Feasibility Studies on Joint Crediting Mechanism Projects towards Environmentally Sustainable Cities in Asia

Feasibility Study on a Large-Scale GHG Emissions-Reduction Project Development in the Iskandar Development Region, Malaysia

March 2014

The Japan Research Institute, Limited

Contents

I. Summary

1. Survey background and purpose

In the Iskandar Development Region (IDR), an environmental agenda has been established based on the idea that the following will be essential elements of future urban development: a) climate change and global warming, b) target setting for a low carbon footprint, and c) the promotion of and positive support for a green economy through increased investment in environmental resources, green technologies and green products. Specifically, the "Low Carbon Society Blueprint for Iskandar Malaysia 2025" (hereafter called LCSBP), a roadmap toward the realization of a low carbon society, aiming at enabling socially, economically and environmentally sustainable development, has been prepared to embody such a society in future.

The purpose of this survey is to advance large-scale GHG emissions-reduction project development under the JCM by embodying the LCSBP in Malaysia's important development area of the IDR, based on the LCSBP or a roadmap to achieve the low carbon society that Japan and Malaysia have worked together to formulate, utilizing the excellent Japanese technologies and products that are now being applied to smart cities.

2. Survey Plan

The implementers of this survey are JRI, Panasonic, and JFS. SMBC is responsible for the finance. Japan's other project-related parties include research institutes such as NIES and Japanese government officials working at the Ministry of the Environment (MOE) promoting the JCM. These agencies

3. Survey results

3-1. Development of the project by the realization of LCSBP

We have gathered information on and analyzed the envisioned programs in the twelve project fields set in the LCSBP. Since the IRDA has the IDR development plan, through their plan's consistency with the LCSBP and its coordination with the existing programs, to enable it to assess how far the LCSBP implementation has progressed and where the needs lie, we have examined fields in which Japanese technologies and products can be utilized to set up demonstration projects.

Comparing more than 10 development projects planned for or underway in the Iskandar area, and their developers according to requirements specified above, we have chosen the projects of Company A and Company B.

3-2. Development of the ESCO projects

For structuring the ESCO projects, we have selected a local ESCO operator, concluded of an agreement with the local ESCO operator, selected by the ESCO operator of buildings for the ESCO project, implemented energy audit by the local ESCO operator and Japan Facility

Solutions for buildings to be included in the ESCO project, prepared an energy audit report and prepared ESCO service proposals.

After 2 months negotiation, as of November 26, 2013, an agreement was concluded between the JFS and TNB-ES. JFS had identified one office building and one shopping-mall building as target buildings for the demonstration of ESCO business. JFS had also implemented energy audit for 6 days from 2nd December. As a result, we have concluded ESCO business will be possible for the shopping-mall building among the demonstration targets.

3-3. Study of the calculation of the effects for GHG emissions reductions

We have calculated the GHG emissions reductions for both projects after examination of the methodologies. As a result of the analyses, we have estimated the reductions as 3,683t-CO2/year for A-project and 859 t-CO2/year for B-project of "Development of the project by the realization of LCSBP", and 1,620 t-CO2/year for shopping-mall building of ESCO project.

4. Summary of the action plan

4-1. Development of the project by the realization of LCSBP

At the sites of the developers that agreed to the utilization of Japanese smart town related technologies and products in town development in the FY2013 F/S, the initiatives will be carried out utilizing the achievements and experience in Japan (Fujisawa) and China (Dalian). Specifically, the initiatives will be implemented for the following two sites in order to achieve the LCSBP and pave the way for the promotion and spread of Japanese smart town related technologies and products.

i. In mixed use development sites with high-rise apartments and commercial facilities, actualize the LCSBP in town development, and plan and review the demonstration in the show villages.

ii. In the mixed development sites of detached housing and apartment houses, plan and review the actualization of the LCSBP in town development.

4-2. Development of the ESCO projects

The ESCO projects (in the fiscal year 2014, the steps immediately before starting construction are regarded as the F/S targets) in relation to the two buildings (a commercial facility and an office building) where the energy audit were conducted in 2013. In fiscal year 2015, the steps including the actual installation of equipment are planned to start.

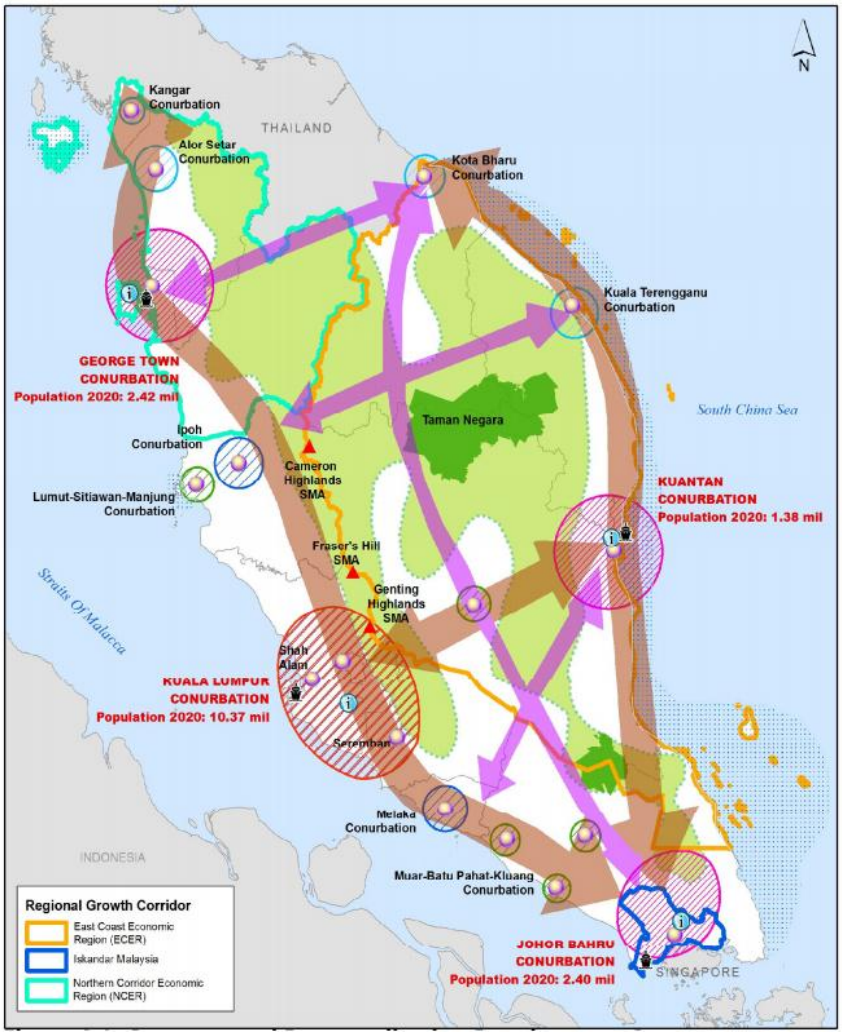
II. Results of the Survey

1. Survey background and purpose

1-1. Background of the survey

Malaysia, aiming at joining the ranks of developed countries by the year of 2020, has formulated and been promoting the 10th Malaysia Plan 2011-2015 and the Economic Transformation Program, in which the Malaysian government specifies the principal economic fields. Concurrently, Malaysia has designated five priority large development areas called "economic corridors." In the plan, program and corridors, the Iskandar Development Region Project for large-scale urban development is ranked among the especially important projects.

Figure 1-1-1: Malaysia's national development plan



Source: Malaysian National Physical Plan

The Iskandar Development Region Project is designed as a large-scale urban development with the aim of improving the existing industries such as the electric power industry, electronics industry and petrochemical industry as well as at developing new industries including finance and education in a target development area of 2,216.3 square kilometers (2.5-3 times larger than Singapore, which is located close to the southern boundary) in the southernmost region of Johor state in the Malay Peninsula. In the five characteristic blocks, development started in 2006. By the year of 2025, it is expected that the following will be developed: an airport, a port and harbor, a research and development base for advanced technologies, factories, educational institutions, hospitals, a theme park, financial center, large commercial facilities, high-class condominiums, detached houses, etc.

Figure 1-1-2: Outline of the Iskandar Development Region

Zone	Area name	Main purpose
Zone A	Johor Bahru City Centre	Business district
Zone B	Nusajaya	New city hall and high-class residential district
Zone C	Western Gate	Transportation base
Zone D	Eastern Gate	Educational district and industrial park
Zone E	SENAI SKUDAI Airport	Transportation base

Source: Adapted from the SJER CDP 2006 - 2025

In the Iskandar Development Region (IDR), an environmental agenda has been established based on the idea that the following will be essential elements of future urban development: a) climate change and global warming, b) target setting for a low carbon footprint, and c) the promotion of and positive support for a green economy through increased investment in environmental resources, green technologies and green products. Specifically, the "Low Carbon Society Blueprint for Iskandar Malaysia 2025" (hereafter called LCSBP), a roadmap toward the realization of a low carbon society, aiming at enabling socially, economically and environmentally sustainable development, has been prepared to embody such a society in future.

The LCSBP is a result of the Science and Technology Research Partnership for sustainable development (SATREPS). This program, assisted by the Japan International Cooperation Agency (JICA) and the Japan Science and Technology Agency (JST), was carried out through collaboration among Universiti Teknologi Malaysia (UTM), Kyoto University, Okayama University, the National Institute for Environmental Studies (NIES) and others.

At the COP17, UTM and NIES jointly hosted a side event entitled "Low Carbon Society in Asia: from Planning to Implementation" to report on how the low carbon society scenario for IDR had been developed. At the COP18, under the title "Low Carbon Actions in Asia: Modeling to Bridge Science and Policy," the role of models bridging science and policy toward the realization of a low carbon Asia was discussed.

In December 2012, Malaysia's Prime Minister Najib Razak announced the LCSBP officially and expressed the Malaysian government's determination to aim at implementing it. Then, the Iskandar Regional Development Authority (hereafter called IRDA) Chief Executive Ismail Ibrahim announced that they would launch implementation of the programs planned for the LCSBP by March 2013.

Currently, twelve actions, 53 sub-actions, 96 initiatives and 300 programs are specified in the LCSBP. To implement these, it is necessary to develop plans incorporating the following: implementers and stakeholders, technologies and products, methodology, schedule, location, etc. For the development of implementation plans, knowledge and experience in smart city project development are essential. The "Fujisawa Sustainable Smart Town" (hereafter called the FSST), on which the cosponsor Panasonic has been working in Fujisawa City, Kanagawa, is of great interest to the IRDA as the embodiment of a "low carbon society" by utilizing excellent Japanese technologies, including solar power generation, energy-saving home appliances and LED illumination so that Panasonic's proposal for commercialization based on the FSST in IDR is attracting attention from the IRDA as a concrete measure under the LCSBP. In addition, for ESCO mentioned in the LCSBP, the cosponsor Japan Facility Solutions (JFS) not only has excellent credentials in Japan, but has also worked on schemes that are operating overseas as well. Their know-how can contribute to the implementation of the LCSBP.

In Malaysia, six feasibility surveys on projects related to the Bilateral Offset Credit Mechanism and Joint Crediting Mechanism (hereafter called BOCM and JCM respectively) have been conducted. Based on the technological field, they can be divided into three: building energy saving (2 surveys), renewable energy (3 surveys) and reductions in N_2O emissions (1 survey). Through these feasibility surveys, knowledge on the introduction of renewable energy and energy

management systems (EMS) expected to be developed in the LCSBP has been accumulated. As a result, it can be expected that large-scale GHG (greenhouse gas) emissions-reduction project development will be further advanced by utilizing this knowledge.

As described above, this survey is backed by the following "timely" circumstances: a) the LCSBP was formulated and announced in 2012, when full-scale IDR development, the most important project in Malaysia, began; b) the IRDA has taken an interest in Japanese technologies and products to implement the LCSBP while Japanese companies can develop feasible implementation plans based on their knowledge and experience; and c) six BOCM/JCM project feasibility surveys were conducted so that the knowledge for large-scale GHG emissions-reduction project development has been accumulated.

1-2. Purpose of the survey

In international negotiations on GHG emissions reductions, the "two-degree target" to hold the rise in global temperature below two degrees compared to that before the Industrial Revolution is critical while closing the "gigaton gap", referring to the amount of insufficient reduction, is a major challenge. For closing the gigaton gap, it is necessary to lift the reduction targets and reduction actions set by countries to a higher level. Particularly in Asian and Oceanian countries where significant economic growth can be seen, it is important to build sustainable low carbon societies by establishing low carbon emissions and low resource consumption while improving the standard of living through economic development. These countries are on the road to economic growth so that they may retrace the path of energy- and resource-wasting development that developed countries have followed for economic or social reasons.

Meanwhile, Japan, recognizing the importance of the two degrees target, is trying to set its own GHG emissions reduction targets to close the gigaton gap and to promote GHG emissions reductions by using excellent Japanese technologies and products through JCM in cooperation with developing countries. Memorandums of understanding on JCM have already been signed with Mongolia and Bangladesh. Negotiations with Indonesia and Vietnam are also underway. Thus, in developing countries focusing on Asia, the understanding of JCM has grown and interest in it has increased. Therefore, as the next step leading to a low carbon society, it is necessary to find, develop and implement GHG emissions reduction projects in JCM. Although feasibility surveys on BOCM/JCM projects have been conducted, the past CDM-related project feasibility surveys could hardly result in actual projects. In light of this fact, it is important to conduct feasibility surveys under a system with the perspective that projects will actually be implemented.

For feasibility surveys from the perspective of setting up practical projects, it is effective to follow the following procedures: 1) Specify the area; 2) Specify the partner country's counterparts having an interest in and authority to establish the development or project in the area; and 3) Coordinate and reach an agreement on specific projects while carefully trying to improve mutual understanding. This procedure can not only make it easy to match Japan's needs with the partner country's needs appropriately, but also make it possible to utilize the partner country's development plans so as to formulate a GHG emissions reduction project on a large scale. Since, with the counterpart serving as the base, feasibility surveys can be conducted while involving the stakeholders on both sides within the JCM framework, it can be expected that the feasibility of the project will be significantly increased.

Based on this recognition, the purpose of this survey is to advance large-scale GHG emissions-reduction project development under the JCM by embodying the LCSBP in Malaysia's important development area of the IDR, based on the LCSBP or a roadmap to achieve the low carbon society that Japan and Malaysia have worked together to formulate, utilizing the excellent Japanese technologies and products that are now being applied to smart cities.

