# Second Batch of Domestic TOP TENs List

## Japan Building BP List

### BP1: Promotion of Super Energy-saving Construction by Achieving "Japan's First Urban-style Zero Energy Building (ZEB)"

#### 1. Details

In order to combat global warming,the Japanese government targets a 26% cut in greenhouse gas emissions by 2030. The country's private sector is required to achieve an even tougher goal of approx. 40% reduction from FY2013 levels.

Zero Energy Buildings (ZEBs) that achieves significant energy conservation are expected to contribute greatly to achieve these goals. ZEBs are environmentally-friendly buildings whose annual primary energy consumption is net zero,which is achieved by combining ultimate energy conservation efforts and the creation of energy. Taisei Corporation built a ZEB demo building in May 2014 at its Technology Center. It achieved ZEB (net ZEB),meaning net zero of primary energy consumption,during three consecutive years from 2014 to 2016.

The following technologies were introduced:

(1) A system combining equipment to use natural light and high efficiency LED lightings to achieve sufficient brightness with low luminance: energy consumption for

lighting reduced by about 86% .

(2) Task and ambient air conditioning combining air conditioning by radiation from the building structure utilizing exhaust heat from fuel cells and personal floor air outlet control: energy consumption for air conditioning reduced by about 76% .

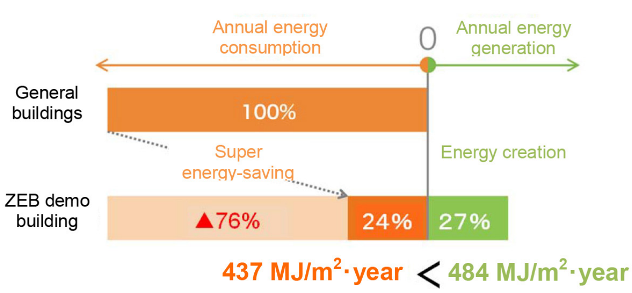
(3) Energy creation by installing high efficiency single crystal silicon solar power panels on the roof and introducing outer wall units of organic thin-film photovoltaics,an essential unit to realize an urban-type ZEB .

(4) Optimum operation control using the company's proprietary next-generation T-Green BEMS.

## 2.Diagrams,etc.

| Use | Office |
| --- | --- |
| Location | Totsuka-ku, Yokohama City |
| Site area | 34,821.92m² |
| Total floor space | 1,277.32m² |
| Structure | Reinforced concrete |
| Levels | 3 levels above ground |
| Completed | May 2014 |

Taisei Corporation's ZEB demo building




Annual energy balance

## 3.Energy conservation performance

(1)ZEB demo building (demonstrated values):

Energy consumption: 437 [MJ/m$^2$d · year],energy creation: 484 [MJ/m$^2$·year]

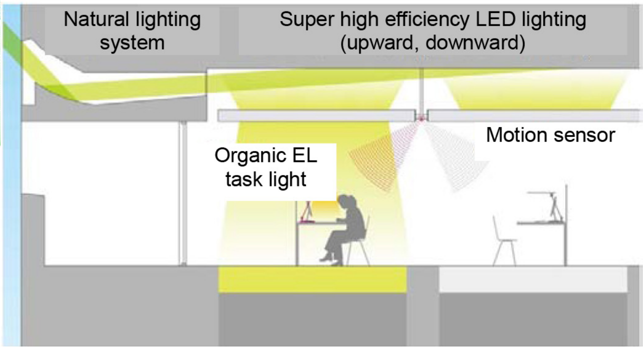
(2)Energy conservation of 103% attained in annual energy balance(energy conservation: 76%,energy creation: 27%)

(3)Reduction of energy consumption: 62 kL/year (Gap of primary energy consumption with that of a standard building* x crude oil conversion factor)

* Standard building:1817 MJ/m$^2$·year

## 4.Advanced nature and originality

So-called ZEBs can also be found outside Japan. Many of them feature solar power generation in a vast area or energy creation using biofuel brought in from outside the building. Meanwhile,our demo building achieves zero energy balance combining the latest energy conservation technologies and solar power generation. The state-of-the-art technologies include the system to bring in natural light to the back of the office space,the task and ambient lighting system considering brightness to the eye,and air conditioning by radiation from the building structure utilizing exhaust heat from fuel cells. It is one of the few cases that realize net ZEB in a small land area,where sufficient energy creation is difficult,without relying on the supply of renewable energy from outside the building.



