INTERSESSIONAL PANEL OF THE UNITED NATIONS COMMISSION ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT (CSTD)

Budapest, Hungary
11-13 January 2016

Contribution of Japan
to the CSTD 2015-16 priority theme on 'Smart Cities and Infrastructure'

Inputs for CSTD Questionnaires

Q1: Can you give examples of 2-3 main smart city and infrastructure applications in your country and how it contributed to sustainable development?

There are dozens of so-called “Smart Cities” throughout Japan.
MLIT shares features and challenges of such cities, taking up ***Kashiwa-no-ha Smart City*** *as an example*.
Please find attached a presentation of ***Kashiwa-no-ha Smart City****, which* can be circulated and reported at the CSTD 18th annual session.

Q2: What are the main challenges confronted while trying to implement smart city related projects in your country or region?

In the case of ***Kashiwa-no-ha Smart City,*** main challenges are in service provision and operation. Above all, the question is how to construct the smart city that can meet needs of “users” and provide solutions to societal problems, including environment, energy, health/wellness, safety and community, in a more effective and sustainable way. Another challenge is continually operating the smart city and maintaining the level of service and positive impacts. Moreover, operational challenge includes increase in initial and running costs in exchange for added value services.

Q3: How can the science, technology and innovation community contribute towards overcoming these challenges? Can you give any success stories in this regard from your country or region?

Since the technology of CO2 reduction and energy saving has been quite matured, establishing a “platform” should be enhanced to promote local community participation and to facilitate information sharing about the city by area-energy management system.

Q4: Could you suggest some contact persons of the nodal agency responsible for smart city projects as well as any experts (from academia, private sector, civil society or government) dealing with smart city projects? We might contact them directly for further inputs or invite some of them as speakers for the CSTD inter-sessional panel and annual session.

NIKKEN SEKKEI Ltd. was a supervisor at the stage of design and construction of ***Kashiwa-no-ha Smart City*** and now acts as a smart city promoter and technical adviser. Two experts from NIKKEN SEKKEI Ltd. can make a presentation of ***Kashiwa-no-ha Smart City*** at the CSTD 18th annual session.

Mr. Shinji YAMAMURA, Executive Director of NIKKEN SEKKEI Ltd. and
Mr. Chiharu SAKAE, Electrical Engineer and General Manager, Energy and Information and Communication Engineering Section, Mechanical and Electrical Engineering Division

They are also ready for introducing some domestic and foreign smart city projects, particularly in Asia, with their features and challenges at the presentation.

