa	2MPa	2MPa
Fouling Factor		0.0176	0.0440	0.0176	0.0440	0.0176	0.0440
Pressure Drop		98.2	103.0	98.2	103.0	98.2	103.0
Nozzle Arrangement In		B	R	B	R	B	R
Nozzle Arrangement Out		C	S	C	S	C	S
Leaving Temperature	℃	6.7	35.2	6.7	35.2	6.7	35.2
Return Temperature	℃	12.2	30.0	12.2	30.0	12.2	30.0
Flow Rate	GPM	4800.0	6000.0	4800.0	6000.0	4800.0	6000.0
Number of Tube		181.0	260.0	181.0	260.0	181.0	260.0

As part of their efforts to reduce cost against rising unit electricity prices, these facilities operate emergency electric generators during peak consumption hours. In the future, they plan to introduce a co-generation system for emergency electric generators (by operating during regular hours and introducing refrigerator based on exhaust heat) in an effort to improve total efficiency and lower power peaks by using exhaust heat from electric generators (more details to be released in a separately report).

（2） Local situation

A walk-through survey highlighted the following points:

1） Introduction of a solar power generation system

An on-site survey was conducted to determine the feasibility of installation of a solar power generation system on the rooftop of each building (West Mall, East Mall, and Skybridge). The findings of the survey are provided below.

Figure 3-5 through Figure 3-10 show candidate installation area of each facility. West Mall and Skybridge have common folded-plate roofs, which provide will be technically more compatible with the instruction of solar batteries. For Skybridge, however, the installation site must be selected with care in order to counter the effect of the shade of heliports, piping, and other structures and the effects of exhaust air released from air ducts. In addition, building owners asked us whether a solar battery can be installed on a top light to prevent increasing loads on the indoor air-conditioning system caused solar heat coming through the top light. Some top lights were found to be wrapped with a cover as shown in Photo 2-x. Solar batteries provide light insulation and heat insulation. We will consider including this area among our candidate sites. Meanwhile, to install a solar battery on the top light, we need to develop a method that takes load resistance and construction safety into consideration. This issue will be discussed in more detail will owners, subcontractors, and other stakeholders. The candidate installation area in East Mall consists of top lights and inclined roofs. We need to also discuss the installation of a solar battery on top light as with West Mall and Skybridge. On the other hand, no technical issues were identified for the inclined roofs. Figure 3-11 through Figure 3-13 show solar batteries installed on each roof.

As discusses above, it is possible to efficiently use roofs left alone as dead spaces in order to save energy by installing a renewable energy unit, while at the same time generating heat insulation effects as needed by the owners. For this reason, these facilities under discussion are appropriate to introduction of a solar power generation system.

Figure 3-5　West Mall (metal-sheet roof)

Figure 3-6　West Mall (top-light)

Figure 3-7　Skybridge (landscape)

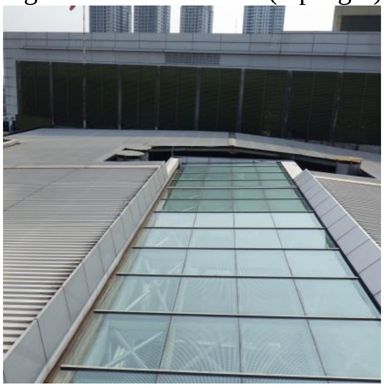


Figure 3-8　Skybridge (top-light)

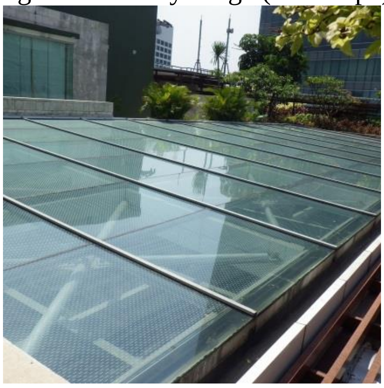


Figure 3-9　East Mall (top-light)

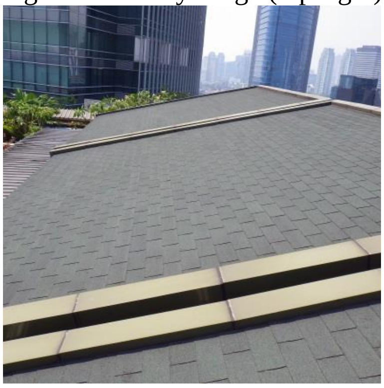


Figure 3-10　East Mall (inclined-roof)

Figure 3-11　Installation image onto metal-sheet roof

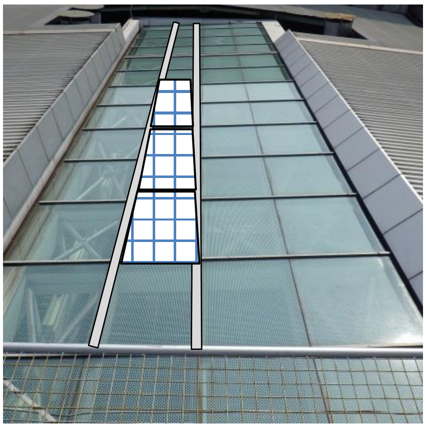


Figure 3-12　Installation image onto top-light

Figure 3-13　Installation image onto inclined-roof

2）Assessing the feasibility of installing new heating source technology

The following points were confirmed in the on-site survey:

Figure 3-14　Turbo chiller

Figure 3-15　Cooling tower

Figure 3-16　Electric generator

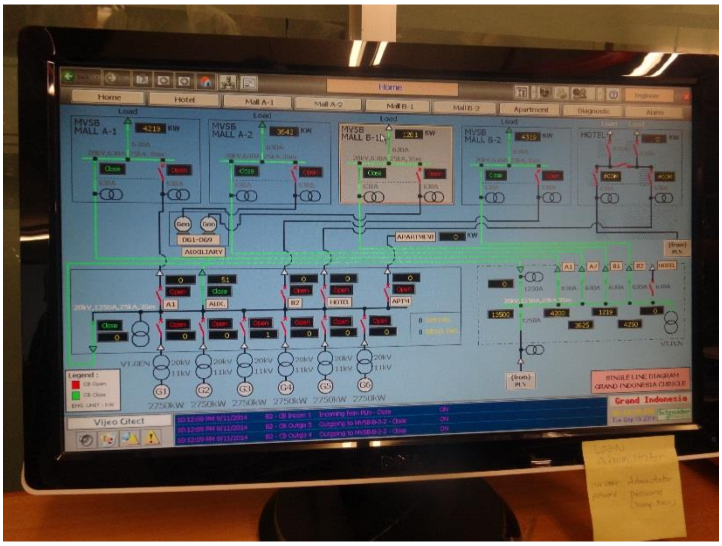


Figure 3-17　Central monitoring

Figure 3-18　Processed drain water

Figure 3-19　RO membrane equipment

Figure 3-20 Electricity intake equipment

Figure 3-21 Oil tank

Figure 3-22 Air-cooling chiller

3. 2 Hotels

Facing the rotary at Monumen Selamat Datang on Jakarta's main street Thamrin, the facilities constitute a five-star hotel. The premises are shared with complex facilities of offices, apartments, and commercial buildings.

The buildings consist of Ramayana Wing and Ganesha Wing. They accommodate Kempinski Grand Ballroom, with the total floor area of 3,000 m2, and Bali Room, with a total floor area of 1,000 m2, in addition to restaurants, pools, spas, and other facilities. Our on-site survey focused on the feasibility of introduction of LED lighting into guestrooms, guestroom passages, and Bali Room.

(1) Outline of apparatuses

The hotel uses electricity as follows:

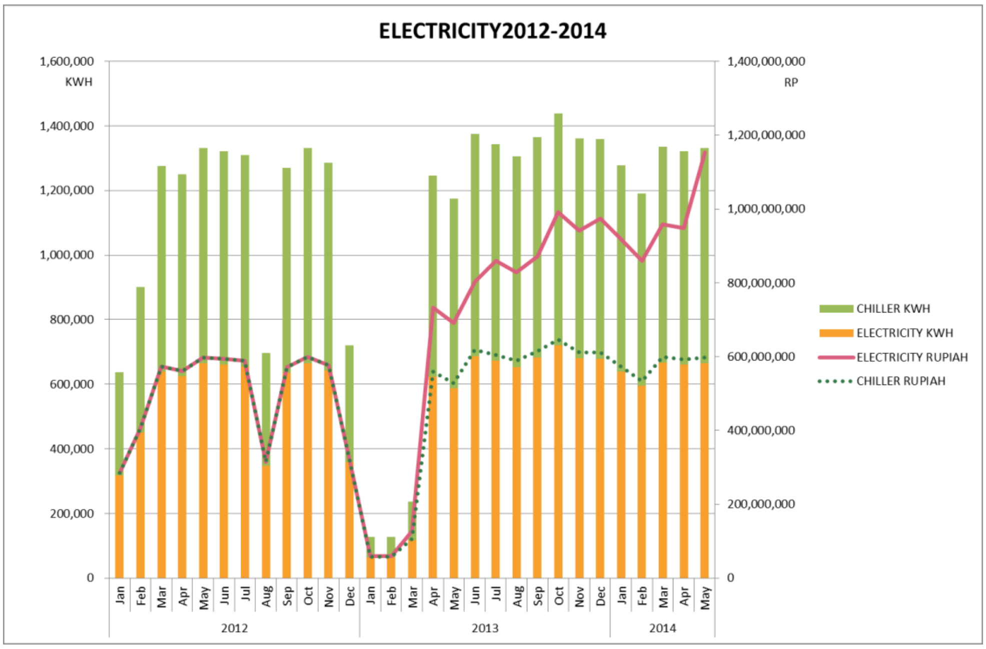


Figure 3-23 Monthly electricity consumption (from 2012 to 2014)

Electricity consumption is very low in some months probably due to the temporary closure of the hotel and some other factors. Overall, power consumption largely remained flat at about 1,300,000 kWh a month, from 2012 to 2014. On the other hand, electricity rates were raised by the government during the same period.

The figures below show flat electricity rates for April during the 2012-2014 periods:

April 2012: 898.1 IDR / kWh
April 2013: 1,175.1 IDR / kWh (up 30.8% year on year)
April 2014: 1,434.8 IDR / kWh (up 22.1% year on year and up 59.8% from 2 years before)

（2）Local situation

Our walk-through survey focused on the following sites:

1）Bali Room

Bali Room, with a ceiling 8 meters high and a total floor area of about 1,000 m2, is a ballroom that can accommodate a large number of guests. The chandelier overhead in the center has 1,000 candle lamps that attract eyes of viewers. In addition, the ceiling is furnished with an LED lighting unit to demonstrate high production performance. In the Study, we plan to install LED lighting in the candle lamps.

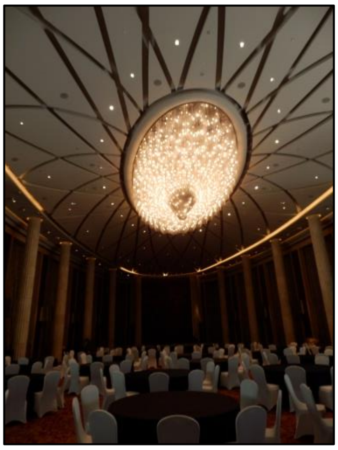


Figure 3-24　Chandelier of Bali Room

Figure 3-25　Indirect lighting of ceiling (Slit part)

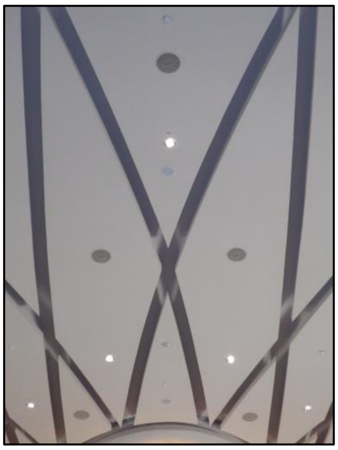


Figure 3-26　Indirect lighting of ceiling (Slit part)

2）Rooms corridor

Since the guest room corridor have intermediate platforms, which need artificial lighting all through the day. Currently, candle lamps are installed on the walls, and fluorescent lights are furnished on the ceiling as indirect lighting. In the Study, we plan to introduce LED lighting into the wall candle lamps in the guestroom passages.

Figure 3-27　Lighting of guest room corridor

3) Guest room

The guest room serves as production of lighting which dropped illumination on the whole. The bedside by the mini halogen lamp and Softone which are arranged at a ceiling and stand lighting, and the indirect illumination of the ceiling side by a fluorescent light are adopted. This time, we are planning replacement with LED with the mini halogen lamp arranged in a guest room at a ceiling, and the bedside and stand lighting by Softone.

Figure 3-28 Bedside stand lighting (outside view)

Figure 3-29 Bedside stand lighting (LED, inside view)

Figure 3-30 Stand lighting (outside view)

Figure 3-31 Stand lighting (LED, inside view)

Figure 3-32 Bedside stand lighting (Bulb, inside view)

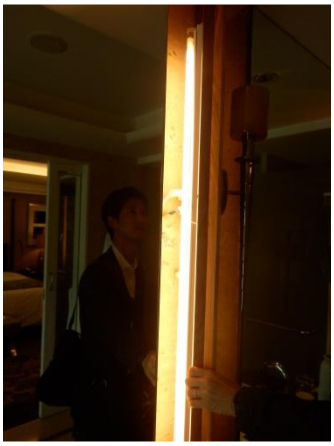


Figure 3-33　Bathroom lighting (outside view)

Figure 3-34　Bathroom lighting (indirect)
(Fluorescent lamp, inside view)

4）External lighting

As exterior lighting, the floodlight for illuminate the side wall called Float Lamp to a roof portion is installed. This time, we are planning replacement Float Lamp with LED in exterior lighting.

Figure 3-35　Exterior lighting of guest room
(from interior)

Figure 3-36　Exterior lighting of guest room
(from roof top)

Figure 3-37　Float Lamp (zoom)

Figure 3-38　Float Lamp (from roof top)

3. 3　Production facility (Factory)

In our field survey, we checked the following:

Figure 3-39　Chiller

Figure 3-40　Cooling tower

Figure 3-41　Electricity intake equipment panel

Figure 3-42　Gas boiler

Figure 3-43　Compressor

Figure 3-44　Raw water storage tank


Figure 3-45 Drain treatment tank


Figure 3-46 Settlement tank

3. 4 Office Building

3. 4. 1 Office Building A

(1) Target Building outline

We discussed the possible capacity expansion of the existing turbo refrigerators and the replacement of these refrigerators with more efficient models.

Office Building A

Floors : 25

Bacement	Office and equipment area
1st Floor	Bank and Retailarea
2nd to 25th Floors	Offices

Construction complession : 1994

Total floor area : 30,000m^2

Building centrifugal chiller renewal

Figure 3-47 and Figure 3-48 are show the existing air conditioning equipment. For this building,central air-conditioning system is adopted. In machine room in the basement,there are four turbo chillers with a total capacity of 1400RT, three with a capacity of 400RT and one with a capacity of 200RT. On the rooftop, coolong towers are installed. We focused on the renewal chillers, which are now 21 years old.

Centifugul chiller
Change in capacity
(400RT × 2 units → 500RT × 2 units)

Cooling tower
Change in operation temp
difference (Δt=5°C → 7°C)

Figure 3-47 Centrifugal chiller

Figure 3-48 Cooling tower

（2）Building A/C system renewal plan.

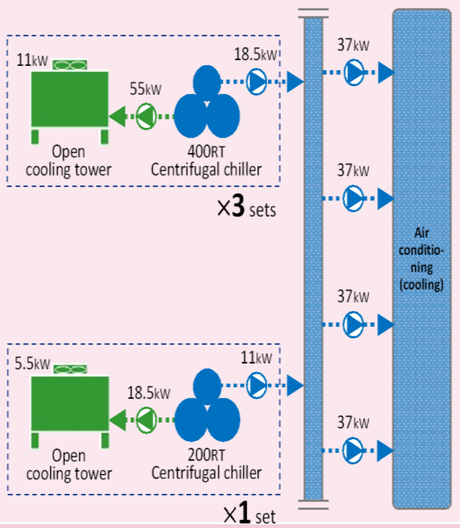
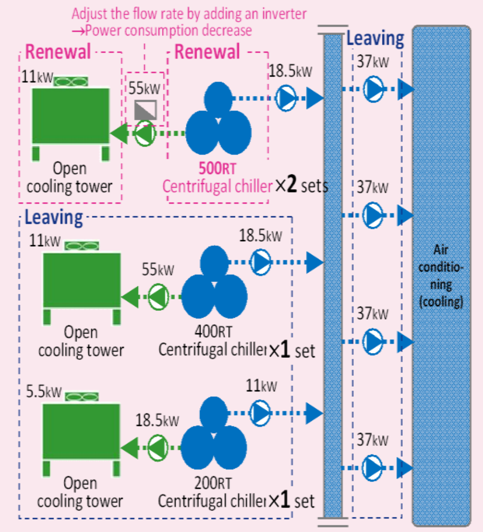
	Existing units	Renewal Proposal
Type	Centrifugal chiller | Cooling capacity 1400RT	Centrifugal chiller | Cooling capacity 1000RT(+Leaving 600RT)
System Outline		
Equipment configuration	400RT Centrifugal chiller×3 200RT Centrifugal chiller×1	500RT Centrifugal chiller×2 | Renewal 400RT Centrifugal chiller×1 | Leaving 200RT Centrifugal chiller×1 | Leaving
Refrigerant	R500 | 400RT , R134a | 200RT	R134a
Coolant temperature	33°C ~ 37.2°C	32°C ~ 39°C
Refrigerant COP	4.1 | aging deterioration 0.5%/year expected	5.9

Figure 3-49 System renewal plan

Figure3-49 shows building A/C system renewal plan. The diagram on the left shows the existing syastem, and diagram on the right shows the system we are planning.

Currentrly there are three 400RT units, and one 200RT unit, making a total of 1400RT. With tihis plan, the system would be renewed by replacing two of the latest 500RT units.

The remaining one 400RT and one 200RT units would be left in place and used as standby units.

Also, by increasing the cooling water temparature difference from 5 to 7 degrees centigrade between the new chillers and cooling towers, the amount of cooling water could be reduced, and therefore, the power consumed by the pumps could be also reduced. Not only could system COP be improved from the current 4.1 to 5.9, but with connection to a central contoroller,power consumed for air-conditioning could be monitored. It would also be possible to sort electricity charges according to area of indoor space.

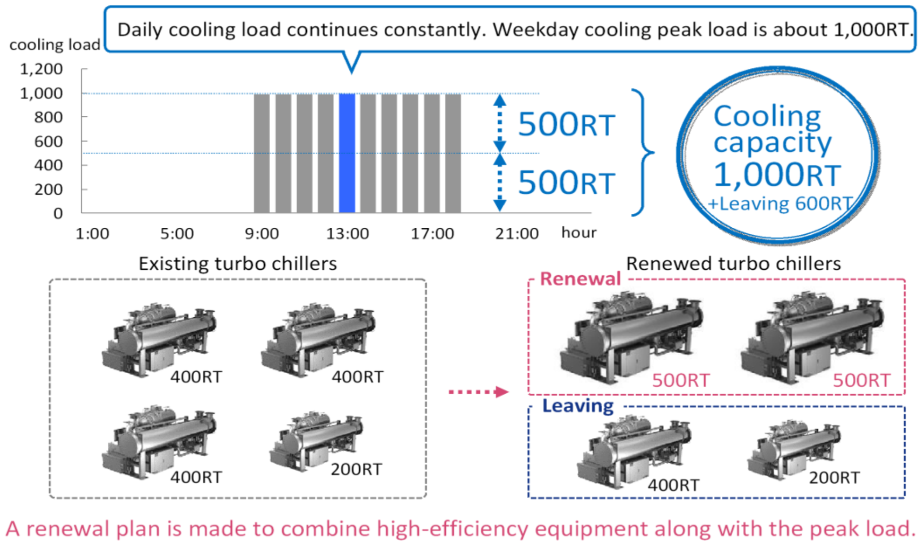


Figure 3-50 Renewal plan

According to information we received from the staff, this building's weekday cooling peak load is about 1,000RT. So, we made a renewal plan to combine high-efficiency equipment along with peak load. The system would be renewal by replacing two of three existing 400RT units by two of the latest 500RT units. The remaining one 400RT and one 200RT units would be left in place and used as standby units.

Benefits of A/C system renewal

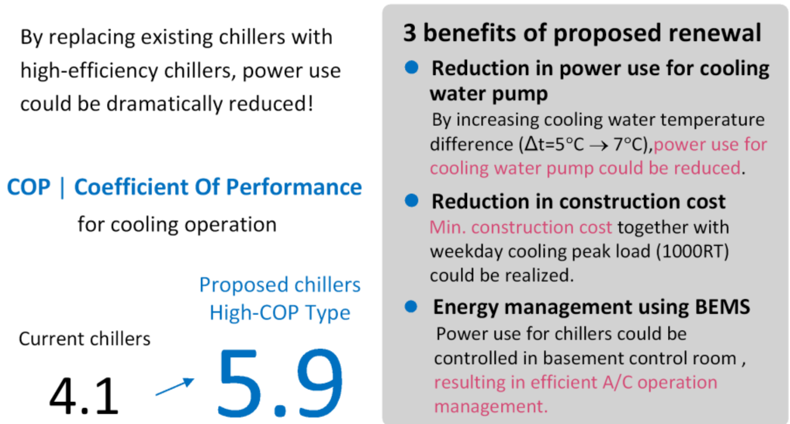


Figure 3-51 Benefit of A/C system renewal

The figure 3-51 shows of the benefits obtained by renewing the existing air-conditioning.

① By increasing the cooling water temperature difference, power use for the cooling water pump could be obtained.

② Weekday cooling peak load is 1000RT .so, by installing two chillers, each with a capacity of 500RT, construction cost would be minimized.

③ BEMS cold be introduced. This would allow monitoring of the operational state of chillers, and management of energy in real time, from the control room. This means, many tasks now done manually by operators could be automated.

3. 4. 2 Office buildings B

The building has an electric power capacity of 3,465 kVA under a B3-category contract. PLN's electricity meters are monitored on a daily basis. Every transformer is checked for kW and A by the hour. The electricity meters for tenants are recorded and billed to them on a monthly basis. The figure below shows annual energy consumption by the building. The two transformers take care of separate lines. TR1 is dedicated to air-conditioning systems and fire-extinguishing units, which consume electricity at all times, while TR2 is used for lighting systems, electrical outlets, and other power systems. When TR1 and TR2 are compared, the air-conditioning systems account for xx% of the total amount of electricity used by the whole buildings, suggesting that the improved efficiency of updated air-conditioning systems would effectively reduce CO_2 emissions.

Table 3-3 Annual power consumption by transformer (by intended use)

MONTH	kWh		MAX.LOAD(kW)
	TR1(AC)	TR2(LIGHTING)	
January	331,300	430,700	2,440
February	342,900	407,100	2,580
March	360,600	428,300	2,650
April	398,500	447,300	2,640
May	395,300	453,100	2,700
June	358,500	432,300	2,600
July	360,800	455,200	2,600
August	342,000	415,800	2,620
September	392,000	441,800	2,650
October	410,700	437,700	2,680
November	371,300	440,600	2,680
December	369,400	454,900	2,750
Total	4,433,300	5,244,800	

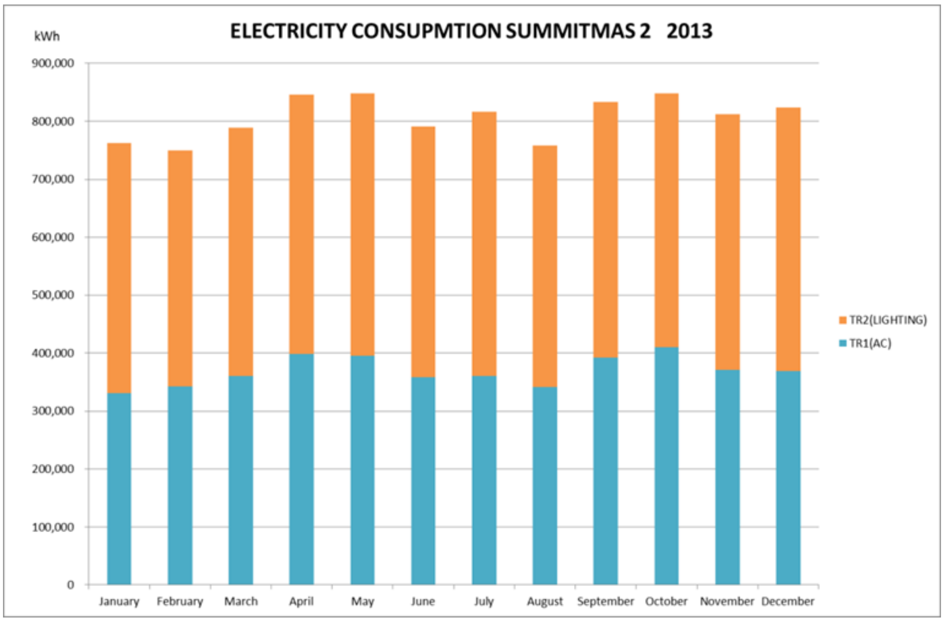


Figure 3-52 Annual power consumption by transformer (by intended use)

This office building is a high-rise structure constructed after the completion of its adjacent office building. The former was built basically on the same specifications as those used for the latter. For the existing office building, air-conditioning systems were replaced due to aged deterioration. In addition, lighting devices were switched from the existing fluorescent lights to Hf lighting devices in 2011 and 2012. A significant reduction in power consumption was achieved because of the reduction of the number of lighting devices and the replacement for more efficient lighting devices.

For this office building, as well as for the existing office building, we consider replacing the existing air-conditioning system for a high-efficiency type, introducing LEDs for office lighting, and reducing the number of lighting devices, in order to achieve more energy-efficient offices.