Task and ambient lighting system

## 5.Versatility and expandability

In April 2014,the Japanese cabinet has adopted the basic plan on energy,which includes the target for ZEB. This case is a demonstration of an urban-type ZEB and verified the feasibility of ZEBs. For this reason,this case is versatile and expandable to other buildings that wish to be ZEB.

## 6.Continuity and sustainability

'T-ZEB simulator',a planning tool,has been developed after consideration of the achievement of ZEB (net ZEB) at the ZEB demo building. It is a unique technology to enable consideration of energy balance and cost study in a short period of time depending on the ZEB level. For the future,the company will continuously develop ZEB promotion activities,while addressing cost issues.

## 7.Investment efficiency

The target of initial cost in 2020 when compared with a standard building: 120%,and that cost reduction for operation: 80% (excluding the base rate).

## 8.Secondary results

(1)$CO^2$ reduction: 122 t-$CO_2$/year [0.1 t-$CO_2$/$m^2$ · year]

(Gap of $CO_2$ emissions compared with that of a standard building x $CO_2$ emissions conversion factor)

(2)No. of visitors: 12,000 (June 2014–May 2017)

(3)Patents and utility models: 11 (energy-saving air conditioning systems,etc.)

(4)Certifications: BELS ★★★★★

LEED-NC Platinum certification,etc.

(5)Awards:

-Environment Minister's Award for Global Warming Prevention Activity (2014)

-5th Energy-Efficient Lighting Design Awards (2014)

-Japan Resilience Award (2015)

-Good Design Award (2015)

(6)Literatures:

-FY2015 Annual Convention of Architectural Institute of Japan,etc.

-'Zaikai'

-'Nikkei Architecture'

-'Shinkenchiku'

-'Building Mechanical and Electrical Engineer'

-'Electrical construction & maintenance'

-'Nikkei Electronics'

(7)Newspaper release:

Nihon Keizai Shimbun [ZEB demo building] (June 17,2014),and others. 70 articles in total.

(8)The Wall Street Journal of the U.S.

'Japan Pushes Zero-Energy Structures' (Sept. 29,2014) . ■

# BP2: Energy Conservation Activities at a Next-generation Green Hospital

## 1.Details

It is a project advanced by a large general hospital to create a next-generation green hospital.

In order to build a next-generation green hospital utilizing abundant natural environment,hospital director himself took the initiative to build an ideal hospital that can reduce energy consumption and $CO_2$ emissions,with the cooperation of the building designers and facility designers.

Major efforts include the establishment of a distributed local heat source system,the use of abundant well water for the heat pump system,the application of radiant heaters and coolers,minimizing the ventilation,the introduction of vaporizing humidifier control,energy management utilizing an automatic reporting function BEMS,and visualization using digital signage.

In promoting energy conservation,continuous efforts were made including eco patrols mainly by the Eco Committee and performance verification by designers.

As a result,the average primary energy intensity after opening the hospital stood at 2,240 MJ/$m^2$ year,representing about 45% reduction compared with average intensity of large hospitals.

## 2.Diagrams,etc.

Energy conservation and reduction of $CO_2$ emissions at Japanese Red Cross Ashikaga Hospital.

Refer to Figure 1.

## 3.Energy conservation performance

(1)Energy intensity: 2,240 MJ/$m^2$ year (average of FY2012 and 2013) → About 45% reduction compared with average intensity of large hospitals.

(2)Amount of energy conservation: Crude oil equivalent 2,315 kL/year (average of FY2012 and 2013).

(3)$CO_2$ reduction: 3,930 t-$CO_2$/year (average of FY 2012 and 2013).