KASHIWA NO HA

The Urban Development of

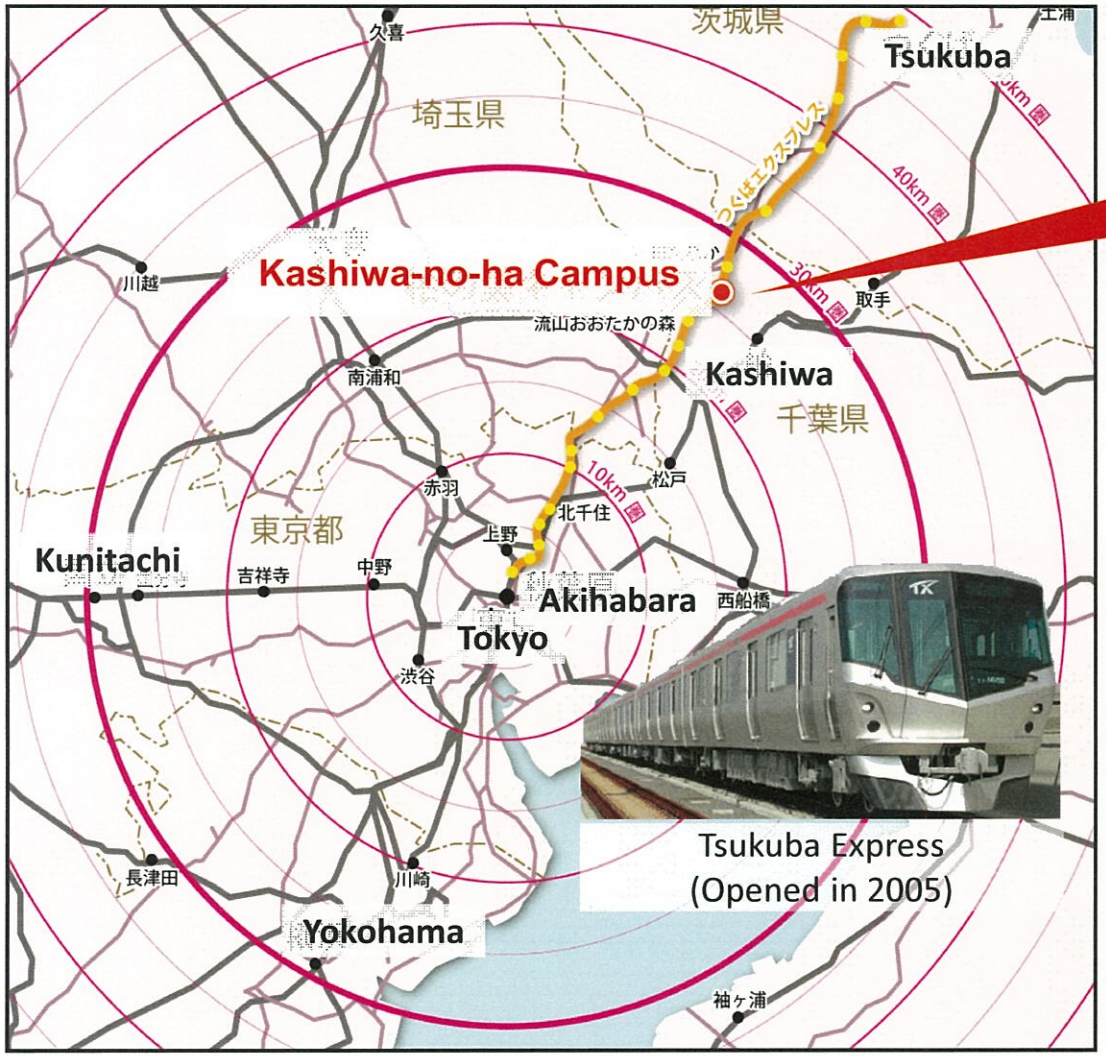
Kashiwa-no-ha Smart City

MITSUI FUDOSAN CO.,LTD.

NIKKEN SEKKEI

Location of Kashiwa-no-ha Smart City

- 25 km from central Tokyo, at the middle point of Akihabara-Tsukuba
- 30 mins from central Tokyo by Tsukuba Express



Tsukuba Express
(Opened in 2005)

Kashiwa-no-ha Campus City

A new town of 461ha with planned population of 30,000.
Stretches across two town re-demarcation projects.

Developed from scratch

- Latest knowledge & tech implemented in town
- Social experiment in progress with residents participation

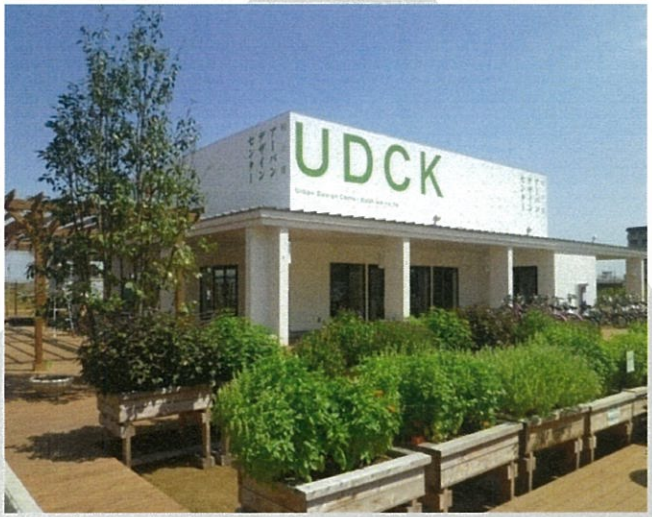
Current status of development

Background and process of the development

Urban Design Center Kashiwa-no-ha (UDCK)

公
Public

Kashiwa City, Chiba Pref.
Kashiwa C. C.
Tanaka Community Committee
NPOs etc.