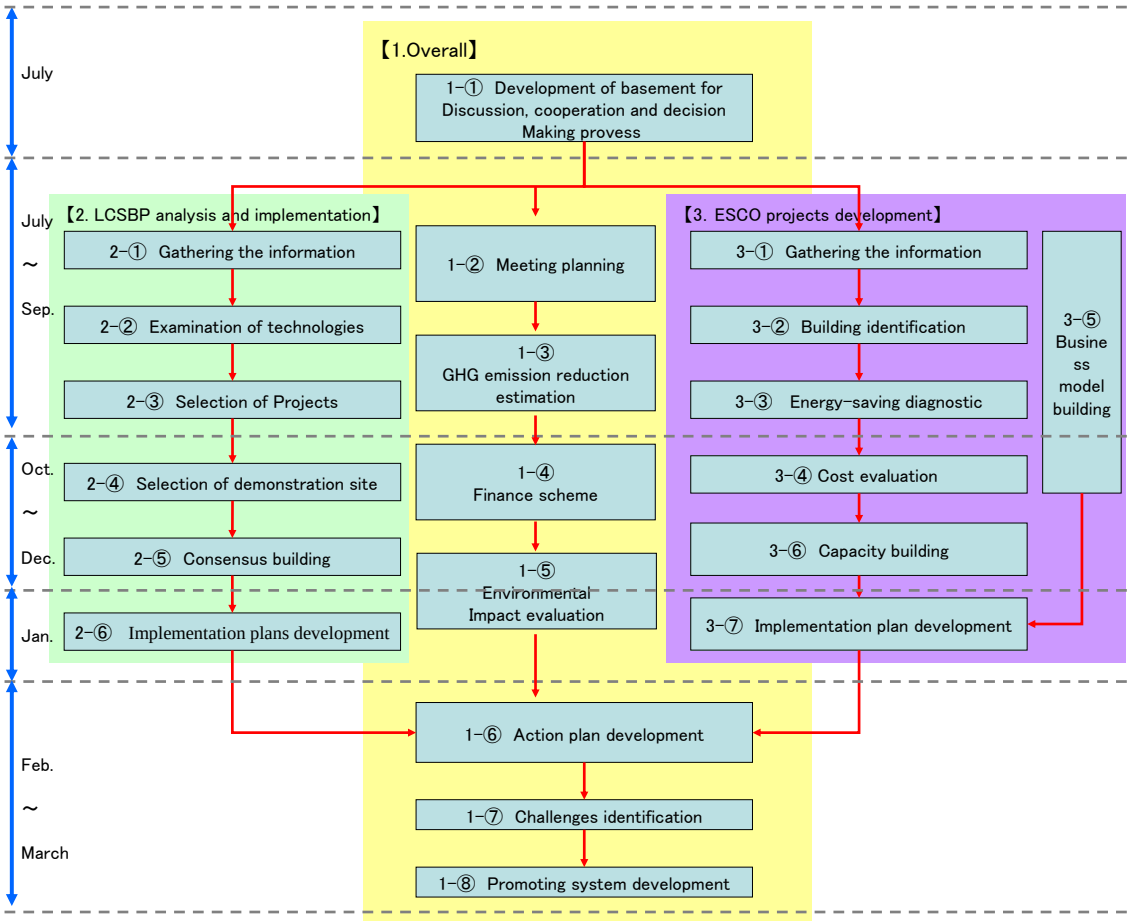
For large-scale development, the Japan Research Institute (JRI) in charge of the overall operation and maintenance of this survey should establish a system of continuous cooperation with the IRDA, Malaysia's counterpart. Centering around this system, the following should be involved in and cooperatively promote this survey: private companies including Panasonic and JFS that have the technologies and products to realize GHG emissions reductions as well as Sumitomo Mitsui Banking Corporation (SMBC) with knowledge regarding finance, and the partner country's stakeholders, including land owners in the IDR and local ESCO companies. As the need arises, they should ask for advice from the research institutes and universities involved in the formulation of the LCSBP including Kyoto University, Okayama University, NIES and UTM. In addition, this puts in perspective the incorporation and demonstration of the initiatives taken for the realization of a low carbon society that Japan and Malaysia have promoted through this large-scale GHG emissions-reduction project development under the JCM so that this survey can spread these initiatives within Malaysia as well as to other Asian and Oceanian countries.

2. Survey plan

2-1. Overall view and schedule of the survey

The implementers of this survey are JRI, Panasonic, and JFS. SMBC is responsible for the finance. Japan's other project-related parties include research institutes such as NIES and Japanese government officials working at the Ministry of the Environment (MOE) promoting the JCM. They have conducted a survey on the items shown in the overall view given below after organizing a GHG emissions reduction project under the JCM as well as through the missions and concrete roles of, and the authority and relations among, the parties concerned in IDR, in cooperation with other organizations involved in IDR, including the IRDA, the Federal Department of Town and Country Planning (JPBD) and UTM.

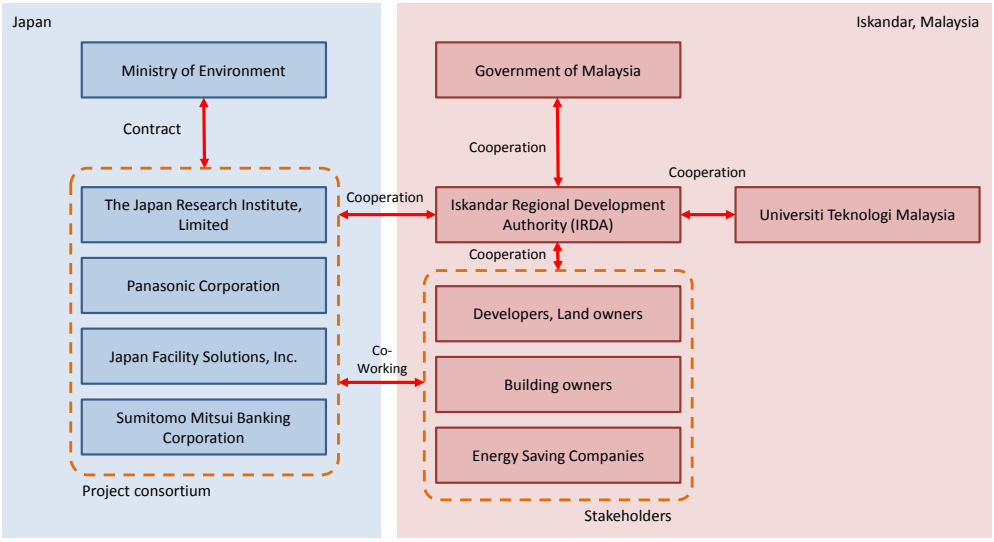
Figure 2-1-1: Overall view of the survey



2-2. Structure of the survey

This survey was conducted under the structure illustrated below.

Figure 2-2-1: Structure of the survey



3. Survey results

3-1. Outline of the survey field

3-1-1. The survey filed

(1) Basic information on Malaysia

Malaysia is located in the middle of Southeast Asia. The national land contains the Malay Peninsula and part of Borneo Island with the states of Sabah and Sarawak. The total land area of the Malay Peninsula and part of Borneo Island is about 330,000 square kilometers, a little under 90% of the size of Japan.

By administrative divisions, Malaysia consists of thirteen states and three federal territories, including the capital Kuala Lumpur[1]. Eleven out of the thirteen states are situated in the Malay Peninsula and the two other states are situated on Borneo Island.

About 70% of Malaysia's land is covered by tropical rainforests. Its climate is also a tropical rainforest climate. The temperature difference between regions is not large, but the rainfall varies according to the region.

Malaysia is a multiethnic country with a population of about 29 million including the majority Malay (67%), Chinese (25%) and Indian (7%) ethnic populations. Multiple languages are used such as the native language Malay, as well as Chinese, Tamil and English.
In Malaysia, the population living in urban areas increased rapidly up to the 1990s so that the urban population reached 50% in 1990 from less than 20% in 1950. Even today, the urban population is increasing gradually but the pace of growth is expected to slow.

[1] The thirteen states are: Johor, Kedah, Kelantan, Mulaka, Negeri Sembilan, Pahang, Pulau Pinang, Perak, Perlis, Selangor, Terengganu, Sabah, and Sarawak. The three federal territories are: WP Kuala Lumpur, WP Labuan, and WP Putrajaya.

The following lists general data on Malaysia.

Table 3-1-1 : Outline of Malaysia

Profile	Data
Total area	329,847 km²
Population	28,334,135 (in 2010)
Capital	Kuala Lumpur
Number of households	6,396,174 (in 2010)
Average household size	4.43 persons
Population Density	85.9 people/km²
Ethnic composition	Bumiputra: 61.8%, Chinese: 22.6%, Indian: 6.7%, Others: 0.7%, and Foreigners: 8.2%
Language	Official language: Malay Others: English, Chinese and Tamil
Religion	Established religion: Islam
Political system	Federal constitutional monarchy (Commonwealth member)
Currency	Ringgit (1 ringgit ≒ 31 yen: Average in 2013)
GDP	30.473 billion USD
Per-capita GDP	10,344 USD
Japanese living in Malaysia	10,411 persons (in 2011)
Number of Japanese companies	1,407 (in 2010)

Source: Prepared by the survey mission based on various materials

Johor Bahru City is the capital of and the largest city in Johor State. This city, situated at the southernmost point of Johor, functions as the gateway to Singapore.

The population of this city was about 1.39 million in 2010 and the population density is 1,304 people per square kilometer. In terms of ethnic composition, Bumiputra account for 47.5%, while Chinese account for 34.2%, or one-third of the population. The area of this city accounts for only about 5% of the total area of the state, while the population accounts for about 40% of the total population of the state, which makes this a comparatively large city. In addition, about 90% of the Japanese living in Johor live in Johor Bahru City.

The “Iskandar Project” is an urban development project implemented for the long-term urban improvement of this city. The project aims at developing an exciting area with seamless urban

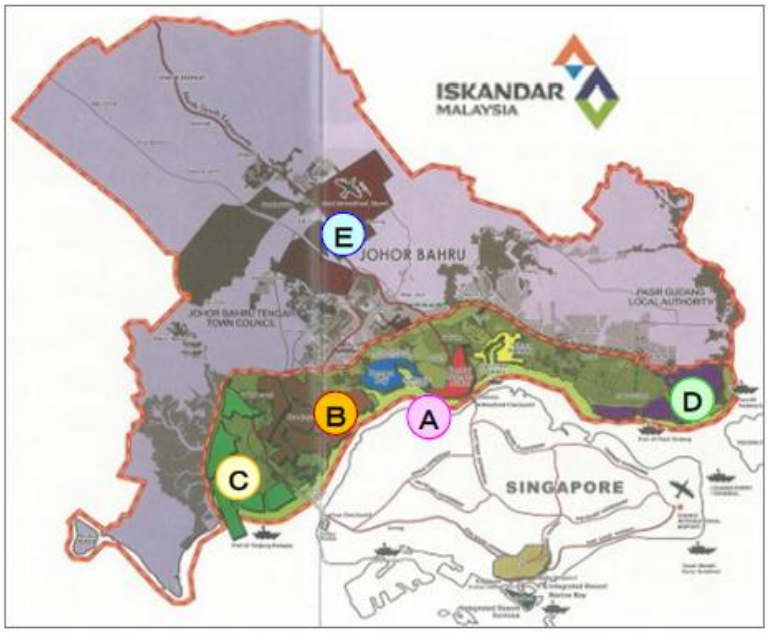
functions including living, entertainment, tourism and business, as the most developed area in the southern Malay Peninsula.

Iskandar is trying to optimize the use of the geographical characteristic of its close proximity to Singapore. Its “advantages” as recognized by the IRDA are the following conditions:

- It is possible to travel between other growth centers in Asia such as Bangalore, Dubai, Hong Kong, Seoul, Shanghai, Taipei and Tokyo within 6-8 hours;
- This area has easy access to the sea, being close to the three major ports of Pasir Gudang, Tanjung Pelepas and Tanjung Langsat; and
- This area, connected to Singapore by two connecting bridges with a railroading plan, has good access to this 8-million consumer market in Asia.

Iskandar has promoted a policy of utilizing the advantages of Malaysia’s workers including their globally competitive wage levels, the low inflation rate, the high rate of retention of workers, the world-class levels of education, and the multilingual human resources, by providing the best business environment in the southern Malay Peninsula.

Figure 3-1-2: Main development areas in the Iskandar Project



Source:IRDA

In the Iskandar Project, a policy to enhance functions by utilizing the characteristics of each area has been promoted.

Table 3-1-3: Development details of the main development areas in the Iskandar Project

Zone	Outline
A	● Target: Johor Bahru city center ・ Improvement as a financial district ・ Improvement as a business center ・ Waterfront development ・ Improvement of the Johor-Singapore Causeway
B	● Target: Area centering around Nusajaya ・ Improvement as an administrative complex in Johor ・ Improvement as a medical hub ・ Improvement as an educational city ・ Improvement as an international resort ・ Improvement as a logistics base ・ Improvement of residential districts
C	● Target: Area around Tanjung Pelepas Port ・ Improvement as a customs-free free-trade zone ・ Improvement as a sub-transportation route between Malaysia and Singapore ・ Protection and improvement of environmental assets
D	● Target: Pasir Gudang Port and Tanjung Langsat Port ・ Improvement around the Tanjung Langsat Technology Park ・ Improvement of warehouses and logistics centers
E	● Target: Senai-Sukdai Area ・ Improvement around Senai International Airport ・ Improvement of warehouses and logistics centers

The area to be developed in the Iskandar Project is 2,217 square kilometers. The set development period is the twenty years from 2006 to 2026. Up to the end of 2010, 69.4 billion RM (Malaysian Ringgit) was invested. This investment amount exceeds the initial target set at 47.0 billion RM.

● Outline of the main areas in Johor Bahru City

This city can be divided into several areas according to its geographical features. It is characteristic of this city that urban areas spread concentrically around the city center connected to Singapore by the Joho-Singapore Causeway. The western coast has been developed over a long period as a high-class residential district and administrative district, while residential districts have spread to the northwest. Recently, new houses and condominiums have been

actively developed in the east and Taman Molek.

Area	Outline
City center	This is the southernmost gateway to Malaysia and the central urban area of Johor Bahru, which is connected to Singapore by the Johor-Singapore Causeway. The largest complex in the city, the "City Square", is a high-rise building with 36 stories above ground. Levels up to the 5th floor are used for commerce while the 6th floor and upwards is used as offices. The tenants include many local subsidiaries of Japanese companies.
Northwest	This is a residential area with a small number of high-rise office buildings or condominiums and a large number of terraced houses or detached houses in which local people live. There are a small number of relatively new houses.
Western coast	This area has many detached houses with large premises and some residences of powerful local figures. An atmosphere as a high-class residential area can be enjoyed from the coastal road through the interior. There are many public facilities as well.
Nusajaya	This area is designed as an accumulation of offices, houses, commerce, government facilities, hotels, entertainment, education, medical facilities, etc., in the Iskandar Project. The land, which used to be covered by large plantations, was cleared to build the state government building of Johor. Currently, in the interior, a residential district centering on a golf course is being developed. In March 2013, ferry services linking Nusajaya to the center of Singapore started.
Eastern coast	This area is under development as a new residential area. In the vicinity, the large JUSCO commercial facility can be seen. In the northeastern residential district Seri Alam, a Japanese school is located and its school bus goes around waterfront condominiums. This is why the families of many Japanese representatives live there.
Taman Molek	This is a mature, popular residential area with orderly districts. Many Japanese who immigrated after their retirement or who have been assigned as representatives live in a series of condominiums constructed by Taisei Corporation (Molek Pine),
Austin	A large rubber plantation used to cover this area and housing development has been implemented over a period of 20-30 years. In particular, in the western part, a new residential district that began to be developed as Seri Austin consists of rows of relatively new semi-detached houses and cluster houses.

3-1-2. Development of the cooperation framework with the local partners

For the development of the cooperation framework with the local partners, we had invited local parties in July to hold an “Inception Workshop” in Iskandar. We asked the IRDA to inform local parties about this workshop so as to attract more than 60 local participants. The objective and details of the workshop are described below.