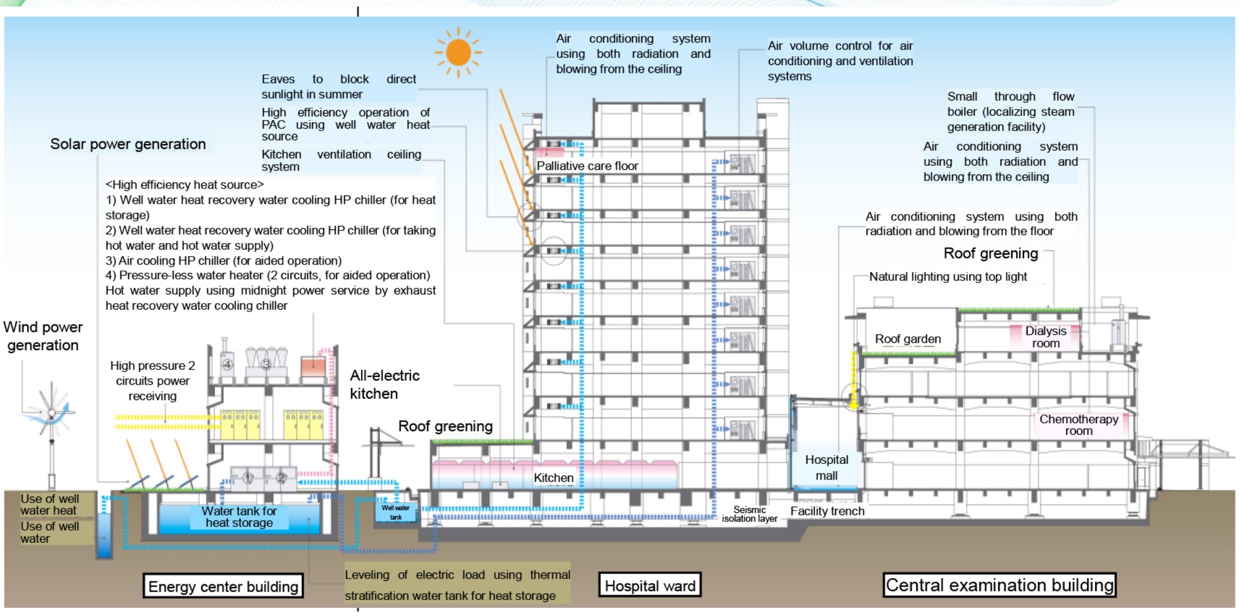



Figure 1

(4)Ratio of energy consumption: Electricity (daytime): 60.6%,electricity (nighttime): 33.9%,gas: 5.4%,oil: 0.1% → Contract electricity: 2,500 kW (48 W/$m^2$),significantly contribute to the leveling of electric load.

## 4.Advanced nature and originality

Introduced as many energy conservation and $CO_2$ reduction technologies as possible that are applicable to hospitals,under the concept of 'next-generation green hospital'.

(1)The use of steam was limited to medical use,and built a high efficiency heat source system for air conditioning and hot water supply.

(2)Heat pump system utilizing abundant supply of well water: adopted a well water heat recovery system for air conditioning and hot water supply to improve efficiency.

(3)Use of wind and solar power generation for enlightenment: installed wind and solar power generation system for display for the people coming to the hospital as a symbol of a green hospital.

(4)Body-friendly radiation cooling and heating system: radiation-type cooling and heating system achieving both energy conservation and comfort,to provide a comfortable environment for the inpatients.

(5)Minimizing ventilation when outer temperature hits peak or during nighttime: control outer air volume to reduce energy consumption for heat source and ventilation.

(6)Total energy conservation for the kitchen: kitchen ventilation ceiling system (displacement air conditioning) + electric kitchen (low heat radiation) + control of ventilation volume.

(7)Automatic reporting function BEMS system: energy data can be output automatically in an excel format report.

## 5.Versatility and expandability

(1)Transmission of information of a green hospital: hospital director,head of the administration section and designers gave lectures and contributed many literatures to newspapers and magazine.

(2)PR activities by accepting inspection tours: efforts of a next-generation green hospital were introduced to more than 200 medical and welfare institutions.

(3)Visualization using digital signage: using display monitors set at the entrance,transmit eco information to the staff members and the patients.

## 6.Continuity and sustainability

(1)Briefing on eco-friendly hospital operation by the designer: held a briefing to explain the intention of the design and the operation methods to the hospital staff members.

(2)Performance verification by the designer: simulation of heat source operation using LCEM,and measurement of the interior environment and energy conservation.

(3)Eco patrol: Major members of the Eco Committee conducted eco patrols.

(4)Periodic reporting of energy usage by the Eco Committee:report energy consumption by division or level of the hospital.

## 7.Investment efficiency

-Initial cost of all facilities for energy conservation: Approx. 1.4 billion yen.

-Yearly running cost: Reduced by approx. 200 million yen .

-Simple investment recovery period: Approx. 7 years

## 8.Secondary results

(1)As a next-generation green hospital aiming to become a ZEB,the hospital was recognized in Japan,Asia and in the world.

(2)Won many environment-related awards. (Energy Conservation Grand Prize for excellent energy conservation equipment,the 1st Carbon Neutral Grand Prize,IFHE International Building Award 1stPrize etc.)

(3)Fostered medical staff members friendly to the environment and also to the patients. Human resources development through the environment.

(4)Fostered sustainable mind of the staff members by introducing a system ceiling,scratch-proof floor materials,wax-free floor materials,curved mirrors,visible piping,and eaves to prevent bird droppings from coming in,to extend the life of the hospital.