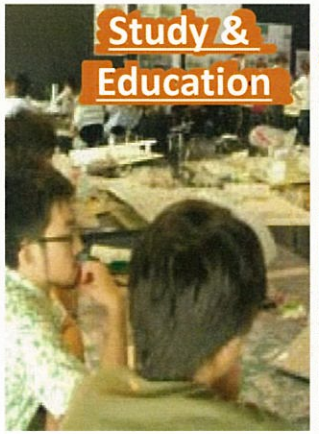
民
Private

Citizens, businesses
Mitsui Fudosan
Metropolitan Intercity Railway Company

学
Academia

University of Tokyo
Chiba University

Activities at UDCK in 2011	
Urban development meetings	420
University lectures and exercises	79
Forums and events	71
Inspection tours from Japan and abroad	208
Workshops	62
Community activities	47
TOTAL	877 times



Social problems behind the development of smart city

Problems of Advanced Countries

Super-aging Society

Saturated Market and Economic Stagnation

Global Urbanization

Problems of advanced countries reflect problem faced by the entire world in the future

Problems of the World

Global Environment

Resource & Energy

Japan should take the leadership role in bringing advanced models of solutions to these problems, and establish itself as a

"leader in solving global common problems"

Future Vision of Kashiwa-no-ha Smart City

Kashiwa-no-ha Smart City is model solution for the world's common problems

Environmental-Symbiotic City
(Smart city in the narrow sense)

Solution for environmental & energy problems

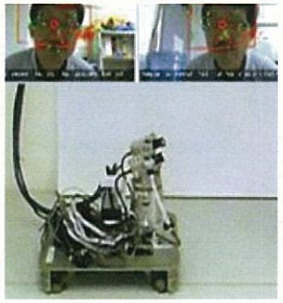
City of Health & Longevity

Solution for an aging society

Innovative City for New Industry

Solution for revitalizing the economy

Safe, secure and sustainable smart city



Smart City concept from Japan

Before the Great East Japan Earthquake 3.11

◆Realization of Low-carbon Smart City

(Environmental improvement × Advanced technology × Community)

- Improvement of environmental symbiosis and biodiversity
- Effective use of renewable energy and natural energy (Energy Creation)
- Construction of a pluralistic energy system which combines various energy sources
- Implementation of energy saving and management system (Energy Saving)
- Low-carbonization with collaboration of users and the community

Functional enhancement after the Great East Japan Earthquake 3.11

◆Safe and Secure city planning

- Enhancement of infrastructure and buildings
- Electric power storage (Energy Storage)
- Electric power accommodation (Energy Sharing)
- Community risk management

◆BCP and LCP

(Business Continuity Plan and Life Continuity Plan)

- Life style proposals
- Development of smart services

Concept of Low-carbon KashiSmart City

Effective use of environmentally friendly Natural energy

- Improvement of environmental symbiosis and biodiversity
- Effective use of renewable energy and natural energy (Energy Creation)
- Construction of a pluralistic energy system which combines various energy sources
- Implementation of energy saving and management system (Energy Saving)

Collaboration with users and community

- Low-carbonization with collaboration of users and the community
- Community risk management
- Environmental activity: e.g., local town eco-promotion conferences

Formation of a middle-scale area reproduction model (aiming for dissemination)

An actual proof of environmentally advanced models: e.g., Smart City

&

Co-creation (aiming for innovation)

Realization of Low-carbon Smart City with integration of Environment ×Advanced Technology × Community

City Planning After 3.11 ～Realization of Smart City～

city planning before 3.11

Realization of Low-carbon Smart City
with integration of Smart Energy × Safety/Secure × Smart Service

city planning after 3.11

Actions on tangible topics

- Electric power storage (Energy Storage)
- Electric power accommodation (Energy Sharing)
- Enhancement of infrastructure and buildings