Table 3-4 Types of air-conditioning systems and a list of lighting devices after replacement

Fl	1985-2011		2012-NOW	1985-2010		2011-NOW	
	AC TYPE			LIGHTING TYPE			
	PW-30 (30HP)	PW-15 (15HP)	City Multi (10HP)	TLD2 X 36W	TLD2 X 20W	TLD2 X 32W	TLD2 X 18W
1	2 unit	1 unit	10 unit	132	-	132	-
2	2 unit	-	8 unit	288	22	160	10
3	2 unit	-	8 unit	288	22	160	10
4	2 unit	-	8 unit	288	22	160	10
5	2 unit	-	8 unit	288	22	160	10
6	2 unit	-	8 unit	288	22	160	10
7	2 unit	-	8 unit	288	22	160	10
8	2 unit	-	8 unit	288	22	160	10
9	2 unit	-	8 unit	288	22	160	10
10	2 unit	-	8 unit	288	22	160	10
11	2 unit	-	8 unit	288	22	160	10
12	2 unit	-	8 unit	288	22	160	10
13	2 unit	-	8 unit	288	22	160	10
14	2 unit	-	8 unit	288	22	160	10
15	2 unit	-	8 unit	288	22	160	10
16	2 unit	-	8 unit	288	22	160	10
17	2 unit	-	8 unit	288	22	160	10
18	2 unit	-	8 unit	288	22	160	10
19	2 unit	-	8 unit	288	22	160	10
20	2 unit	-	8 unit	288	22	160	10
21	2 unit	-	8 unit	288	22	160	10
	42 unit	1 unit	170 unit	5,892	440	3,332	200

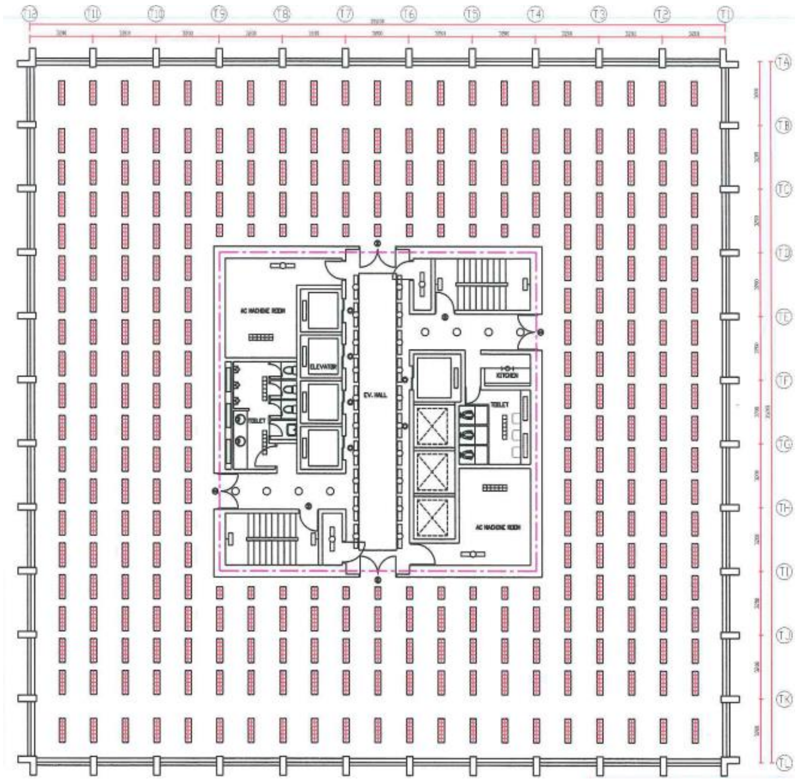


Figure 3-53 Layout of lighting at standard floor (before renewal)

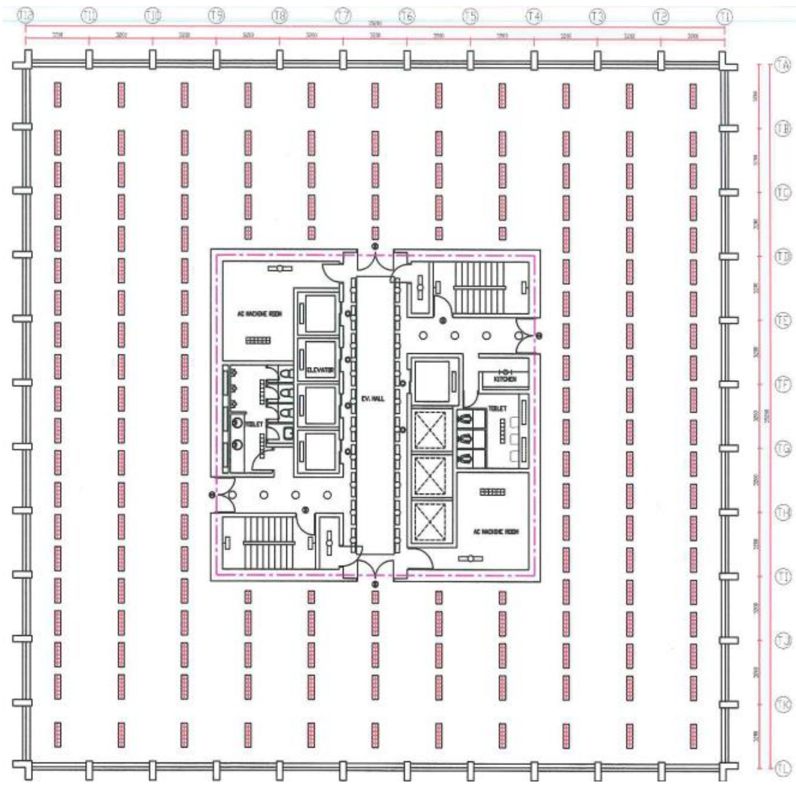
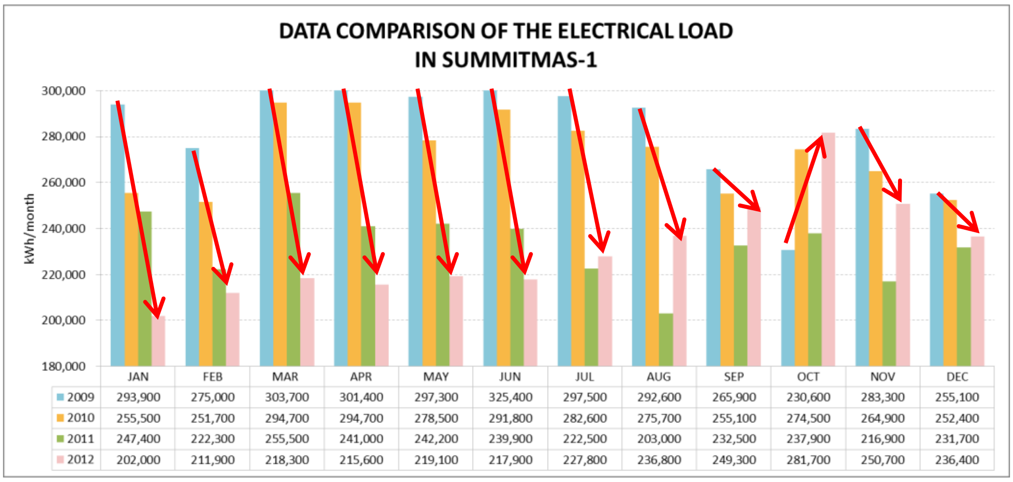
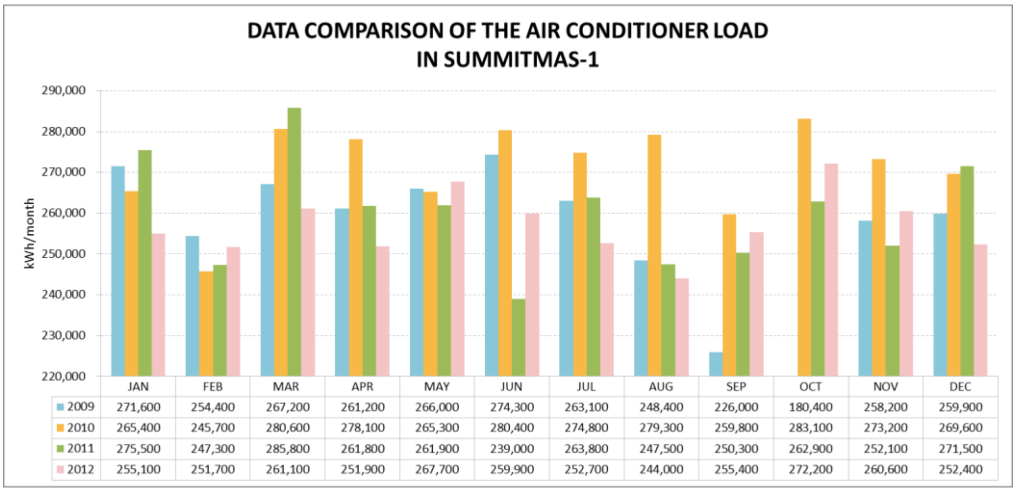


Figure 3-54 Layout of lighting at standard floor (after renewal)



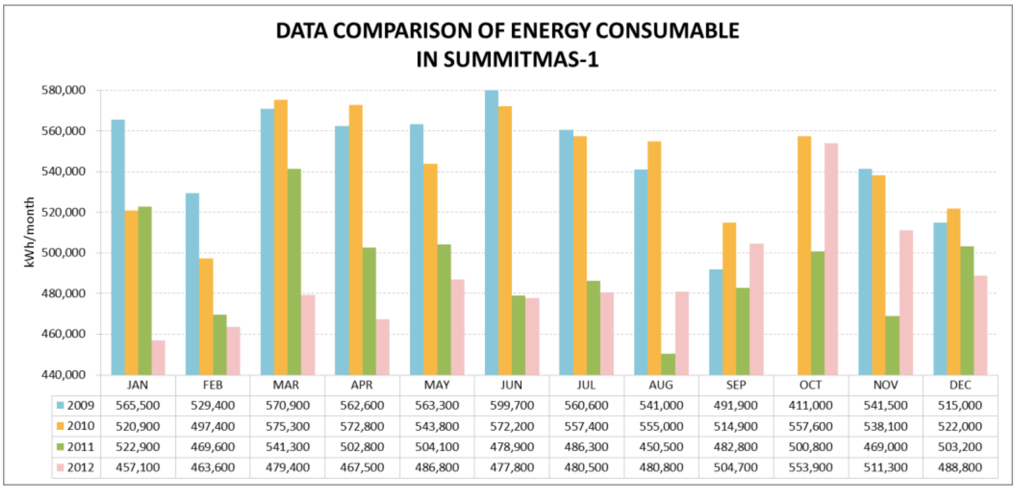
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2009	293,900	275,000	303,700	301,400	297,300	325,400	297,500	292,600	265,900	230,600	283,300	255,100
2010	255,500	251,700	294,700	294,700	278,500	291,800	282,600	275,700	255,100	274,500	264,900	252,400
2011	247,400	222,300	255,500	241,000	242,200	239,900	222,500	203,000	232,500	237,900	216,900	231,700
2012	202,000	211,900	218,300	215,600	219,100	217,900	227,800	236,800	249,300	281,700	250,700	236,400

Figure 3-55 Monthly data of lighting load every year



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2009	271,600	254,400	267,200	261,200	266,000	274,300	263,100	248,400	226,000	180,400	258,200	259,900
2010	265,400	245,700	280,600	278,100	265,300	280,400	274,800	279,300	259,800	283,100	273,200	269,600
2011	275,500	247,300	285,800	261,800	261,900	239,000	263,800	247,500	250,300	262,900	252,100	271,500
2012	255,100	251,700	261,100	251,900	267,700	259,900	252,700	244,000	255,400	272,200	260,600	252,400

Figure 3-56 Monthly data of air-conditioning power load every year



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2009	565,500	529,400	570,900	562,600	563,300	599,700	560,600	541,000	491,900	411,000	541,500	515,000
2010	520,900	497,400	575,300	572,800	543,800	572,200	557,400	555,000	514,900	557,600	538,100	522,000
2011	522,900	469,600	541,300	502,800	504,100	478,900	486,300	450,500	482,800	500,800	469,000	503,200
2012	457,100	463,600	479,400	467,500	486,800	477,800	480,500	480,800	504,700	553,900	511,300	488,800

Figure 3-57 Monthly data of electricity consumption every year

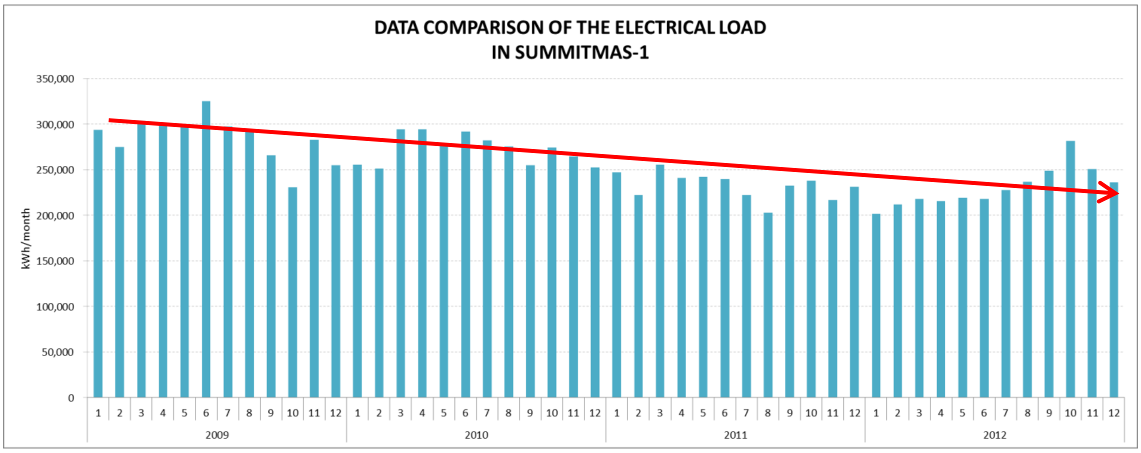


Figure 3-58 Monthly data of lighting load trend with the passage of time

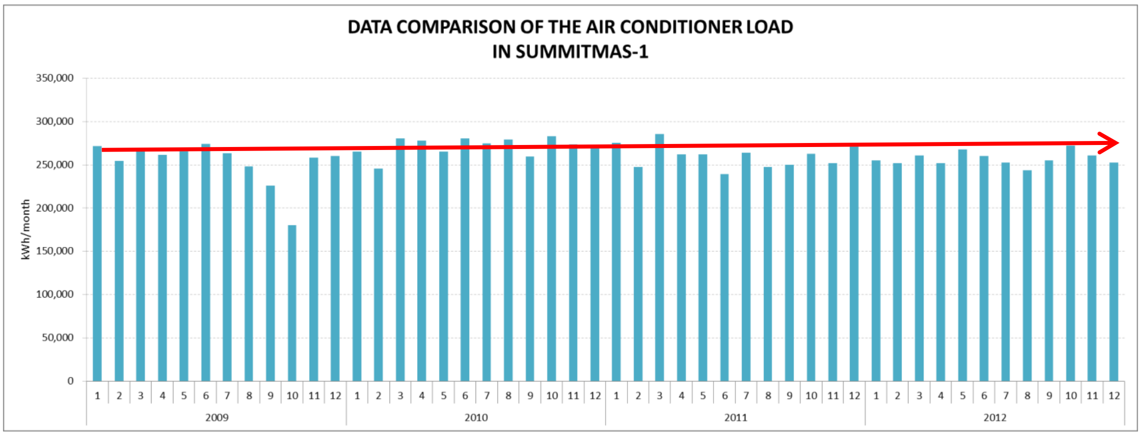


Figure 3-59 Monthly data of air-conditioning power load with passage of time

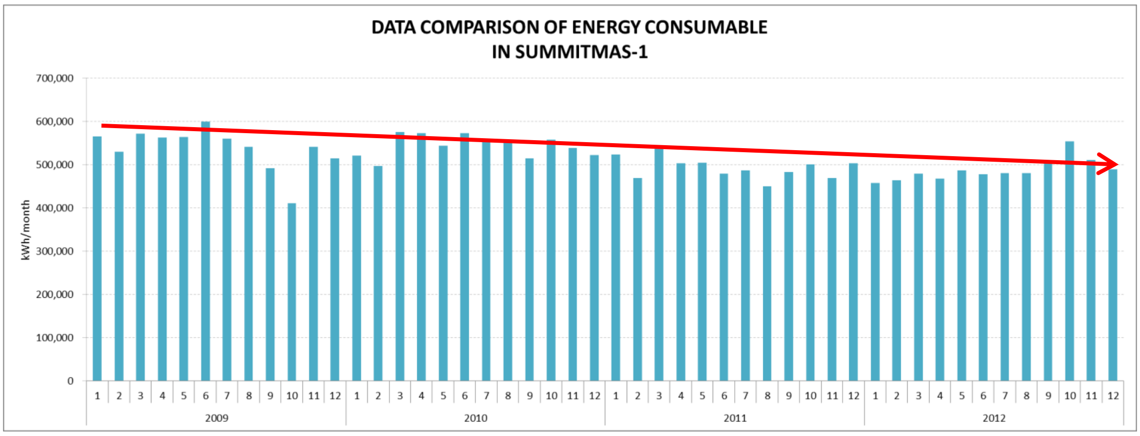


Figure 3-60 Monthly data of electricity consumption with passage of time

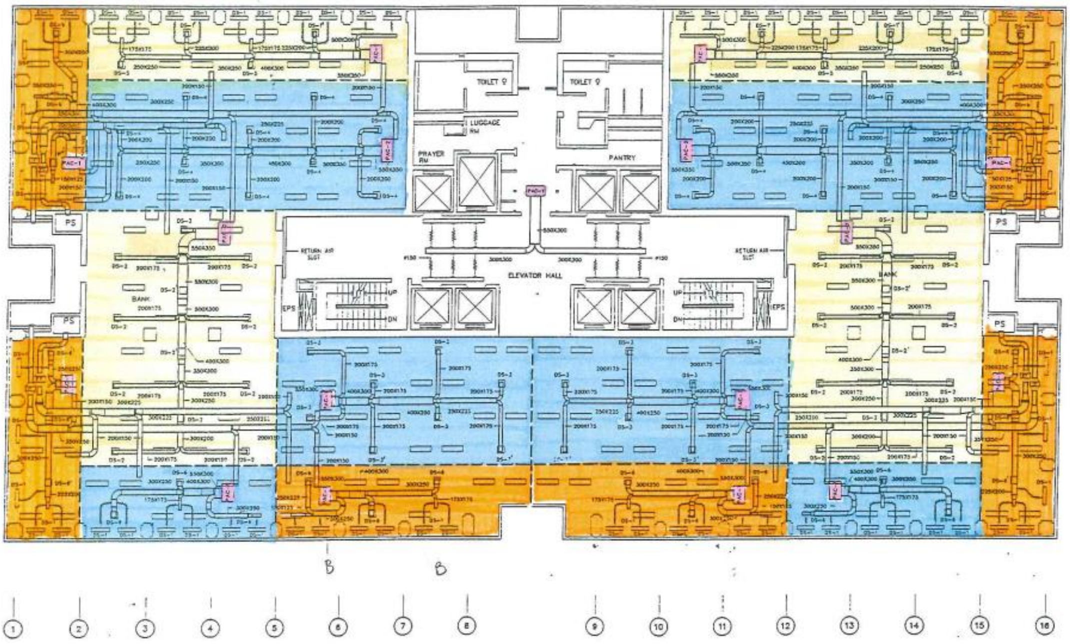


Figure 3-61 Air conditioner layout diagram

This building uses a multi-purpose air-conditioning system for stores, with indoor units embedded in the ceiling. One indoor unit is connected to one outdoor unit. A total of 16 sets of the units are installed on each floor. In addition, a similar air-conditioning system is furnished in the elevator hall. These air-conditioning systems are about 22 years old. The air-conditioning systems are generally operated as follows:

For Office use	: Mon- Fri. AM7:30-PM5:30, Sat AM 7:30-PM 1:30
For Elevator Hall use	: Mon-Fri. AM7:00-PM7:00

In addition, air-conditioning systems are automatically turned on/off by a building automation system (BAS). The room temperatures for each air-conditioning system are preset by the tenant, usually at between 24ºC and 30ºC. Tenants are recommended to set their room temperature at 25ºC. The air-conditioning system is maintained appropriately as the filter is cleaned every month and the outdoor units every three months. The air supply and exhaust fans are operated cyclically as they are run for 2 hours before they are suspended for 15 minutes.

For lighting, the offices use two TL36W units embedded in the ceiling. The lighting is turned on/off by each tenant. Usually, the lighting is turned on between 6:45 and 7:00 am and turned off around 7:00 pm. An energy-saving campaign is carried out regularly to encourage tenants, in a poster on each room entrance, to turn off lighting when no person is present in the room. Electricity is billed in accordance with the amount of electricity used. Tenant can thus reduce electricity expenditure by following this practice.

The parking lot lighting is kept on for 24 hours on the passages and between 5:30 pm and 5:00, am on the parking spaces. The lighting devices originally had a reflective cover for two lamps. Three to five years ago, when PLN was in the midst of a power supply shortage, one of the two lamps was removed to counter the shortage. Currently, one lamp is sufficient to meet the lighting requirements.

The BAS was introduced in 1992 and updated five years ago. The system monitors temperatures at four zones of each floor.

For emergency power generation, four 1,500-kVA generators and one 625-kVA unit are used.

4. Development of JCM methodologies and estimation of GHG reduction potential

4.1 JCM methodologies

4.1.1 Concept

This Study presents an energy-saving proposal for office buildings, commercial facilities, and factories. According to past energy-saving diagnoses carried out by EMI, the following major apparatuses can be introduced as an effective energy-saving measure for office buildings and commercial facilities:

- Heat source equipment;
- Air-conditioning system;
- Isolated power unit based on waste heat;
- Renewable energy;
- Lighting;
- Motors (including elevators and escalators)
- Light insulation glass
- BEMS and other energy management systems

For factories, applicable energy-saving measures vary according to the business field. This Study mainly addresses the replacement of air-conditioning systems, cogeneration systems, and other heat sources equipment.

In developing a JCM methodology, we focused on the following three approaches:

(a) Formulating a methodology separately from technologies (methodology by technology);
(b) Integrating major technologies into one methodology (hole-in-one methodology); and
(c) Integrating major technologies into one methodology but permitting the use of existing approved methodologies (a hybrid methodology combining (a) and (b) above)

In this Study, we discuss energy-saving methodologies for office buildings and commercial facilities separately from those for factories. The methodology selection will be reviewed after we examine energy-saving proposals for the facilities under discussion in more detail. Table 4-1 provides advantages and disadantages of each applicable methodology.

Table 4-1 JCM methodology development approaches to be discussed

Methodology development approaches	Advantage	Disadvantage
(a) Methodology by technology	･Detailed methodologies can be developed	･Depending on the project, it is necessary to use more than one methodology ･Development of methodologies requires a great deal of work
(b) Hole-in-one methodology	･A single methodology can handle all requirements (more than one energy-saving technology can be	･It is difficult to set qualification requirements.

	introduced into a single facility) ・New technologies can be added to a positive list.	
(c)Hybrid methodology	・Same advantages as with the hole-in-one methodology ・Existing methodologies can be used if they are approved.	・Same disadvantages as with the hole-in-one methodology

Source: Study Team

Our energy-saving proposal, based on an energy-saving diagnosis, will cover points and technologies that can be improved for energy efficiency. A decision on the acceptability of a proposed technology will be finally made by the facility owners by taking into consideration the initial necessary investment, the payback period, expected energy-saving effects, introduction timing, business strategy, and other factors. In the past, more than 1,000 energy-saving diagnoses have been carried out under assistance of the Indonesian government. Nevertheless, only a few improvement proposals have been put into practice because the payback periods under approved proposals are not favorable to the investors due to low energy prices in the country.

Table 4-2 JCM methodologies approved or proposed for Indonesia (as of February 6, 2015)

Approval / proposal	Methodology No.	Name of methodology
Approved	ID_AM001	Power Generation by Waste Heat Recovery in Cement Industry
Approved	ID_AM002	Energy Saving by Introduction of High Efficiency Centrifugal Chiller
Approved	ID_AM003	Installation of Energy-efficient Refrigerators Using Natural Refrigerant at Food Industry Cold Storage and Frozen Food Processing Plant
Approved	ID_AM004	Installation of Inverter-Type Air Conditioning System for Cooling for Grocery Store
Proposed	ID_PM004	Installation of LED Lighting for Grocery Store
Proposed	ID_PM006	GHG emission reduction through optimization of refinery plant operation in Indonesia
Proposed	ID_PM007	GHG emission reduction through optimization of boiler operation in Indonesia

Source: New Mechanism Information Platform

As shown in Table 4-2, Indonesia has adopted seven methodologies—more than any other member countries. Initially, the hybrid methodology (c) was considered the most appropriate for office buildings and commercial facilities. Specifically, we should develop those similar to the current JCM methodologies (proposal) originally developed for Vietnam. As shown in Table 4-3, on the other hand, this Study proposes 15 technologies for the four facilities on the basis of an energy-saving diagnosis. These technologies are now the subject of discussion with the facility owners. This Study focused on the hole-in-one methodology (b) and the hybrid methodology (c) as it is highly advantageous to introduce multiple energy-saving technologies into a single office building or commercial facility. In Table 4-1, the difference between approaches (b) and (c) is whether there is already any JCM approval methodology applied.

Table 4-3 Review of proposed technologies for the four facilities

Facility	Technology No.	Proposed technology	Progress of review	Availability of materials for methodology development
Commercial facility	1 2	High-efficiency refrigerator heat pumps (HP)	Reviewing proposed technologies in detail	Not available
	3	Measures against boiler heat loss	Implementation being discussed outside JCM	Not applicable
	4	Solar power generation	A finance method being discussed. Proposed technologies basically approved by the facility owners.	Available
	5	Cold water generation using waste heat	Reviewing candidate technologies in detail	Partly available
	6	CO2 control of OA supply systems		Not available
	7	Introducing a BEMS system		Not available
Spinning factory	8	Closing high-efficiency heat source piping and introducing a secondary pump	A finance method being discussed. Proposed technologies basically approved by the facility owners.	Not available
	9	Introducing cogeneration 875kVA		Not available
	10	Updating the compressor cooling tower		Not available
	11	Introducing a BEMS system		Not available
	12	Improving efficiency of production machinery	Reviewing details	Not available
Office building (a)	13	Replacing for high-efficiency individual package air-conditioning system	The details of the business proposal discussed. Proposed technologies basically approved by the facility owners.	Partly available
	14	Introducing LED lighting		Partly available
Office building (b)	15	Replacing for the latest formula turbo refrigerator	A finance method being discussed. Proposed technologies basically approved by the facility owners.	Not applicable (JCM_ID_AM002 applied)

Source: Study Team

Following the processes above, we briefed the JCM Office in Indonesia in November 2014 on the proposed application of the hole-in-one methodology and the hybrid methodology. Rather, the Office seemed more interested in developing methodologies for each technology. In addition, the Office recommended us to apply the National Standard of Indonesia (SNI) to methodology. In consideration of their suggestion, this Study develops and proposes JCM methodologies targeted at four of the 15 technologies that are being proposed for each facility and are currently in the negotiation process. Emission reduction will be calculated using the four methodologies. For the turbo chiller proposed for introduction into the office building under discussion, the existing methodology ID_AM001 will be applied to the calculation of emission reduction.

- ✓ (a) Introduction of a solar power generation system into the office buildings and commercial facilities;
- ✓ (b) Introduction of a cold water generation system using waste heat from the office buildings and commercial facilities;
- ✓ (c) Updating or introduction of a package air-conditioning system into the office buildings; and
- ✓ (d) Introduction of an LED lighting into the offices and parking lots.

Table 4-4 provides methodologies for emission reduction calculation for the proposed technologies.

Table 4-4 Methodologies for emission reduction calculation for the proposed technologies

	Technology	Reference methodology	Basic concept of calculating reduction	Conservativeness assurance
Complex commercial facilities & Hotel				
Hotel	･High-efficiency refrigerator ･heat pump (HP)	Refrigerator: JCM_ID_Am002_ver 01.1 HP: VN_PM004	Reference emissions are calculated from project electricity consumption by using the efficiency of new and existing apparatuses	SNI is applied with reference apparatus efficiency set for default. However, Green Building certified buildings like GI, existing specifications are adopted because these buildings have higher efficiency than SNI.
	Heat loss prevention for boiler	(Default: CDM)	The piping heat loss ratio of post-project to post-project electricity consumption is multiplied by the thermal output of boiler and the emission factor for gas	A conservative value is set for the efficiency of existing gas boilers
Complex commercial facilities & Hotel				
	Solar power generation	・CDM ・Solar generation methodology currently under development for Mongol	･The amount of electricity consumed or sold by the facilities is multiplied by the emission factor of the private power generator of the grid ･The amount of electricity consumed by an auxiliary unit, excluding the portion of electricity generated by a solar power generation system, is used as project emissions	A higher value is set for the loss rate of inverter
Mall	Absorbing-type refrigerator using waste heat	・JCM_ID_Am001_ver 01.1 ・JCM_ID_Am002_ver 01.1	・The quantity of heat that could have been generated by existing refrigerators is estimated based on the quantity of heat generated by an absorption-type refrigerators	The COP of SNI is applied to existing refrigerators. However, the COP of existing apparatuses is applicable if they are proved to be operable throughout the credit period (15 years－elapsed years since introduction＞credit period)
	CO_2 control of OA supply system	-	・The energy-saving effect of an air blower is calculated by multiplying the rated value of the existing air conditioning systems by the amount of electricity consumed before and after the project ・The COP of existing refrigerators is used to determine cold heat from an enthalpy difference between internal and external air as measured in the project	

	Technology	Reference methodology	Basic concept of calculating reduction	Conservativeness assurance
Complex commercial facilities & Hotel				
Overall	Introduction of a BEMS system	——	・BEMS will be limited to water temperature adjustment refrigerators, water pressure adjustment secondary pumps, and setting for the number of units under control ・Reduction effects will be calculated by using the COP ratio of refrigerators and secondary pumps before and after introduction of BEMS	・For refrigerators, the prior COP is set conservatively with a JCM-approved methodology, and a temperature difference is calculated using the same methodology ・For pumps, the pressure before and after BEMS introduction is set conservatively to the pressure of existing pumps + 0.1MPa
Industry（Factory）				
Spinning factory	・Replacement with high-efficiency heat source apparatus ・Closing piping, introduction secondary pumps	Heat source apparatus JCM_ID_Am002_ver01.1	･Methodologies are developed for air conditioning systems ･Heat source unit: JCM-approved methodologies are applied. ･Piping and pumps: A project electricity consumption difference is subtracted from reference value calculated on pump rated value and operation value	･Conservative values are ensured by applying JCM methodologies to the heat source units
	Introducing co-generation system 875 kVA	JCM_ID_Am001_ver01.1	A gas boiler is adopted for steam generated by reference, and the grid is adopted for electricity	Boiler efficiency: Gas boiler default in CDM is adopted
	Updating compressor cooling tower	--	Reference emissions are calculated based on project electricity consumption by using the efficiency of new and old apparatuses	Refrigerator catalogs are being collected in Indonesia. If appropriate catalogs are not available, conservative values may be set for project emissions.
Industry（Factory）				
Overall	Introducing a BEMS	--	See the BEMS column in GI	
Production machinery	Improving production machinery for higher efficiency	--	・Calculated based on the rated capacity ratio of new and old apparatuses by using operating hours ・Emissions reduction is calculated by calculating a difference in the amount of air used between new and old apparatuses by using the capacity of existing compressors.	Conservative values are ensured by setting the rated capacity of new compressor adopted for reference above the existing rated capacity.
Office building				
Office Building A	Replacement with high-efficiency individual package	VN_PM004	The amount of electricity consumed by the project is multiplied by the efficiency difference	SNI is applied to the default
	Introduction of LED lighting	ID_PM004	The calculation method in ID_PM004 is applied	For the default, see the setting method in ID_PM004. However, the color temperature zone is taken into consideration for offices and parking lots
Office Building B	Replacement with the latest turbo refrigerator	JCM _ID_Am002_ver01.1	Refrigerator: the approval methodology is applied Addition of the energy-saving effect of the cooling tower is currently under consideration .	Refrigerator: the default of the methodology is adopted

4.1.2 Calculation method for emission reduction and approaches to the calculation of reference emissions

Emission reduction is determined by the following formula:

$$ER_p = RE_p - PE_p$$

ER_p	Emission reduction for period p [tCO_2 / p]
RE_p	Reference emissions during period p [tCO_2 / p]
PE_p	Project emissions during period p [tCO_2 / p]

JCM methodologies require calculation methods for net emission reduction. Those calculation methods take either of the following approaches:

(a) The reference emissions are set below the Business-as-Usual (BaU) emissions; or
(b) The project emissions are set above the actual measurements.