(5)Balanced energy-saving and disaster prevention initiatives. Maintained the functions as a disaster center hospital for full back-up in case of a disaster.

(6)$CO_2$ reduction: 3,930 t-$CO_2$/year (average of FY2012 and 2013). ■

# BP3: University-wide Efforts to Build a Smart Campus

## 1.Details

In 2009,Mie University has established a medium-to-long-term plan on energy conservation,with the aim of becoming the most environmentally advanced university in the world. Meanwhile,the addition of new buildings in the campus has expanded the total floor space by 26.3% in 2013 from 2010,dramatically increasing energy demand. At the same time,peak power has also been on the rise. In order to meet an urgent need to reduce energy consumption and $CO_2$ emissions,to decrease peak power and to supply power for disaster prevention,president of the university,who supervises the university's environmental activities,led the university-wide program to create a smart campus in October 2011. Chief initiatives and responsible persons are described below:

(1)Energy conservation by introducing innovative energy-saving facilities (Smart Campus Program)

The objective of the Smart Campus Program is to reduce energy consumption and $CO_2$ emissions and to curtail peak power by introducing innovative energy-saving facilities combining the creation,storage and conservation of energy in an organic way. Reduction goal of $CO_2$ intensity from 2010 was set at 24%. In spring 2010,faculty members took the initiative and voluntarily made research on energy demand with the cooperation of the members at the Smart Campus Division. They also formulated a plan to introduce energy-saving facilities. The planning process took one and a half years. They explained the plan to the board,faculty meeting and department head meeting as necessary. They advanced the plan and successfully achieved the goal,obtaining consensus of all parties concerned in the university.

(2)Power saving efforts of all students and faculty members in the university

University students and faculty members voluntarily carried out environmental activities to reduce energy consumption and curtail power demand. At the beginning,the head of the Smart Campus Division (Professor) explained the objectives and intension,as well as detailed procedure of the activities to the board,faculty meeting,department head meeting and meeting at Center for Environmental Management and Enhancement,in which students can also participate.

1)MIEU Point ('U' stands for University and 'yoU'):

In the MIEU Point system,each member of the university inputs his/her environmentally-friendly and energy-saving activities from a portable terminal, and the data instantly becomes visible to the person who made the

Efforts to become the most environmentally advanced university in the world

**Build cooperative relationships with the stakeholders**

Study sessions and seminars with Mie Prefecture,municipalities and the national government (METI Chubu)

**Introduce innovative technologies for the next-generation energy society**

Technology development expecting a large-scale introduction of renewable energy
- Use of locally-produced energy within the campus (wind power,solar power)
- Control the fluctuation of unstable power consumption and the maximum effect of lowering peak power using hybrid small capacity batteries
- Low-loss LED lighting without power conversion

High efficiency co-generation using electricity and exhaust heat to the full
Energy conservation-oriented air conditioning suitable for marine climate (hot and humid)

Inspection tour of high efficiency co-generation system by elementary school students

**University-wide energy-saving and power-saving activities**

Energy-saving and power-saving activities using the MIEU Point*
Demand response with the university-wide participation
Green walls created mainly by students
Visualizing energy demand by department and power saving

* MIEU Point: A unique initiative of Mie University. Students/faculty members input environmentally-friendly or energy-saving activities they performed instantly. The system then visualizes the achievement and gives points to the persons who implemented the activities.

**Public relations of the demonstrations and expansion of the achievements to other universities**

Educational activities for elementary,junior high,and university students (hands-on experience): 46 times in total
Smart Community exhibition,introduction and presentation at university association: 32 times in total
Planning and supporting smart campus projects to other universities in and outside Japan: 2 universities

Figure 1 Outline of the Smart Campus Concept

action. This motivated each member to make energy-saving efforts.

2) Demand Response (power saving activities)

Peak power demand of the university comes at the end of July each year,before the first semester's final examination. In the nine days at the end of July 2013,the university implemented university-wide power saving program. This university-wide program has been continuing for three years now (2015). The achievement is reported to all departments every year.

## 2.Diagrams,etc.

Refer to Figure 1, 2 & 3.

## 3. Energy conservation performance

Actual rate of reduction o energy and $CO_2$ emissions. Figures shows the comparison with the former facilities (2010); '%' is the comparison of floor area intensity (with 2010).

Refer to Table 1 and Figure 4 .

## 4.Advanced nature and originality

(1) Maximize the use of exhaust heat fromco-generation plant (2 patents filed)

Formulated a method to make a full use of exhaust heat from co-generation to(Patent filed in June 2014) Cost-saving operation is being implemented. Effect of improving operation: Reduction of gas consumption (crude oil equivalent): 210 kl/year Reduction of gas cost: 19.7 million yen/year.