Optimization of use of regional energy with a smart energy network

Actions on intangible topics

- Community risk management
- BCP and LCP (Business Continuity Plan and Life Continuity Plan)
- Smart Service Business

Improvement of quality of local communities

Low-carbon smart city +
Realization of the Smart City from Japan
with integration of Smart Energy × Safety/Secure × Smart Service

Environmental-Symbiotic City

(Smart city in the narrow sense)

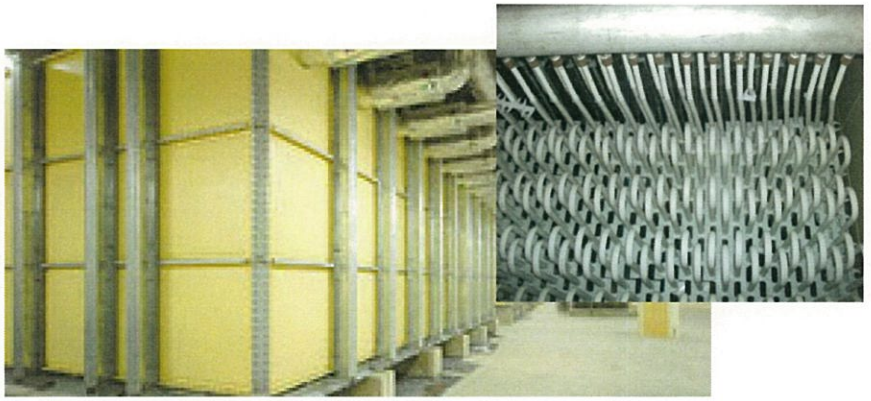
Energy-storage system at Kashiwa-no-ha

Large storage battery

- 2,000-kW storage battery installed in LaLaport
- 500-kW storage battery to be deployed district 148

Ice storage air-conditioning system

- In operation at LaLaport



In normal operation

Store power at nighttime to shift daytime peak power consumption

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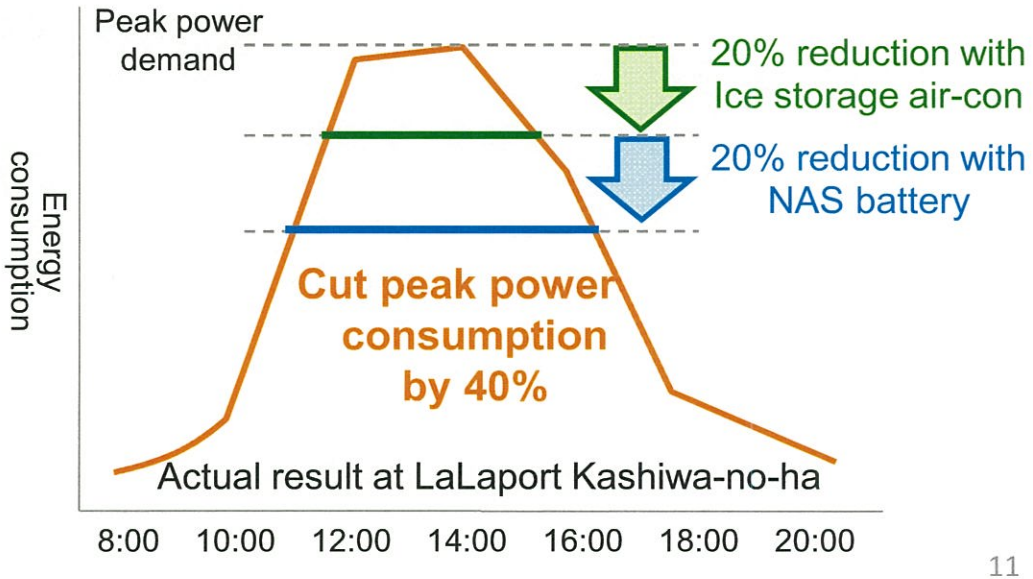
In disasters