1. Objective

The objective of this WS is to explain the Ministry of the Environment Japan Low Carbon Society feasibility study in Iskandar to the relevant local stakeholders and build a network for smooth project implementation.

2. Date and Venue

The morning of 16th July (half day) at meeting rooms in Thistle Johor Bahru

3. Agenda

9:00 Opening remarks (Pn. Maimunah, Head of the Planning and Compliance Division and Environment Division, IRDA)

9:10 Plenary Session 1

- Low Carbon Society Blueprint for Iskandar and toward its implementation (Mr. Boyd, IRDA、Prof. Ho, UTM)
- MOEJ LCS FS in Iskandar (Mr. Kotaro Kawamata, MOEJ)

10:10 Coffee break

10:30 Breakout Sessions

1. Smart Town (Panasonic)
2. Energy Savings (Japan Facility Solutions)
3. Low Carbon Water Supply System (Pacific consultants)
4. Strategic Promotion of the Recovery and Destruction of Fluorocarbons (DOWA ECO-SYSTEM and Institute for Global Environmental Strategies (IGES), Japan)

11:45 Plenary Session 2:

- Report from the breakout sessions
- Activities to Contribute to Sustainability (SMBC)

12:30 Closing

4. Participants

- Malaysia side: Pn. Maimunah, Mr. Boyd, Mr. Engku, IRDA; Prof. Ho, UTM; Developers, Local partners including the Malaysia ESCO Association.
- Japan side: Mr. Kotaro Kawamata, MOEJ; Mr. Koichi Okabe, JICA; Corporations involved or to be involved in the Low Carbon Society project.

Photo 3-1-1. Inception Workshop

3-2 Development of the project for the realization of LCSBP

3-2-1. Gathering information and analysis on the LCSBP

We should gather information on and analyze the envisioned programs in the twelve project fields set in the LCSBP. Since the IRDA has the IDR development plan, through their plan's consistency with the LCSBP and its coordination with the existing programs, to enable it to assess how far the LCSBP implementation has progressed and where the needs lie, we have examined fields in which Japanese technologies and products can be utilized to set up demonstration projects.

i) Outline of the LCSBP

- The LCSBP is a collection of action plans to realize the low carbon future of the Iskandar Project by the year 2025.

  - Toward the realization of a low carbon society (LCS), twelve action plans have been set under the three pillars of a green economy, green communities and a green environment.
  - The LCSBP is designed to disseminate activity plans toward the realization of LCS more comprehensibly by eliminating technical descriptions as far as possible.

Table3-2-1: Twelve action plans in the LCSBP

Table 3: Contribution of 3 main themes and 12 actions

Actions	Contribution * (ktCO2eq)	Share
Green Economy	**7,401**	**59%**
Action 1 Integrated Green Transportation	1,916	15%
Action 2 Green Industry	1,085	9%
Action 3 Low Carbon Urban Governance **	-	-
Action 4 Green Building and Construction	1,338	11%
Action 5 Green Energy System and Renewable Energy	3,061	24%
Green Community	**2,557**	**21%**
Action 6 Low Carbon Lifestyle	2,557	21%
Action 7 Community Engagement and Consensus Building**	-	-
Green Environment	**2,510**	**20%**
Action 8 Walkable, Safe and Livable City Design	264	2%
Action 9 Smart Urban Growth	1,214	10%
Action 10 Green and Blue Infrastructure and Rural Resources	620	5%
Action 11 Sustainable Waste Management	412	3%
Action 12 Clean Air Environment**	-	-
Total	**12,467*** **	**100%**

*Contribution to GHG emission reduction from 2025BaU to 2025CM ** Action 3, 7 and 12 does not have direct emission reduction, but their effect is included in other Actions. *** Since contribution of Action 10 includes carbon sink by forest conservation and urban tree planting, the total of contribution of the 12 Actions is greater than difference of the GHG emissions between 2025BaU and 2025CM in Figure 2 and Table2.

- In the LCSBP, the GHG reduction targets are set according to the categories and action plans (See the Table above).

- Among the action plans, those relevant to this survey are outlined below.
  - Action 1: Integrated Green Transportation

Recognizing the necessity of measures for passenger/cargo transportation that can meet the internal and external demand that is increasing with the population growth in Iskandar, the reform of the transportation systems is proposed by using suitable measures for LCS realization. For this action, the sub-actions shown in Table 3-2-2 below have been set under the following four strategies:

- ✧ Promote a shift to (passenger/cargo) transportation modes with more energy-saving effects;
- ✧ Enhance access within Iskandar by constructing energy-saving high-speed railways;
- ✧ Improve the energy efficiency of automobiles; and
- ✧ Improve passenger/cargo transportation flows and capabilities.

Table 3-2-2: Sub-actions and detailed measures

Sub-action		Measure
1	Integration of public transportation systems	Improvement of public transportation systems
		Introduction of land (rail) and water transportation systems
		Efficient and seamless transportation
2	Improvements in access and connectivity between Johor Bahru and Singapore or between Johor Bahru and Kuala Lumpur	Introduction of High Speed Rail Transit (HSRT) for the city
3	Popularization of low carbon automobiles	Recommendations on low carbon car use
4	Improvement of traffic and performance	Implementation of transportation demand management
5	Promotion of green transportation in rural areas	Improvement of the provision and use of public transportation services in rural areas
6	Promotion of green freight transportation	Shift to greener freight transportation
		Promotion of eco/hybrid freight transportation systems

➢ Action 5: Green Energy System and Renewable Energy

On the premise that electric power is essential to industrial development while it is also the largest source of GHG emissions, Iskandar will try to lower the use of carbon fuels in energy production to reduce future GHG emissions. For this action, the sub-actions shown in Table 3-2-3 below have been set under the following three strategies:

- ✧ Promote the use of renewable energy (photovoltaics, biomass, biogas, waste, hydrogen, etc.);
- ✧ Construct advanced energy systems (smart grids, etc.) that can incorporate both consumers and suppliers in more sustainable, clean, stable, reliable and efficient systems; and
- ✧ Recommend and promote energy-saving activities to reduce the power needs in Iskandar.

Table 3-2-3: Sub-actions and detailed measures

Sub-action		Measure
1	Promotion of renewable energy and alternative sources of energy	Utilization of solar energy
		Waste recycling (transformation into energy)
		Utilization of hydrogen
2	Smart grid construction	Integration of electricity distribution systems
		Establishment of electricity storage systems
		Introduction of demand response
		Introduction of electronic management systems
3	Provision of incentives and subsidies as well as the calculation of power prices	Provision of incentives to adopt green energy initiatives
		Setting of electricity prices (at peak hours and at off-peak times)

- Action 6: Low Carbon Lifestyle

  Aiming at the realization of "low carbon lifestyles" denoting citizens' sustainable living and working styles, encourage behavioral changes in government institutions, companies, public facilities, schools, and other facilities for individuals and groups. For this action, the sub-actions shown in Table 3-2-4 below have been set.

Table 3-2-4: Sub-actions and detailed measures

Sub-action		Measure
1	Change in consciousness and education	Development and education for social awareness concerning environmental conservation
		Education in teaching fields, and environmental education for young people
2	Smart working styles	Promotion of SOHO work environments
		Promoting flexible working hours
3	Green ambassador appointment system	Appointment of individuals to become green ambassadors/champions of communities, companies and organizations
		Appointment of schools to become green ambassadors/champions
4	Energy saving promotion	Promotion of the sale and use of energy saving devices
		Recommendations for power saving
		Provision of incentives for green energy use
5	Environmental conservation responsibility and carbon offsets	Responsibility for environmental conservation (disclosure of information etc.)
		Carbon offsets

- Action 8: Walkable, Safe and Livable City Design

In order to realize the LCS, a quality, sound and safe living environment has to be provided for local residents. Iskandar aims at the realization of this by guiding a voluntary modal shift from automobiles to walking or cycling for short- or middle-distance journeys. For this action, the sub-actions shown in Table 3-2-5 below have been set.

Table 3-2-5: Sub-actions and detailed measures

Sub-action		Measure
1	Walking city development	Provision of comfortable sidewalks
		Development of interconnected sidewalk networks
2	Cyclist-friendly town development	Provision of safe and comfortable cycling networks
3	Safe town development	Security measures through environmental design
		Increase in police personnel
4	Civilized and comfortable town development through traffic calming measures	Traffic speed reduction
		Road environment improvement
		Recovery of pedestrian spaces

- Action 9: Smart Urban Growth

Iskandar, in which rapid population growth and economic development can be expected, aims at "smart" urban space development to concurrently realize a LCS. Specifically, it decided to reduce automobile traffic and mileage while increasing and promoting the use of public transportation systems. For this action, the sub-actions shown in Table 3-2-6 below have been set under the following four strategies:

- ✧ Promote a multipolar growth pattern;
- ✧ Promote compact urban development;
- ✧ Encourage land-use planning to facilitate transportation development; and
- ✧ Develop a "smart digital city."

Table 3-2-6: Sub-actions and detailed measures

Sub-action		Measure
1	Promotion of Iskandar's multipolar growth	Expansion of the public transportation service network, and the gradual recentralization of urban functions
2	Promotion of compact urban development	Establishment of an "urban growth boundary (UGB)" in urban areas
		Development of high-density and mixed land use (diversified land use)
3	Land-use planning to facilitate transportation system development	Transportation system priority and station planning
4	Smart digital city development	ICT development for the provision of the infrastructure necessary for a smart life

3-2-2. Study of the technologies and products that apply to the LCSBP

- For achieving urban development based on the LCSBP, Fujisawa Sustainable Smart Town (Fujisawa SST), a project that Panasonic Corporation is carrying out, was used as a benchmark in studying what functions and product groups would be needed and available for the Iskandar project.
  - Overview of the Fujisawa SST
    - The site of a former Panasonic factory (an area of about 19 hectares) is being used for the Sustainable Smart Town project.
    - The project was announced in May 2011. In this single-family housing area, construction work gets started this September. An opening ceremony is scheduled for spring 2014.
    - The project is designed to build a smart town for about 1,000 families to live in for 100 years, together with the adoption of new services and technologies that will help them foster a community so that the town will develop in a sustainable way.
  - Characteristics of the Fujisawa SST
    - First, based on a study of the needs of the residents, the characteristics of the region, and future lifestyles seen from various aspects, such as energy, safety, mobility, and heath care, aspects of a smart community life were suggested.
    - Then, an entire town, which includes houses and other facilities that are optimal for the lifestyle, is being designed as a smart space. Finally, an optimal smart infrastructure that underpins the new lifestyle will be constructed.
  - Future development
    - We intend to be aggressive in spreading the concept and process of the Fujisawa SST in Japan and abroad. Iskandar is planned to be a model project for this development.

➢ Basic elements of the Fujisawa model

✧ The six elements below are taken from the business model planned for the Fujisawa SST as the basic ones applicable to the Iskandar project and the LCSBP.

- Green energy
- Water
- Health
- Community
- Safety
- Mobility

Figure 3-2-7: Basic elements from the Fujisawa model

➢ The six basic elements are summarized below.

✧ Green energy

- Town blocks are structured in a manner such that the residents are aware of nature and live in an area with fresh breezes recognizing the bounty of nature, so that environment-conscious, energy-productive and energy-efficient conditions can be realized.

✧ Water

- Town blocks have water resources arranged in an effective way to provide people with an environment that has abundant water and ever-changing scenic beauty they can enjoy and attain peace of mind.

✧ Health

- With a rich natural environment and fresh, clean water and air, the town provides its residents with a healthy lifestyle.

✧ Community

- The town has embedded in it a “mechanism” for community development to help the residents make connections with each other and work among

themselves to develop the community.

- ✧ Safety
  - ● Security gates are installed to maintain safety and security for the residents and provide a space where they can live in peace amid the blessings of nature.
- ✧ Mobility
  - ● The residents are provided with a convenient and environment-friendly means of transport to move around comfortably within the town.

Studying what product groups ensure the achievement of the elements mentioned above, we have concluded that those listed below are worth suggesting for their introduction

Table 3-2-8: Product Groups that are recommended

Element	Product Group	Overview
Green energy	● Community PV ● LED lighting	✓ All houses are equipped with solar panels on the roof. Revenues from the sale of power generated by the photovoltaic equipment are used for maintenance of the town. ✓ LED appliances, a form of energy-efficient lighting equipment, are installed on the streets and in houses for energy-efficient lighting.
Water	● Water treatment facilities	✓ Revenues from the sale of power are used to maintain good aquatic environments. ✓ Water treatment facilities are built to provide children with water environments that are good enough for them to play by the waterside.
Health	● Indoor environmental equipment	✓ Appliances that can be connected to the HEMS and a security system are installed to control and monitor indoor environments.
Community	● ICT solutions	✓ The community is integrated both physically and virtually, through websites or by other means, to raise community awareness among the people living there.
Safety	● Security systems	✓ To eliminate potential hazards in the streets, a security system is adopted using security gates and LED lighting appliances in an effective

				way.
Mobility	●	Transport equipment	✓	Electric bicycles, EVs, charging facilities for EVs, an outdoor mist cooling system, and other facilities are introduced.

For conforming to the action plans in the LCSBP, we should take part in the project from the stage of community and town design, and work to reduce energy consumption in households at the same time in order to reduce GHG emissions.

3-2-3. Selection of LCSBP projects for demonstration and the demonstration sites

In the Iskandar area, there are many development projects underway.

- A selection process has been carried out with the focus on the elements mentioned below:
  - ✧ That the developer has a strong interest in adding value to the town;
  - ✧ That the project has yet to reach the stage of town designing, so we can participate from the designing phase;
  - ✧ That the project targets people who are wealthier than the average as the potential customers; and
  - ✧ That the developer, instead of being engaged only in a development project in the Iskandar area, is expected to develop the scope of their business more widely in future.

- Comparing more than 10 development projects planned for or underway in the Iskandar area, and their developers according to requirements specified above, we have chosen the projects of Company A and Company B.

3-2-4. Plans of the demonstration projects

At the sites of the developers that agreed to the utilization of Japanese smart town related technologies and products in town development in the FY2013 F/S, the initiatives will be carried out utilizing the achievements and experience in Japan (Fujisawa) and China (Dalian). Specifically, the initiatives will be implemented for the following two sites in order to achieve the LCSBP and pave the way for the promotion and spread of Japanese smart town related technologies and products.

i. In mixed use development sites with high-rise apartments and commercial facilities, actualize the LCSBP in town development, and plan and review the demonstration in the show villages.

ii. In the mixed development sites of detached housing and apartment houses, plan and review the actualization of the LCSBP in town development.

3-3. Development of the ESCO projects

This fiscal year, the specific tasks below were performed to develop the ESCO projects in the Iskandar area.

(1) Selection of a local ESCO operator;
(2) Conclusion of an agreement with the local ESCO operator;
(3) Selection by the ESCO operator of buildings for the ESCO project;
(4) Energy audit by the local ESCO operator and Japan Facility Solutions for buildings to be included in the ESCO project;
(5) Preparation by the local ESCO operator of an energy audit report; and
(6) Preparation by the local ESCO operator of ESCO service proposals

Below are the detailed descriptions of the tasks.