Both methods require the collection and validation of appropriate data, that is, it is essential to collect high-reliability information. In a project involving energy-saving technologies, the emission reduction is a difference in efficiency between the reference apparatus and the project apparatus. In approach (b), however, it is possible that project emissions will increase beyond expectation, and if the wrong method is applied, there could be no energy-saving effect of inverters or any other control technology. For this reason, this methodology will adopt approache (a).

4.1.3 Introduction of solar power generation system into office buildings and commercial facilities

(1) Qualification requirements

Table 4-5 shows the qualification requirements.

Table 4-5 Qualification standards for introduction of the solar power generation system under discussion

Requirement 1	A solar power generation system shall be introduced into commercial and factory facilities. Power generated by the system shall be consumed by the facilities or supplied to the linked grid.
Requirement 2	The power conditioner system (including the inverters) mounted on the solar power generation system shall have an energy conversion rate of at least 94% .
Requirement 3	The solar power generation system shall be compatible with (i) and/or (ii) below: (i) The design standard and safety standard set forth by International Electrotechnical Commission (IEC); and (ii) National standard equivalent to the IEC standards. Standard and standard certificate types: IEC 61215 (Silicon), IEC 61646 (Thin film), and IEC 62108 (CPV) - Safety standard: IEC 61730-1 (Construction) and IEC 61730-2 (Inspection)

Source: Study Team

(2) Calculating reference emissions

In the Clean Development Mechanism (CDM), it is assumed that electricity generated by solar power substitute electricity from the grid, and thus baseline emissions are calculated by using the emission factor of the grid. On the other hand, with the methodologies proposed in this Study, reference emissions are calculated based on the "net amount of electricity generated," which excludes electricity lost between the generator and the consumer. Electricity loss occurs in processes before electricity is supplied to the consumer. The greatest loss takes place in the solar panel and next during DC-AC conversion in power conditioners or inverters. In this Study, Net emission reduction is determined by applying conservative values of loss ratio to power conditioners and inverters.

The reference emissions are calculated by using the following formula:

$$RE_p = EG_{PE,p} \times \left(1 + InvLoss_{PJ} - InvLoss_{RE}\right) \times EF_{elec}$$

RE_p	: Reference emissions during period p [tCO_2 / p]
$EG_{PE,p}$	: Net amount of electricity for period p supplied to project apparatuses and/or connected grid [MWh/p]
$InvLoss_{PJ}$	: Maximum energy loss in the project power conditioner system [-]
$InvLoss_{RE}$	: Maximum energy loss in the reference power conditioner system [-]
EF_{elec}	: CO_2 emission factor of electricity consumed in the project [tCO_2 / MWh]

(3) Calculation method for project emissions

Project emissions are calculated based on the amount of fossil fuel-derived electricity consumed in the project, in accordance with the following formula:

$$PE_p = EG_{AUX,p} \times EF_{elec}$$

PE_p	: Project emissions during period p [tCO_2 / p]
$EC_{AUX,p}$	: Amount of electricity from an isolated power unit or the grid consumed by the project apparatus during period p [MWh/p]
EF_{elec}	: CO_2 emission factor of electricity consumed by the solar power generation system [tCO_2 / MWh]

(4) Pre-fixed parameters

The following parameters are pre-fixed:

Table 4-6 Pre-fixed parameters in methodologies related to the solar power generation system under discussion

Parameter	Content of data	Source
$InvLoss_{PJ}$	Maximum energy loss in the project power conditioner system	Manufacturers' specifications
$InvLoss_{RE}$	Maximum energy loss in the reference power conditioner system Default: 6%	Additional information
EF_{elec}	CO_2 emission factor for electricity consumed in the project If an isolated power unit is not available at the project site, the currently available emission factor for Indonesia's grids is applied and fixed for use during the successive monitoring period. If an isolated power unit is available at the project site, then EF_{elec} is selected as described below: Option 1: A conservative value is set for EF_{elec} and is fixed for use during the succeeding monitoring period; EF_{elec} = min (EF_{grid}, $EF_{captive}$) $EF_{captive}$ = 0.8 tCO_2 / MWh* *The currently available emission factor is selected from CDM-approved small-scale methodology AMS-I.A and applied.	[EF_{grid}] Unless otherwise specified by the Joint Committee, data are taken from "Emission Factors of Electricity Interconnection Systems" from National Committee on Clean Energy Development Mechanism (Designated National Authorities (DNA) of Indonesian CDM). [$EF_{captive}$] CDM-approved small-scale methodology: AMS-I.A

4.1.4 Introduction of an exhaust heat recovery system into office buildings and commercial facilities for cold water generation

(1) Qualification requirements

Table 4-7 shows the qualification requirements.

Table 4-7 Qualification standards for the introduction of an exhaust heat recovery system for cold water generation under discussion

Requirement 1	An exhaust heat recovery (WHR) system for cold water generation shall be installed in the existing office buildings or commercial facilities.
Requirements	If refrigerants used for cold water generation in the project contain CFC, HFC, or HCFC, then a plan shall be in place to prevent the release of such refrigerants into air.

(2) Calculating reference emissions

Reference emissions are calculated by multiplying the volume of cold water generated through the use of heat and/or gas recovered to WHR by the COP of existing chillers and the CO2 emission factor of the power source used for the project.

According to Indonesian air-conditioning experts, existing facilities usually do not undergo chiller calibration, and therefore the efficiency of such chillers fall short of specification values. Considering these circumstances, this methodology sets conservative values by adopting the following approach:

- When the product lifetime of existing chillers comes expires during the credit period: the Indonesian national standard (SNI) 03-6390 is applied because the standard is, according to local experts, sufficiently strict for existing chillers; or
- When the product lifetime of existing chillers survive the credit period: the rated COP set forth in manufacturers' specifications for existing chillers is adopted without taking aged deterioration into consideration.

The product lifetime of chillers shall be 15 years in compliance with CDM's "Tool to determine the remaining lifetime of equipment" (version 01).

The reference emissions are calculated by using the following formula:

$$RE_p = [(Q_{PJ,p} / \eta_{RE} / 3.6) + EC_{RE\_aux,p} + EC_{RE\_CT,p}] \times EF_{REc}$$

$$EC_{RE\_aux,p} = \sum_i EC_{CAP\_aux,i} \times O_p$$

$$EC_{RE\_CT,p} = \sum_i EC_{CAP\_CT,j} \times O_p$$

RE_p	Reference emissions during period p [tCO_2 / p]
$Q_{PJ,p}$	Amount of cooling energy generated in the project during period p [GJ / p]
η_{RE}	Efficiency of the reference cooling energy generation apparatus [-]
$EC_{aux,p}$	Power consumption by electrical auxiliary machine for existing chiller removed for the project for period p [MWh / p]
$EC_{CT,p}$	Power consumption by the cooling tower for the existing chiller removed for the project for period p [MWh / p]
EF_{Rec}	CO2 emission factor of electricity consumed the existing chiller [tCO_2 / MWh]
$EC_{CAP\_aux,i}$	Total rated output of auxiliary machine i removed for the project [MW]
$EC_{CAP\_CT,j}$	Total rated output of cooling tower j removed for the project [MW]
O_p	WHR operating hours during period p [hour / p]

(3) Calculation method for project emissions

Project emissions are determined on the basis of total electricity consumption by the WHR system and all other apparatuses introduced for the project, including cold water generation equipment, pumps, and cooling towers. The following formula is used in the calculation:

$$PE_p = (EG_{chiller,p} + EG_{AUX,p} + EG_{CT,p}) \times EF_{elec}$$

PE_p : Project emissions during period p [tCO_2 / p]

$EC_{chiller,p}$: Power consumption by the cold water generation apparatus during period p [MWh/p]

$EC_{AUX,p}$: Power consumption by electric auxiliary machines introduced for the project, during period p [MW/p]

$EC_{CT,p}$: Power consumption by the cooling tower introduced for the project, during period p [MWh / p]

EF_{elec} : CO2 emission factor of electricity consumed by apparatuses introduced for the project [tCO_2 / MWh]

(4) Pre-fixed parameters

The following parameters are pre-fixed:

Table 4-8 Parameters pre-fixed under methodologies related to the solar power generation system under discussion

<table>
<tr><th>Parameter</th><th>Content of data</th><th>Source</th></tr>
<tr><td>η_{Rec}</td><td>Efficiency of the reference cooling energy generation system

If the replaced chiller is a centrifugal type, defaults under JCM-approved methodology JCM_ID_AM001 may be applied.

The following defaults may be applied to water-cooling and air-cooling chillers:

Chiller defaults
<table>
<tr><th>A/C types</th><th>COP*</th></tr>
<tr><td>Air-cooling chiller < 150 TR (reciprocal)</td><td>2.8</td></tr>
<tr><td>Air-cooling chiller < 150 TR (screw)</td><td>2.9</td></tr>
<tr><td>Air-cooling chiller > 150 TR (reciprocal)</td><td>2.8</td></tr>
<tr><td>Air-cooling chiller >150 TR (screw)</td><td>3</td></tr>
<tr><td>Water-cooling chiller < 150 TR (reciprocal)</td><td>4</td></tr>
<tr><td>Water-cooling chiller < 150 TR (screw)</td><td>4.1</td></tr>
<tr><td>Water-cooling chiller > 150 TR (reciprocal)</td><td>4.26</td></tr>
<tr><td>Water-cooling chiller > 150 TR (screw)</td><td>4.4</td></tr>
</table>
*Energy efficiency shall be measured at an external temperature of 33ºC for the air-cooling type and at an external temperature of 30ºC for the water-cooling type. For water-cooling type capacitors, energy efficiency shall be measured at 30ºC on the cooling water inlet.</td><td>Defaults under the methodologies (for validation, the latest Indonesia national standards SNI-03-6390 are applicable)</td></tr>
<tr><td>EF_{elec}</td><td colspan="2">Same as in Table 4-5</td></tr>
</table>

$EG_{aux\_cap,i}$	Total rated output of auxiliary machine *i* removed for the project	Manufacturers' specifications
$EG_{CT\_cap,i}$	Total rated output of cooling tower *i* removed for the project	Manufacturers' specifications

4.1.5 Replacement and introduction of a package air-conditioning system in office buildings

(1) Qualification requirements

Table 4-9 shows the qualification requirements.

Table 4-9 Qualification standards for replacement/introduction of a package air-conditioning system in office buildings under discussion

Requirement 1	New package air conditioning system (project package air conditioning system) introduced into the buildings shall account for at least 70% of the entire air-conditioning system. The performance of project package air conditioning system shall comply with the latest SNI03-6390.
Requirement 2	If refrigerants used in package A/C contain CFC, HFC, or HCFC, then a plan shall be in place to prevent the release of such refrigerants into air. Where existing package air conditioning system are to be replaced with project package air conditioning system, refrigerants in the existing package air conditioning system shall be processed in compliance with the national or shall be recovered to avoid the release of fluorocarbon gas.

(2) Calculating reference emissions

Reference emissions are determined by using power consumption package air conditioning system introduced for the project, the COP ratio of the reference package air conditioning system to the project package air conditioning system, and the CO2 emission factor of power consumed by isolated power units or connected grids. The reference net emission reduction is determined by the product lifetime of existing apparatuses, as with the methodology for exhaust heat recovery systems for cold water generation. However, the default under the methodology is applied where new package air conditioning system are introduced without replacing existing apparatuses.

Reference emissions are calculated with the following formula:

$$RE_p = [(EC_{PJ,p} \times \eta_{PJ} / \eta_{RE} / 3.6) + EC_{RE\_aux,p} + EC_{RE\_CT,p}] \times EF_{RE}$$

$$EC_{RE\_aux,p} = \sum_i EC_{CAP\_aux,i} \times O_p$$

$$EC_{RE\_CT,p} = \sum_j EC_{CAP\_CT,j} \times O_p$$

RE_p	Reference emissions during period *p* [tCO_2 / *p*]
$EC_{PJ,p}$	Power consumption by project package air conditioning system during period *p*

	[MWh / p]
η_{RE}	Efficiency E of the reference package air conditioning system [-]
η_{PE}	Efficiency of the project package air conditioning system [-]
$EC_{RE\_aux,p}$	Power consumption by auxiliary machines under the existing package air conditioning system removed for the project, during period p [MWh / p]
$EC_{RE\_CT,p}$	Power consumption by cooling towers under the existing package air conditioning system removed for the project, during period p [MWh / p]
EF_{RE}	CO2 emission factor electricity consumed by the reference package air conditioning system [tCO_2 / MWh]
$EC_{CAP\_aux,i}$	Rated output of auxiliary machine i removed for the project [MW]
$EC_{CAP\_CT,j}$	Rated output of cooling towers j under existing package air conditioning system removed for the project [MW]
O_p	Operating hours project package air conditioning system during period p [hour / p]

(3) Calculating project emissions

Project emissions are determined on the basis of the amount of electricity consumed by the project package air conditioning system and all other apparatuses introduced under the project. The following formula is used for calculation:

$$PE_p = (EC_{packaged,p} + EC_{AUX,p}) \times EF_{elec}$$

PE_p	Project emissions during period p [tCO_2 / p]
$EC_{packaged,p}$	Power consumption by project package air conditioning system during period p [MWh / p]
$EC_{AUX,p}$	Power consumption by electrical auxiliary machine introduced under the project, during period p [MWh / p]
EF_{elec}	CO2 emission factor of electricity consumed by apparatuses introduced under the project [tCO_2 / MWh]

(4) Pre-fixed parameters

The following shows pre-fixed parameters:

Table 4-10 Parameters for pre-fixed methodologies related to the introduction of package air conditioning system under discussion

<table>
<tr><th>Parameter</th><th>Content of data</th><th>Source</th></tr>
<tr><td>η_{RE}</td><td>Efficiency of reference package A/C

Defaults for package air conditioning system
<table><tr><th>A/C types</th><th>COP</th></tr><tr><td>Split duct</td><td>2.60</td></tr><tr><td>Variable refrigerant flow (VRF)</td><td>3.70</td></tr></table></td><td>Defaults under the methodologies (at time of validation, the latest Indonesian national standards SNI-03-6390 are applicable)</td></tr>
</table>

η_{PJ}	Efficiency of project package air conditioning system	Manufacturers' specifications
EF_{elec}	Same as in Table 4-5	
$EC_{aux\_cap,i}$	Total rated output of auxiliary machine *i* removed under the project	Manufacturers' specifications
$EC_{CT\_cap,i}$	Total rated output of cooling tower *i* removed under the project	Manufacturers' specifications

4.1.6 Introduction of LED lighting into offices and parking lots

(1) Qualification requirements

Table 4-11 shows the qualification requirements.

Table 4-11 Qualification standards for the introduction of the LED lighting under discussion

Requirement 1	G13-type LED lighting shall be installed in offices or parking lots as an addition to the existing fluorescent lights or to replace them.
Requirement 2	The LED lighting to be installed shall be a straight type having a color temperature of 4,000K to 5,000K and a luminous efficiency of at least 70 lm/W. In addition, the illuminance (unit: lux) shall comply with the Indonesian national standards (Indonesia National Standard: SNI) (offices: 350lux; parking lots: 100lux).
Requirement 3	If existing fluorescent lights are replaced with project LED lighting, mercury contained in the existing fluorescent lights shall be disposed of in compliance with Indonesian national or local standards.

(2) Calculating reference emissions

Reference emissions are determined on the basis of power consumption by the project lighting, the luminous efficiency ratio of project lighting to reference lighting, and CO2 emission factor of electricity consumed by the project. The Japanese government has a target of introducing LED lighting into 50% of office buildings nationwide by 2020, while Indonesia has no such target in place. In addition, given the fact that the majority of office buildings completed after 2010 in Japan still use fluorescent lights, it would be difficult to encourage developing countries to introduce LED lighting. Considering these circumstances, we have set conservative values for luminous efficiency of reference lighting, as follows:

- In Indonesia, fluorescent lights are commonly used in offices and parking lots.
- The luminous efficiency of the reference lighting is set so that a conservative luminous efficiency value is set for LED lighting.
- As explained in Section I, the highest efficiency value for locally available LED lighting is defined as η RE.

Reference emissions are calculated with the following formula:

$$RE_p = EC_{PJ,p} \times (\eta_{PJ}/\eta_{RE}) \times EF_{elec}$$

RE_p	Reference emissions during period p: [tCO_2 / p]
$EC_{PJ,p}$	Amount of electricity consumed by the project lighting during period p: [MWh / p]
η_{PJ}	Luminous efficiency of the project lighting: [lm / W]
η_{RE}	Luminous efficiency of the reference lighting: [lm / W]
EF_{elec}	CO2 emission factor of electricity consumed by the project: [tCO_2 / MWh]

(3) Calculating project emissions

$$PE_p = EC_{PJ,p} \times EF_{elec}$$

PE_p	Project emissions during period p: [tCO_2 / p]
$EC_{PJ,p}$	Amount of electricity consumed by the project during period p: [MWh / p]
EF_{elec}	CO2 emission factor of electricity consumed by the project: [tCO_2 / MWh]

(1) Pre-fixed parameters

The following shows the pre-fixed parameters:

Table 4-12 Parameters pre-fixed under methodologies related to the introduction of the LED lighting under discussion

Parameter	Content of data	Source
η_{PJ}	Luminous efficiency projects lighting. Values under manufacturers' specifications shall be adopted. If the number of types of lighting devices to be installed is more than one, then the lowest efficiency among installed devices shall be adopted.	Manufacturers' specifications
η_{RE}	Luminous efficiency of reference lighting Luminous efficiency default: 84.2 lm / W	Additional information
EF_{elec}	Same as Table 4-5	

4.2 PDD proposal

A PDD has been developed for proposal for a solar power generation system as this is the most feasible of the four proposed JCM methodologies. In addition, sufficient amounts of information are available concerning solar power generation. More details are provided in the Appendix 2.

4.3 GHG emission reduction

Table 4-13 provides emission reductions calculated in accordance with the JCM methodologies (proposal). Project and existing apparatuses are compared in emission reduction.

Table 4-13 Emission reduction calculated with the proposed methodologies and emission reduction with existing apparatuses

Facilities	Technology No.	Technology	Where JCM methodologies are applied			Comparison with existing apparatuses in emission reduction (tCO2 / yr)
			Reference emissions (tCO2 / yr)	Project emissions (tCO2 / yr)	Emission reduction (tCO2 / yr)	
Commercial facilities	4	Solar power generation	2,019	0	2,019	2,100
	5	Cold water generation using waste heat	3,217	568	2,649	2,649
Office building (a)	13	Replacement for high efficiency individual package air-conditioning	2,929	2,585	344	781
	14	Replacement for LED lighting	257	244	13	800
Office building (b)	15	Replacement for latest-type turbo refrigerators	1,646	1,402	243	737

Emission reductions substantially decrease when JCM methodologies, including the introduction of LED lighting, are employed, compared with existing apparatuses. In order to determine appropriate reference emissions, we should collect more information from local experts and machinery manufacturers and through consultation with the Indonesian government.

4.4 Estimating GHG reduction potential

Our energy-saving proposals are compiled on the basis of the specific conditions of each facility. For this reason, it is impossible to apply the results of this Study to GHG reduction potentials nationwide in Indonesia. The project under this Study is intended to establish a finance approach to promoting energy-saving projects in Indonesia. GHG reduction potential relates to all energy-saving projects to which the finance approaches proposed in Chapter 5 are applicable. In this Study, several assumptions are made to estimate reduction potential in each field under the Study.

- Office buildings and commercial facilities
- Industry (see the example of a spinning factory)

A recent two-year survey indicates that electricity accounts for the major part of total energy consumption at office buildings and commercial facilities. Thus, it is clear that measures targeted at reducing electricity consumption will be the most effective in GHG reduction. In estimating GHG reduction potentials, we will determine average energy-saving effects based on statistics released PLN in 2014 and the results of this Study. This Report assumes an average energy-saving effect of 20%. Table 4-14 shows the calculation results.

Table 4-14GHG reduction potential
(Java, Sumatra , Kalimantan)

		Java	**Sumatra**	**Kalimantan**	**Total for 3 islands**	**Jakarta & *Tangerang***
Power consumption in 2013 (GWh)	Industry	57,562	2,935	431	60,929	*11,409*
	Business	23,504	1,585	1,488	26,577	*12,087*
	Total	81,066	4,521	1,919	87,506	*23,497*
Energy-saving effect of 20% (GWh)	Industry	11,512	587	86	12,186	*2,282*
	Business	4,701	317	298	5,315	*2,417*
	Total	16,213	904	384	17,501	*4,699*
GHG reduction effects at energy-saving effect of 20% (tCO2)*	Industry	9,316,715	475,120	69,712	9,861,547	*1,846,637*
	Business	3,804,207	256,578	240,831	4,301,617	*1,956,389*
	Total	**13,120,922**	**731,698**	**310,544**	**14,163,164**	***3,803,026***

Note:*The weighted average emission factor of the grids updated by DNPI in 2013 for the three islands (0.809tCO2 / MWh) is adopted as the mission factor of the grid.

Source: Compiled by the Study Team based on the PLN Statistics 2013 and the DNPI grid emission factors

According to PLN data, power consumption by commercial facilities in Jakarta (including Tangerang) during 2013 was approximately 12,087GWh. If a 20% energy-saving project is implemented in commercial facilities alone, 1.95 million t-CO_2 could be cut annually, as shown in Table 4-14. An equivalent project would reduce 457 million t-CO_2 annually in three islands of Java, Sumatra, and Kalimantan combined, which include major economic cities in Indonesia.

In 2013, industrial facilities in Jakarta (including Tangerang) consumed approximately 11,409 GWh. If the same energy-saving approach is taken as for the commercial facilities, we could expect an annual emission reduction of 1.84 million t-CO2. In addition, the three islands combined would see a reduction of about 10 million t-$CO_{2.}$

However, to achieve expected reduction effects under energy-saving initiatives, we should take a number of factors into consideration, including the size, age, and electricity consumption pattern of the facility and calculate emission reduction effects for each project.

5. Policy recommendations on ESCO projects

5.1 Issues related to the promotion of ESCO projects in Indonesia

To promote ESCO projects in Indonesia, we need to identify issues specific to the country and formulate measures to deal with them. In the following paragraphs, three points are discussed for this purpose—payback period, market interest rates, and corporate finance.

5.1.1 Long payback period

Generally, housing investments in Indonesia are recovered in two or three years. In ESCO projects, investments in energy-saving apparatuses for commercial buildings are recovered for a longer period. On the other hand, investments in energy-saving apparatuses for factories are recovered in a shorter period.

As, the payback period for investments in buildings widely varies ESCO projects, depending on the sector, we need to discuss payback periods with facility owners before making investments. In this respect, Japan's financial assistance is important in promoting ESCO projects.

5.1.2 High market interest rates

In Indonesia, a resource-rich country, energy prices are kept relatively low, whereas market interest rates remain at over 10% amid rapid economic growth.

For this reason, funds tend to be directed to projects with high investment efficiency rather than to energy-saving investments. To prompt energy-saving investments in Indonesia, it is necessary to provide interest subsidies for energy-saving projects to make them more attractive.

5.1.3 Difficulty financing to companies targeted for investment

In making an energy-saving investment in a company, it is generally necessary to finance the company in order to evaluate the company for managerial soundness and determine the feasibility of investment, as well as determining a payback period.

Different from Japanese companies operating in Indonesia, the majority of local companies do not ensure the transparency of corporate management or provide documentation or data necessary for investment decisions, thus making investment almost impossible.

In order to encourage energy-saving projects in Indonesia, we need to establish a financing system for local enterprises through cooperation with Japanese local subsidiaries.

5.2 Policy recommendations on establishment of an ESCO finance scheme

This section reviews existing financing schemes in Indonesia necessary for Japan to contribute to dissemination of apparatuses and products designed for energy-saving and renewable energy.

5.2.1 Electricity subsidies Indonesia

In Indonesia, a country rich in energy resources, the government has maintained retail electricity prices low by providing subsidies for fuel and electricity prices, and thus there is no incentive for citizens to make energy-saving efforts. The former administration of President Yudhoyono took radical action to cut subsidies for electricity in 2008 and 2013. In 2013, the government introduced an electricity subsidy system under which electricity rates were to be raised by 6% every quarter during the year. In 2014 as well, ESDM planned to raise electricity rates as shown in Table 5-1

Table 5-1 ESDM plan to raise electricity rates (as of February 2014)

Class	Standards	Increase in electricity rate
I3	Medium-sized manufacturer consuming 200 kVa or more	38.9%
I4	Large manufacturers consuming less than 30,000 kVa	64.7%
B2	Commercial facility consuming 6,600Va to 200 kVa	The fuel cost adjustment system applicable. A 4.3%targeted for investment. A quarterly 4.3% price increase to be enforced in October 2014.
B3	Commercial facility consuming more than 200kVa	
	Government buildings consuming 6,600Va to 200kVa	

Source: Jakarta Post, January 22, 2014(electronic version) and Study Team Study

As shown above, the government plans to raise electricity rates by 64.7% for manufacturers who consume 30,000 kVa and by 38.9% for medium-sized listed companies consuming more than 200 kVa. Electricity rates were increased in May 2014 and will be further raised incrementally every two months by about 8% for consumers of more than 200 kVa. These increases will provide incentives for investing in energy-saving projects and constitute an important element of finance scheme.

5.2.2 Finance incentives for energy-saving programs

The Energy-saving Law (2009 Government Regulation No.70) was established in 2009 as a requirement under the National Energy Law. Under the Energy-saving Law, the incentives as shown in Table 5-2 are granted to projects only if they achieve their energy-saving target established in an energy-saving diagnosis and comply with the success standards provided in a ministerial order. As the incentives are granted only after the energy-saving effects are confirmed, they are not suitable for energy-saving projects that require large amounts of initial investment.

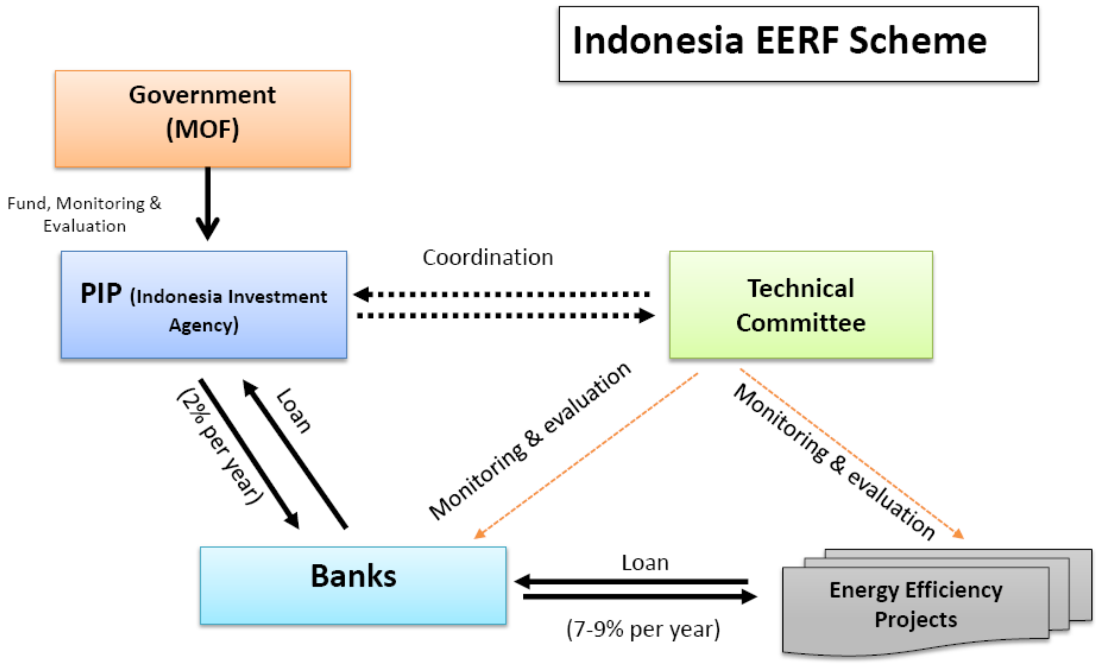
Table 5-2 Incentives under the 2009 Energy-saving Law (No.70)

Target	Incentive
Energy user of more than 6,000 tons	・Favorable tax treatment of energy-saving products ・Tax credit/tax cut/tax exempt relating to local tax on energy-saving products ・Preferential import duties ・Below-market-rate government loans for energy-saving investments ・Compensation for energy-saving diagnosis expenses
Domestic manufacturer of energy-saving products	・Favorable tax treatment for parts / spare parts and raw materials of energy-saving products ・Local tax credit / tax cut / tax exempt for parts / spare parts and raw materials of energy-saving products ・Preferential import duties on parts / spare parts and raw materials of energy-saving products ・Below-market-rate government loans for investments in the manufacture of energy-saving products

Source: Peer Review on Energy Efficiency in Indonesia, APEC 2012

ESCO projects are faced with difficulty financing due to a lack of understanding of energy-saving projects on the part of financial institutions and a lack of credit of emerging ESCO enterprises. In order to alleviate this problem, it is important to have financial institutions deepen their understanding of energy-saving projects through workshops and other training events and thus facilitate their decisions for loans to such projects.

A revolving fund (EE Fund Facility) is part of the government's framework on financial assistance to energy-saving projects. The Indonesian Investment Agency (PIP) is reportedly planning to contribute 500 billion rupiah to the facility as part of its budget. The EE Fund Facility is part of the activities in the energy-saving section of the national action plan for GHG reduction. The facility is designed to encourage the financial sector to support the government in promoting the use of energy-saving technologies by all energy consumers, in cutting government energy subsidies, and in reinforcing the government’s energy-saving efforts. Under this facility, projects are implemented and regularly evaluated and, as energy manager, the technical support team of the committee implements projects that can be evaluated for energy performance, prepares an energy management report, and formulates plans for achieving energy-efficiency targets. The operation of this facility program has been slowing since the change in administration in 2014.