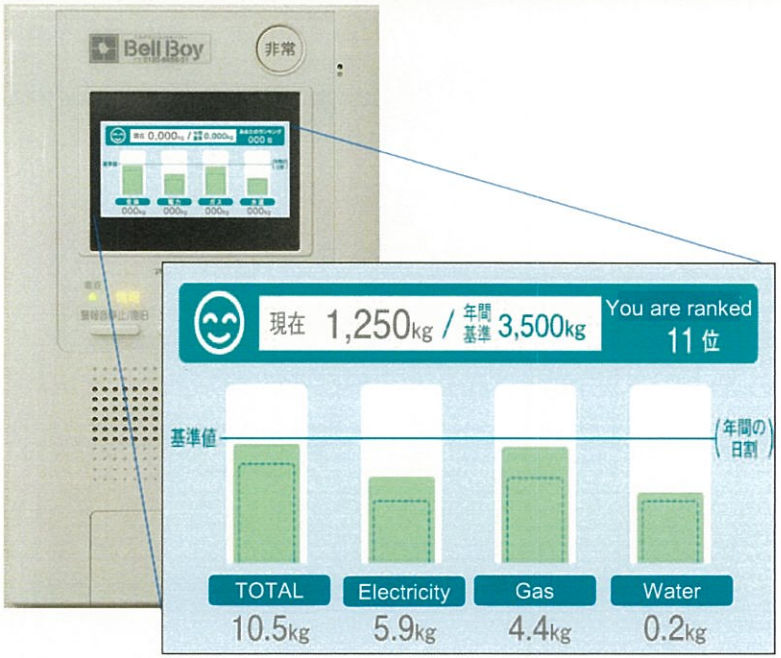
Acts as emergency power source



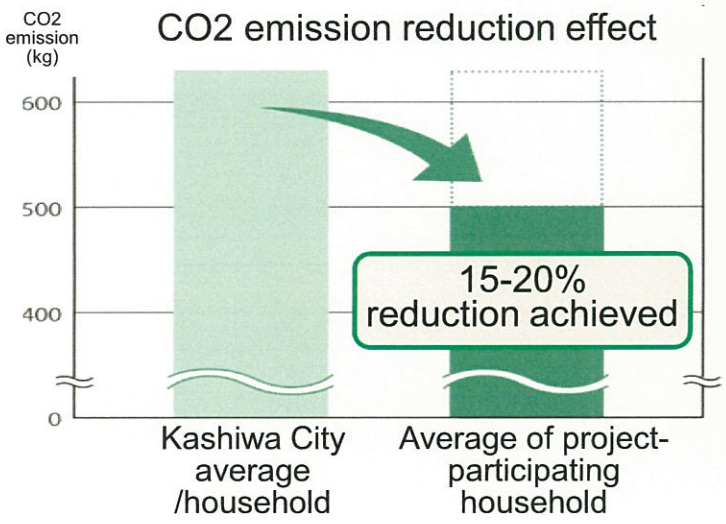
Energy-saving system at Kashiwa-no-ha

HEMS (Home Energy Management System)

- Monitors electricity, gas and water usage in each residential unit
- Displays energy consumption as CO2 emission equivalent
- Has ranking function to motivate residents to reduce energy consumption
- Residents have club to exchange energy-saving ideas



Increase residents' environmental consciousness by visualizing energy-saving efforts