3-3-1. Selection of a local ESCO operator

The TNB Energy Service emerged as an ESCO company fully owned by Tenaga National, a state-run power company. The TNB Energy Service can be regarded as a counterpart of JFS in the sense that it is a subsidiary of a power company. The parent of JFS, which is the Tokyo Electric Power Company, and Tenaga National, having worked together for 40 years under an exchange agreement concluded between them are in quite a good relationship. When we visited the company in October, the president made a quick decision, and accepted our proposals..

3-3-2. Selection of the buildings for the ESCO projects

TNB-ES selected the three buildings below as candidates for the ESCO projects, and suggested them to JFS. JFS consulted with TNB-ES and decided to choose two buildings, (1) Wisma Daiman Office Building and (3) Angsana Johor Bahru Mall below, as it is expected that their energy consumption can be effectively reduced.

(1) Wisma Daiman Office Building

Type of building: Office for lease

Total floor area: 13,256 m^2

Completion: October 1984

Photo 3-3-1 Wisma Daiman

ESCO conformity:

(1) The building has a floor-by floor air-conditioning system on a water-cooled package unit, a system with energy efficiency at a certain level.

(2) Its equipment has reached the time for replacement.

(3) The building is rather small in scale with an area of 10,000 m^2, but it is easier to make it more energy efficient as it is an office building.

(4) It has old equipment, thus just by replacing this equipment considerable energy savings can be made.

(2) Meneral Landmark (building complex)

Type of building: Hotel, offices, stores, and a hospital

Total floor area: 137,333 m^2

Completion: October 1999

Photo 3-3-2 Meneral Landmark

ESCO conformity:

(1) The complex is composed of a hotel, offices, and stores, making it difficult to decide which to focus on for energy saving efforts.

(2) Large parts of its tenanted areas are irrelevant for energy saving initiatives.

(3) The building is rather new.

(3) Angsana Johor Bahru Mall (Shopping mall)

Type of building: Shopping mall
Total floor area: 95,892 m^2
Completion: October 1996

Photo 3-3-3 Angsana Johor Bahru Mall

ESCO conformity:

(1) The building is energy-intensive.
(2) As the building was completed 18 years ago, its equipment has reached the time for replacement.
(3) As its tenants pay cooling expenses directly to the building owner, they can also benefit from energy saving.
(4) The building has a central air-conditioning system, which makes energy saving efforts easier.

3-3-3. Energy audit by TNB-ES and JFS for the ESCO project

(1) Schedule of the energy audit by TNB-ES

Between December 2 and 6, 2013, TNB-ES conducted a audit of the buildings selected for the project in cooperation with JFS. Table 3.1.1 below shows the schedule.

Table 3-3-1: Schedule of the energy audit

activities	Dec.2	Dec.3	Dec.4	Dec.5
1 Kick-off Meeting (Hearing of former activities by TNBES)				
2 Visiting IRDA				
3 Walkthrough with TNBES Angsana Johor Bahru Mall			Presentation to the owner / Audit	
Wisma Daiman		Presentation to the owner / Audit		
4 Collect more energy related data	Data acquisitted from last week till Dec.6			
5 Analysis				
6 Concretize problems concerning energy consumption				
7 Discussion				

Participants: (JRI) Gen Hashimoto (Global Management Group, Society and Industry Design Division)

(JFS) Tetsuya Maekawa (Overseas Business Manager, Sales Division)

Susumu Yasue (same as above)

TNB Energy Services

Ir. Hamadan Ali

Ahmad Nizam Hassan

and four other members

(2) Overview of the buildings

・Wisma Daiman Office Building

An energy audit was conducted on December 2 and 3, 2013.

The office building is owned by Daiman Properties Sdn Bhd, a real estate company, for lease. It currently has some 21 companies in it as tenants. The first and second floor is vacant at the moment.

An overview of the building is given below.

Address:	64, Jalan Sulam, Taman Sentosa, 80150 Johor Bahru, Malaysia
Use:	Office building
Size:	7 stories above and one below ground
Total floor area:	13,256 m^2
Age:	30 years
Power consumption:	1,314 MWh/year (December 2012 - November 2013)
Air-conditioning equipment:	Water-cooled air conditioning system Floor-by-floor air-conditioning 3 cooling towers

・Angsana Johor Bahru Mall (Shopping mall)

An energy audit was conducted in the afternoon of December 4, 2013.

The shopping mall is owned by Uda Agsna Sdn Bhd, a real estate company. It has hundreds of tenants in it.

An overview of the building is given below.

Address:	Jalan Padl Emas, Pusat Bandar Tampoi, 81200 Johor Bahru, Malaysia
Use:	Shopping mall
Size:	4 stories above and one below ground
Total floor area:	95,892 m^2
Parking lot:	13,500 m^2
Age:	17 years
Power consumption:	20,028 MWh/year (December 2012 - November 2013)
Air-conditioning equipment:	Heat source for central air-conditioning: 6 chillers and 18 cooling towers Central air-conditioning system In part, independent air-cooled packages (stores and backyards)

(3) Audit results

1) Wisma Daiman Office Building

a. Inspection date: December 2 - 5, 2013

- Interviews
- Facility inspection: December 3
- Data collection and analysis
- Luminous intensity and temperature measurements

b. Audit conducted by: Daiman Properties SDN. BHD.: Eddie Chan yean Hoe
Sr Andrew Ong Teng Eng
Victor K. S. Lim
JFS: Tetsuya Maekawa
Susumu Yasue
TBN Energy Services: Ir. Hamadan Ali, Ahmad Nizam Hassan and four other members.

c. Audit results

(1) Building specifications

- Name of the building
  Wisma Daiman

- Address:
  64 Jalan Sulam,
  Taman Sentosa,
  Johor Bahru,
  Malaysia

Photo 3-3-4: Exterior

・Use:

Building for rent (mainly for offices, and in part for a hospital, restaurants, and stores)

・Size:

7 stories above and one below ground

・Age:

29 years (completed in October 1984)

・Building surveillance system:

Unavailable

・Electrical equipment:

Access to electricity: 3-phase 4-wire system (50 Hz; 415 kV); Receiving capacity: 479.5 kW

Generator: 250 kVA x 1 unit

・Air-conditioning equipment

Air-cooled PAC: 25.5 RT x 12 units; 18.75 RT x 2 units

Cooling tower: 350 RT x 2 units; 125 RT x 1unit

・Energy consumption:

Annual energy consumption: 1,314,000 kWh/year (December 2012 - November 2013)

Energy consumption per square meter: 99 kWh/m^2 (December 2012 - November 2013)

Air-conditioning time: 9:00 a.m. - 5:00 p.m. (Weekday); 9:00 a.m. - 1:00 p.m. (Saturday)

Sunday: Off

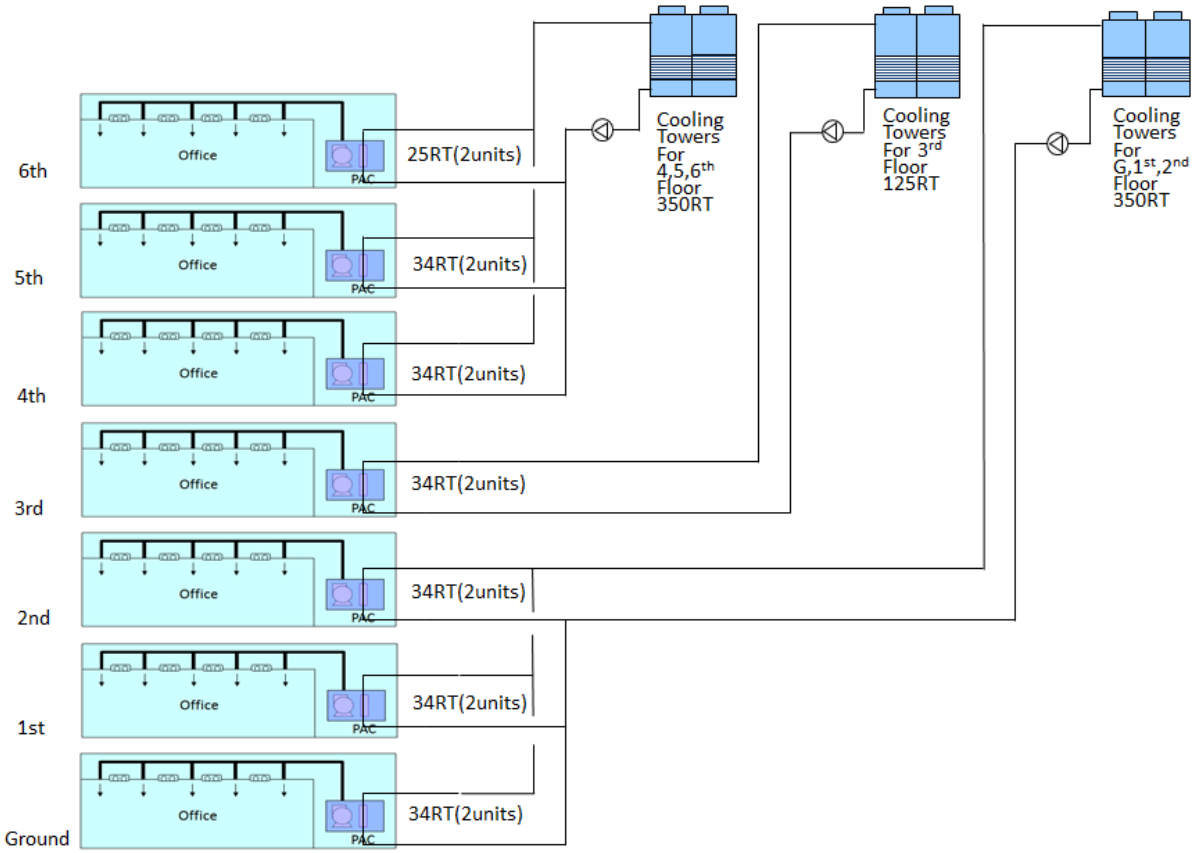


Figure 3-3-1 Air-conditioning system diagram

(2) Audit procedures

- Preliminary inspection by TNB-ES
- Interviews by JFS on the findings of the preliminary inspection, and discussions between TNB-ES and JFS concerning the schedule
- On-site inspection by JFS and TNB-ES
- Discussions about energy-saving solutions and conclusions
- Scheduling

(3) Audit results

・**Annual power consumption**

In Southeast Asia, energy consumption per square meter (annual energy consumption divided by the total floor area) generally stands at around 100 to 250 kilowatt-hours. This building consumes an annual 99 kilowatt-hours per square meter (December 2012 - November 2013).

・**Monthly power consumption**

Figure 3-3-2 below shows the monthly power consumption between December 2012 and November 2013. On average, 110,049 kilowatt-hours of electricity is consumed per month.

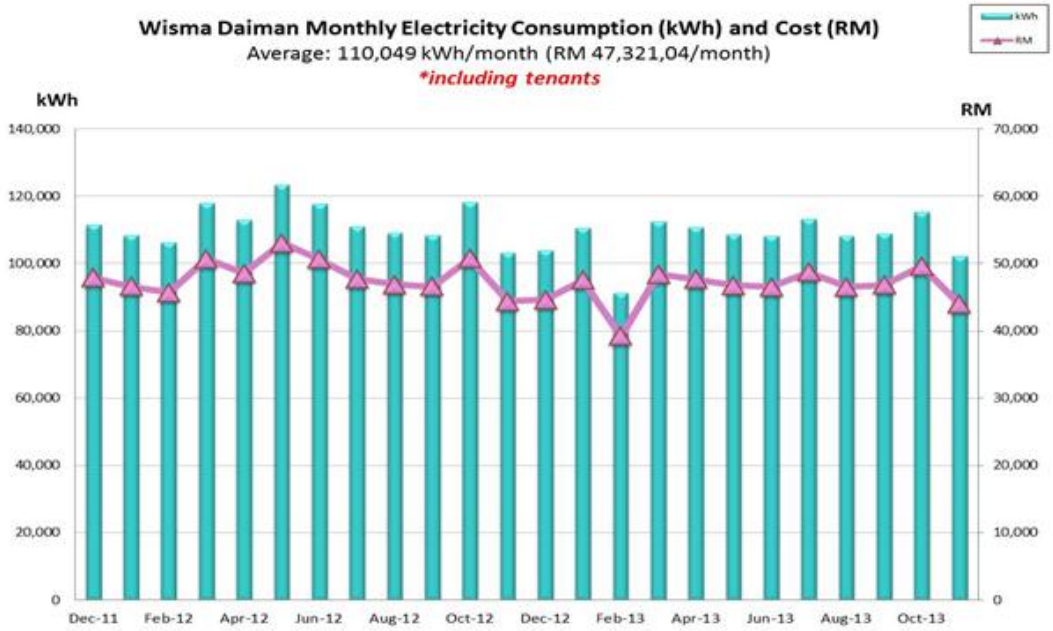


Figure 3-3-2: Monthly power consumption (December 2012 - November 2013)

・**Power consumption by use**

As part of the on-site inspection, energy consumption by use was analyzed. Figure 3-3-3 below shows the estimated consumption for each main use.

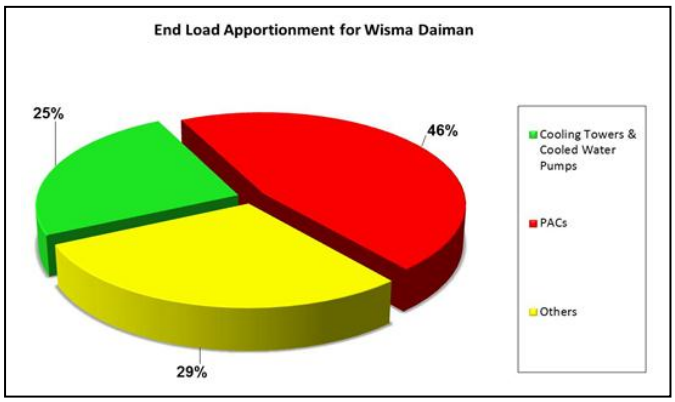


Figure 3-3-3: Power consumption by use

・**Current state of the equipment**

The state of the scale remaining on fillers in the cooling towers and the quality of water in them suggests that good maintenance has been provided for the equipment. The cooling water pumps had erosion developing on their surface. In terms of the quality of the cooling water, no problem was found in the visual inspection. Regular (monthly) inspections of water quality are also carried out, and we heard that water in the cooling towers is replaced at the same time (only water in the lower tanks, not that in the pipes)

Water-cooled packages on the floors are significantly damaged, and have almost reached the time for replacement. With no duct equipped with a damper, the packages cannot control airflow. A possible solution is controlling the airflow from the fans and reducing the power consumed by them. In terms of air-cooling on the floors, the temperature was set at an appropriate level of 18°C, though only at a single point (an office on the 7th floor).

As for lighting, T8 fluorescent tubes are most common, which can be replaced by T5 tubes to reduce power consumption. Lighting can be reduced in the underground parking area and passageways, common spaces of the building, and on each floor.

Photo 3-3-5
State of cooling water in a water tank for a cooling tower

Photo 3-3-6
State of the packed beds in a cooling tower

Photo 3-3-7
Corrosion at the joints of the cooling water pump

Photo 3-3-8
The filters in an air-cooled package are kept clean.