Source: Indonesian Ministry of Finance

Figure 5-1 Scheme of the Energy Efficiency Reinforcement Fund (EERF)

5. 2. 3 Obstacles to development of ESCO projects in Indonesia

In order to develop successful ESCO projects in Indonesia, where consumption of coal and other fossil fuels for power generation is expected to expand in line with economic growth, it is necessary for the government to develop and reinforce financial and institutional support initiatives as shown in Table 5-3.

Table 5-3 Obstacles to development of ESCO projects in Indonesia

Issue	Description
Institutional and political issues	A lack of financial assistance from government to ESCO Continued fuel subsidies
Social issues	Poor recognition among citizens and companies of the importance of energy-saving efforts (exacerbated by fuel subsidies)
Business issues	Issues caused by a lack of understanding of new businesses among financial institutions (a lack of understanding of energy-saving projects and energy reduction contracts, a lack of experience in projects and finance programs) A lack of funds at ESCO companies

Source: Study Team

ESCO grants two types of contracts: (i) a guaranteed savings contract, under which the building owner, as the customer, makes an initial improvement investment at its own expense, and (ii) a shared saving contract, under which the ESCO operator makes such investment at its own expense. In the shared saving contract, the first-year capital investment is made by the ESCO operator, not by the customer, and the investment is recovered from the reduced portion of energy cost. Shared saving contracts are not used in Indonesia, while guaranteed savings contracts have been granted to customers who purchase certain energy-efficient apparatuses.

5.3 Proposal of a finance scheme promoting energy-saving apparatuses

In formulating a finance scheme for dissemination of energy-saving and renewable-energy apparatuses and products in Indonesia, here are discussed financing programs by the Ministry of the Environment, including a single-step development fund, an eco-friendly interest subsidy fund, and an interest subsidy fund for green finance promotion.

A number of energy audits have been conducted in Indonesia. However, these audits are yet to be effective enough in encouraging the introduction of more energy-saving apparatuses, partly because electricity rates have been maintained low with subsidies, and also because cash-rick Indonesian project managers are making capital investments to increase procurement capacities, not to save energy. In fact, project operators have been more sensitive to prices and expenses since the government enforced electricity rate increases. For companies keen to expand their production capacity, the problem is how to reduce initial expenses in introducing energy-saving apparatuses. This will create greater demand for ESCO funds.

Manufacturers seek to shorten the payback period to three to four years and use collected funds as working capital. Meanwhile, financial institutions in Indonesia, where the inflation rate is high and its currency and markets are unstable, have no interest in long-term lending to local companies. Thus, the ESCO finance scheme, which mainly use shared savings contracts, is not common due to two factors—high interest rates in Indonesia and the poor financing capability of ESCO operators.

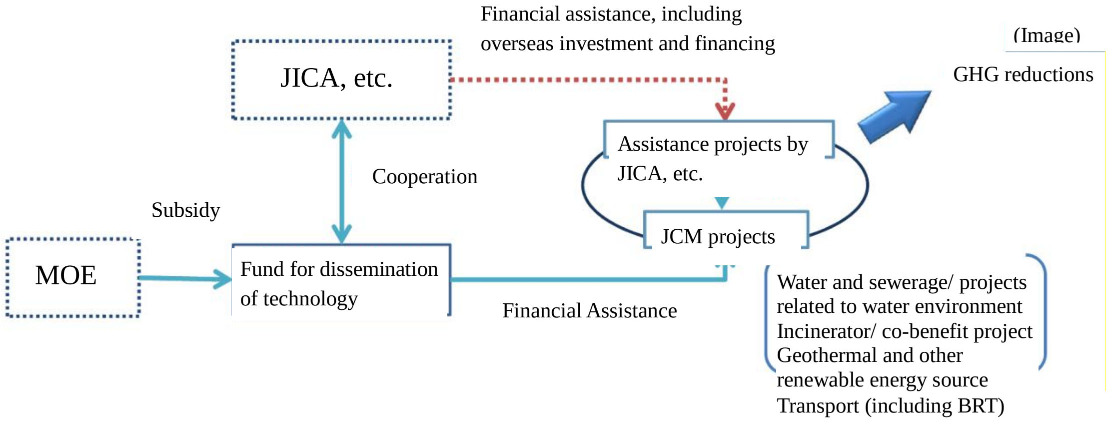
5.3.1 Use of the Japanese government's existing assistance programs

To overcome high interest rates in Indonesia and the poor financing capability of ESCO operators and promote energy-saving initiatives, this Study discusses Japan's support for a bilateral credit (JCM) project and Japan's domestic finance policy on ESCO and on dissemination of energy-saving apparatuses.

(1) Financial assistance (fund) for “single-step” development

To assist developing countries in shifting to an advanced low-carbon society in a single step, Japan has a new scheme for building cooperation among the Ministry of the Environment, JICA, and Asian Development Bank.

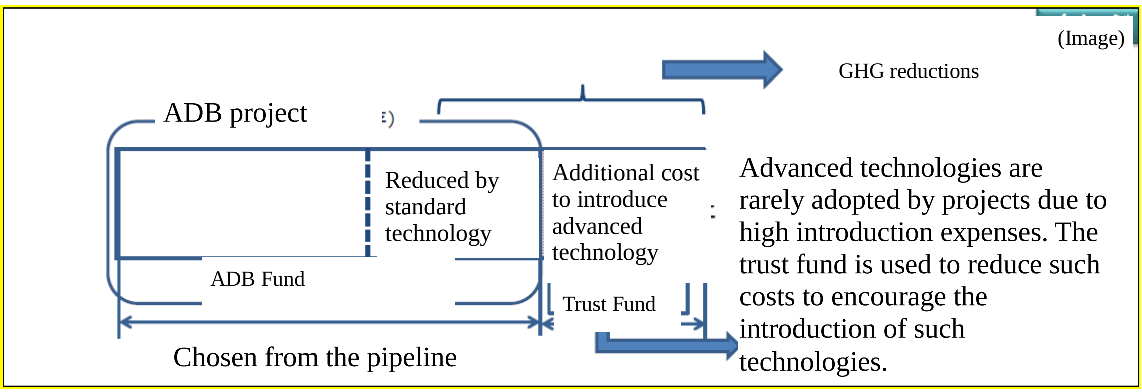
In mutual cooperation, the Ministry of the Environment and JICA aim to establish a fund for supporting high energy-efficiency projects overseas and, through the fund, to promote Japan’s advanced low-carbon technologies having high emission reduction effects even if high initial costs are involved. (See Figure 5-2.)



Source: Ministry of the Environment[6]

Figure 5-2 A fund for disseminating low-carbon technologies

Under another scheme, the Ministry of the Environment makes contribution to a trust fund at Asian Development Bank (ADB) to jointly finance advanced low-carbon technologies that are rarely adopted due to high initial costs. Specifically, the added contribution is used to cut such initiative costs to accelerate the adoption of advanced technologies in ADB projects. (See Figure 5-3)



Source: Ministry of the Environment

Figure 5-3 Financial assistance in “single-step” development (ADB contribution)

6 http://www.env.go.jp/guide/budget/h26/h26-gaiyo.html

(2) ESCO proposal for buildings of government agencies and state-owned companies

According to our Study last year, energy expenses for government buildings are determined in advance and included in the national budget, and the unused budget is returned to the government, that is, building owners are not authorized to appropriate saved expenses for energy-saving or any other purposes. Giving a top priority to energy savings at state-owned facilities, the Indonesian government is considering a pilot project to communicate the importance of energy saving and a program to encourage energy-saving activities.

Currently, JICA is implementing “Project of Capacity Development for Climate Change Strategies in Indonesia” for Indonesia’s BAPPENAS and Ministry of Finance (BMKG). The Indonesian government has established Centre for Climate Change Financing Policy, which is tasked with problems related to climate-change financing for Monetary Policy Bureau (FPA) of the Ministry of Finance. JICA provides technical assistance to this center during the 2013 to 2015 period. Its activities involve four tasks as follows:

- Capacity building for FPA to establish and implement the finance mechanism for the Action Plan on GHG Reduction (RAN-GRK);
- Capacity building for FPA to establish a financial incentive for promoting Green City initiatives;
- Capacity building for FPA to introduce agricultural insurance;
- Capacity building for FPA to evaluate the scope of economic approaches for assistance in the implementation of environmental and climate policies.

The abovementioned JICA project “Financing Mechanism for Construction of a Green City” aims at identifying and developing specific properties (including state-owned buildings) that utilize Japanese apparatuses and systems. For those properties, we suggest implementing a pilot project by using a fund for promotion of low-carbon societies, through cooperation among the Ministry of the Environment, ADB, and JICA.

For example, an incentive for individual energy-saving projects might be developed among state-owned companies through ESCO or other financial assistance programs, which could further help disseminate Japan’s technologies.

5.3.2 Finance scheme for promoting energy-saving projects in the private sector

An interest subsidy will be a highly effective in promoting ESCO projects for private buildings and factories. As in the interest subsidy program for green finance promotion implemented by the Japanese Ministry of the Environment, an interest subsidy should be provided to local financial institutions in Indonesia, which should in turn extend low-interest-rate loans to ESCO projects. Under this subsidy program, the interest subsidy is targeted at investments in energy-saving ESCO projects, while local banks, with Japan’s assistance funds, finance projects using advanced energy-saving technologies that comply with certain standards. Local financial institutions make credit decisions on individual energy-saving projects. The effectiveness of an ESCO project is assessed by ESCO operators to determine the applicability of a guaranteed savings contract.

This Study will further review this interest subsidy program in the future to make clear how the program should be operated.

6. Project execution plan

6.1 Commercial complex

6.1.1 The installation of solar PV system

We make a proposal for the CO_2 emission reductions by installing solar PV panels onto the rooftop are in this building. The plan for the installation of solar PV system is shown below.

Layout plan of solar PV panels in each building (West Mall, Skybridge and East Mall) was considered based on the site survey. The results are shown in Figure6-4, Figure6-5 and Figure6-6 using poly-crystalline solar PV panels that has been used most commonly in Japan. The installation capacity is 790kW in West Mall, 160kW in Skybridge and 56kW in East Mall. Totally, the installation capacity is 1,006kW, which is one of the largest rooftop solar PV systems in Indonesia.

Annual power generation is simulated using the climate data in Jakarta. The result is shown in Figure6-5. Annual power generation is approximately 1,423MWh and capacity factor is around 16%. Compared to the capacity factor in Japan, about 12%, more power generation is expected due to a large amount of sunshine in Jakarta. Additionally, we calculated the power consumption reduction of air conditioning systems through the insulation by solar PV panels. According to the experimental result conducted by University of California, San Diego, the insulation rate by solar PV panels is assumed 30%. As a result, the power consumption of air conditioning systems can be saved by 1,168MWh annually (Figure6-6). Therefore, total CO_2 emission reduction is approximately 2,110ton-CO_2 per year based on the grid emission coefficient.

Payback period is about 12 years using the feasibility simulation in consideration of energy-saving benefit, maintenance cost and degradation of solar PV panels (Table 6-1).

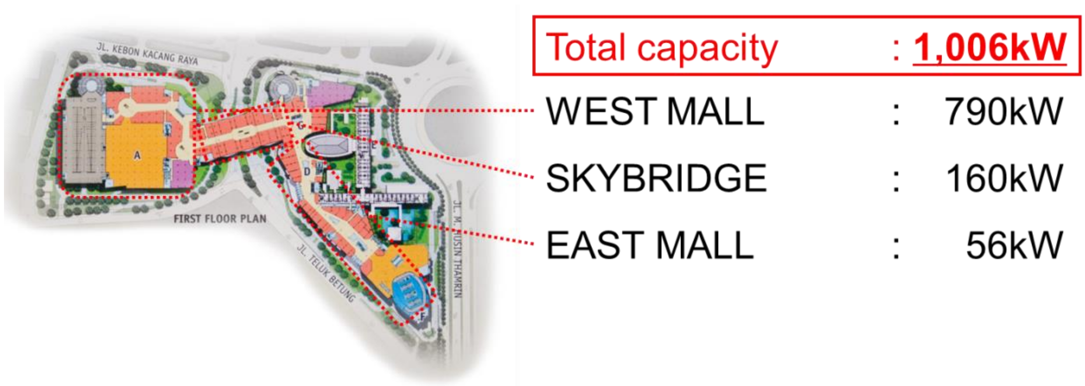


Figure 6-1 Solar PV panel capacity in GI

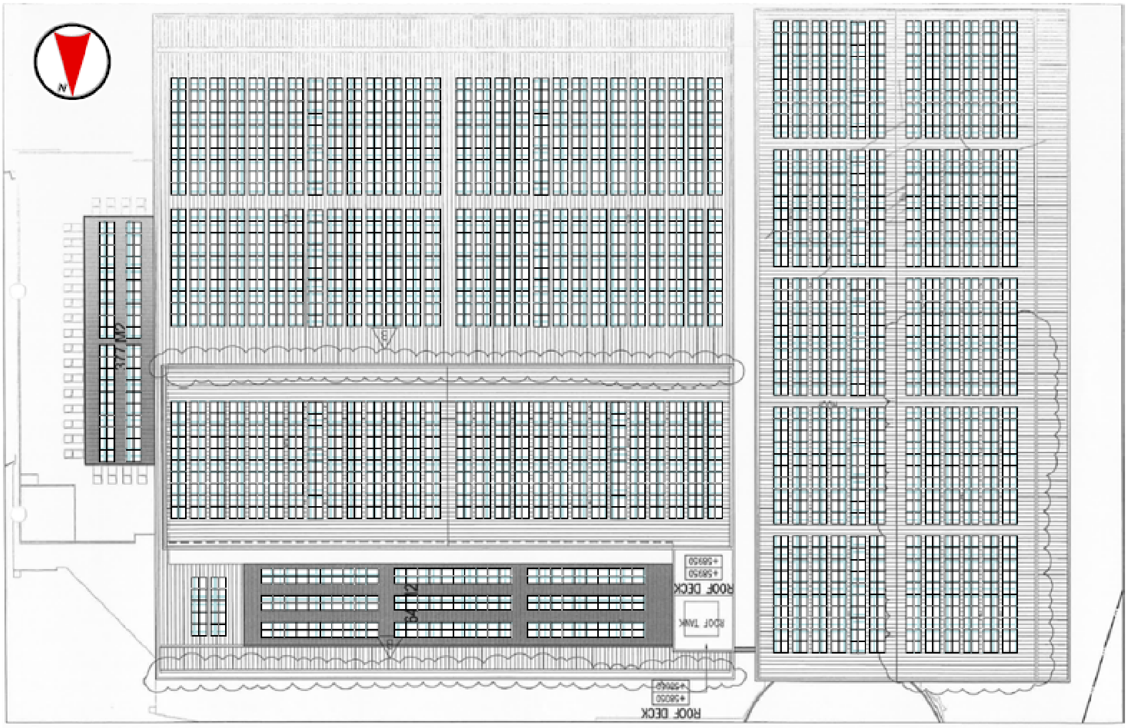


Figure 6-2 Layout plan in West Mall

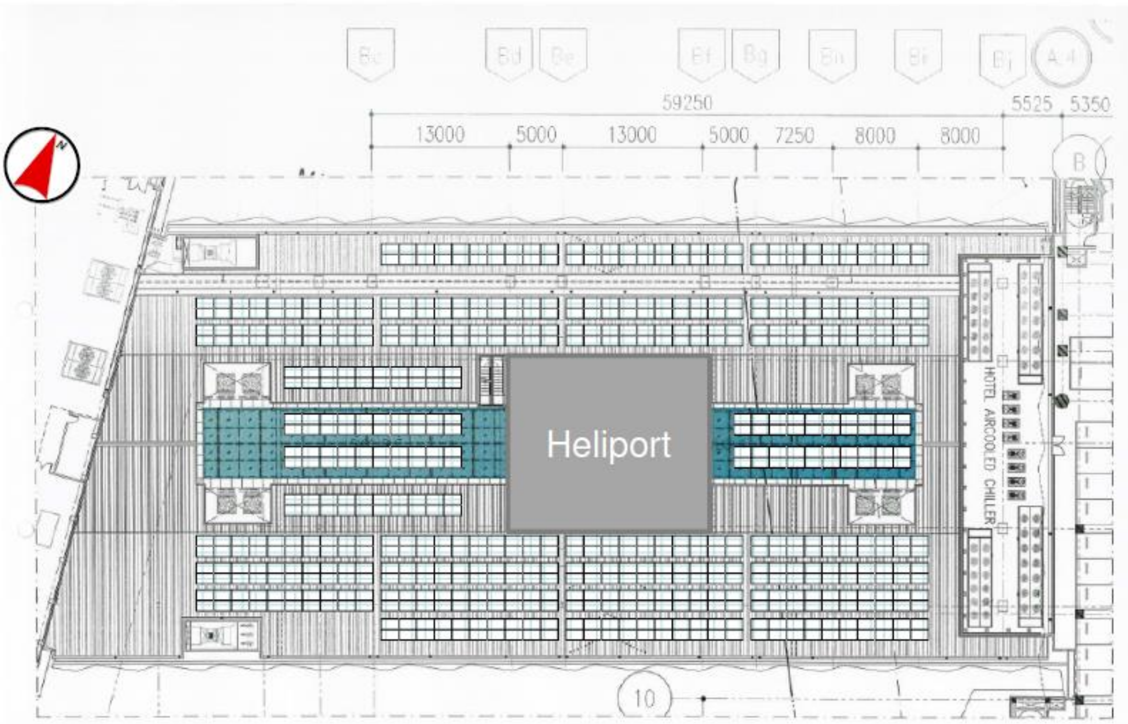


Figure 6-3 Layout plan in Skybrige

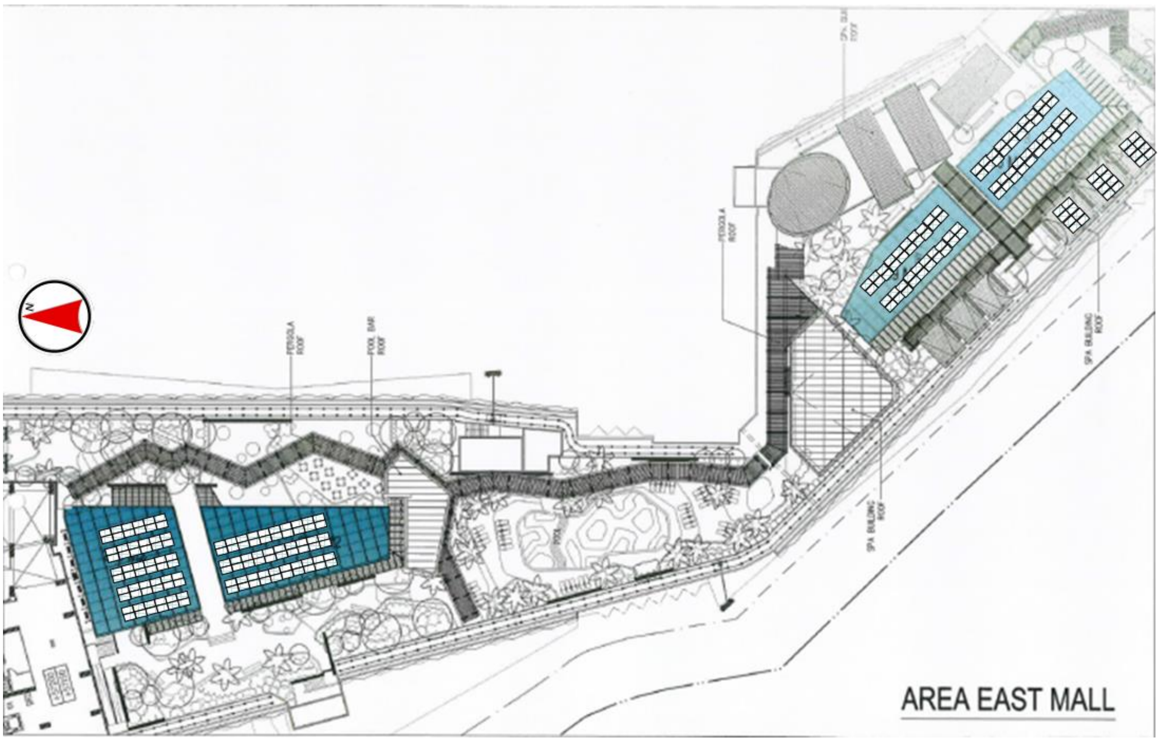


Figure 6-4 Layout plan in East Mall

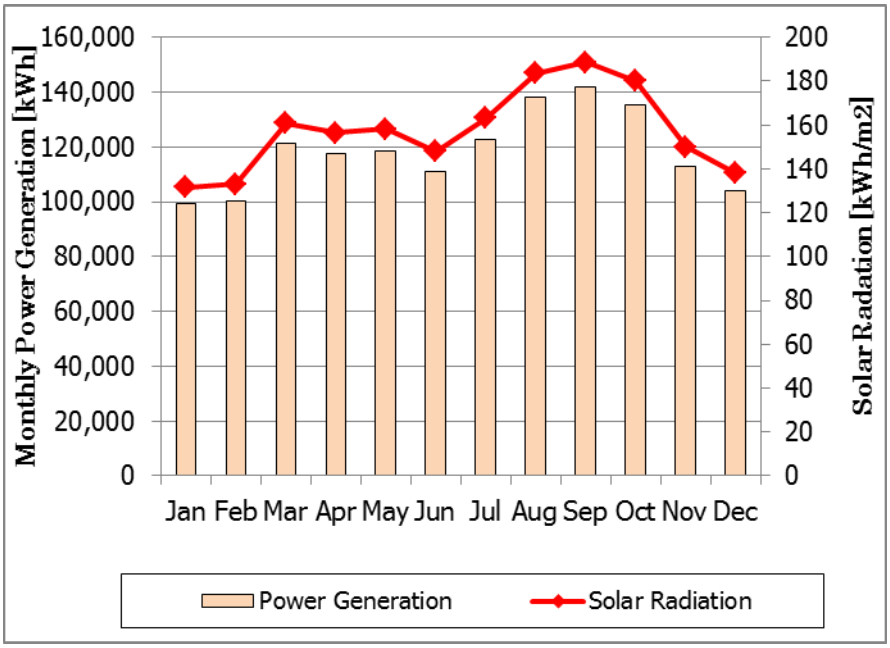


Figure 6-5 Power generation simulation result

Estimated annual A/C reduction **1,168,543 kWh**

	Item	Unit	Value	Remarks
(1)	Annual total solar radiation per area	kWh/m^2	1,891.58	
(2)	Solar panel area	m^2	6,240	
(3)	Annual total solar radiation on solar panel area	kWh	11,806,459	(1)*(2)
(4)	A/C load reduction rate by heat insulation	%	30	UCSD's results
(5)	Annual A/C load reduction	kWh	3,541,038	(3)*(4)
(6)	Power consumption per A/C load	kWh/kWh	0.33	COP=3.0
(7)	Annual A/C power consumption reduction	kWh	1,168,543	(5)*(6)

Figure 6-6 Power consumption reduction of air conditioning systems

Table 6-1 Feasibility simulation result

	Benefit	Cost	Balance
	MIDR	MIDR	MIDR
0		32,570	-32,570
1	2,988	83	-29,664
2	2,980	83	-26,766
3	2,972	83	-23,877
4	2,964	83	-20,995
5	2,956	83	-18,122
6	2,948	83	-15,257
7	2,940	83	-12,399
8	2,932	83	-9,550
9	2,924	83	-6,708
10	2,916	83	-3,875
11	2,908	83	-1,049
12	2,900	83	1,769
13	2,893	83	4,579
14	2,885	83	7,381
15	2,877	83	10,176
16	2,870	83	12,963
17	2,862	83	15,743
18	2,854	83	18,514
19	2,847	83	21,279
20	2,839	83	24,036
21	2,832	83	26,785
22	2,824	83	29,527
23	2,817	83	32,262
24	2,810	83	34,989
25	2,802	83	37,709

With regard to project scheme, as basic a "financing programme for JCM model projects", to establish an international consortium, such as shown in Figure 6-7.

Facility Installation, implementation of MRV and PDD, we are considering that it execute collaboration with local partners and Japanese companies basically.

In addition, shown as the schedule in Figure 6-8, we are considering that to be adopted JCM. According to This action, it is believed to be carried out facility installation and inspection in 2015 fiscal year.

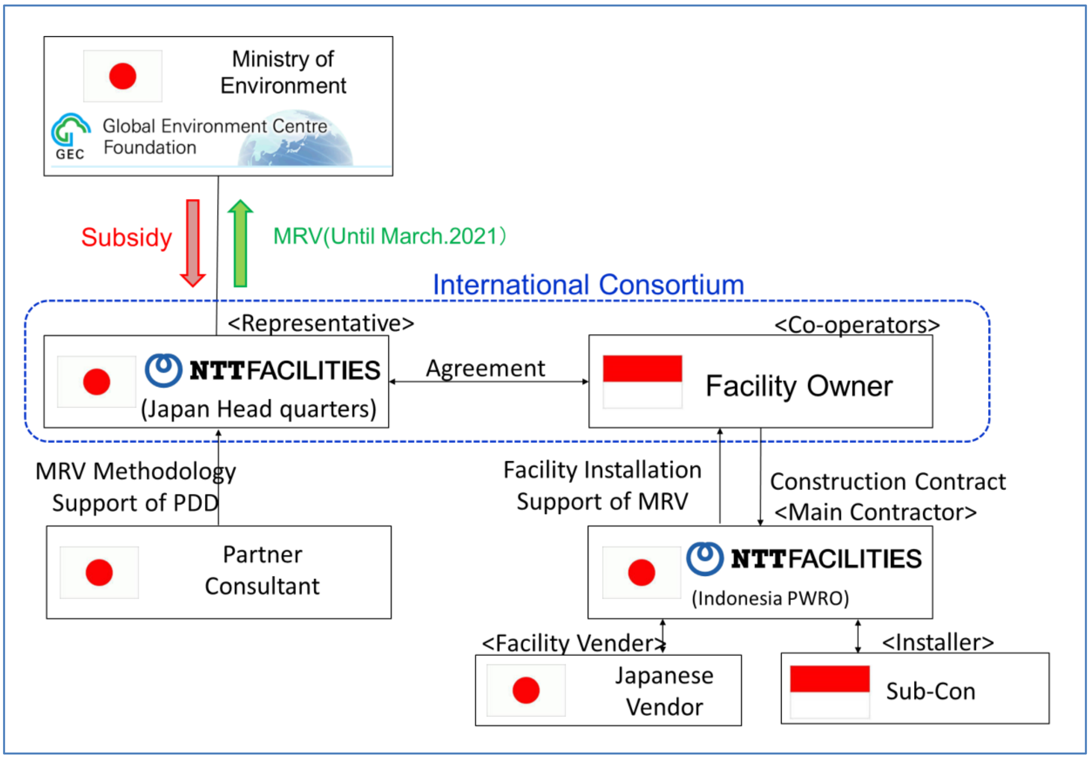


Figure 6-7　Proposed Project Scheme

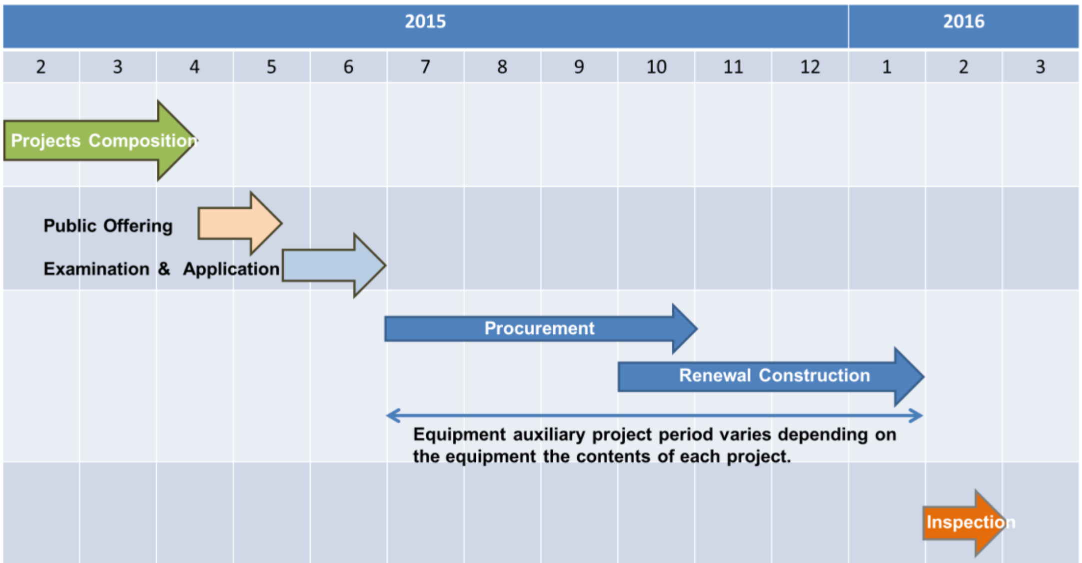


Figure 6-8　Proposed Project Schedule

6.1.2 Installing heating source technology

(1) Introduction technology and effect

Based on energy analysis, we deduced that the following 5 measures could be taken to mitigate CO2 emissions (save energy).