(2)Desiccant air conditioning to achieve both comfort

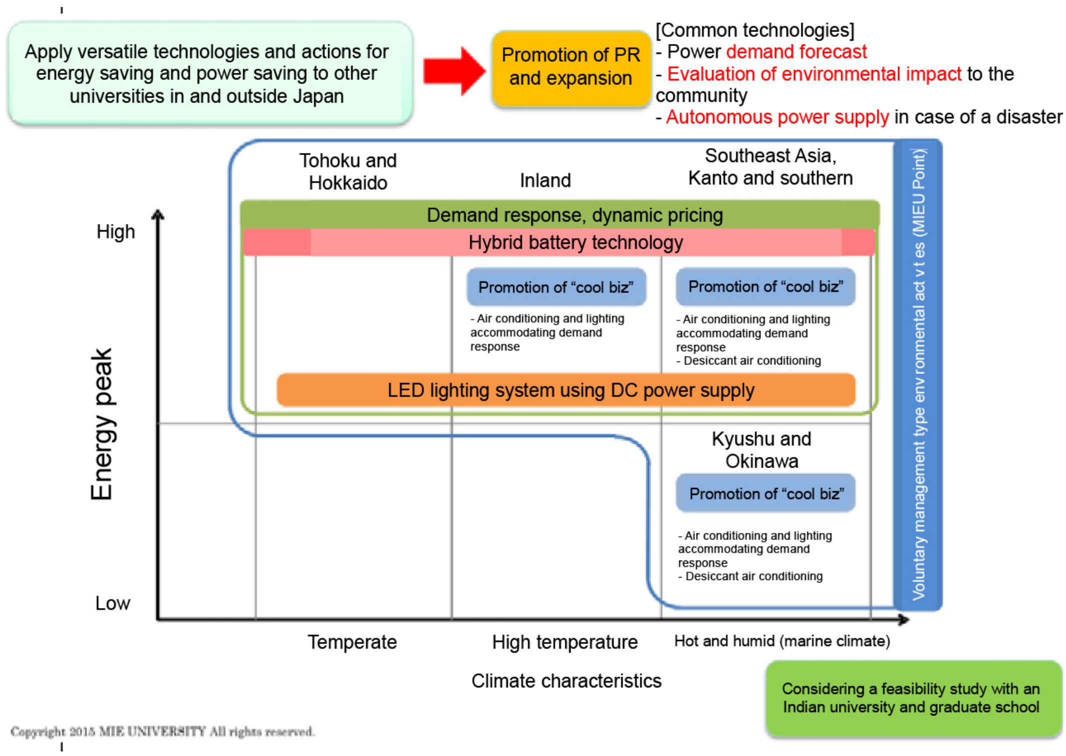
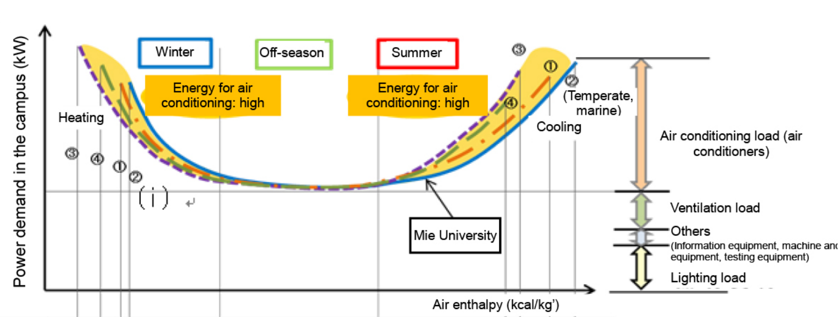



Figure 2 Generalization of the methods implemented in the Smart Campus Program and future expansion




| Air conditioning | | | Heating | | None | Cooling | |
|---|---|---|---|---|---|---|---|
| Climate conditions | Temperate | ① Inland | | | | | |
| | | ② Close to the sea | | | | | |
| | Cold | ③ Inland | | | | | |
| | | ④ Close to the sea | | | | | |
| Heat source for cooling and heating | Use exhaust heat *1 | Absorption | ○ | | — | ◎ | |
| | | Steam/hot water | ◎ | | — | ○ | |
| | Electricity *2 | Turbo | — | | | ◎ | |
| | | Desiccant | △ (Low COP*3) | ◎ | — | ◎ | |
| | | Heat pump | △ (Low COP) | ○ | — | ◎ | ◎ |
| | Gas *1 | Absorption | ◎ | ○ | — | ○ | |
| | | Gas heat pump | △ | ○ | — | ○ | |
| | Gas/oil *1 | Boiler | ○ | | — | | |