Photo 3-3-9
A supply duct in an air-cooled package has no damper installed on it for controlling the airflow.

Photo 3-3-10
T8 fluorescent tubes are used in the parking space.

Photo 3-3-11
The toilet stalls and urinals are equipped with a flush valve. Water saving is possible by replacing the valves with automatic washing system.

・Suggestions for improvement and the effects of improvements

A. Problems

When actually measured, the volume of the flow of cooling water turned out to be too large. By adopting variable flow controls, the amount of pumped flow can be reduced.

Though found to be quite deteriorated, the water-cooled packages were excluded from the ESCO project as their performance was difficult to identify and replacements would cost too much.

The airflow is also excluded from the ESCO project as no outside air was taken in (the facility was ventilated mainly with draft through windows, and by changing the air) and the outflow could not be measured in the audit.

As for lighting, energy-consuming fluorescent lamps were still in place, which left some energy to be saved.

There was also some room for saving water consumption by replacing flush valves installed on toilet bowls with an automatic washing system. However, lower water rates than in Japan leave

such an initiative infeasible as any investment would be difficult to recover. Therefore, we have decided not to include it in the project.

B. Inverter controlling of the cooling water pumps

The difference in the temperate of the cooling water between the supply and return, varying between systems, ranges from one to three degrees centigrade. Adopting inverter control, which adjusts the rotation rate of the motor in a way that keeps the temperature difference at five degrees centigrade could reduce power consumed by the pumps for conveyance. Below are the results of a provisional calculation.

Estimated annual hours of operation:	2,288 hours/year
Present power consumption (December 2012 - November 2013):	92,252 kWh/year
Estimated power consumption after replacement:	7,253 kWh/year
Reduced power consumption:	84,999 kWh/year
Reduced cost:	43,264 RM/year (Electricity rate: 0.509 RM/kWh)
Roughly estimated improvement work expenses:	282,100 MYR
Simple payback period:	6.5 years

C. Replacement of lighting appliances: Replacement of T8 fluorescent lamps with T5 ones

The building uses T8 fluorescent lamps, which can be replaced by T5 ones for energy saving.

Current state:	Equipment capacity:	Length: 120 cm ((36+9) W x 1) x 362 units = 16.29 kW
		Length: 60 cm ((18+3) W x 1) x 106 units= 2.226 kW
	Hours in use: 9:00 a.m. - 5:00 p.m. (Mon. - Fri.); 9:00 a.m. - 1:00 p.m. (Sat)	
	Days in use: 6 days/week	
	Power consumption: 70,211 kWh/year	
Improvements:	Equipment capacity:	Length: 120 cm (28+9) W x 1) x 362 units= 13.394 W
		Length: 60 cm ((14+3) W x 1) x 106 units= 1.802 kW
	Power consumption: 47,746 kWh/year	
	Annual reduction in power consumption: 22,465 kWh/year	
	Annual cost reduction: 11,500 RM/year	
		(Electricity rate: 0.509 RM/kWh)

D. Summary of the effects of improvements

In the table below are the effects that improvements are expected to produce through the energy-saving measures mentioned above.

Table 3-3-2: Summary of the effects of improvements

No.	Improvements	Reduced power consumption (kWh/year)	Reduced cost (RM/year)	Energy saving rate (%)	Reduced CO_2 emissions (tons/year)
1	Inverter control of the cooling water pumps	84,999	43,264	91.8	59
2	Replacement of lighting appliances with more efficient ones	22,465	11,500	32.0	15
Total		107,464	54,764	8.2*	74

Notes) CO_2 emissions factor: 0.689 ton/MWh
Total power consumption:1,314,000 kWh/year
*: Reduction rate for the entire building

2) Angsana Johor Bahru Mall

a. Date of audit: December 2 - 5, 2013

・Interviews

・Facility inspection: December 4

・Data collection and analysis

・Luminous intensity and temperature measurement

b. Audit conducted by: Tetsuya Maekawa

Susumu Yasue

TBN Energy Services: Ir. Hamadan Ali

Ahmad Nizam Hassan

and four other members

c. Audit results

(1) Overview of the building

・Name of the building

Angsana Johor Bahru Mall

・Use:

Building for rent (mainly for offices, and in part for a hospital, restaurants, and stores)

・Size:

7 stories above and one below ground

・Age:

18 years (Completed in October 1984)

Photo 3.1.12: Angsana Johor Bahru Mall

・Building surveillance system:

A BCS (central surveillance system) is installed, but has been left out of order. (It works only partially, under manual operation)

・Electric equipment:

Access to electricity: 3-phase 4-wire system (50 Hz; 2,200 kV); Receiving capacity: 5,140 kW

Transformer capacity: 1,500 kVA x 4 units and 1,000 kVA x 2 units

Generator: 1,500 kVA x 2 units

・Air-conditioning equipment

Chillers: 500 RT x 4 units (one out of order) and 350 RT x 1 unit

Cooling towers: 700 RT (3 units) x 6

Air-conditioners: 61 units

PAC: Dozens of units (in stores)

・Energy consumption:

Annual energy consumption: 20,028 kWh/year (December 2012 - November 2013)

Energy consumption per square meter: Annual 209 kWh/m^2 (December 2012 - November 2013)

Business hours of the building: 8:00 a.m. - 11:00 p.m. (7 days a week)

(2) Audit procedures

- Preliminary inspection by TNB-ES
- Interviews by JFS on the findings of the preliminary inspection, and discussions between TNB-ES and JFS concerning the schedule
- On-site inspection by JFS and TNB-ES
- Discussions about energy-saving solutions and conclusions
- Scheduling

(3) Audit results

・**Annual power consumption**

In Malaysia, energy consumption per square meter (annual energy consumption divided by total floor area) generally stands at around 300 to 450 kilowatt-hours. This building consumes an annual 209 kilowatt-hours per square meter, which is not too much compared with other buildings.

・**Monthly power consumption**

Figure 3-3-4 below shows the monthly power consumption between December 2012 and November 2013.

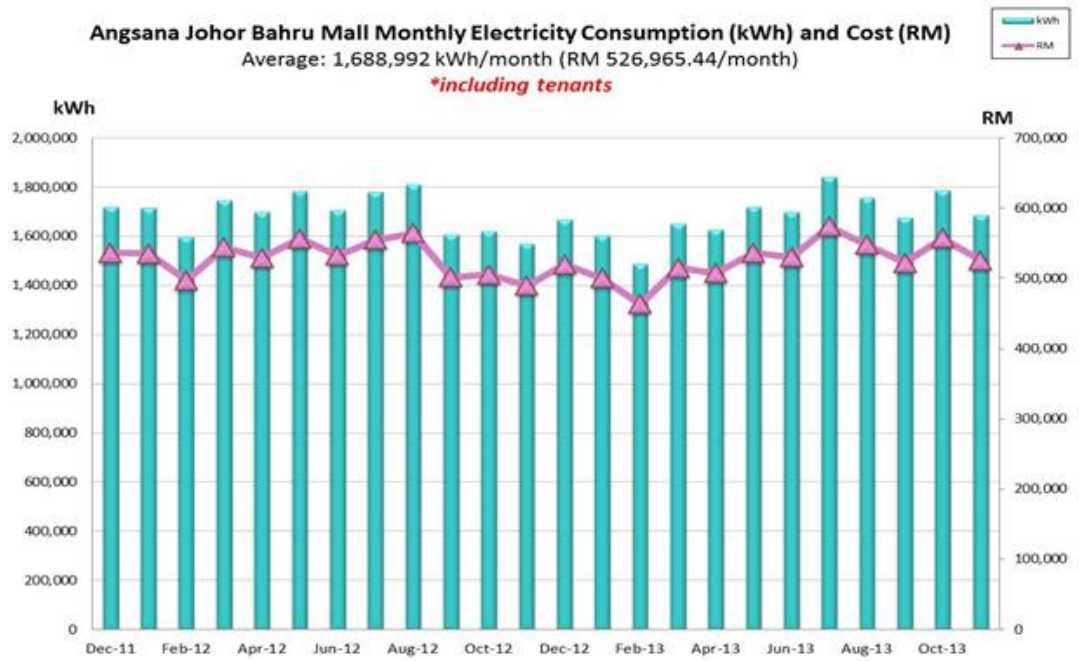


Figure 3-3-4 Monthly power consumption

・**Power consumption by use**

As part of the on-site inspection, energy consumption by use was analyzed. Figure 3-3-5 below shows the estimated consumption.

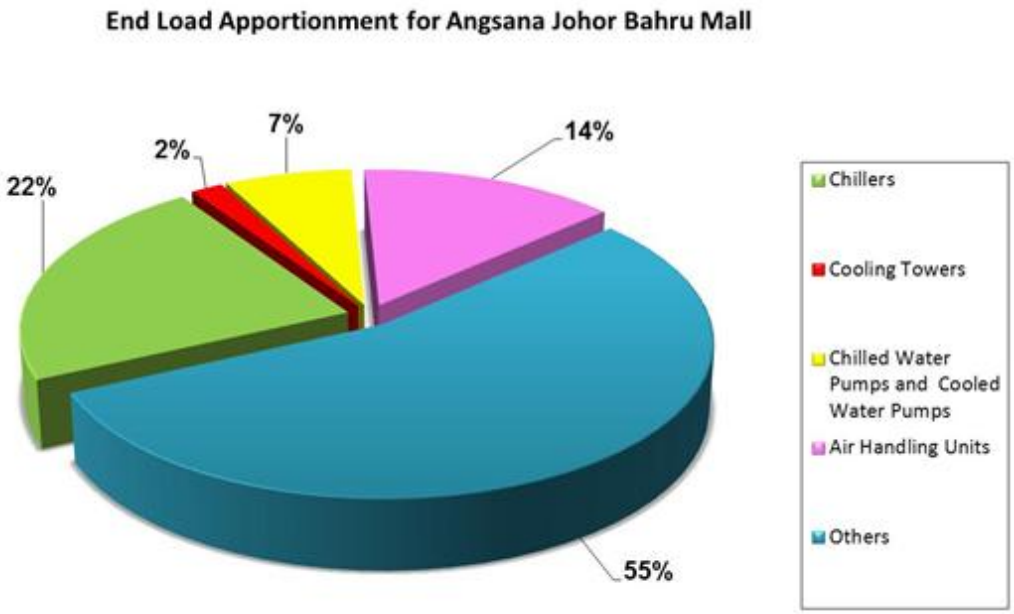


Figure 3-3-5: Power consumption by use

・**State of maintenance of the equipment**

The chillers were obviously reaching the time for replacement as they had been in place for 18 years and one of them had broken down. The central monitoring system had been out of order, leaving it impossible to see how much chilled water they can produce. No flow meter was in place. Such conditions required us to estimate the power of the chillers based on the difference in temperature of cooling water, flow rate, and their power consumption, all measured on-site. (See Figure 3-3-6)

$$Q_2 = (Cp\,\gamma \times V_2(m^3/h) \times \Delta t(^\circ C)) \times 4.1868(kJ/kcal)$$

$$Q_1 = Q_2 - (E_1 \times 860(kcal/kW) \times 4.1868(kJ/kcal) \quad (kJ)$$

$$= (Q_2 - (E1 \times 860(kcal/kW) \times 4.1868(kJ/kcal)) \times (4.1868/3{,}024) \quad (RT)$$

Cp: Specific heat (kcal/kg°C)

γ : Specific gravity (kg/m^3)

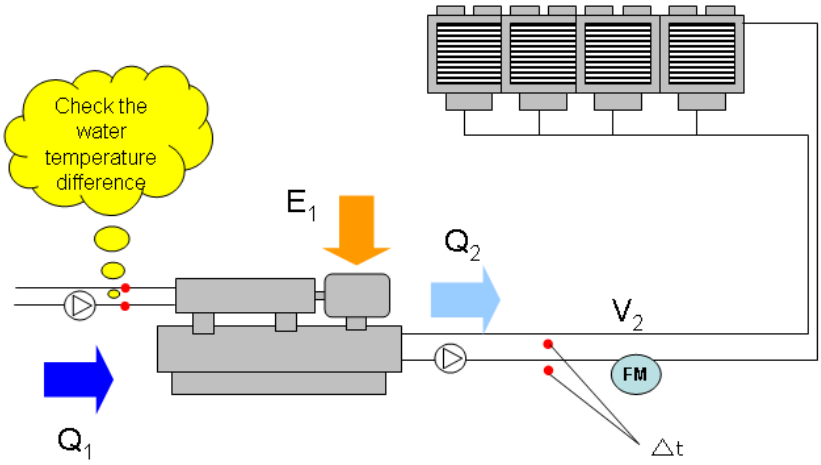


Figure 3-3-6 Calculation of the power of the chillers

Photo 3-3-13
The chillers are reaching the time for replacement

Figure 3-3-7 below shows the air-conditioning system.

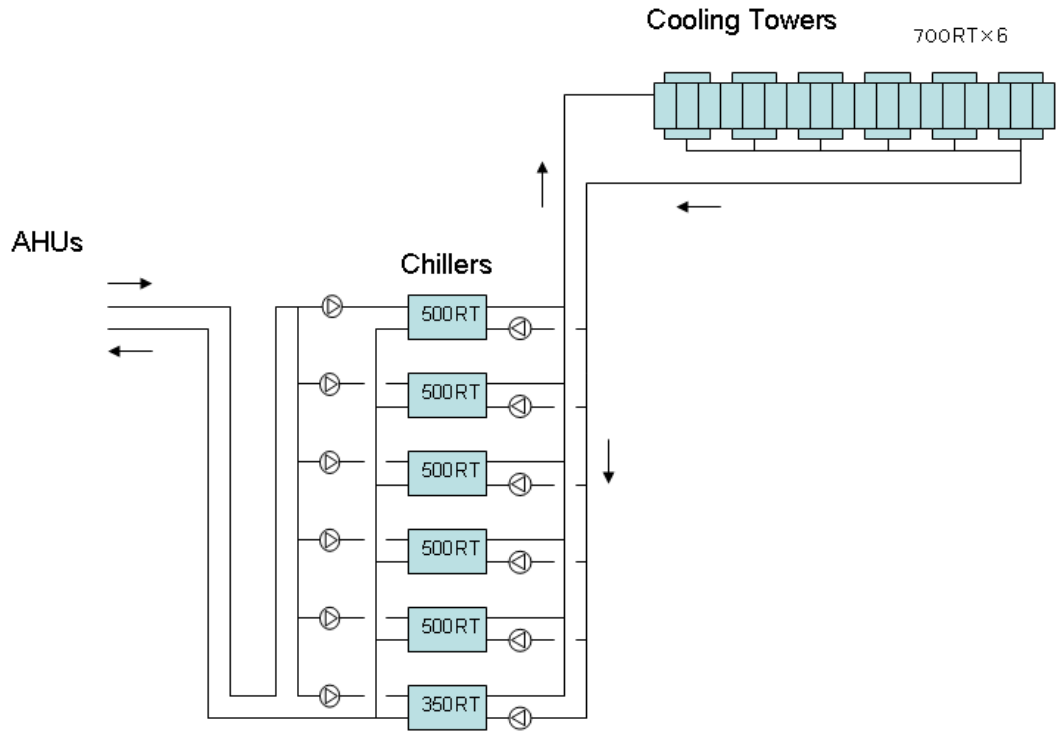


Figure 3-3-7 System diagram

As the system is left completely out of control at the moment, conveyance power could be reduced by controlling the flow rate of the cooling and chilled water systems. As the current state of the systems cannot be seen because no flow meter is in place, the flow rate was measured along the chilled water system at a point where no heat insulation was installed, so that the flow rate of the secondary system could be estimated based on the power consumed by chillers and the temperature measured visually using a thermometer.