① Effective use of waste gas : Recovering generator waste heat

→Currently, 4 generators (2,807kW output) are running on weekdays from 18:00 to 21:00 hours during the high BWP electricity tariff period. On weekends, 6 generators (same output) run during that same period. Waste heat from the generators is not being made use of. By recovering the waste heat to use in the secondary facilities to generate chilled water, the turbo chillers that are currently in use can be turned off, thereby greatly reducing CO2 emissions.

② Install high-efficiency heating source equipment

→The hotel' s air-cooled chiller was installed about 12 years ago.
Due to the nature of its business, the hotel's chiller is often run for long periods of time. As such, it has experienced much wear and tear.
Revamping the heating system to a high-efficiency one will greatly contribute to a reduction in CO2 emissions.

③ Anti-heat loss measures

→Currently, steam is produced by the gas-steam boiler and supplied to the secondary side via steam pipes. However, as the joints are not insulated, there is heat loss at the joints. Providing better insulation to the joints will reduce the heat lost as well as reduce the volume of gas consumed by the boiler.

④ Improve the efficiency of the air supply system

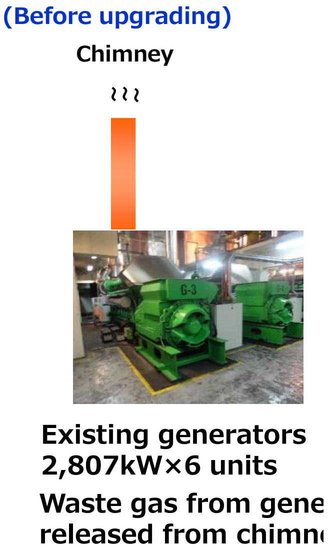
→Currently, the AHU (outdoor air handling unit) is operating on fixed air volume. As a result, even if the number of occupants in the building is small, an excessive amount of conditioned air is being supplied. By installing a CO2 sensor on the AHU and installing inverter controls for the fan, we can save energy by ensuring that only the necessary volume of conditioned air is supplied.

⑤ Install Takasago Thermal Engineering's BEMS system

→Data on energy is recorded on paper by the operator who is stationed on-site. As such, it is not clear how energy usage is categorized. With the introduction of BEMS, the categories of energy usage will be made clear, so that areas where energy is being wasted will be made obvious, and energy can be saved by improving those areas.

① Effective use of waste gas・・・Recovering generator waste heat

【Current system】See below:

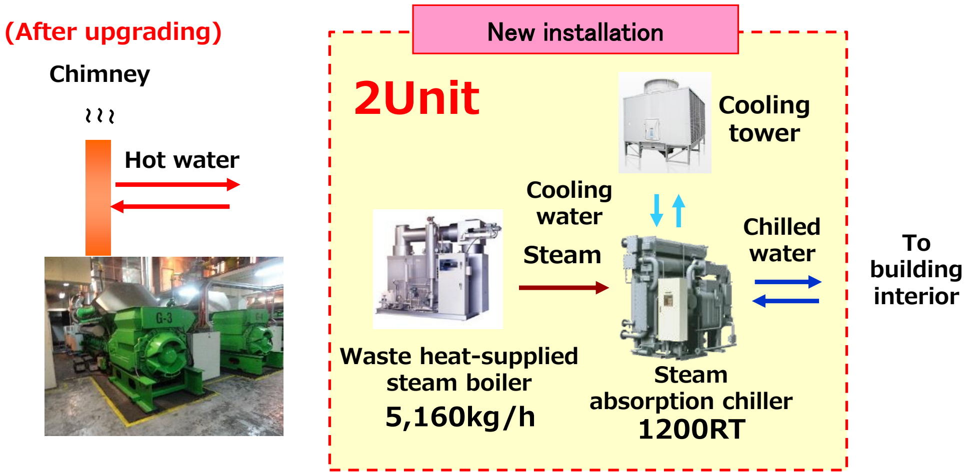


Oparation Weekday 4.5h、Saturday and Sunday 5.5h

Operation pattern	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
GE-1	○	○	○	○	○	○	○
GE-2	○	○	○	○	○	○	○
GE-3	○	○	○	○	○	○	○
GE-4	○	○	○	○	○	○	○
GE-5						○	○
GE-6						○	○

Currently, 4 generators (2,807kW output) are running on weekdays from 18:00 to 21:00 hours during the high BWP electricity tariff period. On weekends, 6 generators (same output) run during that same period. Waste heat from the generators is not being made use of. By recovering the waste heat to use in the secondary facilities to generate chilled water, the turbo chillers that are currently in use can be turned off, thereby greatly reducing CO2 emissions.

【Proposed system】See below:



Existing generators 2,807kW×6 units

Waste heat (hot water) will be extracted from waste gas produced by the generators and will be used in the steam boiler. Energy can be saved by using the steam to produce chilled water.

【Reductions】

No	Energy-saving measure	Survey results Reduction in energy consumption Electricity [kWh/year]	Survey results Reduction in energy consumption Gas [m3/year]
1	Effective use of unused waste gas	3,254,690	

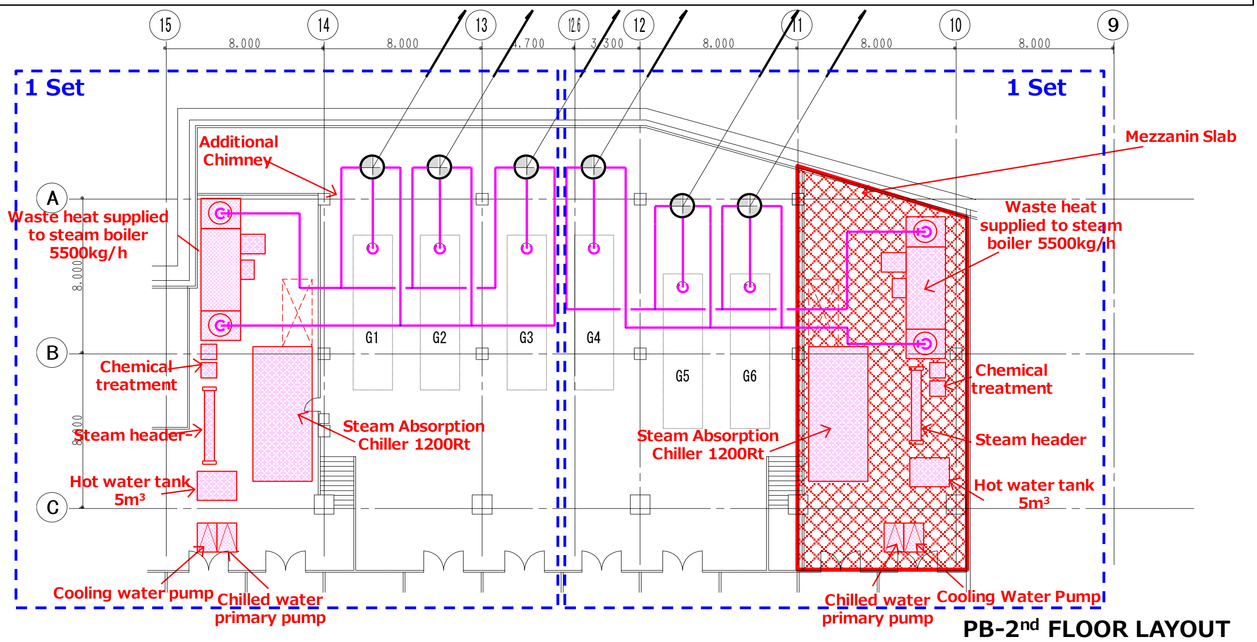
Results of the details study from waste gas analysis

Recoverable amount of steam from 1 unit gas diesel generator
2,807kW(0.8Mpa) = 1,834 kg/h is gained
1 unit Absorption Chiller (1,200 RT) required 5,130 kg/h steam

3 units Gas Diesel Generator becomes 1 set

The maximum number of installed is 2 sets → It becomes 2 sets Absorption Chiller 1,200RT

By using of the exhaust gas of gas diesel generator, there is no impact of the draft ventilation
1. Additional chimney short distance 2. Exhaust gas temperature after recovery (520℃→135℃)
No impact for generator efficiency



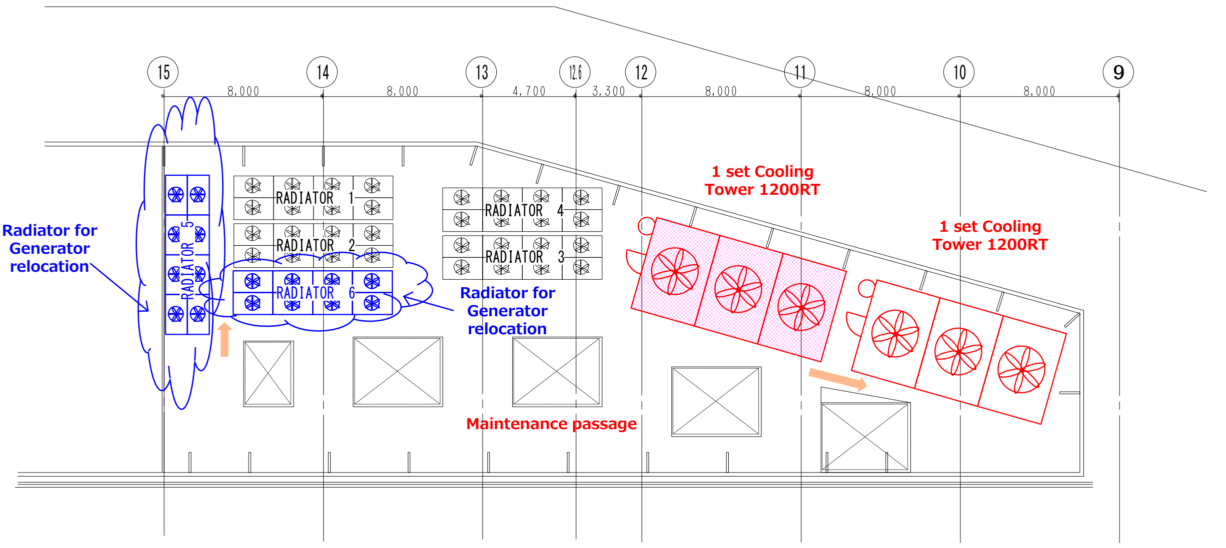
PB-2nd FLOOR LAYOUT

Study result of GL floor installation space

2 sets Cooling Tower for 2 sets Steam Absorption Chiller 1200RT is maximum
Existing radiator No.5 must be relocated to higher level to avoid space for electrical room entrance

Other possibility by detail design

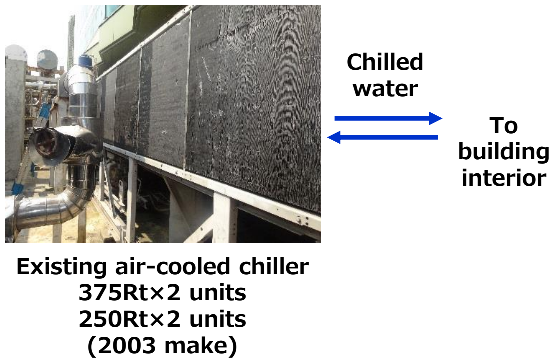
Waste hot water from Radiator can be use for boiler feed water heating, and make some extra energy saving. There is a possibility to eliminate some portion of radiator.



PB-2nd FLOOR LAYOUT

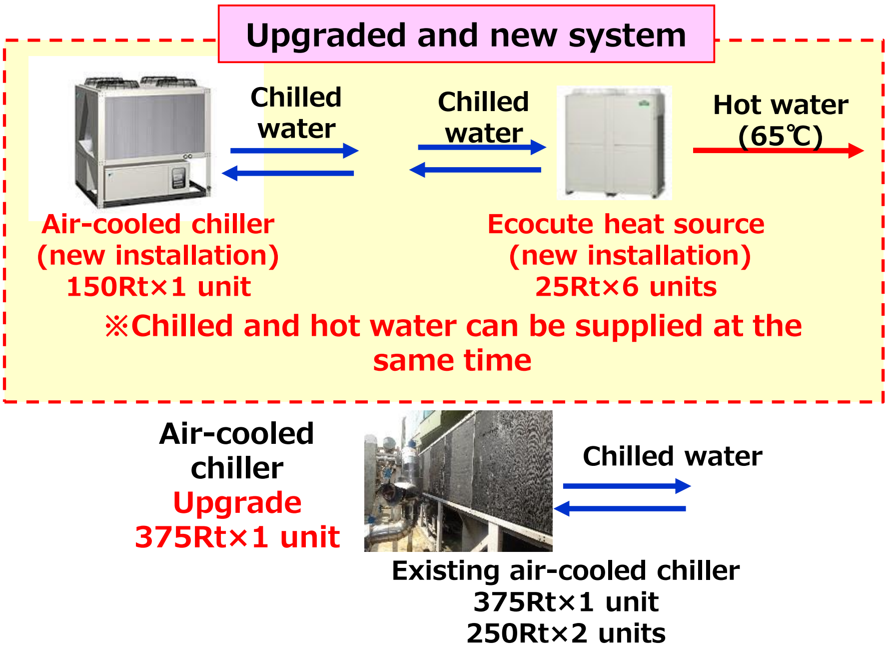
② **Install high-efficiency heating source equipment**

【Current system】See below:



Dismantle the existing air-cooled chiller (1 unit) and install a higher-efficiency air-cooled chiller to make effective use of waste heat.

【Proposed system】See below:



By installing the EcoCute system which can supply chilled and hot water at the same time, the electricity usage will be reduced. By making effective use of waste heat (chilled water) produced by the EcoCute system, the number of chilled water heating source equipment in operation will be reduced.

【Reductions】

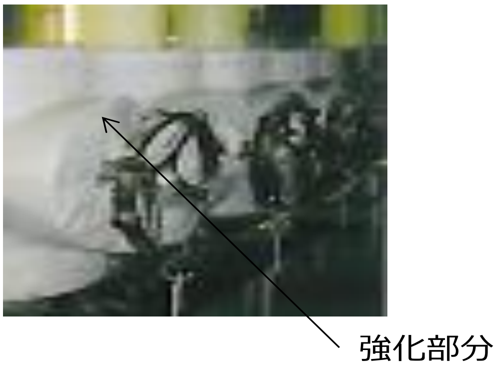
No	Energy-saving measure	Survey results	
		Reduction in energy consumption	
		Electricity [kWh/year]	Gas [m3/year]
2	Installation of high-efficiency heating source equipment	**675,880**	**133,270**

③ Anti-heat los s measures

【Current system】See below:

The steam valve and joints are not insulated, leading to heat loss after 1 year.

【Proposed system】See below:



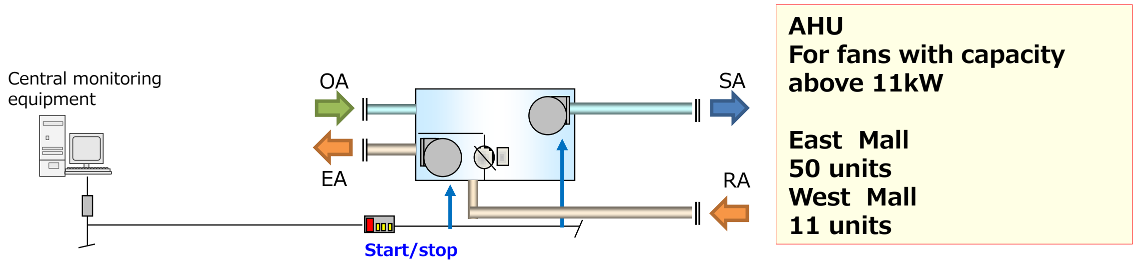
Heat loss can be mitigated by providing the steam valve and joints with better insulation.

【Reductions】

No	Energy-saving measure	Survey results: Reduction in energy consumption	
		Electricity [kWh/year]	Gas [m3/year]
3	Countermeasures for boiler heat loss		**5,030**

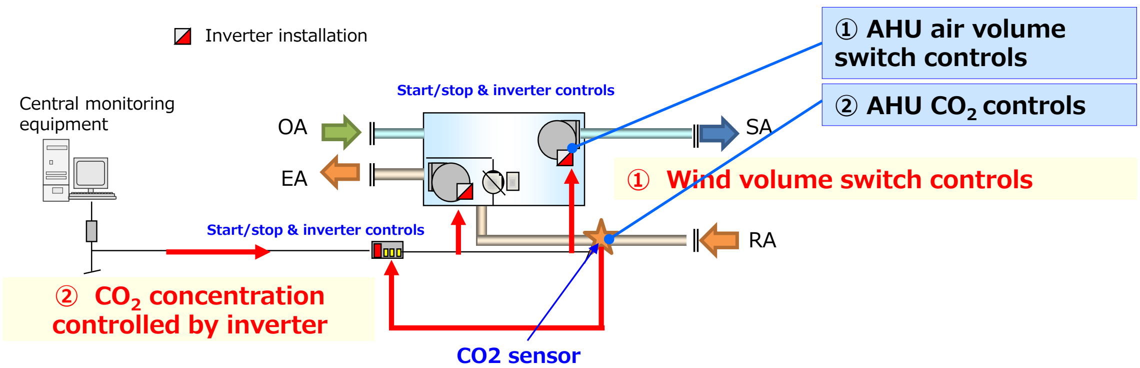
④ **Improve the efficiency of the air supply system**

【Current system】See below:



Currently, the AHU (outdoor air handling unit) is operating on fixed air volume. As a result, even if the number of occupants in the building is small, an excessive amount of conditioned air is being supplied. By installing a CO2 sensor on the AHU and installing inverter controls for the fan, we can save energy by ensuring that only the necessary volume of conditioned air is supplied.

【Proposed system】See below:



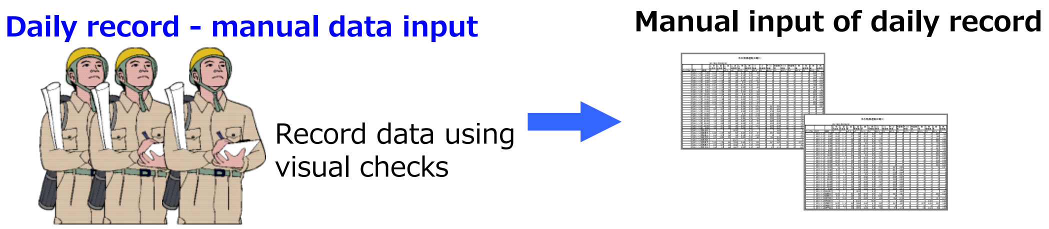
By reducing the fan's supply motor and the energy used by the heating source, energy usage can be greatly reduced.

【Reductions】

No	Energy-saving measure	Survey results Reduction in energy consumption	
		Electricity [kWh/year]	Gas [m3/year]
4	Upgrading air supply system to high-efficiency system	**2,048,870**	

⑤ **Install Takasago Thermal Engineering's BEMS system**

【Current system】 See below:

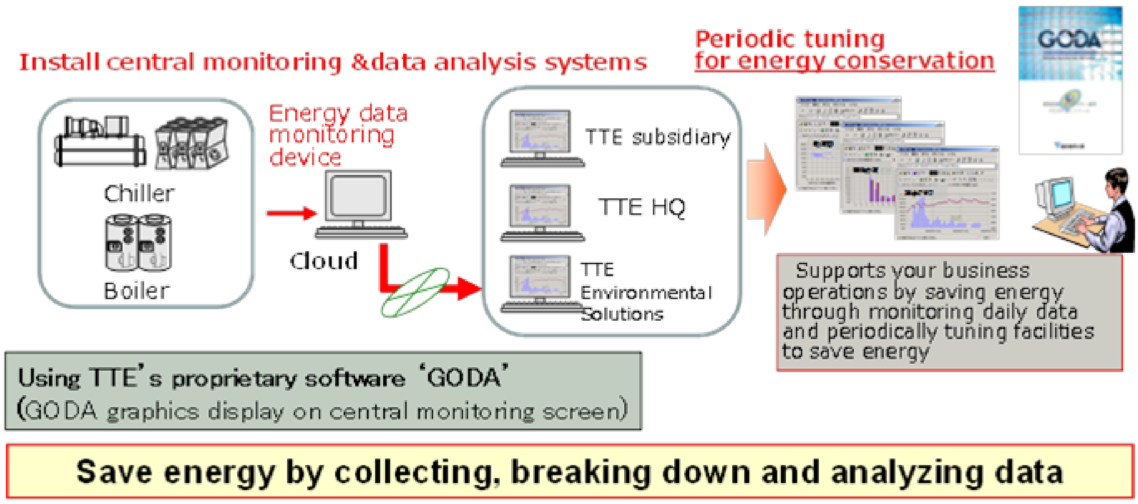


Currently, there is almost no data on energy monitoring. This data is necessary for energy conservation. Monthly and daily reports are recorded by the equipment operators who input the data that they can read visually.

【Proposed system】 See below:

- Structure of the BEMS system

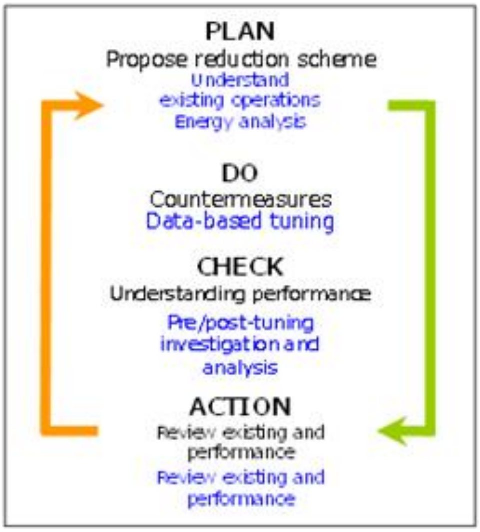
Data on energy is recorded on paper by the operator who is stationed on-site. As such, it is not clear how energy usage is categorized. With the introduction of BEMS, the categories of energy usage will be made clear, so that areas where energy is being wasted will be made obvious, and energy can be saved by improving those areas.



- Structure of performance improvement mechanism

Structure of operating plan and energy saving meetings

Collection and interpretation of existing data, assessment of consumed energy



Year 1	Once every quarter
Year 2 – Year 3	Twice yearly

Energy conservation meeting in progress ▲

【Reductions】

No	Energy-saving measure	Survey results	
		Reduction in energy consumption	
		Electricity [kWh/year]	Gas [m3/year]
5	Installation of Takasago Thermal Engineering’s BEMS system	**124,640**	

【Cost-effectiveness】

The table below shows the number of years until break-even on investment, calculated using approximate figures for cost savings due to energy-saving measures and installation expenses for energy-saving equipment.

Taking into consideration factors that are not eligible for subsidy, the subsidy amount is calculated as 1/3 of the project funds, rather than 1/2 (maximum ratio). Furthermore, design fees, on-site SV, post-installation validation and reporting fees have also been added to the calculations for installation expenses.

Therefore, given installation expenses of approximately 86,000,000,000 rupiah, the annual savings on utilities expenses is 8,600,000,000 rupiah. Supposing that there is zero subsidy contribution, it will take 10 years for the savings to break even. If there is contribution from subsidy, break-even will occur in 6.7 years.

(2) Implementation Plan (Proposal)

An international consortium will be formed, composed of a Japanese project management company and Indonesian companies that have facilities eligible for the installation of the equipment described in this report. Japanese leasing companies may also be included in the consortium, if the situation calls for it. Work on the equipment to be installed, as well as the provision of after-sales service will be carried out the local subsidiary of the project management company, and if there is a need for it, the local subsidiary will also contract with local companies for materials, installation, construction work, etc. The table below shows the distribution of work by company, as well as the cash flow between companies.

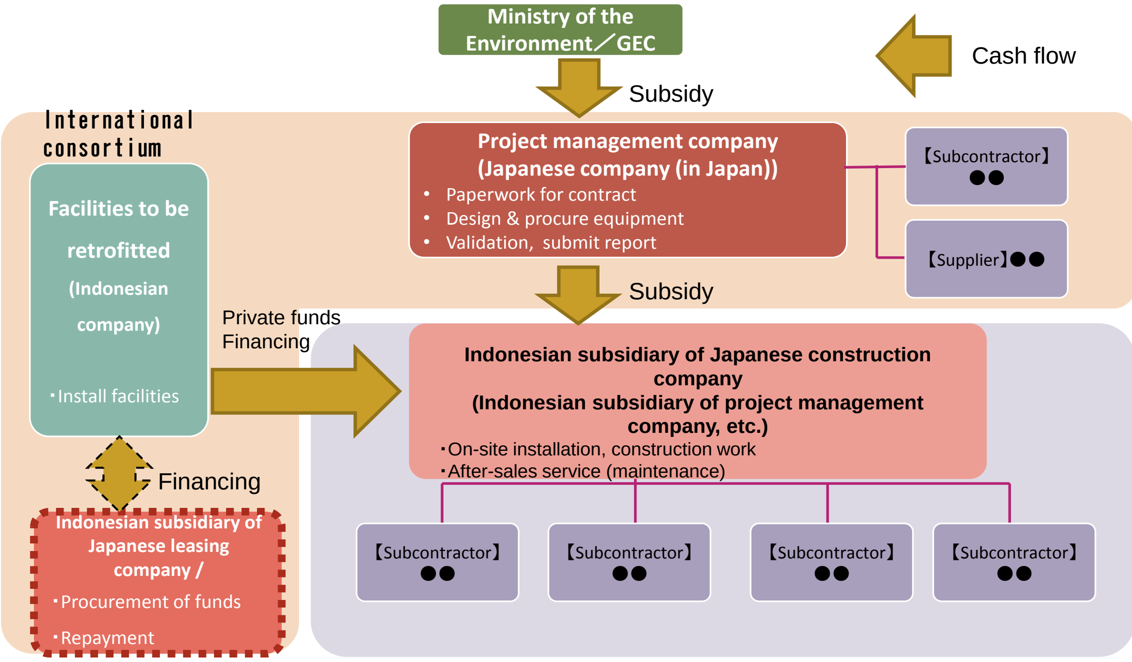


Figure 6-9 Organizational flow chart: Distribution of work and funds among the participants

1) Funds procurement and repayment

a. Procuring funds

In addition to funds derived from subsidies, self-financing and taking a loan from a leasing company are also options for raising funds for the project. The diagram below shows the percentage of the total funds that each option makes up.

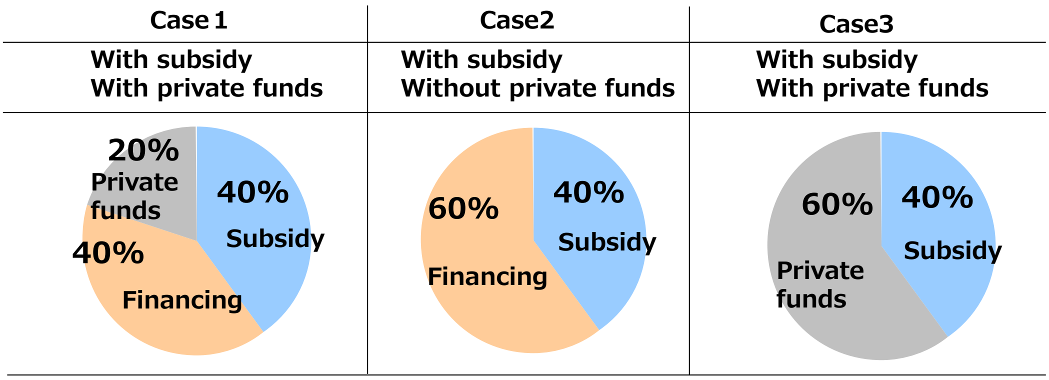


Figure 6-10 Representative means of procuring funds

b. Repayment scheme for borrowed funds

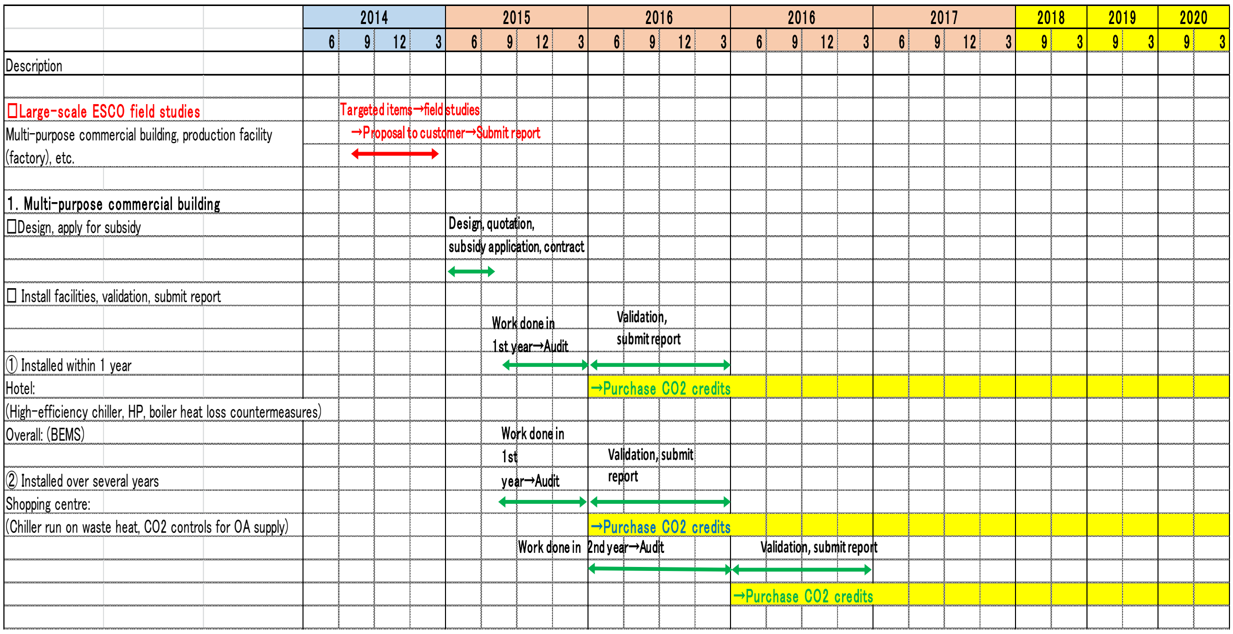
If a portion of the funds procured for the project are borrowed from a leasing company, as shown below, there are 3 ways in which the funds can be repaid after factoring in after-sales service expenses: 1) full payout, 2) refinancing the loan, 3) purchasing.