Evaluation of energy efficiency

◎ > ○ > △

*1: Power consumption: low
*2: Power consumption: high
*3: Coefficient of performance (representing efficiency)

Figure 3　Selection of optimum heat source for air conditioning by region

Table 1

| Item | | Unit | 2013 | 2014 |
|---|---|---|---|---|
| Entire university | Energy (crude oil equivalent) | kl/year (%) | ▲1,855(▲20.4%) | ▲2,191(▲24.1%) |
| | $CO_2$ | t-$CO_2$/year (%) | ▲4,401(▲21.7%) | ▲5,354(▲26.4%) |

## Results of major initiatives

| | Major initiatives | Energy (crude oil equivalent) kl/year | $CO_2$ emissions t-$CO_2$/year | Other achievements |
|---|---|---|---|---|
| Energy creation | (1) Introduce innovative energy conservation facilities and improve operation<br>- Renewable energy facilities: Solar power generation; Wind power generation<br>- Co-generation using gas<br>- Conversion of fuel for heat source facilities (from heavy oil to gas) | ▲56<br>▲68<br>▲1,183<br>▲466 | ▲81<br>▲99<br>▲1,725<br>▲2,322 | Prior evaluation of environmental impact |
| Energy storage | - Small capacity battery to maximize the effect of curtaining peak power<br>- Battery to reduce fluctuation of renewable energy generation<br>- Autonomous power supply in case of a disaster or an emergency (BCP) | —<br>—<br>— | —<br>—<br>— | Peak power ▲60 kW<br>Reducing instant fluctuation ±50 kW<br>Power supply in case of a disaster |
| Energy conservation | - Energy-saving desiccant air conditioning to create a comfortable interior environment<br>- Use of DC generated by solar power generation (for lighting) | ▲82<br>▲18.1% | ▲173<br>▲18.1% | Comparison with A/C |
| | (2) Power saving with the participation of all students and faculty members of the university<br>- Visualizing environmental and energy-saving activities and give incentives to start such activities (MIEU Point)<br>- Demand response to lower peak power during summer (power saving activities)<br>- Green walls to combat global warming | ▲2,770kWh<br>—<br>—<br>Solar insolation shielding effect ▲65 - ▲90% | ▲1.03<br>—<br>— | Peak power: an average 4.5% reduction for nine days (430 kW) |

and energy conservation during hot and humid summer Generally,air conditioning in summer is controlled based on the room temperature. This time,we adopted a new air conditioning system to evaluate the comfort level (discomfort index) of the persons in the room,considering humidity as well. Energy conservation effect of the desiccant air conditioning has been demonstrated (a reduction of 36.6%). This is a unique and creative initiative that can be applied and expanded to other universities and office buildings.

(3)DC power supply to lighting equipment expecting a extensive introduction of PV

Intelligent DC (Direct Current) power supply is an energy-efficient system to sustainably supply power to important loads,such as lightings,POS terminals and ATMs in convenience stores using renewable energy in a time of disaster. In normal times it utilizes renewable energy efficiently,and at the time of disaster,this advanced system has an effective function for BCP.

(4)Power saving by demand response (DR)activity

Mie University implemented demand response initiative for nine days,which is effective to reduce electricity demand when it becomes tight in the daytime during mid-summer. The University has set two different pricing systems,the normal pricing system and the one for critical peak pricing. The latter charges higher unit price for power consumption during daytime to encourage people to reduce power consumption. People were allowed to choose the cheaper one. 41% of the entire university participated in the power saving activities,and the power saving effect was 4.5% in 2013 and 5.9% in 2015. Mie University became the first university in Japan to implement university-wide power saving through DR. The efforts are still continuing.

(5)MIEU Point system to encourage students and faculty members to perform energy conservation activities

MIEU Point system is for encouraging people to perform environmentally-conscious and energy conservation activities,by visualizing the achievements and give points depending on the contents of the activities. Prizes are given or the points can be exchanged for gifts. This leading-edge initiative started in 2012 is still ongoing every year.

## 5.Versatility and expandability

(1) Details of versatile technologies

The following technologies realized by Mie University can widely be expanded to other universities and office buildings. (See Table 2)

(2) Introduction guideline of air conditioning facility plan (versatility)

When establishing a plan to optimize chilled and heat source equipments,it is important to consider the characteristics of the area where the equipment is located (ambient temperature and the distance from the sea). Figure 3 shows appropriate chilled and heat source systems for different weather conditions. This classification supports the planner to make an appropriate selection of heat source system for the area.