Photo 3-3-14
Chilled water pump left out of energy-saving control

Photo 3-3-15
Cooling water pump left out of energy-saving control

The cooling water was treated, however, whether the blow off water was treated was not examined. As far as we could see by visual inspection, the water was being treated to create rather good conditions, with no slime found in the lower water tanks, though there was some in the upper tanks. The fillers were well maintained and kept clean. As for the chilled water system, as seen in Photos 3-3-18 and 3-3-19, the water temperature and flow rate at the outlets and intakes of the chillers, and the power input to the chillers were measured on site. Based on the data, we examined the possibility of saving energy consumed by the pumps, and whether replacing the chillers could reduce energy consumption.

The air handling unit (AHU) had two-way valves that controlled the flow-out temperature of the chilled air, but we heard there had been many left out of order. The unit did not take in fresh air, and instead ventilated air through gateways and by draft. The density of the CO_2 measured by a densitometer in the hall was less than 1,000 PPM. This suggested that enough outside air was coming in through a back entrance as a draft. At the common space in the hall, the temperature of the discharged air was around 18 degrees centigrade, though this was a measurement result taken only in a limited place.

Photo 3-3-16
Distribution basin on the cooling tower

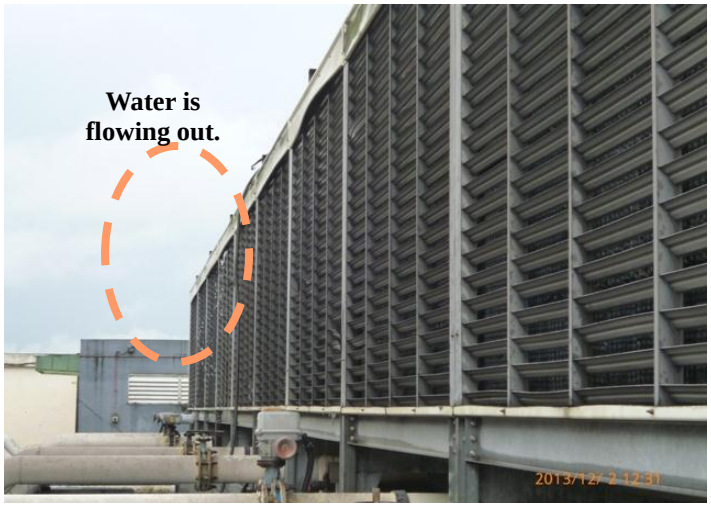


Photo 3-3-17
Packed bed in the cooling tower

Photo 3-3-18
An ultrasonic flow rate sensor installed on a chilled water pipe

Photo 3-3-19
Flow rate meter

Photo 3-3-20
An AHU supply duct equipped with a temperature sensor for an automatic two-way valve for controlling the chilled water flow rate.

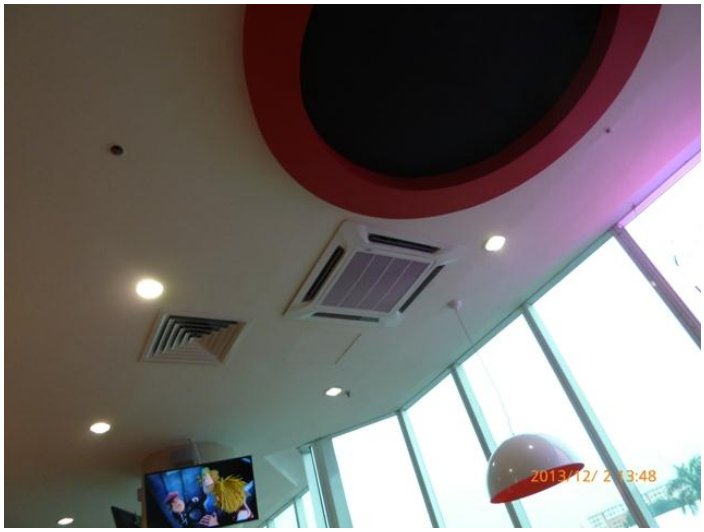


Photo 3-3-21
The temperature of air flowing out of a diffuser was around 18°C.
(in a cafeteria on the 2nd floor)

・Suggestions for improvement and the effects of improvements

A. Problems

When actually measured, the capacity of the chillers was around 0.83 kW/RT, some 30% less efficient than that of the latest model, 0.60 kW/RT. That means that replacement under the ESCO scheme is feasible.

Conveyance power for the chilled water pumps can be reduced by adopting inverter control as there is a three or four-degree centigrade difference in the temperate of cooling water between the supply and return.

Fans for the cooling towers could be reduced. We expect that by widening the difference in the temperature of the cooling water, now four degrees centigrade, by roughly one degree centigrade,

conveyance power can be reduced.

As for the AHU, it seems that no solution for reducing power consumption can be suggested as the airflow volume could not be measured.

The automatic two-way valves for the chilled water system need repairing. However, the effects of this repair cannot be easily quantified. As no external air is taken in, it cannot be included in the items for reduction.

As for lighting, T8 fluorescent tubes are used in the parking lots and backyards and can be replaced by T5 tubes to reduce power consumption.

B. Replacement of the heat source equipment (replacement of the turbo chiller)

Turbo chillers, having been in place for 15 years, have reached the time for replacement. Taking into consideration the degenerated compressors, deteriorated condensers with scale building up on them, and poor management of the water quality, power consumption can be reduced by more than 30 percent once the latest models of machine (inverter type) are introduced. Replacing them as part of the ESCO project is possible. Below are the results of a provisional calculation of the economic effects.

Estimated annual hours of operation:	4,562.5 hours/year
Present power consumption (December 2012 - November 2013):	6,360,125 kWh/year
Estimated power consumption after replacement:	1,761,125 kWh/year
Reduced power consumption:	4,599,000 kWh/year
Reduced costs:	642,810 RM/year (Electricity rate: 0.365 RM/kWh)
Roughly estimated improvement work expenses:	3,800,000 RM
Simple payback period:	5.9 years

C. Adjustment to an appropriate level of temperature of the returning cooling water, difference in temperature of water between the supply and return, and circulation flow rate: Control of the flow rate of the cooling water pumps

The present load could not be captured as the flow rate could not be measured. When read by visual inspection, a thermometer installed on the equipment indicated three to four degrees centigrade of difference in the temperature of water between the supply and return. We assume that energy consumption can be reduced by controlling the flow rate according to the air-conditioning load on the secondary equipment. Here we examine the case where all the

pumps are controlled on inverters to reduce the flow rate, that is, the variable-frequency drive (VFD) of the pumps is adjusted to keep the temperature difference at five degrees centigrade.

Below is a provisional calculation of the economic effects.

Estimated annual hours of operation:	4,563 hours/year
Present estimated power consumption of the circulating pumps (December 2012 - November 2013):	473,131 kWh/year
Estimated power consumption after replacement:	174,744 kWh/year
Reduced power consumption:	298,387 kWh/year
Reduced cost:	108,911 RM/year (Electricity rate: 0.365 RM/kWh)
Roughly estimated improvement work expenses:	247,000 RM
Simple payback period:	2.3 years

D. Replacement of lighting appliances: Replacement with high-efficiency fluorescent tubes

The parking lots and backyards use T8 fluorescent tubes for lighting. Only replacing them with T5 fluorescent lamps can produce great energy savings.

The building uses T8 fluorescent lamps (36 W and 18 W), which can be replaced with T5 lamps (28 W and 14 W) to reduce energy consumption.

Current state:	Equipment capacity:	36 W type: (36+9) W x 3,232 units = 145.440 kW 18 W type: (18+3) W x 684 units = 14.364 kW
	Hours in use:	8:00 a.m. - 11:00 p.m. (As the hours in use differ in various places; see the TNB-ES's report, attached separately, for more details)
	Days in use:	365 days
	Power consumption:	900,992 kWh/year
Improvements:	Equipment capacity:	28 W type: (28+9) W x 3,232 units = 119.58 4kW 14W type: (14+3)W x 684 units = 11.628kW
	Power consumption:	608,659 kWh/year
	Annual reduction in power consumption:	292,333 kWh/year
	Annual cost reduction:	106,702 RM/year (Electricity rate: 0.365 RM/kWh)

E. Summary of the effects of the improvements

Table 3-3-3 below summarizes the results of the examination.

Table 3-3-3 Summary of the effects of the improvements

No.	Improvements	Reduced power consumption (kWh/year)	Reduced cost (RM/year)	Energy saving rate (%)	Reduced CO_2 emissions (tons/year)
1	Replacement of heat source equipment	1,761,125	643,000	27.7	1,213
2	Inverter control of the cooling pumps	298,387	109,000	63.1	206
3	Replacement of lighting appliances: Replacement with high-efficiency fluorescent tubes	292,333	107,000	32.4	201
	Total	2,351,845	859,000	11.7*	1,620

Notes) CO_2 emissions factor: 0.689 ton/MWh
Total power consumption: 20,028,000 kWh/ year
*: Reduction rate for the entire building

3-3-4. ESCO proposals

Table 3-3-4 below shows the ESCO proposals based on the energy audit.

Table 3-3-4: Summary of the energy audit

	Cost reduction (RM/year)	Total investment (RM)	Simple payback period (Years)	CO_2 reduction (ton/year)
Wisma Daiman (Office building)	55,000	297,000,000	5.4	74
Angsana Johor Bahru Mall (Shopping mall)	859,000	4,357,000	5.1	1,620

(Note) "Total investment" indicates the total for the ESCO scheme.

We had prepared the ESCO proposals based on the results of the energy audit. Actual expenses for construction work, financing plans, and others will be designed, depending on the actual conditions of the project sites. Here, the calculations were carried out based on provisionally estimated conditions. The analysis has demonstrated:

1. That, for Angsana Johor Bahru Mall, it is highly likely that there will be a feasible standard ESCO plan; and
2. That, for Wisma Daiman, there will be no feasible standard ESCO plan, and that any improvement will be made possible with some additional solutions.

In the next term, we would like to try these schemes in concrete ways, asking our clients for cooperation.

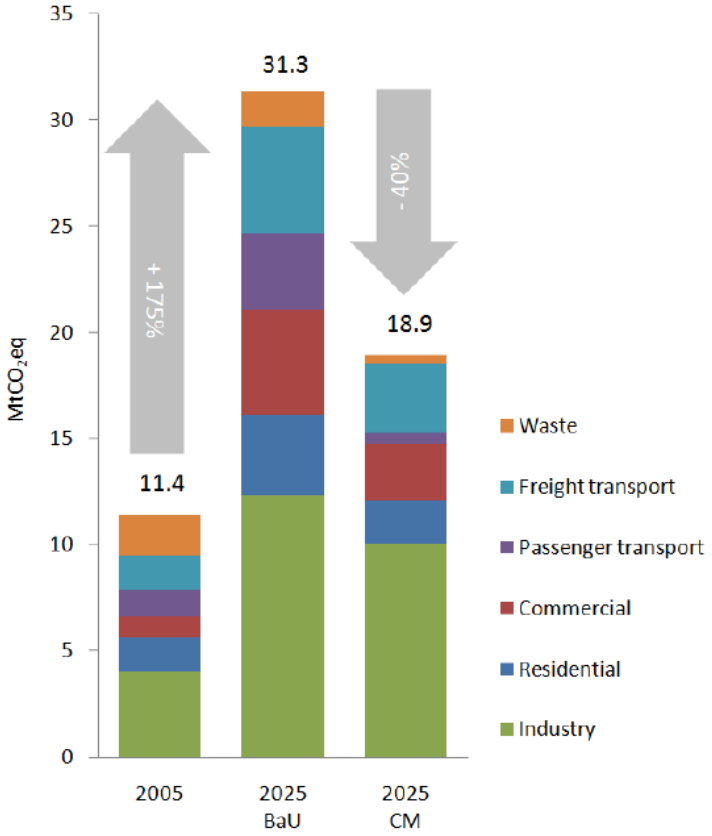
3-4. Study on the calculation of GHG emissions reductions

1) Basic ideas of GHG emissions reductions in this FS project

As this FS project is intended to contribute to the realization of the Iskandar LCSBP, the effects of individual projects for a reduction in GHG emissions is positioned as part of the GHG emissions reduction effects produced from the JCM project, when carried out on a full-scale for the entire Iskandar area (12.8 million t-CO_2).

For the LCSBP, it is estimated that, with the year 2005 set as the base year, baseline emissions will increase from about 11.4 million t-CO_2 as of 2005 to about 31.3 million t-CO_2 in 2025, a rise of 175%. Meanwhile, a provisional calculation shows that if all the projects for the LCSBP are carried out, project emissions will amount to about 18.9 million t-CO_2, an annual emissions reduction of 12,758,000 t-CO_2. We aim at achieving part of the reductions under the framework of the JCM, once the project is carried out on a full scale.

Figure3-4-1: Reduction in GHG emissions (base year, baseline, and project case in the LCSBP)



(Source: Low Carbon Society Blueprint for Iskandar Malaysia 2025, Kyoto University, Okayama University, National Institute for Environmental Studies, and Universiti Teknologi Malaysia (UTM))

For the calculation of the reduction in GHG emissions in the LCSBP, described above, the ExSS (Extended Snapshot Tool) is adopted. The ExSS is a calculation tool to estimate GHG emissions in a certain year through preparing a calculation model that incorporates in it, as shown below in the figure, factors that influence GHG emissions, such as macroeconomic variables, lifestyle modes, and the state of buildings and transport, as modules. The tool has been used so far in Japan to set a target for specific regions in terms of a reduction in GHG emissions and it demonstrates the effects of activities to reduce GHG emissions, including social changes, in quantitative terms.

This technique is relevant for estimating macro and long-term effects for a reduction in GHG emissions for an entire city. Meanwhile an expert engaged in calculation of the effects of the LCSBP for a reduction in GHG emissions commented that this technique is too rough in data granularity and calculation precision to calculate the effects of individual JCM projects for their contribution to a reductions in GHG emissions. That has led us to conclude that the ExSS should not be adopted for a demonstration project now under consideration (Energy saving of newly-built houses, and ESCO for energy saving in buildings). In terms of the effects for a reduction in GHG emissions on a demonstration project basis, a study was conducted based on the CDM methodology, taking into account the characteristics of each of the demonstration projects.

2) Method for calculating GHG emissions reductions in a demonstration for an LCSBP project (housing energy saving)

For the time being, the demonstration of an LCSBP project is being conducted by introducing energy-saving, generating, and storing equipment for newly built houses for housing energy saving. We examined which JCM methodology should be used to calculate the effects of a reduction in GHG emissions under a basic principle that sufficient attention should be paid to rationality and strictness as a methodology, while placing as little burden as possible on the project operators.

For the study of JCM methodologies to be applied to housing, the issues below were examined.