① Full payout → Repay full amount during service period
② Refinancing → Re-contract with residual value* at end of service period
③ Buyback → Buyback with residual value* at end of service period

*** Residual value will be determined according to rate of lending and service period**

2) Schedule

Our future schedule is as shown below. This year, we conducted feasibility studies on a multi-purpose commercial building and a production facility (factory). Next year, we will install new systems in a multi-purpose commercial facility that is highly interested in installing new equipment and reducing their CO2 emissions. Next year, we plan to audit and review the proposed installations, after which, we plan to install the equipment in the following year.



6. 2 Hotel

The table below shows lamps commonly used in the hotel building. A total of 2,600 incandescent lamps are used in passages and guestrooms. Specifically, lighting devices are used on the passages all through the day because the intermediate platforms on the passages prevent the entry of external light. In addition, a substantial amount of power is consumed by guestrooms used by hotel guests. The ballroom is furnished with about 1,000 lighting devices, all of which are turned on while the room is being used.

The table below discusses reductions in power consumption achieved by the new lighting devices to determine the payback period for the investment.

Table 6-1 Investment and effect of replacement of lighting devices

[Existing apparatus]

Site	Lamp type	Lamp shape	Quantity (unit)	Electricity consumption (W)	Lighting hours (h / day)	Lighting days (day / year)	Operating ratio (-)	Annual electricity consumption (kWh / year)
Passage	Incandescent lamp	Candle (E14)	284	15	24	365	1.00	37,318
Guestroom	Incandescent lamp	Candle (E14)	988	15	8	365	0.75	32,456
Guestroom	Incandescent lamp	Softone (E27)	1,328	25	8	365	0.75	72,708
Guestroom	Minimum-halogen lamp	Halogen (Mr16)	1,208	35	8	365	0.75	92,593
Ballroom	Incandescent lamp	Candle (E14)	1,000	15	12	150	1.00	27,000
							Total	**262,075**

[After replacement]

Site	Lamp type	Lamp shape	Quantity (unit)	Electricity consumption (W)	Lighting hours (h / day)	Lighting days (day / year)	Operating ratio (-)	Annual electricity consumption (kWh / year)
Passage	LED	Candle (E14)	284	3	24	365	1.00	7,464
Guestroom	LED	Candle (E14)	988	3	8	365	0.75	6,491
Guestroom	LED	Globe (E27)	1,328	7	8	365	0.75	20,358
Guestroom	LED	Beam (Mr16)	1,208	7	8	365	0.75	18,519
Ballroom	LED	Candle (E14)	1,000	3	12	150	1.00	5,400
							Total	**58,232**
						Electricity reduction (kWh / year)		**203,843**
						CO2 emission reduction (t-CO2 / year)		**148.8**
						Reduction (IDR)		**224,227,344**

[Investment vs. effects]

Site	Lamp	Quantity (unit)	Unit price of apparatus (IDR)	Total price of apparatus (IDR)	Unit construction price (IDR)	To price of construction (IDR)	Grand total (IDR)
Passage	Candle (E14)	284	150,000	42,600,000	10,000	2,840,000	45,440,000
Guestroom	Candle (E14)	988	150,000	148,200,000	10,000	9,880,000	158,080,000
Guestroom	Globe(E27)	1,328	125,000	166,000,000	10,000	13,280,000	179,280,000
Guestroom	Beam (Mr16)	1,208	200,000	241,600,000	10,000	12,080,000	253,680,000
Ballroom	Candle (E14)	1,000	150,000	150,000,000	150,000	150,000,000	300,000,000
						Investment (IDR)	**936,480,000**
						Reduction (IDR)	**224,227,344**
						Payback period	**4.18 years**

6.3 Industry(factory)

6.3.1 Energy analysis

Figure 6-11 shows the annual usage ratio of electricity by equipment. Spinning machines in the spinning factory account for 68% of the factory's total electricity consumption. By replacing the existing production equipment with high-efficiency units, it is possible to enhance production efficiency, save energy, and significantly reduce CO2 emissions.

This Study was focused on utility apparatuses at a spinning factory, rather than on production equipment. Chillers, pumps, and cooling towers used in air-conditioning systems represent 7% of the factory's total electricity consumption, while air compressors, cooling towers, and pumps necessary for the factory account for 25%. Updating or replacing these apparatuses will contribute to CO2 reductions.

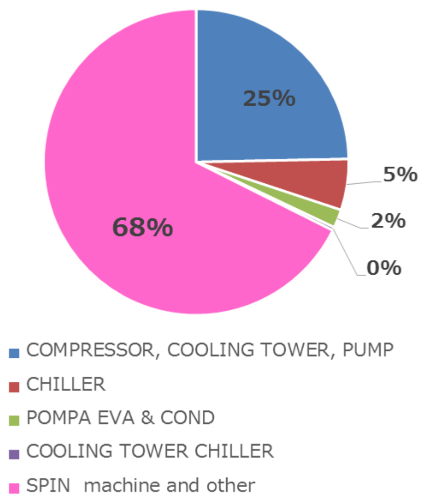


Figure 6-11 Annual usage ratio for electricity by equipment (July 2013-June 2014)

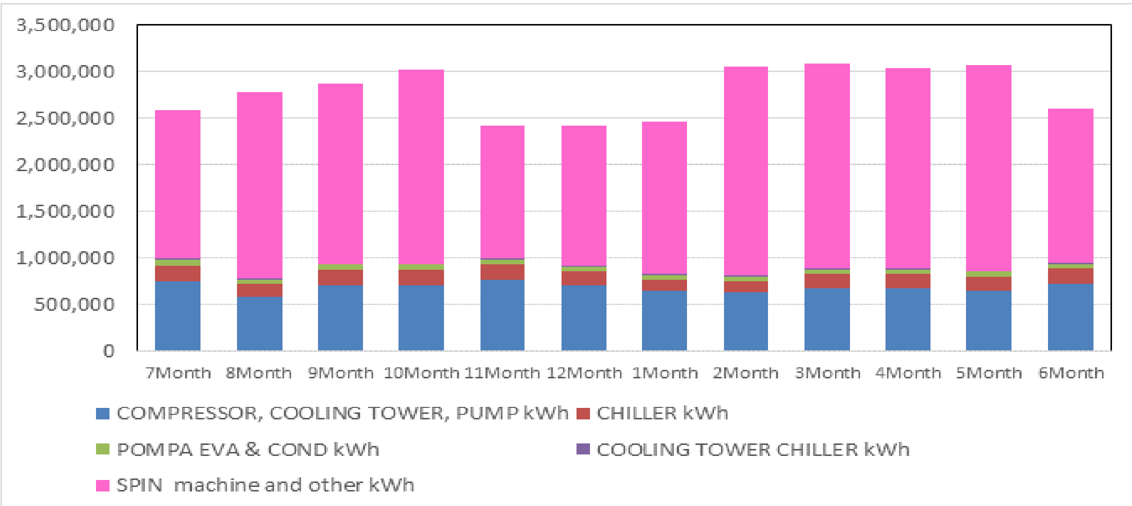


Figure 6-12 Monthly electricity consumption by equipment (July 2013-June 2014)

Figure 6-12 shows the monthly breakdown of electrical usage by category. In each month, electricity consumption for equipment not used for production (equipment not including the SPIN machine, etc.) is stable at 1,000,000kWh/month. As the electricity consumed by the production equipment depends on production demands, maximum consumption was in February (2,238,544kWh/month), about 1.5 times the electricity consumed in November (1,434,632kWh/month), the month of lowest electricity consumption.

Figure 6-13 shows the annual percentage of gas usage by category. Gas used for production makes up 19% of total gas used, while the boiler uses 81% of the total gas usage. By implementing energy-saving measures for the gas boiler, CO_2 emissions can be greatly reduced.

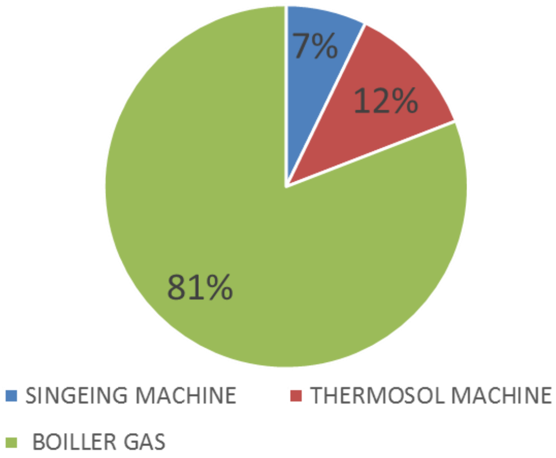


Figure 6-13 Percentage of annual gas usage by category, July 2013 to June 2014

Figure 6-14 shows the figures for monthly gas usage. The volume of gas used in a month is dependent mainly on the volume of production and the figures vary by each month.

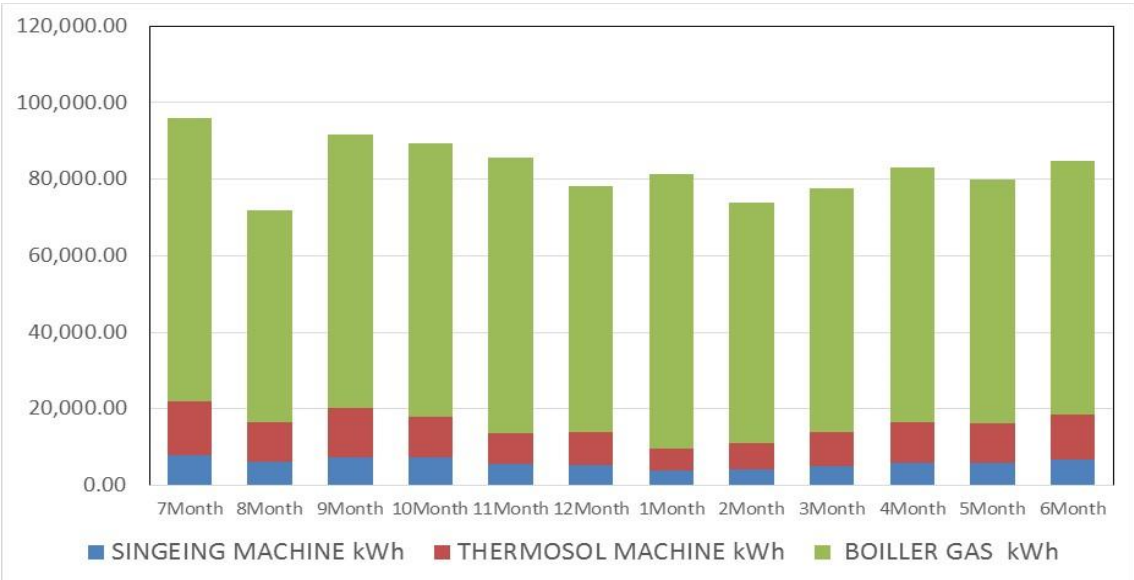


Figure 6-14 Monthly gas usage by category, July 2013 to June 2014

6.3.2 Measures to mitigate CO2 emissions (energy conservation)

(1) Introduction technology and effect

Based on energy analysis, we deduced that the following 5 measures could be taken to mitigate CO_2 emissions (save energy).

① Revamp the heating source system

→Replace the existing turbo chillers with new ones

→Install secondary chilled water pump and variable flow controls

→Replace cooling water pump with new one and install variable flow controls

→Close the cooling water pipe system

→Close the chilled water pipe system

② Install co-generation system

→Currently, steam is produced by the boiler which uses gas. Indonesia has a particularly bad situation with electricity supply. As such, by installing a co-generation system, energy can be saved by generating electricity and supplying steam at the same time.

③ Replace cooling tower for the compressor with new one

→The existing cooling tower used for the compressor is considered to have become worn out due to poor water quality at the factory, as well as through long use. This has caused the cooling tower' s rate of heat exchange to have dropped. By changing the cooling tower, and thereby improving the compressor's efficiency, energy can be saved.

④ Install Takasago Thermal Engineering's BEMS system

→Data on energy is recorded on paper by the operator who is stationed on-site. As such, it is not clear how energy usage is categorized. With the introduction of BEMS, the categories of energy usage will be made clear, so that areas where energy is being wasted will be made obvious, and energy can be saved by improving those areas.

⑤ Replace production machinery with new ones

→By replacing the machines used at the spinning factory with higher-efficiency models, pressurized air energy used for production and the electricity used to run the production machinery can be reduced.

① **<u>Revamp the heating source system-1</u>**

【Current system】See below:

A　Cooling tower installation

Existing cooling tower is facing wear and tear.

B　Cooling water tank installation

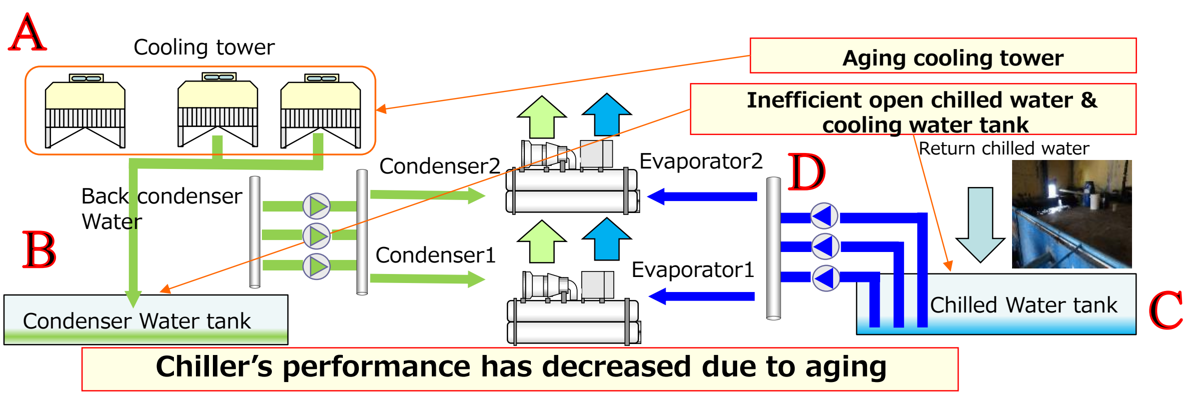
The cooling water tank uses an open system that requires a lot of power to supply water and is a source of corrosion. This has caused scale to build up in the chiller, which in turn results in the chiller's efficiency going down.

C　Chilled water tank installation

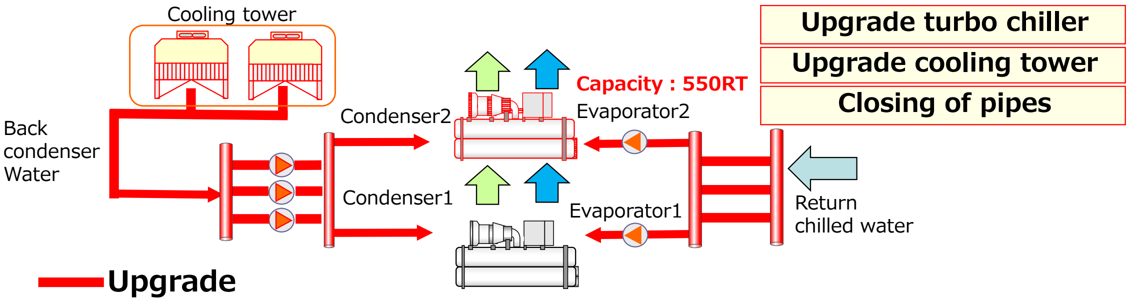
The chilled water tank uses an open system that requires a lot of power to supply water and is a source of corrosion. This has caused scale to build up in the chiller, which in turn results in the chiller's efficiency going down.

D Chiller

The chillers were installed 15 years ago. There are 2 turbo chillers but as only one is used to carry out basic operations over a long period of 24 hours, it can be assumed that its efficiency has gone down by a fair bit.



【Proposed system】 See below:



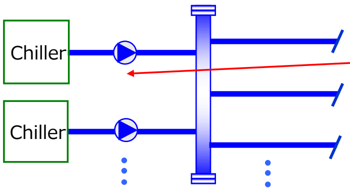
・Replace existing turbo chillers with new ones
・Install secondary chilled water pump and variable flow controls
・Replace cooling water pump with new one and install variable flow controls
・Close the cooling water pipe system
・Close the chilled water pipe system

【Reductions】

No	Energy-saving measure	Survey results	
		Reduction in energy consumption	
		Electricity [kWh/year]	Gas [m3/year]
1	Upgrading the heating source system-1	**1,294,760**	

① **Revamp the heating source system-2**

【Existing system】See below:

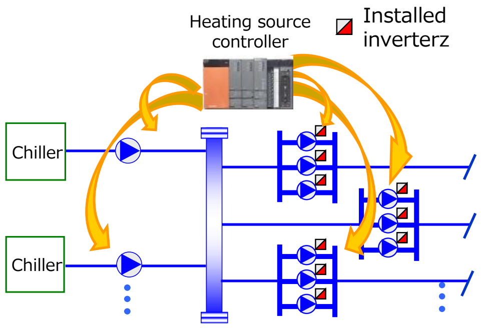


Primary pump system

⇒ **Requirement: uniform water supply from different lines**
If flow rate is insufficient, need to use unnecessary heating source equipment

The primary pump is used for the heating source system which supplies more than the required load for the secondary pump, resulting in a lot of need for the pump's supplying action.

【Proposed system】See below:



Using secondary pump and inverter controls

- **Install secondary pump system**
- **Install inverter**
- **Use heating source controller for high-efficiency control**

Secondary pump variable lift / variable flow controls (install inverter + energy-saving controls)

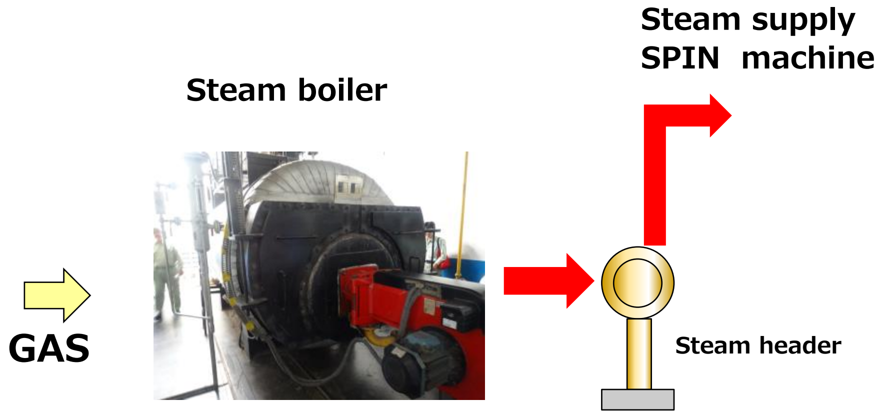
Primary pump variable flow controls (install inverter + energy-saving controls)

【Reductions】

No	Energy-saving measure	Survey results	
		Reduction in energy consumption	
		Electricity [kWh/year]	Gas [m3/year]
1	Upgrading the heating source system-2	**45,140**	

② **Install co-generation system**

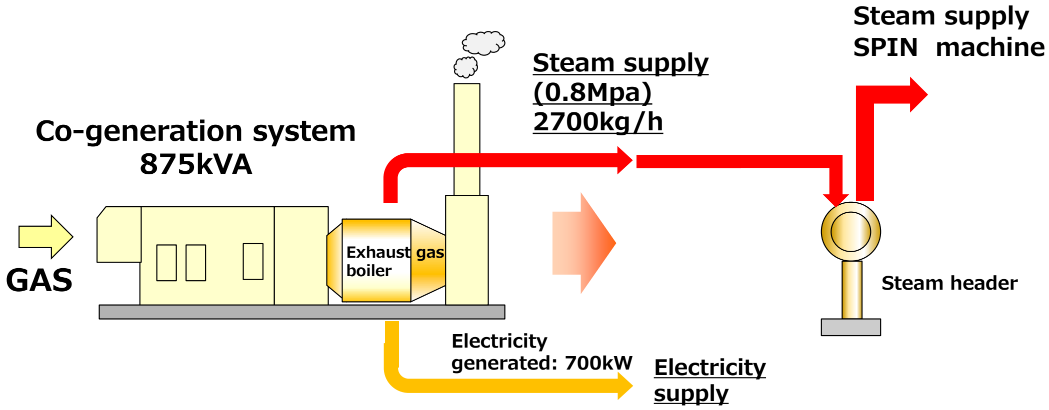
【Current system】 See below:



Waste heat is not used effectively as gas is injected into the machine and steam is supplied to the production machinery.

【Proposed system】 See below:

By installing a co-generation system, energy can be saved by generating electricity and supplying steam at the same time.



【Reductions】

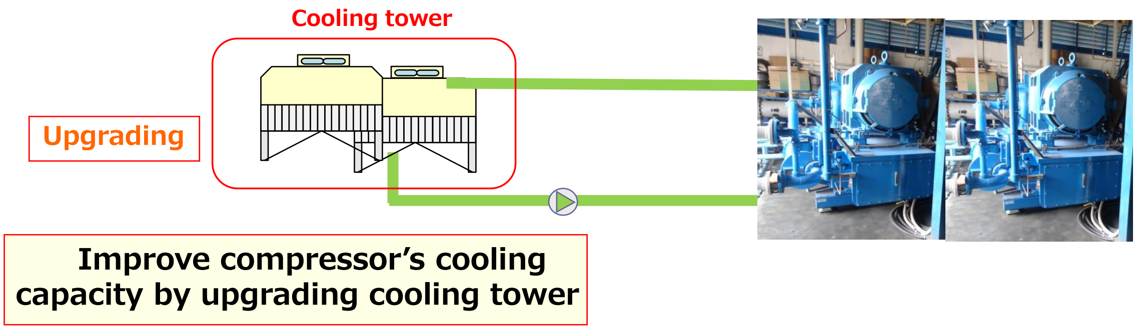
No	Energy-saving measure	Survey results	
		Reduction in energy consumption	
		Electricity [kWh/year]	Gas [m3/year]
2	Installing co-generation system	**3,631,490**	**-802.820**

③ <u>Replacing the cooling towers for the compressor with new ones</u>

【Current system】 See below:

【Proposed system】 See below:

The existing cooling tower used for the compressor is considered to have become worn out due to poor water quality at the factory, as well as through long use. This has caused the cooling tower's rate of heat exchange to have dropped. By changing the cooling tower, and thereby improving the compressor's efficiency, energy can be saved.

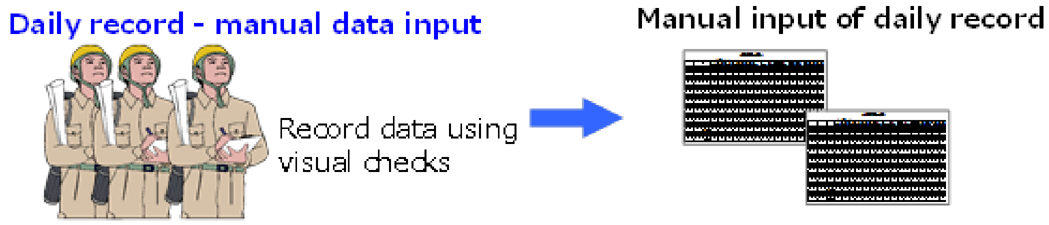


【Reductions】

No	Energy-saving measure	Survey results	
		Reduction in energy consumption	
		Electricity [kWh/year]	Gas [m3/year]
3	Upgrading compressor cooling tower	**330,800**	

④ **<u>Install Takasago Thermal Engineering’s BEMS system</u>**

【Current system】See below

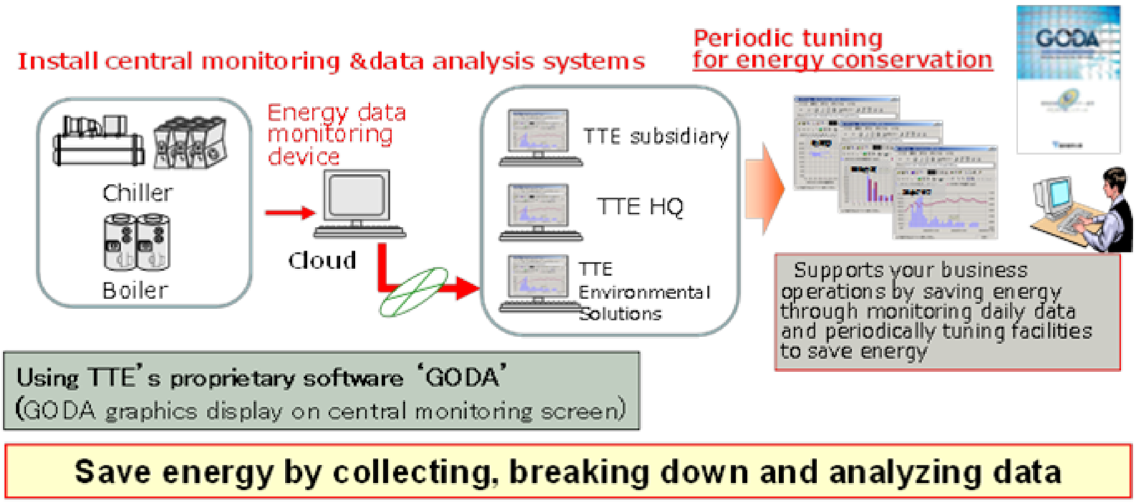


Currently, there is almost no data on energy monitoring. This data is necessary for energy conservation. Monthly and daily reports are recorded by the equipment operators who input the data that they can read visually.

【Proposed system】See below:

- Structure of the BEMS system

Data on energy is recorded on paper by the operator who is stationed on-site. As such, it is not clear how energy usage is categorized. With the introduction of BEMS, the categories of energy usage will be made clear, so that areas where energy is being wasted will be made obvious, and energy can be saved by improving those areas.



- Structure of performance improvement mechanism

Structure of operating plan and energy saving meetings

Collection and interpretation of existing data, assessment of consumed energy

Year 1	Once every quarter
Year 2 – Year 3	Twice yearly

Energy conservation meeting in progress ▲

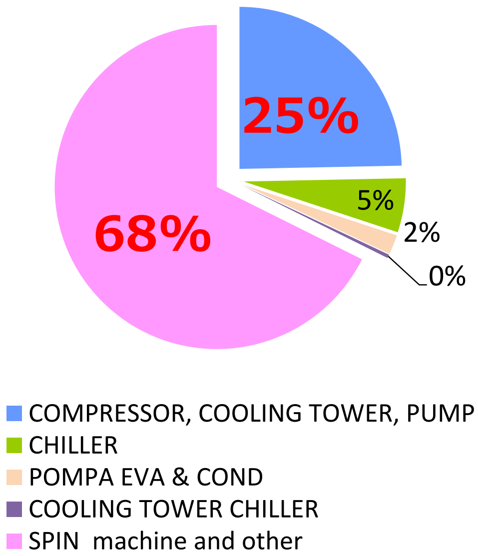
【Reductions】

No	Energy-saving measure	Survey results	
		Reduction in energy consumption	
		Electricity [kWh/year]	Gas [m3/year]
4	Energy data device (BEMS) and tuning for energy conservation	**334,490**	

⑤ **Replacing production machinery (spinning machinery) with new ones**

By replacing the spinning machinery with new ones, the volume of pressurized air used for production can be reduced, and the electricity consumed by the production machinery can be reduced as well.

The compressor used in production will reduce its electricity consumption from 25% of total electricity consumption to 17%, and the production machinery will reduce their electricity consumption from 68% of the total to 58%.



Compressor25%→17%
Production Equipment
68%→58%

【Reductions】

No	Energy-saving measure	Survey results	
		Reduction in energy consumption	
		Electricity [kWh/year]	Gas [m3/year]
5	Production Equipment Renewal	**20,549,140**	

【Cost-effectiveness】

The table below shows the number of years until break-even on investment, calculated using approximate figures for cost savings due to energy-saving measures and installation expenses for energy-saving equipment.

Taking into consideration factors that are not eligible for subsidy, the subsidy amount is calculated as 1/3 of the project funds, rather than 1/2 (maximum ratio). Furthermore, design fees, on-site SV, post-installation validation and reporting fees have also been added to the calculations for installation expenses.

Therefore, given installation expenses of approximately 101,000,000,000 rupiah, the annual savings on utilities expenses is 23,000,000,000 rupiah. Supposing that there is zero subsidy contribution, it will take 4.4 years for the savings to break even. If there is contribution from subsidy, break-even will occur in 2.9 years. As the effectiveness of replacing the production machinery is considerably promising, there is a need to carry out detailed audits to get more concrete details.