Concept of AEMS-based smart grid

Area-wide energy management

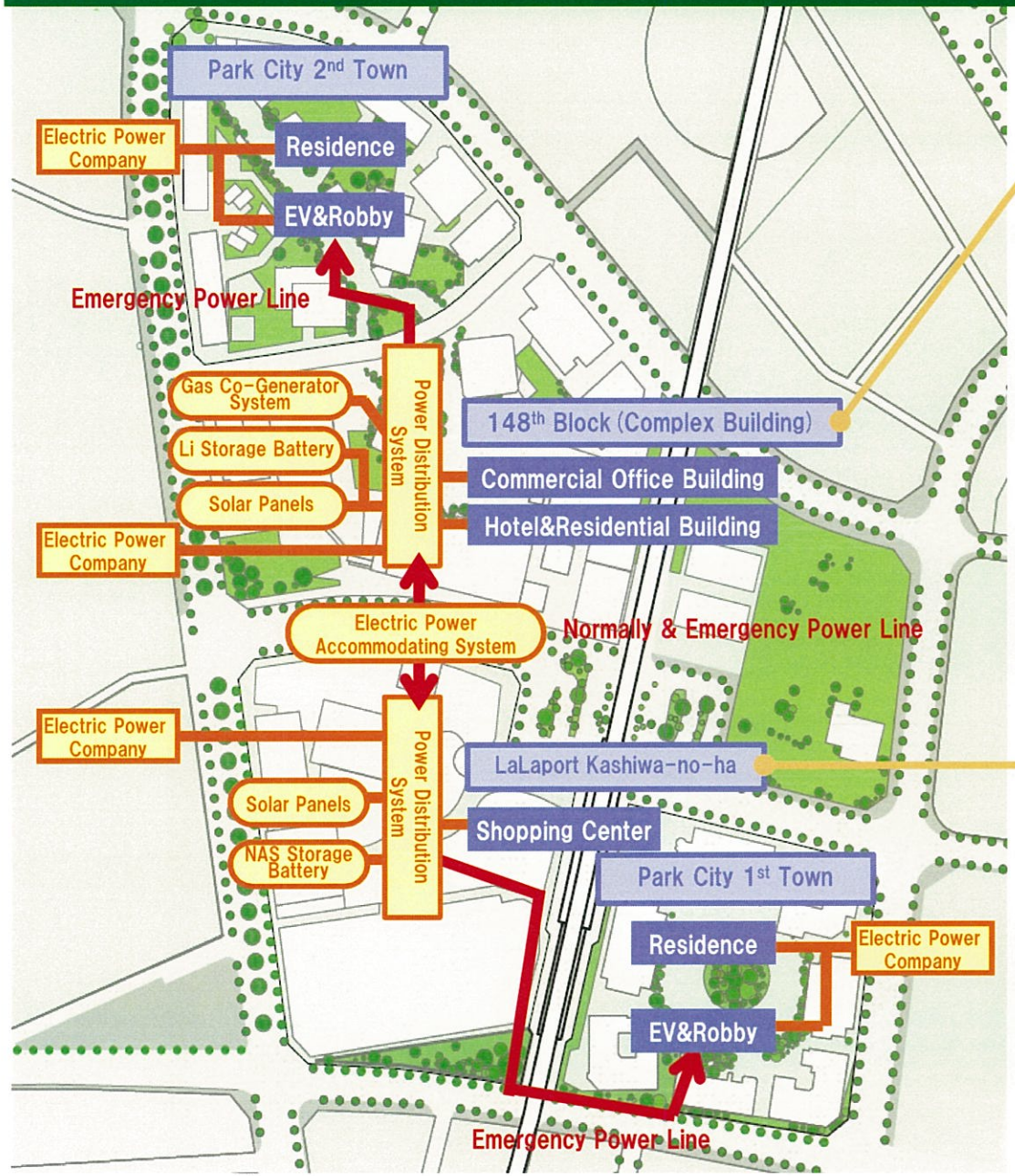
AEMS (Area Energy Management System)

AEMS Monitor

- Real-time monitoring of energy supply and demand in the area
- Power grid controlled by ICT network
- Generated and stored energy is allocated within the area for self-sustained energy management

Japan's first smart grid in practical use

Smart Grid of Kashiwa-no-ha (Power Supply Line)



148th Block (Complex Building) Smart Center

Electric Power Accommodating System (1000kW)

Storage Battery (500kW)

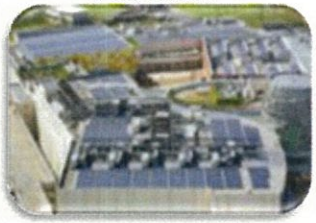
Generator System

Solar Power System (216kW)