- Preparation of eligibility criteria (List of eligibility criteria)
- Monitoring method (items for monitoring, frequency, etc.)
- Setting of the default values (method of setting them and the reference emissions (secured conservativeness))
- The method of quantifying the reference emissions
- The method of quantifying business and activity emissions
- The method of calculating the reduced emissions

Below is a similar CDM methodology applicable to housing.

Methodology

- Small-scale methodology [AMSⅢ-A.E. (Energy efficiency and renewable energy measures in new residential buildings)]

2-1) Study of the methodologies

Houses in Iskandar, Malaysia, for which a demonstration project would be conducted by introducing energy saving equipment, were kept in mind when JCM methodologies were examined. In the examination process, the focus was placed on finding a methodology that would require no complicated model, regression analysis, or too many monitoring items, potential obstacles to carrying out a project, and the principles below were adopted.

- Baseline emissions should be set as the "average electricity consumption of a comparison group."

  "Comparison group" refers to a group composed of at least 100 houses that satisfy similar conditions as those of the houses included in the project.

  "Similar conditions" refers to those have an influence on the energy consumption of a house, regardless of its energy efficiency, such as the size of the household and the ownership of home appliances (air-conditioners and refrigerators).
- "Power consumption" of the houses included in the project is the sole major monitoring item.
- Any JCM methodology should be designed not from "technical viewpoints (by house, home appliance, etc.)" in a conventional way but from the "users' viewpoint (houses and home appliances and others in them as a whole)."

The principles described above were adopted for designing a methodology.

3) Methods for calculating GHG emissions reductions in a demonstration for the ESCO projects

The demonstration of the ESCO projects aims at improvements in energy saving (renewal of air-conditioning, conversion of motors to inverters, renewal of lighting, etc.) of the existing buildings such as office buildings and shopping malls where the energy audit were conducted in this investigation. Although various measures are assumed for energy saving in buildings, the load on air-conditioning-related systems is relatively large as the average temperature is constant and always high in Malaysia, and thus the measures for air-conditioning–related systems were also proposed in the energy audit conducted in this investigation. In this investigation, therefore, the examination was conducted with regards to the effects of GHG emissions reductions from air-conditioning-related systems. Besides, the effects of GHG emissions reductions from facilities such as lighting other than air-conditioning are regarded as issues to be examined in future.

3-1) Examination of the methodologies

The results of the energy audit target the air-conditioning facilities of the building and are envisaged to achieve energy savings on the demand side through the renewal of facilities and other aspects. Thus, as the existing CDM methodologies that are applicable in the demonstration projects, the small-scale methodologies for energy conservation AMS-II. C "Demand-side energy efficiency activities for specific technologies" (hereunder, "AMS-II. C") and the small-scale methodologies for energy conservation AMS-II. E "Energy efficiency and fuel switching measures for buildings" (hereunder, "AMS-II. E") are given.

As a result of the analyses of the existing CDM projects that utilize these methodologies, the perspectives of the methodologies that are applied to the projects for air-conditioning facilities in buildings are summarized as below.

A) Methods for setting the baselines

The baselines were set through a combination of the following three calculation methods, the calculation methods based on actual values, and those based on measured values after the project implementation.

- Calculation methods using models
  - ✧ Heat demand of the buildings
- Calculation methods based on actual values
  - ➢ Calculate the future values using the rate of change in actual values over a certain time period
    - ✧ Energy demand, etc., of the entire building
  - ➢ Calculate the average value of actual values over a certain time period and estimate the future values regarding them as the same
    - ✧ Unit production output of factories, energy consumption of the entire building, etc.
- Calculation based on measured values after the project implementation
  - ✧ Operating time of the facilities, production output (of factories), etc.

With regards to the assumed demonstration projects, it is possible for the values to be calculated from the operating time as the measured values after the project implementation if the air-conditioning facilities of the building are installed at the rated output, although this depends on the existing facilities. In addition, in the case of facilities that are not installed at the rated output, a method for calculating directly from the actual values is also feasible. To further improve accuracy, however, the key indicators that influence the energy consumption of the air-conditioning should be identified and the unit energy consumption per key indicator needs to be calculated from past actual values. More rational baselines can be set by measuring the key

indicators after the project implementation. Moreover, this calculation method is also specified as being applicable to facilities using electricity in the methodology AMS-II. C.

1. Examination of baseline emissions and reference emissions

For the preparation of the JCM methodologies, baseline emissions and reference emissions have to be set. In order to do this, it is necessary to examine how to consider the baseline scenarios and to prevent the baseline emissions from being irrational.

At first, the baseline emissions are subject to the following prerequisites:

- Baseline energy consumption means GHG emissions that are assumed when ESCO is not implemented by this project.
- The baseline is calculated by "the product of energy consumption per unit time and operating time" according to the AMS-II.C methodology.

Two calculation methods for the AMS-II.C methodology are recognized: one is "the product of the number of items of equipment and their output and operating time" and another is "the product of energy consumption per unit and the determinant indicator of unit consumption." As air-conditioning facilities do not always perform at the rated operation level, the latter calculation method, which is more accurate, is adopted. As the most influential indicator for air-conditioning facilities, the operating time is regarded as the indicator of the unit consumption. In order to improve the accuracy of baseline emissions, it is desirable to use actual values over a long period as far as possible when calculating the energy consumption per unit time.

Subsequently, the results of the examination of the decision procedures for baseline scenarios are indicated. For each of the assumed multiple baseline scenarios, the potential contribution of this target project was examined, and then for the scenarios that could occur, the means of dealing with them in the methodologies was studied. Based on the prerequisites determined above, in particular, focusing on "energy consumption per unit of time", which affects the baseline emissions, how this will vary was examined for each of the assumed baseline scenarios.

The assumed baseline scenarios are the following five:

A) Renewal and introduction of facilities

i. The air-conditioning efficiency changes due to the renewal and introduction of new air-conditioning facilities

⇒ Set a new baseline if the air-conditioning facilities are actually renewed.

ii. The air-conditioning load changes due to the introduction of heat insulators and insulating glass

⇒ Set a new baseline if any facilities such as heat insulation that affects the air-conditioning load are actually introduced.

B) Change in the heat sources

i. The air-conditioning load changes due to fluctuations in the outdoor temperature, humidity, and the radiation temperature of the building

⇒ It is assumed that this scenario will not occur since the climate in Malaysia, the target region of this project, is stable.

ii. The air-conditioning load changes due to variations in the floor area that provides air-conditioning as a result of the moving-in and -out of the tenants, etc.

⇒ It is assumed that the baseline energy consumption changes at the constant rate of energy consumption after the project implementation due to the variation in the floor area (or the rate of vacancy).

iii. The air-conditioning load changes due to a change in the equipment used and fluctuations in the number of staff due to the variation in business conditions.

⇒ In the case of variations in the business conditions of the building or its conversion to business use or commercial use, it is regarded as being possible to continue by setting new baselines. In the case of a shift to other business conditions, however, the project will be closed as it is not covered by these methodologies.

On the other hand, reference emissions are calculated by multiplying the baseline emissions, which are calculated from the baseline scenarios, by a constant discount rate, in the same way as the JCM methodologies that are applied to the LCSBP projects (the reasons are also the same). The discount rate will be examined in future, including the application of common values to the JCM methodologies.

2. Examination of eligibility criteria

It is difficult to determine the eligibility criteria uniformly as the ESCO projects use a variety of equipment. Japan and Malaysia, therefore, should cooperate to prepare positive lists of eligible equipment, and the projects for which they are applicable should be automatically considered as JCM projects.

The specific equipment and the like that is recorded in the positive lists will be examined through consultations between the business operators and government officials of Japan and Malaysia in future.

3. Methods for calculating the effects of GHG emissions reductions

To determine the methods for calculating the effects of GHG emissions reductions from air-conditioning facilities, the measurement methods for energy consumption that are actually used in the building air-conditioning market have to be confirmed primarily.

The following three methods are given in order to calculate the energy consumption of building air-conditioning facilities. Besides, specific calculation formulas and parameters are presented in the reduction methodologies (draft).
Methods for measuring the quantity of heat in a coolant (water in the figure) using calorimeters

* If the installation of calorimeters is difficult: Measure the quantity of heat in the coolant using flowmeters and thermometers.

Methods for measuring the quantity of heat in the air distributed by air-conditioning (air in the figure) using flowmeters and thermometers.
Methods for measuring the electricity consumption of air-conditioning facilities (HVAC) and chillers using wattmeters.

When measuring the energy consumption of existing building air-conditioning systems, appropriate measurement methods are adopted in consideration of the availability of the existing measurement equipment, additional costs to introduce measurement equipment, the length of the work period, and other aspects.
The draft of the reduction methodologies in this project also takes into account the fact that the measurement methods for energy consumption may vary widely according to the conditions of the respective air-conditioning systems of the buildings, and thus it considers the above three measurement methods to be applicable.

In this investigation, an examination was conducted on the parts that can be simplified for the purpose of improving the usability and applicability for practical use in accordance with the CDM methodology AMS-II.C whose methods have already been simplified.
Indicators that affect the energy consumption of air-conditioning

- Outdoor temperature and humidity
  A) In regions where the difference in the monthly average temperatures is within ten percent throughout the year, the impact of the outdoor temperature on energy consumption is considered small, and thus the energy consumption unit that is derived from data measured over about ten days can be used throughout the year.
- Calculation methods for the baseline energy consumption in the case of the changes in the vacancy rate
  A) In buildings leased for commercial use and office buildings, the volume of air-conditioning varies largely according to the moving-in and –out of the tenants, which can affect the air-conditioning load. Strictly speaking, although the amount of change in energy consumption caused by the change in air-conditioning load is not constant before or after

the project implementation, the variation in the amount of baseline energy consumption at that time is considered proportional to the rate of change in energy consumption after the project implementation.

The methodologies were formulated on the basis of the above examination results.

3-5. Financial environment in Malaysia

1. Financial sector in Malaysia

The bank sector in Malaysia is broadly divided into the following three forms: commercial banks, Islamic banks, and investment banks, all of which are supervised by Bank Negara Malaysia (BNM, the central bank).

Table 3-5-1: Overview of the bank sector in Malaysia

Category	Characteristics	Number of Banks (*)
Commercial Banks	Conduct regular banking business such as savings, lending, exchange, etc. for both corporate and individual customers.	27 banks (8 local and 19 foreign banks)
Islamic Banks	Conduct financial services in accordance with the doctrine and practices of the Islamic religion.	16 banks (10 local and 6 foreign banks)
Investment Banks	Concurrently undertake securities business and banking business for corporations	15 banks (all are local banks)

(Source) The BNM's website (*) As of November 12, 2013

The total assets of the bank sector as of the end of November 2013 amount to 2,059.7 billion ringgit and the balance of loans is 1,204.5 billion ringgit. A little less than 80 percent of both are accounted for by commercial banks. The most recent trends in total assets and the balance of loans by bank category are given below. From 2010 to November 2013, the total assets increased steadily by approximately 33% and the balance of loans did so by approximately 37%.

In the commercial bank sector in Malaysia, local banks take the initiative, among which the so-called three mega's, that is, Malayan, CIMB (both are Malay), and Public (Chinese) occupy the core. As for foreign banks, in addition to the Singaporean banks such as UOB and OCBC, the Western banks including HSBC, StanChart, and Citi are the leading ones. The following table indicates the respective financial conditions of major local and foreign banks in the most recent fiscal year end. Although local banks exceed the foreign banks in terms of asset size and the balance of loans, in terms of profit efficiency such as ROA (Return on Assets) and ROE (Return on Equity), the foreign banks are superior to local banks that have broadly developed a retail business.

Besides, with regards to the provision of financing by foreign banks to local commercial banks,

in principle there is a regulation that allows an ownership ratio by foreign banks of up to 30 percent and that of single foreign banks up to 20 percent. The open door for foreign banks depending on discretion, however, is expanding as Prime Minister Najib Razak stated that Australian ANZ is allowed to increase the investment ratio in AMBank up to 49 percent, and the Central Bank of Malaysia (BNM) said that "there is a regulation, but exceptions are possible," and the like.

In addition, Malaysia aims to become a hub of Islamic finance as it observes the doctrine and practices of the Islamic religion. Malaysia handles Islamic finance with Islamic banks as well as with commercial banks and investment banks as it has made efforts to expand Islamic finance through enacting the Islamic Banking Act, establishing various incentives for Islamic financial business and preferential tax systems, and other aspects. The amount of outstanding Sukuk (Islamic bonds) issued in Malaysia in 2012 amounted to 97.1 billion US dollars, which was the largest share in the world of 69.7 percent.

Furthermore, Malaysia founded the Labuan International Business and Financial Centre (IBFC) on Labuan Island off the coast of Borneo Island in 1990. This is an attempt to develop and expand the financial services of the country through giving various favorable tax treatments with regard to financial transactions and general commercial transactions to offshore companies (non-residents) that were established inside the center.

2. Financing scheme

This section examines the possibility of establishing a financing scheme when Japanese companies advance smart city development projects and ESCO projects that can become the targets of JCM in the Iskandar Development Region of Malaysia.

Firstly, with regards to smart city development, the contents of the project scheme have not been decided yet and the means of funds recovery are still unknown. The possible major sources of funds recovery, however, are from the purchase prices received from the sale of condominiums or the rental income from commercial facilities and office tenants, in consideration of which real estate financing should be considered as a realistic means of financing.
In this case, the financial methods will be decided by taking into account the means of the developers and the funds recovery methods that the developers desire.

Subsequently, it is assumed that the ESCO projects will utilize Japanese leasing companies under the following scheme that Japan Facility Solutions, Inc., the business operator, is reviewing. At the time of reviewing the scheme, it is necessary for the following points to be considered.

Points of attention

- ✓ Can leasing companies take on the credit risks of the ESCO companies?
- ✓ Can leasing companies take on the credit and performance risks of the construction companies?
- ✓ Can leasing companies take on the credit risks of overseas customers?
- ✓ Can leasing companies take on the performance risks of the local ESCO companies that become the counterparties when the overseas branches of construction companies establish JVs?
- ✓ In the case of yen-denominated leasing, a mismatch of currencies accrues at the time of the payment of the lease fees as the service costs to be paid by the customers are most likely to be in local currencies. Under these circumstances, can the foreign exchange risks be taken on by the JVs that construction companies will establish jointly with the local ESCO companies?

Besides, ensuring sufficient profits to Japan becomes a prerequisite for the application of Japanese institutional finance. As there are almost no past records of financial support to real estate development and the ESCO projects by any of JBIC, NEXI, and JICA, more time should be spent on discussions regarding its application.

3-6. Environmental impact assessment

The LCSBP raises the level of improvement in the atmospheric environment in relation to the assumed co-benefit effects. Currently in Iskandar, air pollution from PM, SO2, NOx, CO, and VOC is deteriorating, and the main emission sources are vehicles, industrial activities, smoke from wood-burning that flows across the border, and other aspects. The utilization of superior Japanese technologies and products that are applied to smart cities can contribute to improvements in air pollution.

With regards to the project composition through the actualization of the LCSBP, it is determined that promotion of the introduction of the following product groups will be carried out as a result of examination of the functions and product groups that are necessary for and are possible to introduce to Iskandar, using the "Fujisawa Sustainable Smart Town (Fujisawa SST)," which Panasonic Corporation is implementing, as a benchmark for the LCSBP. In addition, qualitative assessment has been conducted concerning the respective environmental impacts (improvement effects) of these product groups.