No	Energy-saving measure	Survey results						
		Reduction in energy consumption		①	②	②/①	③	(②-③) /①
		Electricity [kWh/year]	Gas [m3/year]	Reduction in spending on utilities [Rp/year]	Installation cost [Rp]	No. of years to investment payout [year]	Subsidy received [Rp]	After Subsidy received No. of years to [year]
1	Upgrading the heating source system	1,339,900		1,182,900,000	15,068,400,000	12.7	MAX 33,680,900,000	2.9
2	Installing co-generation system	3,631,490	-803	3,190,400,000	25,500,400,000	8.0		
3	Upgrading compressor cooling tower	330,800		290,400,000	2,362,600,000	8.1		
4	Energy data device (BEMS) and tuning for energy conservation	334,490		271,600,000	1,724,100,000	6.3		
5	Production Equipment Renewal	20,549,140		18,042,100,000	56,387,700,000	3.1		
Total		26,185,820	-803	22,977,400,000	101,043,200,000	4.4		

Reduction in utilities spending

22,977,400,000 Rp/year

Installation cost

101,043,200,000 Rp

(2) Implementation Plan (Proposal)

An international consortium will be formed, composed of a Japanese project management company and Indonesian companies that have facilities eligible for the installation of the equipment described in this report. Japanese leasing companies may also be included in the consortium, if the situation calls for it. Work on the equipment to be installed, as well as the provision of after-sales service will be carried out the local subsidiary of the project management company, and if there is a need for it, the local subsidiary will also contract with local companies for materials, installation, construction work, etc. The table below shows the distribution of work by company, as well as the cash flow between companies.

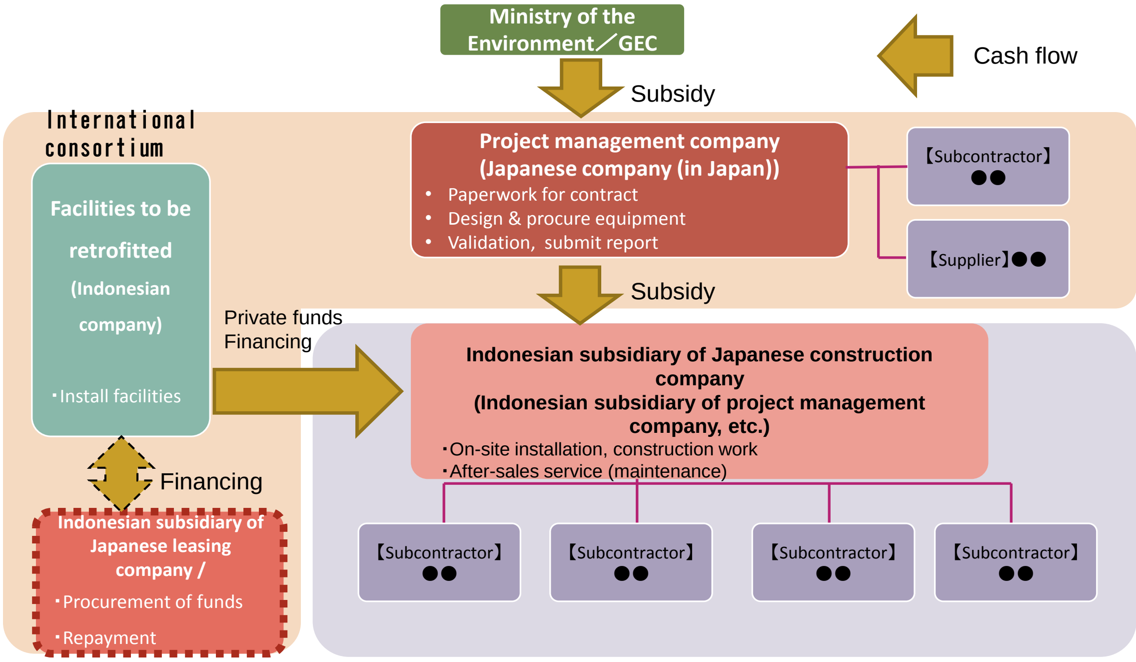


Figure 6-15 Organizational flow chart: Distribution of work and funds among the participants

1) Funds procurement and repayment

a. Procuring funds

In addition to funds derived from subsidies, self-financing and taking a loan from a leasing company are also options for raising funds for the project. The diagram below shows the percentage of the total funds that each option makes up.

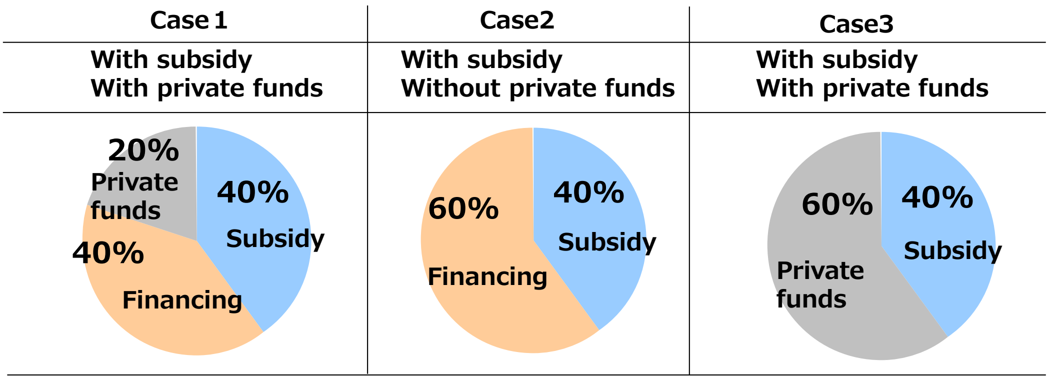


Figure 6-16 Representative means of procuring funds

b. Repayment scheme for borrowed funds

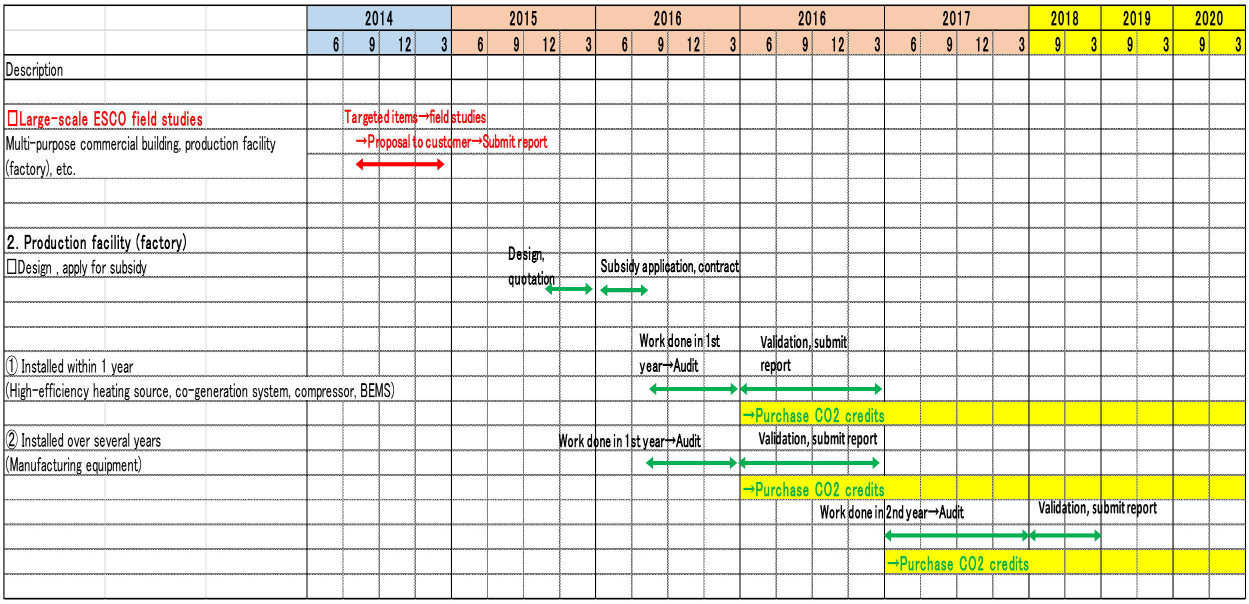
If a portion of the funds procured for the project are borrowed from a leasing company, as shown below, there are 3 ways in which the funds can be repaid after factoring in after-sales service expenses: 1) full payout, 2) refinancing the loan, 3) purchasing.

① **Full payout → Repay full amount during service period**
② **Refinancing → Re-contract with residual value* at end of service period**
③ **Buyback → Buyback with residual value* at end of service period**

*** Residual value will be determined according to rate of lending and service period**

2) Schedule

Our future schedule is as shown below. This year, we conducted feasibility studies on a multi-purpose commercial building and a production facility (factory). Next year, we will install new systems in a multi-purpose commercial facility that is highly interested in installing new equipment and reducing their CO2 emissions. Next year, we plan to audit and review the proposed installations, after which, we plan to install the equipment in the following year.



6. 4　Office building

6. 4. 1　Office building A

（1）Cut in electricity charge for the building

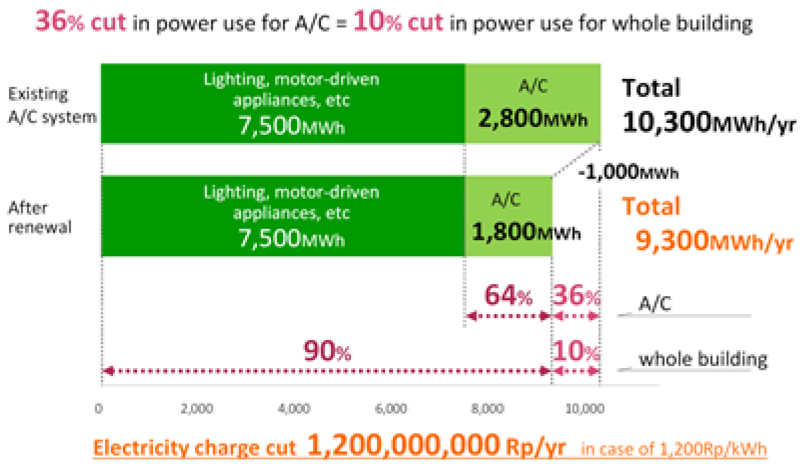


Figure 6-17 Cut in electricity charge

The Figure 6-17 shows the current electricity charge could be cut, by replacing the existing system with our proposed high-performance air conditioning system. According to information we received from the staff, the building currently uses 10,300MWh per year.

By renewing system, this could be cut by 1,000MWh. A reduction to 9,300MWh per year. This would mean a 36% cut in power use for air conditioning, equivalent to a 10% cut in power use for the whole building. This means, 1,200,000,000 Rp per year could be saved.

（2）CO2 reduction by the building A/C system renewal.

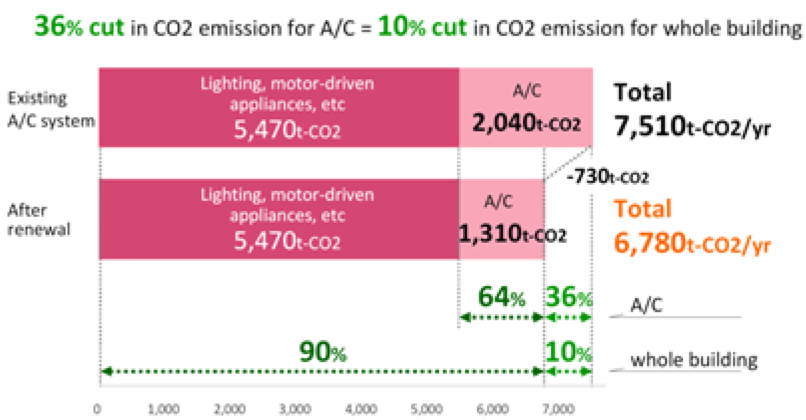


Figure 6-18 CO2 reduction

The Figure 6-18 shows the cut in Carbon dioxide emission that could be achieved by renewing the air conditioning system. By the graph, a very significant cut of 730 tons of CO2 per year could be achieved with installation of high-performance type.

(3) Cost recovery period for renewal work

Table 6-2 Cost recovery period for renewal work

	Target building
kWh reduction	1,000 MWh
Electricity charge reduction	1,200 million Rp
Construction cost	21,600 million Rp
Cost recovery period	18 years

Earlier renewal would be more beneficial, taking into account inflation rate and rising electricity rate in Indonesia!

The table summarizes reductions in power-use that could be made through our proposed renewal work.A construction cost to achieve the reduction in electricity charge is 21billion 600 million Rp. The cost recovery period is 18 years.

(4) Proposed renewal project scheme

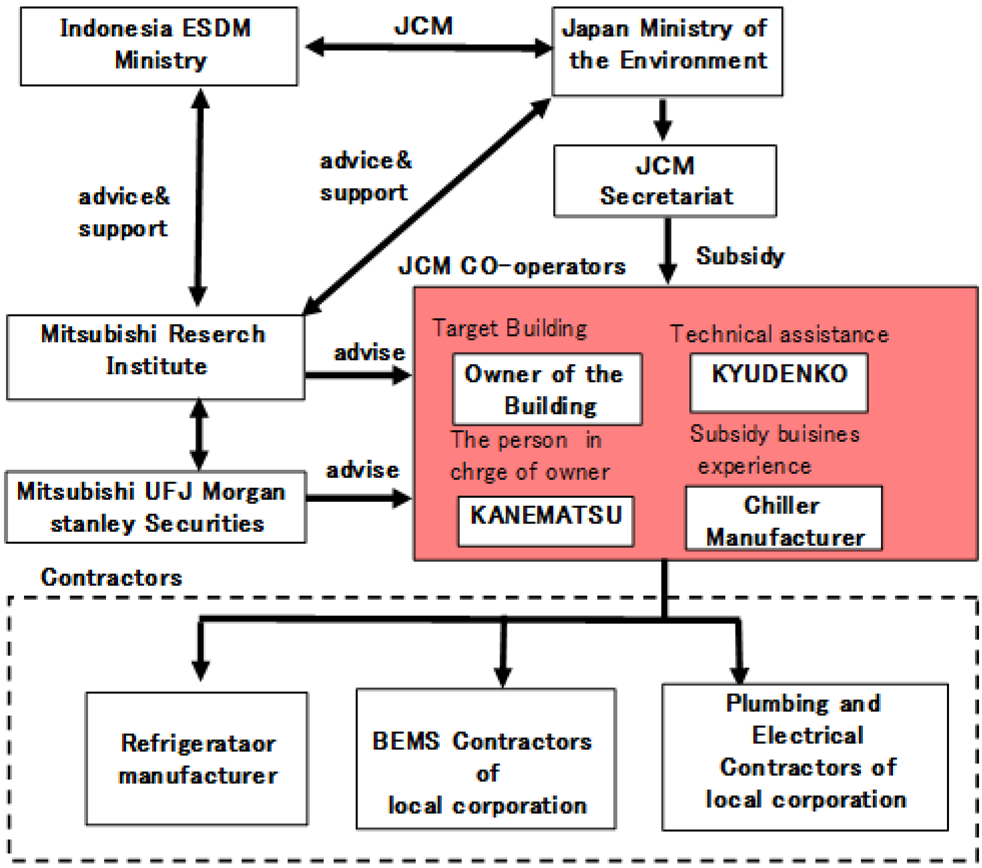


Figure 6-19 Project scheme

The Figure 6-19 shows a renewal project scheme which we studied as part of the energy audit. Although Kyudenko has not yet received final comments from the building's business operator regarding its intentions, we propose to implement this project; Mitsubishi Research Institute and Mitsubishi UFJ Morgan Stanley Securities construct its scheme.

Indonesia's target building's business operator and Japan's Kanematsu take joint charge of this renewal project.

And that renewal work be jointly implemented by Kyudenko and PT Denki Engineering Installation of chillers and BEMS would be done by Japanese manufactures.

(5) Renewal plan

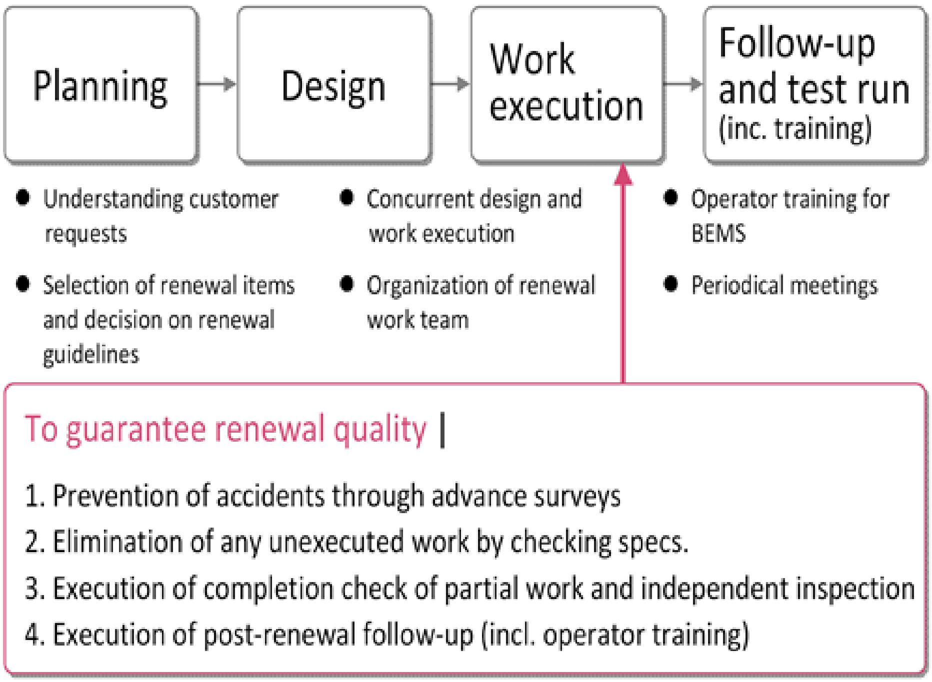


Figure 6-20: Renewal plan

The Figure 6-20 shows the four major processes of our renewal plan. We would plan to adopt the concurrent building method. This means that while we discussed the design with you, work would be executed at the same time. Various checks on renewal time and guidelines would be carried out, to guarantee renewal quality. After completion, we would regulate all renewal equipment, carry out a test run, and train your operators to control energy use using BEMS.

（6）Proposed renewal schedule

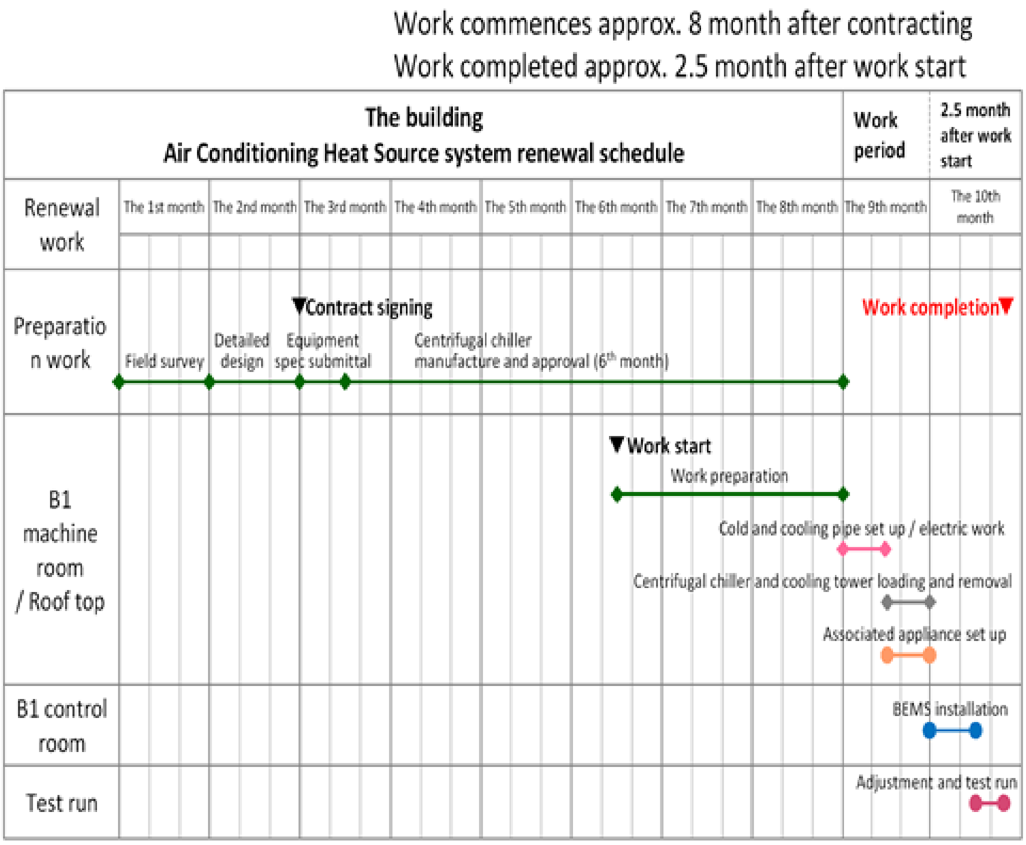


Figure 6-21 : proposed renewal schedule

The Figure 6-21 shows our proposed renewal schedule for the target building's air conditioning system. It is assumed that we would receive the building's business operator approval on specifications for air conditioning units and ancillary equipment about 8 months after contract signing. And after the work started, about 2.5 months would be needed to finish. Renewal for two floors would take about one mouth.

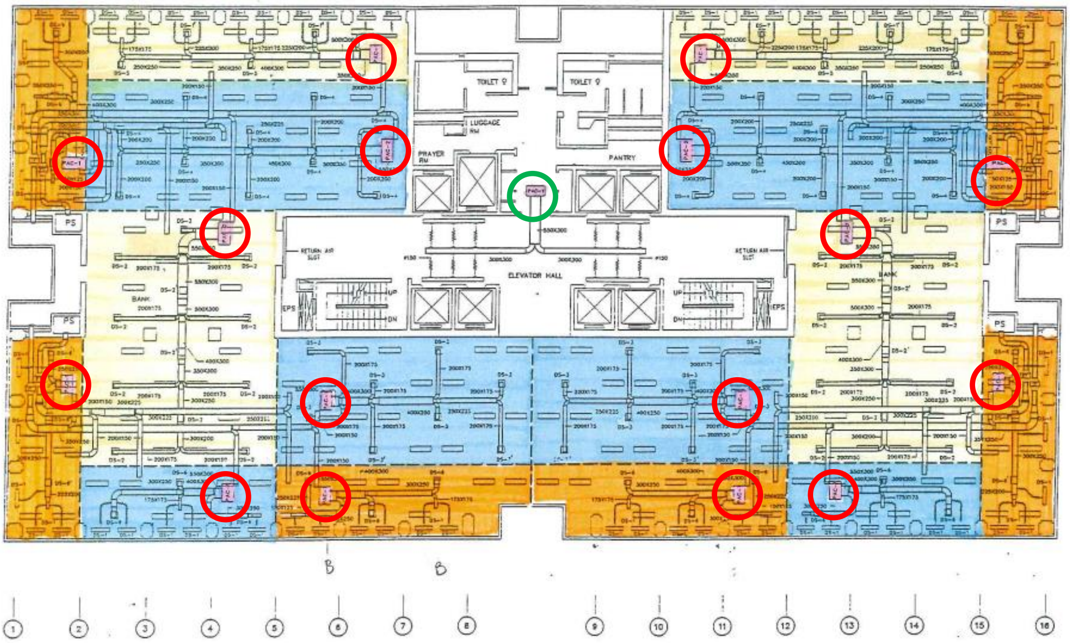
（7）Joint Crediting Mechanism Approved Methodology of the renewal plan.

About this building A/C system renewal plan, already apply the methodology JCM__ ID_AM002 __Ver01.0 that has been approved by the Indonesian government, were carried out to calculate the effect size. The table 6-2 and 6-3 show a reduction due to the methodology. The difference between RE:the reference emissions and PE: the project emissions is 243 t-CO2/year. The difference between EE:the existing emissions and PE: the project emissions is 737 t-CO2/year.

6. 4. 2　Office building B

（1） The CO2 reduction proposal by renewal of air conditioning in the office

Air-conditioning of this building is a multi-type air-conditioning unit (an interior unit is a ceiling hide type), and the interior unit and the exterior unit are connected by 1 to 1. 16 sets are installed in each story. Moreover, one set of air-conditioning unit for elevator halls are installed (Figure 6-22). The case study at the time of renewing these air-conditioning units in the newest model is shown in Table 6-3.



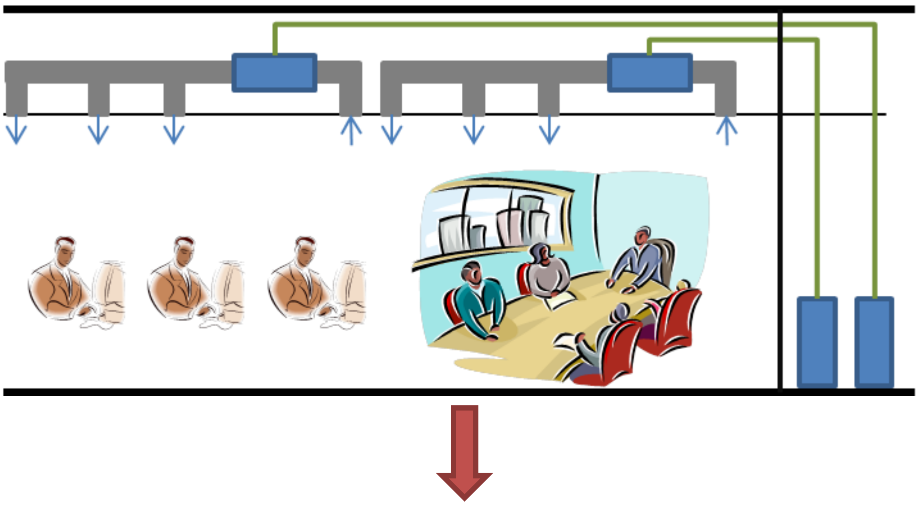
: indoor unit (for office)　: indoor unit (for common area)　: outdoor unit space

Figure 6-22 Layout of air-conditioning unit

Table 6-3 Comparison of before/after specification of air-conditioning unit

ITEM	Existing Equipment	Renewal Equipment
Cooling Capacity	14.0kW	13.5kW
Total Input	5.64kW	4.41kW
EER	2.48	3.06

【Existing image】



【Renewal image】

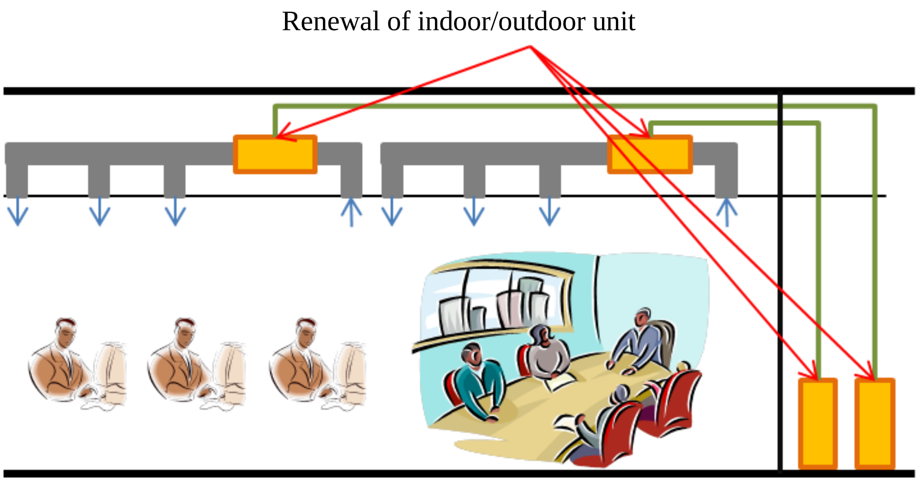


Figure 6-23 Image of renewal of air-conditioning unit

Table 6-4 Case study of CO2 reduction by renewal

FLOOR 1F			Current System(kW)					Recommended System(kW)	
Equip. Name	Indoor Unit	Outdoor Unit	Comp. INPUT	Cond. Fan Input	Evap. Fan Input	Sub total	Grand Total	Sub total	Grand Total
	QTY	QTY	kW	kW	kW	kW	kW	kW	kW
PAC-1/CU-1-1	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-2	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-2/CU-2-3	1	1	15.4	0.6	2.0	18.0	18.0	13.16	13.16
PAC-2/CU-2-4	1								
PAC-2/CU-2-11	1	1	15.4	0.6	2.0	18.0	18.0	13.16	13.16
PAC-2/CU-2-12	1								
PAC-1/CU-1-5	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-6	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-7	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-8	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-9	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-10	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-13	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-14	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-15	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-16	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-17	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-6/CU-6-18	1	1	1.4	0.15	0.05	1.6	1.6	5.00	5.00
PAC-6/CU-6-19	1	1	1.4	0.15	0.05	1.6	1.6	5.00	5.00
Total							112.52		93.65

Table 6-5 Case study of CO2 reduction by renewal

FLOOR 2F-19F			Current System(kW)					Recommended System(kW)	
Equip. Name	Indoor Unit	Outdoor Unit	Comp. INPUT	Cond. Fan Input	Evap. Fan Input	Sub total	Grand Total	Sub total	Grand Total
	QTY	QTY	kW	kW	kW	kW	kW	kW	kW
PAC-1/CU-1-1	17	17	4.8	0.24	0.6	5.64	95.88	4.41	74.97
PAC-1/CU-1-2	17	17	4.8	0.24	0.6	5.64	95.88	4.41	74.97
PAC-1/CU-1-3	17	17	4.8	0.24	0.6	5.6	95.9	4.41	74.97
PAC-1/CU-1-4	17	17	4.8	0.24	0.6	5.64	95.88	4.41	74.97
PAC-1/CU-1-5	17	17	4.8	0.24	0.6	5.6	95.9	4.41	74.97
PAC-1/CU-1-6	17	17	4.8	0.24	0.6	5.64	95.88	4.41	74.97
PAC-1/CU-1-7	17	17	4.8	0.24	0.6	5.64	95.88	4.41	74.97
PAC-1/CU-1-8	17	17	4.8	0.24	0.6	5.64	95.88	4.41	74.97
PAC-1/CU-1-9	17	17	4.8	0.24	0.6	5.64	95.88	4.41	74.97
PAC-1/CU-1-10	17	17	4.8	0.24	0.6	5.64	95.88	4.41	74.97
PAC-1/CU-1-11	17	17	4.8	0.24	0.6	5.64	95.88	4.41	74.97
PAC-1/CU-1-12	17	17	4.8	0.24	0.6	5.64	95.88	4.41	74.97
PAC-1/CU-1-13	17	17	4.8	0.24	0.6	5.64	95.88	4.41	74.97
PAC-1/CU-1-14	17	17	4.8	0.24	0.6	5.64	95.88	4.41	74.97
PAC-1/CU-1-15	17	17	4.8	0.24	0.6	5.64	95.88	4.41	74.97
PAC-1/CU-1-16	17	17	4.8	0.24	0.6	5.64	95.88	4.41	74.97
PAC-1/CU-1-17	17	17	4.8	0.24	0.6	5.64	95.88	4.41	74.97
Total							1,629.96		1,274.49

Table 6-6 Case study of CO2 reduction by renewal

FLOOR 20F			Current System					Recommended System	
Equip. Name	Indoor Unit	Outdoor Unit	Comp. INPUT	Cond. Fan Input	Evap. Fan Input	Sub total	Grand Total	Sub total	Grand Total
	QTY	QTY	kW	kW	kW	kW	kW	kW	kW
PAC-1/CU-1-1	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-2	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-2/CU-2-3	1	1	15.4	0.6	2.0	18.0	18	13.16	13.16
PAC-2/CU-2-4	1								
PAC-2/CU-2-13	1	1	15.4	0.6	2.0	18.0	18	13.16	13.16
PAC-2/CU-2-14	1								
PAC-1/CU-1-5	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-6	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-7	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-8	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-9	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-10	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-11	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-12	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-15	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-16	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
PAC-1/CU-1-17	1	1	4.8	0.24	0.6	5.64	5.64	4.41	4.41
Total							109.32		83.65
Grand Total							1,851.8		1,451.79

On the following conditions, we make the trial calculation of the annual amount of electric power reduction.