Table 2: Versatile technologies used in smart Campus

| Technologies | Specific measures |
|---|---|
| Power demand forecast within the campus (temperature,humidity and insolation) (patent filed)<br>Methods to evaluate environmental impact of the introduced facilities to the campus<br>(renewable energy,gas co-generation)<br>Operation method of cold and heat source equipment (patent filed)<br>Minimize the capacity of power storage facility<br>Autonomous operation of power source in case of a disaster | Methods of optimum operation of each equipment depending on power demand<br>Measures against noise,low frequency vibration and shadow flickers from windmills<br>Noise of co-generation and odor from exhaust gas<br>Methods to prioritize the operation of equipment<br>Low operation cost,high-load operation of high efficiency equipment<br>Maximize investment effect of reducing peak power<br>Autonomous and independent operation of gas co-generation system,wind power generation and solar power generation systems in case of a disaster |

Table 3

| Contents | | Investment amount (million yen) | Recovery periods |
|---|---|---|---|
| Renewable energy | Solar power generation (consumed internally) | 29 | 28 |
| | Wind power generation (consumed internally) | 150 | 29 |
| Gas co-generation (advanced use of waste heat and large contract of city gas (medium pressure)) | | 750 | 8 |
| Desiccant air conditioning | | 117 | 18 |
| Batteries | | 80 | 48 |
| Replacing lighting fixtures with LED lightings and the use of DC from solar power generation | | | 11 |
| Environmentally-friendly and energy-conservation activities by students and faculty members | Environmental activities by MIEU | 7 | Within one year |
| | Demand response (DR) and dynamic pricing (DP) aiming at reducing power consumption (enhance the visualizing function) | 8 | 2.6 |
| | Green walls and roof gardening | 0.5 | Short-term |
| | ESD (education for sustainable development) and education on energy for elementary school students | - | Continuous education |
| | Expanding visualizing function to the entire university | 8 | 2.6 |

(3) Planning an optimum method considering the amount of investment (versatility and expandability) Investment recovery period differs by respective energy-saving equipments,from short-term (3-8 years) to long-term (10 years or longer). Mie University aptly combined these two types,aiming to increase the total amount of energy conservation. This method has versatility and expandability that can be applied to different

universities having different conditions.

## 6. Continuity and sustainability

(1)The final year of the medium-to-long-term energy conservation plan is 2020. In 2014,Mie University reorganized its environmental management system into a better organization (Mie Global Environmental Center for Education & Research),enhancing the division for energy conservation and the reduction of $CO_2$ emissions.

(2) 'Visualizing function' has been expanded to each department,so that all students and faculty members can monitor electricity demand of its department and also other departments. University-wide electricity saving activities (demand response) is still continuing. In 2015,the third yearof the activities,electricity demand at the peak time was reduced by 5.9%.

## 7. Investment efficiency

Contents and cost-effectiveness (Investment recovery periods)

Refer to Table 3.

## 8.Secondary results

Announcement,field survey,observation,exhibitions, release in magazines,academic meetings,theses,patents, awards.Refer to Tabile 4. ■

Table 4

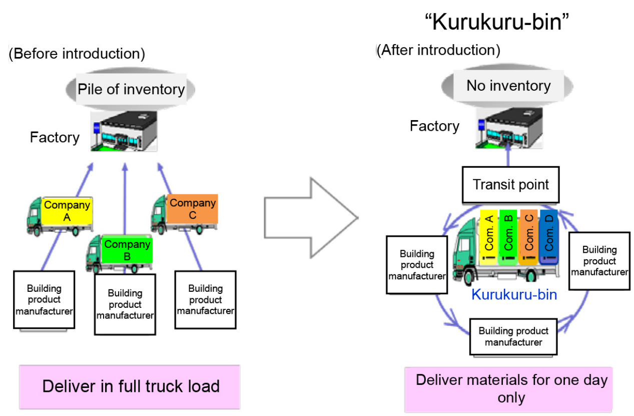
| | |
|---|---|
| ① Announcement | 62 times |
| ② Announcement (newspapers) | 46 media |
| ③ Field survey and observation of Smart Campus | 50 organizations |
| ④ Exhibitions | 9 exhibitions |
| ⑤ Release in magazines | 5 magazines |
| ⑥Academic meetings,theses | 5 theses |
| ⑦ Patents | 2 patents filed |
| ⑧ Awards (22nd Grand Prize for the Global Environment Award (Minister Prize of Education, Culture,Sports,Science and Technology),Minister Prize of Economy,Trade and Industries in the Energy Conservation Grand Prize for excellent energy conservation equipment,etc.) | 4 awards |