Table 3-6-1: Product groups proposed for introduction and their environmental impacts

Element	Product Group		Environmental Impacts (Improvement Effects)
Green energy	● Community PV ● LED lighting	✓	Energy saving effects from the utilization of PV and LED can reduce electric power consumption. As a result, power generation using fossil fuels decreases and the contaminants released to the air are expected to be mitigated.
Water	● Water treatment facilities	✓	In the surrounding areas where the deterioration in water quality is increasing, considerable improvements can be achieved to ensure the quality of the water environment that is good enough for children to play at the waterside through the introduction of water treatment facilities.
Health	● Indoor environmental equipment	✓	HEMS can reduce excess electric power consumption. As the result, power generation using fossil fuels decreases and the contaminants release into the air are mitigated.
Community	● ICT solutions	✓	N/A
Safety	● Security systems	✓	N/A
Mobility	● Transport equipment	✓	Electric powered bicycles and EV's do not discharge exhaust gases. As the result, air pollution due to exhaust gases from vehicles and the inclusion of gases such as SOx and NOx decreases, and the growing air pollution caused by the increase in the number of vehicles is expected to be mitigated.

The composition of the ESCO projects is targeted at air-conditioning facilities, lighting, and other energy-consuming facilities of existing commercial facilities and office buildings in Iskandar. It is envisaged that energy conservation can be achieved through the introduction of the latest high-efficient facilities while mitigating the load on the users' side through the use of the ESCO scheme. As a result of the energy audit conducted in this investigation, it was considered that the following facilities could be introduced. Although these are part of the facilities that can be introduced by ESCO, qualitative assessment has been conducted concerning the environmental impacts (improvement effects) of these product groups.

Table 3-6-2: Energy saving measures based on the energy audit and the environmental impacts (Improvement effects)

Site	Measures	Environmental Impacts (Improvement Effects)
Wisma Daiman (Office building)	● Inverter control of cooling-water pumps ● Increase in the efficiency of lighting equipment	✓ Increase in the efficiency of pumps and lighting can reduce electricity consumption. As a result, power generation using fossil fuels decreases and the contaminants released into the air are expected to be mitigated.
Angsana Johor Bahru Mall (Shopping mall)	● Renewal of the heat source facilities ● Inverter control of cooling-water pumps ● Renewal of lighting equipment – replacement with high-efficiency fluorescent light tubes	✓ Renewal of heat sources for air-conditioning and an increase in the efficiency of pumps and lighting can reduce electricity power consumption. As a result, power generation using fossil fuels decreases and the contaminants released into the air are expected to be mitigated.

4. The action plans for the next fiscal year

4-1. Summary of the action plans

4-1-1. Demonstration of the LCSBP projects

(1) Contents of the plan

At the sites of the developers that agreed to the utilization of Japanese smart town related technologies and products in town development in the FY2013 F/S, the initiatives will be carried out utilizing the achievements and experience in Japan (Fujisawa) and China (Dalian). Specifically, the initiatives will be implemented for the following two sites in order to achieve the LCSBP and pave the way for the promotion and spread of Japanese smart town related technologies and products.

i. In mixed use development sites with high-rise apartments and commercial facilities, actualize the LCSBP in town development, and plan and review the demonstration in the show villages.
ii. In the mixed development sites of detached housing and apartment houses, plan and review the actualization of the LCSBP in town development.

(2) Contents of the commercialized projects

The establishment of smart towns will be implemented in the Iskandar region, Malaysia.

i) Multicomplex smart projects of high-rise apartments and commercial facilities in the center of Iskandar. The total project costs for 3,000 apartments and their tenants amount to over 40 billion yen.
ii) Smart town projects in the east area of Iskandar.
Construction of about 500 houses on 26 ha of land. The total project costs are approximately 30 billion yen.
iii) Horizontal expansion of smart town projects in Iskandar and throughout Malaysia. Supported by vigorous housing demand, horizontal expansion into the surrounding areas of Kuala Lumpur and other areas. The total project costs are estimated at over 100 billion yen.

(3) Schedule

Regarding i), the show villages are to be completed and housing construction is to be started in the fiscal year 2014.

Regarding ii), the site preparation is to be completed in fiscal year 2014, construction work for the common areas of the town blocks to start in fiscal year 2015, and construction work for housing is to start in fiscal year 2016.

Regarding iii), this is assumed to start after fiscal year 2016.

(4) Effects of CO_2 reduction and cost effectiveness

Through the F/S for the fiscal year 2014, the effects of GHG emission reductions and cost effectiveness in the smart town projects will be calculated. As reference values, in the case of the Fujisawa Sustainable Smart Town that Panasonic initiated, the GHG emissions reduction amount is set at a 100 percent reduction for detached housings and at 50 percent reduction for apartment houses. Thus, when the same effects of GHG emissions reductions are presumed, the GHG emissions reduction amount at each site is calculated as below:

i) 3,593 t-CO_2/year (for 3,000 apartment houses)

ii) 838 t-CO_2/year (for 300 apartment houses and 200 detached houses)

・Basis for the calculation

Electric power consumption of the Malaysian houses is 3,564 kWh/year and the emissions factor is 0.000672 t-CO_2/kWh. The cost effectiveness based on the above GHG emissions reduction amount is as below:

Total: 9,874 yen/t-CO_2

・*The assumptions of the trial calculation - necessary additional costs: 1 million yen/house, service life of the housing: 40 years, subsidy rate: 50%, (total subsidy amount: 3,500 houses x 1 million yen x 50% = 1.75 billion yen)*

(5) Japanese technologies to be introduced in the projects and their superiority

The adoption of energy saving equipment such as photovoltaic power generation systems, storage batteries, and air-conditioning, and the HEMS equipment that controls them is assumed. In addition, know-how such as the concept of smart town establishment and community development will be included. As there are no smart towns under actual operation yet in the world, their superiority is presumed to be high.

(6) Strategies for large-scale development of the projects

With the support of Japanese government officials such as from the Ministry of the Environment and JICA, the networks with the local Iskandar Development Corporation and other parties concerned will be established, and through the use of these networks, relationships with local developers will be strengthened.

Through the opportunities to introduce the concept of Japanese smart towns into the development master plan by strengthening the relationships with local developers, further high-level commitments to the projects will enable the introduction of the use of Japanese technologies and products.

4-1-2. Demonstration of the ESCO projects

(1) Contents of the plans

In fiscal year 2013, the expected outcomes could be achieved. In other words, with the support of the Iskandar Regional Development Authority (IRDA), energy audit were conducted for two buildings (a commercial facility and an office building) jointly with TNB-Energy Services (hereafter, TBB-ES), a local ESCO company, in December. Based on the results, the ESCO business scheme will be reviewed and the ESCO scheme will be proposed to the customers (the building owners) at the time of the local visit in February. In a series of processes of this FS, it is considered that the know-how of our company was successfully transferred to TNB-ES and the business capacity of TNB-ES has been improved.

By carefully advancing the steps to realize this ESCO proposal in collaboration with TNB-ES and the customers, it is expected that TNB-ES will be able to develop the ESCO projects independently. In other words:

i. Implementation of secondary diagnoses based on the proposed contents and the preparation of secondary proposals
ii. Planning of verification methods regarding the effects and consultations with the customers
iii. Close investigation of specific contracts and consultations with the customers
iv. Examination of specific equipment, the system setting and installation methods, and other aspects.

It is difficult to further these processes without the cooperation of customers. Even if sufficient economic efficiency is admitted as a result of the energy audit, a great deal of work is required for both parties to advance their first practical business such as the ESCO contracts and the concept of performance guarantees. In particular, the burden on the customers will become significant. When our company established companies in Japan, all the steps were shared as a form of trial with the cooperation of the particular customers. As business practices differ according to the country, this step is also indispensable in Malaysia. By this means, the improvement of the business capabilities of TNB-ES as our counterpart can be expected.

Through furthering these processes as an FS in the fiscal year 2014, the environmental improvements in order to promote the ESCO in the Iskandar region will be made possible, and a reduction in the amount of GHG emissions and an increase in business opportunities for Japanese companies can be expected.

(2) Contents of commercialization

The ESCO projects (in the fiscal year 2014, the steps immediately before starting construction are regarded as the F/S targets) in relation to the two buildings (a commercial facility and an

office building) where the energy audit were conducted in 2013. In fiscal year 2015, the steps including the actual installation of equipment are planned to start.

(3) Schedule

In the fiscal year 2014: Sharing of the steps required to realize the ESCO projects

In the fiscal year 2015: Construction work for equipment installation, etc., in order to realize the ESCO projects

In the fiscal year 2016: Measurement, analyses, etc. (which are required to actualize the guarantees of the effects, a feature of the ESCO projects)

(4) Effects of CO_2 reductions and cost effectiveness

Angsana: 5,372,000RM (188 million yen) to be invested against 1,619 ton-CO_2/year

17.2 kg-CO_2/thousand yen, assuming that the subsidy rate is 50% of the investment

Wisma: 400,000 RM (14 million yen) to be invested against 74 ton-CO_2/year

10.6 kg-CO_2/thousand yen, assuming that the subsidy rate is 50% of the investment

In total, 16.8 kg-CO_2/thousand yen

(5) Japanese technologies to be introduced in the projects and their superiority

Japanese air-conditioning related technologies are at the world's highest level.

Refrigerators, air conditioners, inverter control systems, and air-conditioning construction technologies

(6) Strategies for large-scale development of the projects

Although the ESCO projects in Malaysia are still at the starting line, the government is attempting to proactively support them and has just approved ten ESCO companies that can receive orders for ESCO services for government buildings. TNB-ES is also one of these and their capacity could be assessed in terms of their energy audit processes in this period of cooperation. It was confirmed that as our partner, they have already reached a sufficient technical level to verify business models that profit Japanese companies.

On the other hand, although TNB-ES has experience in energy audit, they have not had experience in carrying out the ESCO projects themselves. By sharing this step in a proficient manner in the fiscal year 2014, collaboration with Japanese companies can be put into practice. Their capabilities and the capacity of their parent companies can be fully utilized. Thus, this experience can be extended more broadly to ESCO business operators throughout Malaysia.

The gracious cooperation of the first customers was the key to taking the initial step. Although the steps to institutionally and economically verify whether the business models will be successful are necessary for any models, it is difficult to verify them if they are requested only to make the project “cheaper and cheaper” at the same time. The customers that were introduced by Iskandar Regional Development Authority (IRDA) this time all constructively took into account the benefits of these projects by Ministry of the Environment, and their future cooperation can be expected.

The business model (financing scheme) to be used this time is as in the following Figure 4-1-1. If this scheme is established without using subsidies, energy saving support businesses can be developed sustainably throughout Malaysia as well as in Iskandar, and moreover, it is expected that Japanese companies will profit from this. During the energy audit conducted this time, there were cases in which sufficient economic efficiency could be secured without the use of subsidies. The service provision to the customers while reducing the burden on them of the practical aspects of the energy saving business is considered important to pursue through the development of the TNB-ES experience into a series of processes using subsidies and securing incentives for the customers to cooperate.

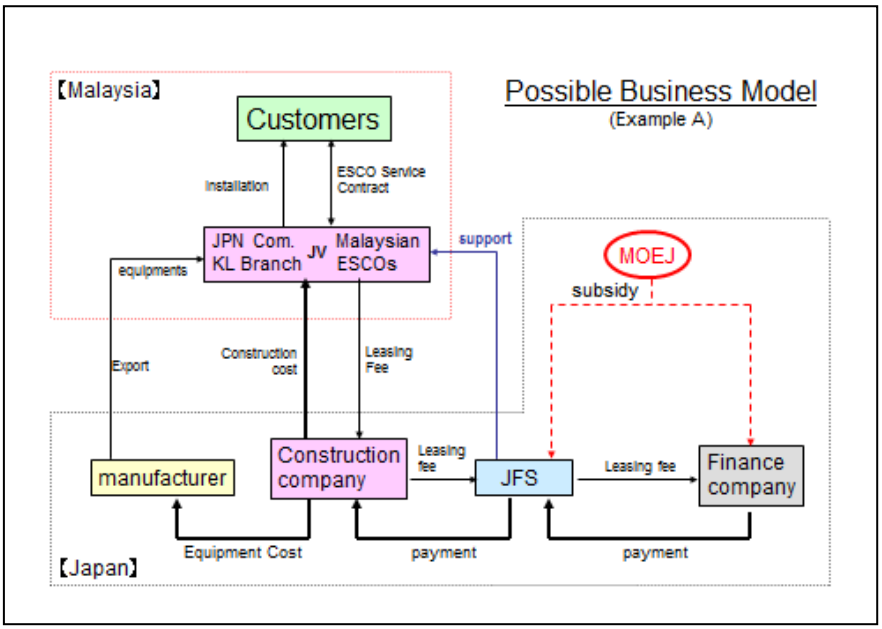


Figure 4-1-1 Business model to be applied (Financing scheme)

4-2. Challenges towards realization

4-2-1. Demonstration of the LCSBP projects

At the time of the processes and the horizontal expansion of the LCSBP project demonstration, in the case of regions where the energy systems of the target countries such as the electricity rate systems, certification of equipment and services, and labeling systems, which are supposed to contribute to promoting low-carbon societies towards smart towns, do not serve as incentives, it is generally difficult to promote projects among residents and local developers by taking advantage of the promotion of the benefits of establishing low-carbon societies and dealing with energy problems. Thus, if there are policies that actively encourage the establishment of low-carbon societies, the interest of the residents and local developers will increase and the projects will be furthered more easily.

Besides, in countries with emerging economies, personnel expenses and land prices are continuing to rise and the total project costs are also on the upward trend. They are therefore in a difficult situation to determine the final costs. In these circumstances, it is assumed that financing schemes that compensate for cost fluctuations are very useful if they are available.

4-2-2. Demonstration of the ESCO projects

After the joint energy audit, the results of the diagnoses were summarized during approximately one month of work by TNB-ES, which verified that the following energy saving measures can be considered for the Wisma Daiman office building.

i. Inverter control of cooling-water pumps
ii. Energy saving of lighting (replacement of fluorescent tubes)

For Angsana Johor Bahru Mall, the following energy saving measures were verified as conceivable:

i. Renewal of chillers
ii. Inverter control of cooling-water pumps
iii. Energy saving of lighting (replacement of fluorescent tubes)

Moreover, the effects of energy savings in the Wisma Daiman office building will be a reduction of 107 MWh/year, achieving an energy saving of 8.2 percent with a simple payback period of 5.4 years; and those for Angsana Johor Bahru Mall will be 2,351 MWh/year, achieving a rate of energy saving of 11.7 percent with a simple payback period of 5.1 years. In both cases, it was

confirmed that there are possibilities to pursue these as ESCO projects. If the subsidies from the Ministry of the Environment (which subsidizes half of the investment amount) are available, the ESCO projects can be developed in both cases within ten years or more. In addition, regarding the equipment to be used, it is considered possible to use Japanese products for refrigerators, pumps, air-conditioning equipment, and automatic control. Considerations, therefore, are taken in order to smoothly develop cooperation in receiving orders through the introduction of Japanese subcontractors (constructors) as TNB-ES's subcontractors.