- Operation time per day: 12 hours
- Annual operation days: 250 days
- Annual average load factor: 0.8

Table 6-7 Cost simulation of renewal

Item	Unit	Value
Electricity consumption of existing equipment	kWh/year	4,444,320
Electricity consumption of renewal equipment	kWh/year	3,484,320
Annual electricity consumption	kWh/year	**960,000**
Annual cost reduction of electricity*1	IDR/year	1,056,000,000
Annual CO2 emission reduction *2	t-CO2/year	**781**
Investment (Rough estimation)	IDR	30,000,000,000
Payback period	year	**28.4**

*1: 1,100IDR/kWh *2: 0.814t-CO2/MWh

(2) The CO2 reduction proposal by renewal of lighting in the office

The layout of the lighting of this building is shown in figure 6-24. Existing equipment is an object for FL36Wx2 lighting, are 380 per one floor, and sets 17 floors as the object of case study.

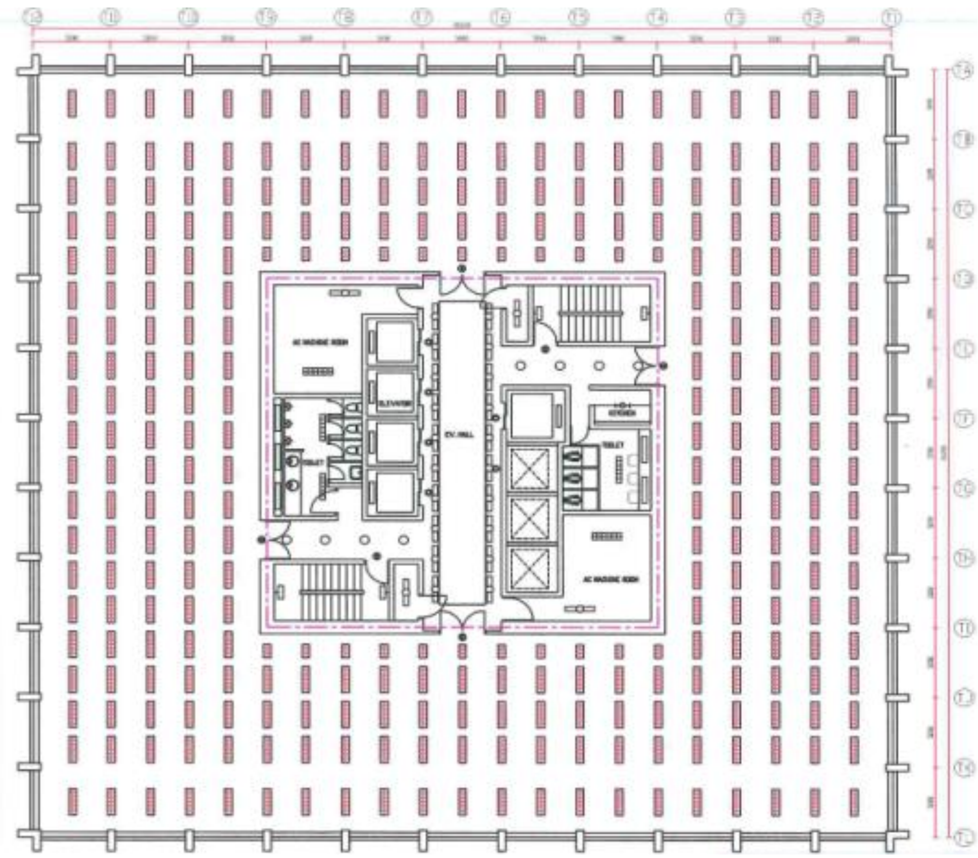


Figure 6-24 Layout of lighting equipment

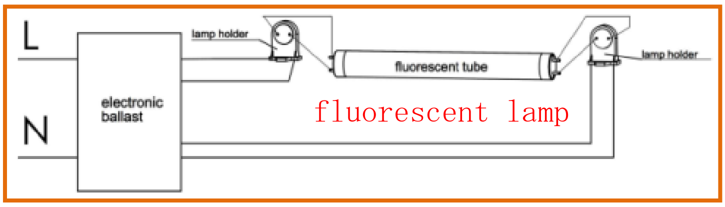
The renewal procedure for replacement the existing fluorescent lamp with LED lamp is shown in figure 6-25.

First, remove the existing ballast as Step 1.

As Step 2, the socket of one side removes wiring and changes it into the state where it is not connecting with electricity. Moreover, wiring substitute among the wiring which became open, and change into the state where only one side connect with electricity.

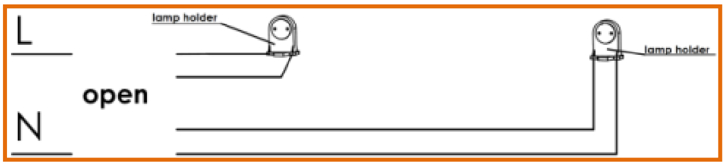
It will be in the state which can be turned on by finally connecting the socket side which can be turned on electricity the power supply input side of an LED lamp.

<Renewal step 1>



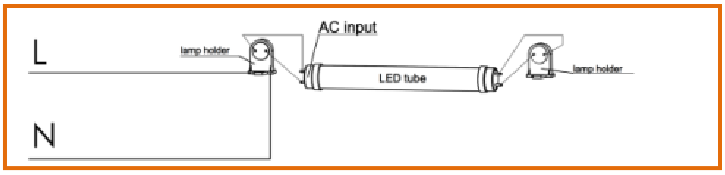
・Remove the existing ballast

<Renewal step 2>



・Wiring substitute with removing the existing ballast

<Renewal step 3>



・Installation of LED lamp

Figure 6-25 Procedure of lighting renewal

The spec. of the equipment which is due to be renewed is shown below.

High efficiency ＞86lm/W

◆Reducing electricity charge
◆Getting brightness with less power consumption

Safety one-side electricity supply

◆Overpower, short, and open circuit protected

Longer lifetime 30,000h

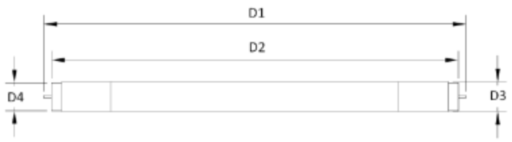
◆Saving maintenance cost

※Not including the fixture
(lamp and power supply only)

Model Name		DL-0TA1U	DL-0TA2U	DL-0TA3U
Optical feature	Luminous flux	1,600lm	1,650lm	1,600lm
	CRI	80		
	Color temperature	4,000K	5,000K	6,000K
	View Angle	150°		
Electric character	Rated input voltage	AC 100V-277V, 50Hz/60Hz		
	Power supply	Built In		
	Power consumption	18.5W		
	Efficiency	86 lm/W	89 lm/W	86 lm/W
Basic specification	Lifetime	30,000h *		
	Base	G13		
	Dimension	ϕ27.0 x 1,198mm		
	Weight	210g		
Operating temperature range	-10 ～ 45℃			
IP Level	20			

＊Estimated Lifetime calculate as LLMF 70%

Outside Dimension



Tube Length (D1)	1,212 mm
Tube Length (D2)	1,198 mm
Tube Diameter (D3)	ϕ 27.0 mm
Tube Diameter (D4)	ϕ 25.0 mm

Figure 6-26 Spec of LED lamp

Existing fluorescent lighting equipment consumes 72W per unit, since an LED lamp consumes 18.5W, it can expect reduction of about 70% of power consumption. The projection of annual power consumption and the amount of CO2 reduction is shown in table 6-8.

Table 6-8 Impact of replacement with LED

項目	単位	値
Electricity consumption of existing equipment	kWh/year	1,294,894
Electricity consumption of renewal equipment	kWh/year	307,537
Annual electricity reduction	kWh/year	**987,357**
Annual cost reduction of electricity *1	IDR/year	1,086,092,410
Annual CO_2 emission reduction *2	t-CO_2/year	**803.7**
Investment (Rough estimation)	IDR	1,692,520,000
Payback period	year	**1.56**

With regard to project scheme, as basic a "financing programme for JCM model projects", to establish an international consortium, such as shown in Figure 6-27.

Facility Installation, implementation of MRV and PDD, we are considering that it execute collaboration with local partners and Japanese companies basically.

In addition, shown as the schedule in Figure 6-8, we are considering that to be adopted JCM. According to This action, it is believed to be carried out facility installation and inspection in 2015 fiscal year.

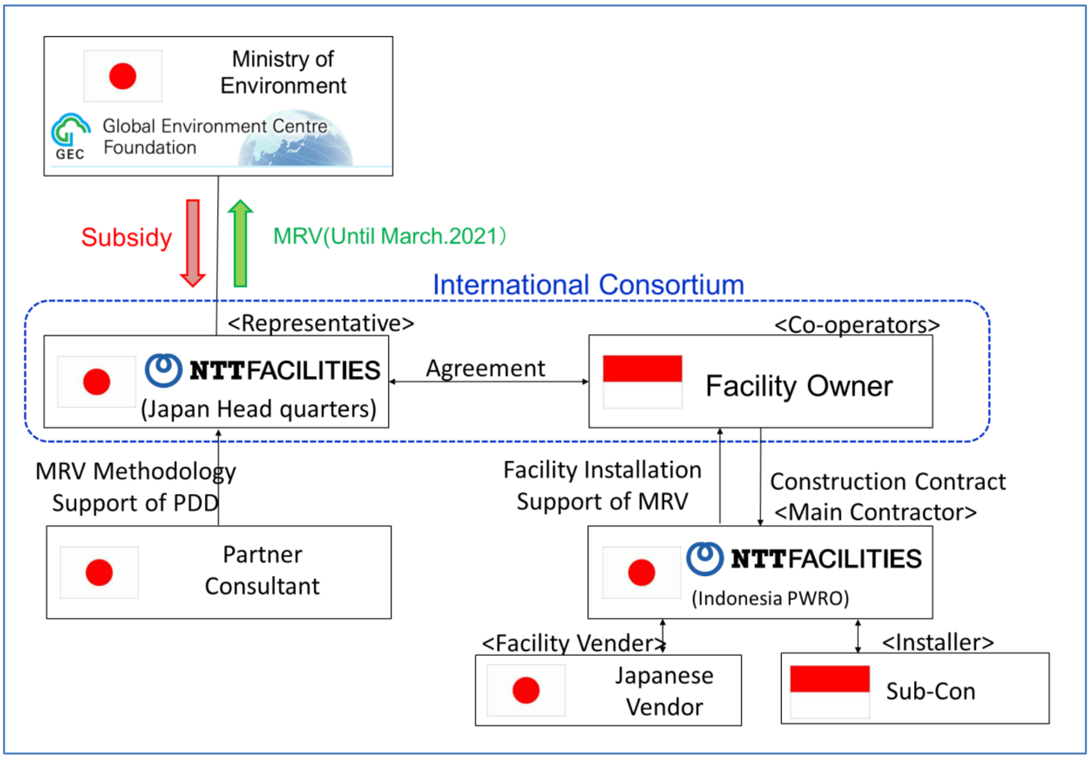


Figure6-27 Proposed Project Scheme

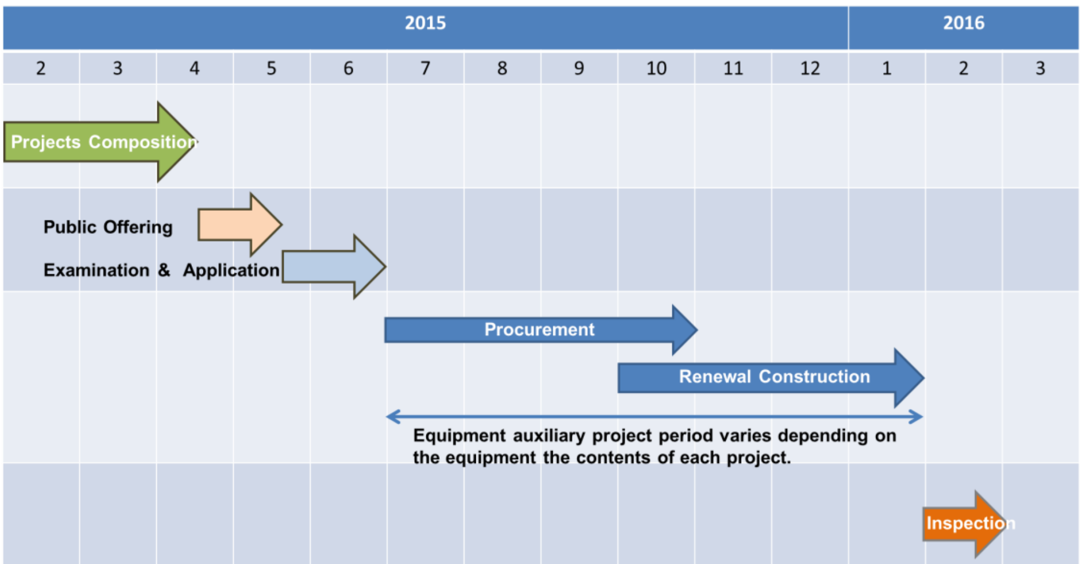


Figure 6-28 Proposed Project Schedule

7. Workshop “Financing Options for Energy Efficiency Projects for Buildings and Industries in Indonesia”

Q&A Summary

Panel Session 1

Mrs. Liana Bratasida, Executive Director, APKI (Indonesia Paper & Pulp Association)

1) To MOI : Mrs. Liana appreciated the efforts of MOI to bring Sustainability issue into the center stage of MOI activities. There are already existing criteria and standards for sustainability that are recognized by Indonesia government, such as PROPER (http://www.menlh.go.id/proper/) and Sustainability Business award, so it is hoped that the standards to be developed by MOI can be synchronized with the existing standards, awards, and criteria.

(Mrs. Shinta) : MOI appreciated the inputs from Mrs. Liana and in fact, they also already do synchronization with existing standards and criteria. In fact, since 2014, MOI has included PROPER as the mandatory criteria for Green Industry award, so each industry considered must first meet PROPER criteria. Mrs. Shinta also urged the financial institutions to utilize PROPER as the criteria for financing accessibility for companies / industries.

2) To JCM Secretariat : How is the progress of International recognition towards JCM, because Indonesia has put a lot of efforts towards this mechanism, and certainly would like it to be recognized by international such as UNFCCC ?

How is the price of Emission Reduction Unit (Carbon Unit) of JCM ? Is it comparable with existing one such as CER of CDM ? Also, how is the allocation towards the project owner and Japanese counterpart.

(Mr. Dicky) : Currently JCM is a bilateral cooperation between Japan and Indonesia (and also with other developing countries). There are 12/13 counterparts of Japan for this JCM, and Japan is continuously participating in international meetings in UNFCCC to gain recognition of JCM and to be included in one of alternate market mechanism, hopefully by Paris Summit 2015. While Indonesia is not the first country which signed JCM, but it is definitely the most advanced country in implementation of the scheme to become the role model by having many FS and demonstration projects. While international recognition is slow, this emission reduction can still be counted in INDCs (Intended Nationally Determined Contributions; http://www.wri.org/indc-definition) towards the reduction of the relevant parties.

About the allocation, it depends on the share of each party in the project. But there is Net Emission Reductions (difference between BAU and average emissions), which automatically belong to Indonesia and can be reported.

About the price, so far the emission reductions achieved between the two countries are not tradable in international market, so the price is 0. The reason for not being tradable is because the basis / scheme has been modified such that there is a grant / upfront payment from Japanese government to compensate for the ER.

(Question from the floor) : Is the technology to be used here must come from Japan ?

(Mr. Dicky) : Yes, it is part of the leapfrog initiative using advanced technologies. In

Indonesia it has been done in 2 cities currently, i.e. Surabaya (for waste management, transportation, EE, etc) and Bandung (smart street lighting, waste management) through JCM.

Panel Session 2

Mr. Widodo Santoso, Indonesia Cement Association (Asosiasi Semen Indonesia – ASI)

1) To Kyudenko : How much investment is needed to achieve efficiency/savings as stated ? From the savings, then cost recovery period can be calculated. In Indonesia, if the cost recovery period is more than 5 years, then it is useless to propose. If JCM can somehow reduce the cost recovery period to make it more attractive, then this scheme would be welcomed, bearing in mind hat 5 years in the typical expected payback period.
2) To NTT-F : For solar panel technology, what is the cost / kWh for the electricity generation from solar panel ?

(Ms. Shimura) : The Japanese companies understood that 8 years is too long for the payback return expected by typical Indonesian companies. JCM scheme can maybe reduce the payback period to the expected one, and there will be further negotiation between the companies and the client about this. For the solar panel, the cost is not able to be disclosed, and it is up to the parties' negotiation.

Mrs. Shinta Sirait, Ministry of Industry

Suggestion : The relevant parties involved should move the project towards implementation / commercialization stage, and not only until end of FS. So, it is important to have several rounds of negotiation with prospective client(s), taking into consideration the local price (as the contractors building the system will be local) to bring the price to a feasible level.

1) To NTT-F : How much space / area is needed to produce electricity from solar panel ? Also, what is the feasible size of the solar project ?

(Mr. Hakuta) : For 1 kW, the space required for the panel is around 10 – 15 m2. The feasible size for a solar project, based on previous experience, is around 100 kW.

Panel Session 3

Mr. Ari Rahmadi, BPPT (Ministry of Research and Technology)

To Apkenindo : What is the most significant barrier in implementing Energy Efficiency project, and what can Apkenindo do to mitigate / reduce the barriers ?

(Mr. Judianto Hasan) : Some of the significant barriers in Indonesia context are high interest rate and availability of ESCO / Energy Efficiency fund (which is available in some other countries). How Apkenindo do to mitigate the barriers is to represent the companies and members to bring up the issues to regulators (e.g. Ministry of Finance) and also to share the issues in national forum / events.

2nd thing is about the regulation on ESCO contract. Most of the ESCO project currently is still in small-scale and mostly are guaranteed savings based. ESCO regulation is still under development right now, and it is hoped that once the regulation is in place, it can reduce the barrier, especially for State-Owned companies constraint of a single year budgeting, and to improve the number of ESCO projects with synergy of government and private sector using ESCO shared savings contract.

Mr. Slamet Ristono, PT Grand Indonesia

To OJK : So far the pressing issue for further advancement of EE project is incentives. And currently each ministry relevant in EE is not involved in finance (except for MoF). Thus, it is suggested, especially in building sector, that EE and environmentally friendly building (green building) can be developed if there is a demand for it. One way to create the demand is for example, for BKPM (Investment Coordinating Board) to mandate that companies that are going to invest in Indonesia must have their office located in a certified green building.

In the matter of incentives, for non-technical professionals like Executive officers, getting an incentive (be it tax breaks or subsidy) is perceived to be more prestige rather than just that the facility is saving energy by xx %. So, it is a matter of prestige to get the incentive.

> **(Mrs. Marlina Efrida, OJK) :** As mentioned in the presentation, the incentive scheme is stated in the roadmap of sustainable financing of OJK from 2016 – 2018. So it has to go through step by step process to get approval from relevant stakeholders.
>
> **(Mr. Edi Setijawan, OJK) :** OJK has just discussed with BKF (Fiscal Policy Agency) of MoF, and talking about incentives, there is still a lag in policy from the government as BKF direction is still not going there yet. Rather, they are now considering balancing of incentives and disincentives, such as those environment-friendly projects will have lower VAT compared to those that are not and OJK is also now preparing the related regulations.
>
> Secondly, the problem with financial sector right now is “mismatch”, as the market structure of funding source is mostly for shorter-term projects, especially for banking. Government is also starting to channel the infrastructure funds to the banking to achieve greater multiplier effect. By going into that direction, it is hoped that the funds (including revolving fund) create more leverage rather than channeling to government department.
>
> For the suggestion on using BKPM, OJK can also coordinate the efforts together and communicate them among the departments and government institutions.

Mr. Feri Lasman, PT Tracon Industri

To OJK : Why it takes quite long time to come up with regulations on incentives (targeted 2017) ? In other countries such as Japan, those doing EE project is given 0% interest and possibly some subsidy. In Thailand, the interest rate for EE project is lower at 4%. However in Indonesia the interest rate follows the commercial bank rate, thus EE project cannot be developed in Indonesia and this situation has been ongoing for a long time.

> **(Mrs. Marlina Efrida, OJK) :** OJK will raise the potential issues during the discussion with relevant ministries and institutions, hopefully to accelerate the roadmap implementation.
>
> **(Mr. Edi Setijawan, OJK) :** The schedule is targeting in 2017 because OJK needs to lay foundation for control and monitoring of the incentives to prevent potential misuse and loopholes in the future. One of the efforts that OJK is currently initiating is “Global Public Funds” to gather the funds from investors domestically and overseas. Overseas investment / loan must also be carefully considered such as not to burden the overall balance of payment.
>
> **(Mr. Banu Anang Priyanto, Apkenindo) :** Apkenindo has also make efforts in Business-to-Business sector to create a feasible financial structure while waiting for the incentives and change of regulations. Apkenindo also makes use of private fund from capital markets as part of the efforts to promote EE on greater scale.

Mr. Widodo Santoso, Indonesia Cement Association (Asosiasi Semen Indonesia – ASI)

To OJK : How about the existing incentives that has been given to cement industry ? Will it be ongoing given the possibility that new incentive scheme is coming in 2017 ? Also, now the free trade agreement has covered whole ASEAN and Indonesia companies need to compete globally for market share (given that electricity and gas prices are increasing rapidly now), so the incentives are getting more urgent.

Dr. Idris F. Sulaiman, Indonesia Energy Efficiency & Conservation Society (MASKEEI)

To OJK : Regarding financing of Renewable energy / EE projects, what are the barriers in terms of regulation for funding from Offshore financing ?

> **(Mr. Edi Setijawan, OJK) :** As mentioned before, OJK is now looking to solve issues related to Global Public Funds, including offshore financing, considerating other strategic issues in the government. Once the analysis is finished, the result will be presented to the relevant government and Central Bank of Indonesia.

Mr. Arief Heru Kuncoro, EBTKE, Ministry of Energy and Mineral Resources

It is suggested that Ministry of Finance / OJK can coordinate the efforts to issue regulations regarding the incentives of RE & EE projects, as it is also mentioned in the Energy Law No 30 / 2007 and Government Decree on Energy Efficiency. The regulation may be similar in the form of Ministry of Finance decree (PMK) No 21 Year 2010 regarding Fiscal incentives.

On the topic of revolving fund, the term is now refreshed and called “Energy Efficiency financing facility” and the discussion is also raised with regards to Government guarantee for companies using this facility.

There is also a proposal in cooperation between EBTKE with Fiscal Policy Agency of Ministry of Finance to give “discount” scheme for energy efficient equipment in household such as Air Conditioning and refrigerator.

Mr. Totok Brawijayantoko, PT Asahi Indofood Beverage Makmur

It seems there is no materials focusing to industries in the workshop apart from presentation from Takasago. Industry is especially interested in the use of ESCO and financing to invest on new equipments and to achieve PROPER certification. Who should the industry approach / contact if interested in the program ?

(Mr. Judianto Hasan, Apkenindo) : For B-to-B program, Apkenindo welcomes to have initial discussion and help to coordinate the available proposals and solutions, taking into consideration the success of ESCO in other countries such as Japan, US, Korea, China, and Thailand. As such, ESCO can be considered as an alternative way of financing, taking into consideration the risks and barriers involved such as long term ESCO contract (mostly for Gov’t and State Owned Companies) and high interest rate.

Ms. Dwi Utari, Fiscal Policy Agency, Ministry of Finance

It should be noted that there are many departments / centers within Fiscal Policy Agency. The one doing the research and analysis relevant to energy efficiency is the Centre for Climate Finance and Multilateral Policy (PKPPIM). However, the topics of incentives and subsidy are the domain of budgeting policy center (PKAPBN). Whether it can be approved or not needs a further analysis which is the domain and responsibility of Fiscal Risk Management Center (PPRF).

Panel Discussion

Ms. Grace Yurianne, PT Enercon Indonesia

To OJK : For formulation of EE policy from financing point of view, what are the hurdles / difficulties to realize the policy ? It may be worthwhile to discuss with private sector, represented by Apkenindo. It has been several years since the conception, unfortunately it seems that the realization is still far away.

> **(Mr. Edi Setijawan, OJK) :** I think the development of the policy for ESCO need to be shared across the government institutions (MEMR, MoF, OJK included etc). With the Green movement programs and introduction of ESCO scheme, this concept will be officially introduced into OJK, so it is hoped that the program can go smoothly such that OJK can understand the roles of each stakeholders in the scheme.

Ms. Ade Rafida, IBJ Verena Finance

From the financing models presented so far, is there any scheme that involves having the guarantees (such as buyback guarantee), because ESCO equipment is not easy to be traded (low liquidity), in case of default by the client ?

(Ms. Mari Yoshitaka, MUMSS) : So far there is no guarantee scheme for EE equipment in Latin America. In Japan itself, the team has been discussing with Japan government to provide guarantee program to developing countries, but 100% guarantee may not be good for this kind of business. So there needs to be some arrangement / modification towards the guarantee program for ESCO scheme, e.g. interest rate guarantee.

For the case of Japan, the way to mitigate this risk of default is similar with other countries in general, which depends on credit worthiness of the client.

(Mr. Yoshiyuki Inoue, PT Takasago (TTE)) : In Japan, TTE does joint contract with the leasing companies to offer the complete package to the customer, sometimes with addition of government subsidy / incentives. TTE wants to do the same thing and try to find potential local leasing company as partner. TTE will take care of the engineering and performance aspect while Leasing company takes care of the financing portion including analysis of credit worthiness of the client.

Mr. Slamet Ristono, PT Grand Indonesia

It is recommended to apply leading by example, thus the companies involved in the Energy Efficiency initiatives need to show that the office that they are working in is already having EE measures and has got certification as green building, and not just NATO (no action talk only). E.g. the building of Ministry of Public Works already got platinum award for Green Building. Once the demand is created for more EE measures, the incentives will follow (can be from government or exposure / publicity by media).

Mr. Arief Udhiarto, University of Indonesia

It seems that the import tax for EE equipment is still not attractive (such as solar panel, as it is still considered as luxury item). If the EE equipment can be given tax breaks and subsidy / incentives, it will be helpful to accelerate the diffusion of Energy Efficiency initiatives.

About options of financing schemes from the case of Latin America which were presented by MUMSS, it is suggested to add the description of benefits of each scheme such that it can become a comparative study for MoF / OJK / building owners for consideration.

Feasibility Study Final Report on FY2006 a JCM Large-scale Project for Achievement of a Low-carbon society in Asia

-Feasibility Study on the Establishment of an Energy-saving Promotion Finance Scheme in Indonesia-

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Mitsubishi Research Institute, Inc.
International Project Center
TEL +81-03-6705-5280
E-mail norio@mri.co.jp