# BP4: Energy Conservation in the Distribution of Procured Building Products

## 1.Details

From early on,Misawa Homes has made great efforts to reduce $CO_2$ emissions in its distribution system by establishing a logistics subsidiary and creating its unique distribution system. 'Kurukuru-bin' (Daily circulating mixed loading pickup and delivery system) introduced in 1986 uses just one truck in one route that goes around building product manufacturers in an optimized route to gather building products,rather than receiving the materials separately to factories and depots. 'Module Palette' adopted in 1993 dramatically improved the loading efficiency of different building products of different sizes,by combining the combination of nine types of palettes. Then,in 2004,Misawa Homes established the 'a-net system' with which construction manufacturers can register the number of palettes they ship (minimum number for registration is one palette). Building product manufacturers affix the slip output after the registration on the materials to be shipped,put them on the module palette and place it in the shipment yard. This saved trouble of ordering and transshipment.

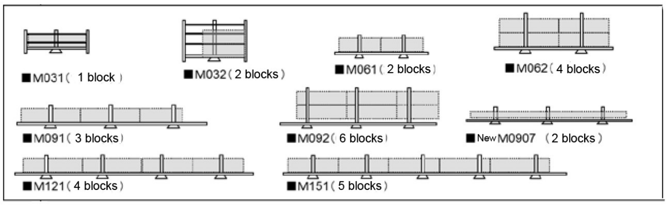
## 2.Diagrams,etc.



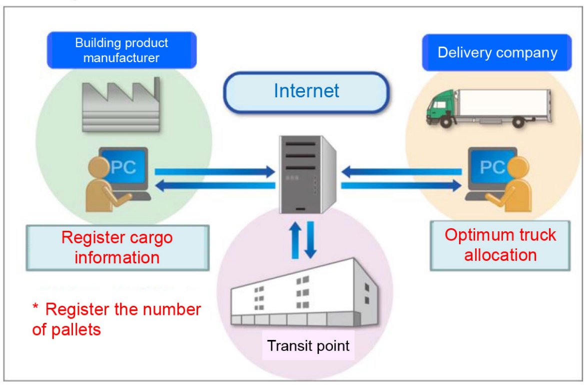

## 3. Energy conservation performance

(1)Deliver necessary amount for the day in consolidated cargo of 'Kurukuru-bin'.

Module Palette




a-net system




(2)'Module Palette' can deliver long objects and products that are difficult to carry.

(3)Know the amount of cargo in advance using the 'a-net system'to allocate necessary number of truck.

These initiatives has led to a reduction of about 37% of energy usage per building for the delivery of purchased materials (GJ conversion) from FY2001.

## 4.Spirit of innovation and originality

An advanced model to manage the 'distribution of small quantities of various types of products',to delivery necessary amount of building products,facilities to the factories and depots all around Japan from building products manufacturers. The system has been improved by developing the company's original palettes and systems. For the future,the company is planning to begin waste distribution.

**Distribution system of procured products**

-Frequent delivery of consolidated cargo (nationwide,at the fixed time,amount not fixed)

-Integrated palletization of building products (9 types of original palettes)

-Web system to know the distribution amount (a-net system)

**Waste distribution system**

-Recover waste at the construction sites after delivery of the products.

## 5.Versatility and spread effect

(1)The system was initially a closed system established internally. The company established a subsidiary and made the system open. Started external sales in 2010 to other companies and building product manufacturers. (joint distribution)

(2)The ratio of external sales stood at 35% (FY2014).

(3)The system can also be introduced by other distribution companies as a delivery service of building products. It can be expanded on a large scale.

## 6.Continuity and sustainability

(1)The company has made efforts for about 20 years to carry long objects and building products of special forms efficiently. It adopted various ideas such as establishing a nationwide distribution network,the development and introduction of palettes,and the development and introduction of a web system to know the amount of cargo.

(2)Going forward,the company will continue its efforts including the promotion of joint distribution and the development of new palettes,in consideration of the market situation.

(3)The system will be expanded to the competitors in the industry.

## 7.Investment efficiency

(1)Investment amount: About 50 million yen (year)

(2)Recovery period: 1 year

## 8.Secondary results

Breakage of building products reduced by using Module Palettes.

Addressed the problem of driver shortage by reducing the number of trucks to be allocated.■