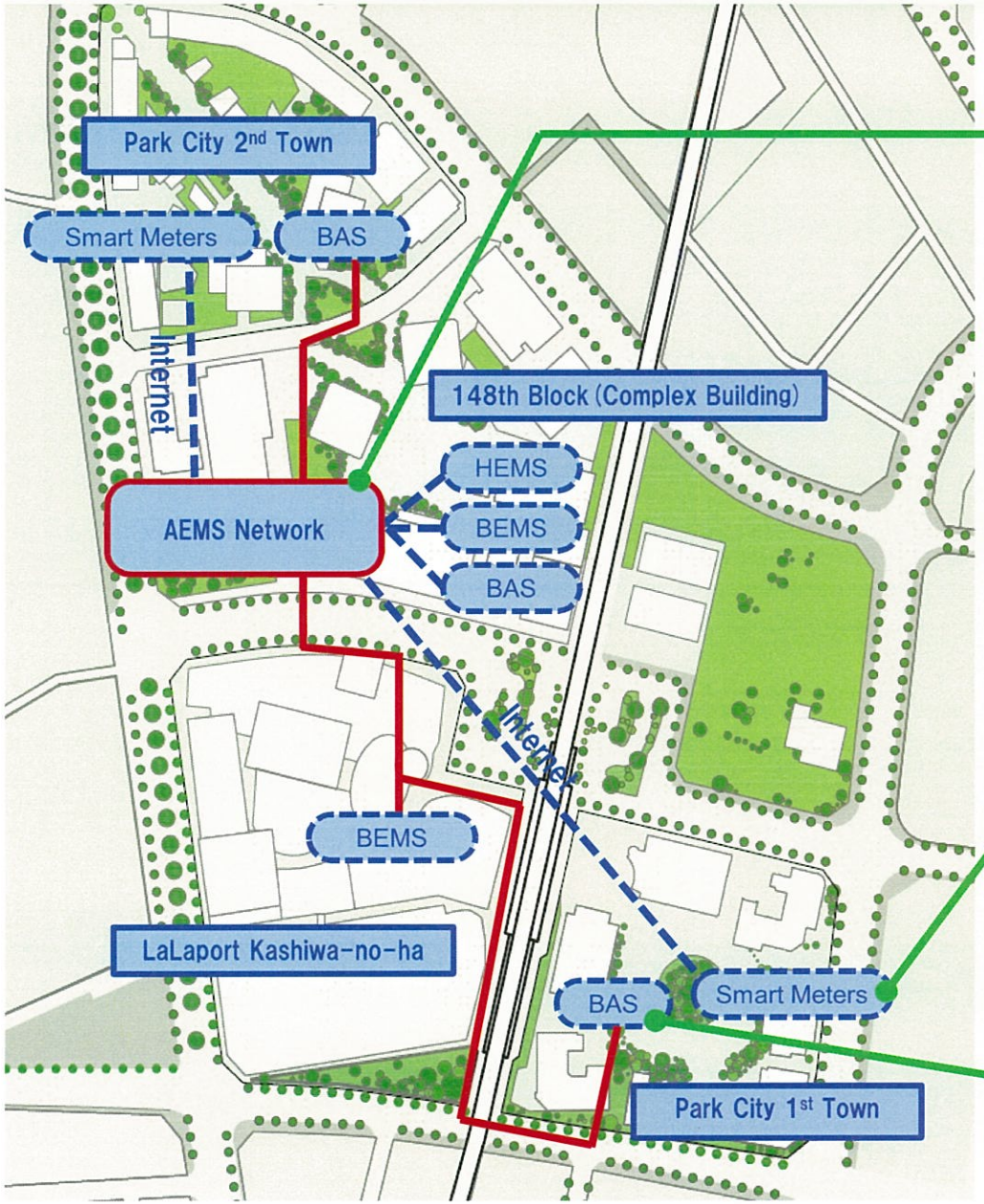
LaLaport Kashiwa-no-ha

NAS Storage Battery (1800kW)

Solar Power System (500kW)



Smart Grid of Kashiwa-no-ha (ICT Network)



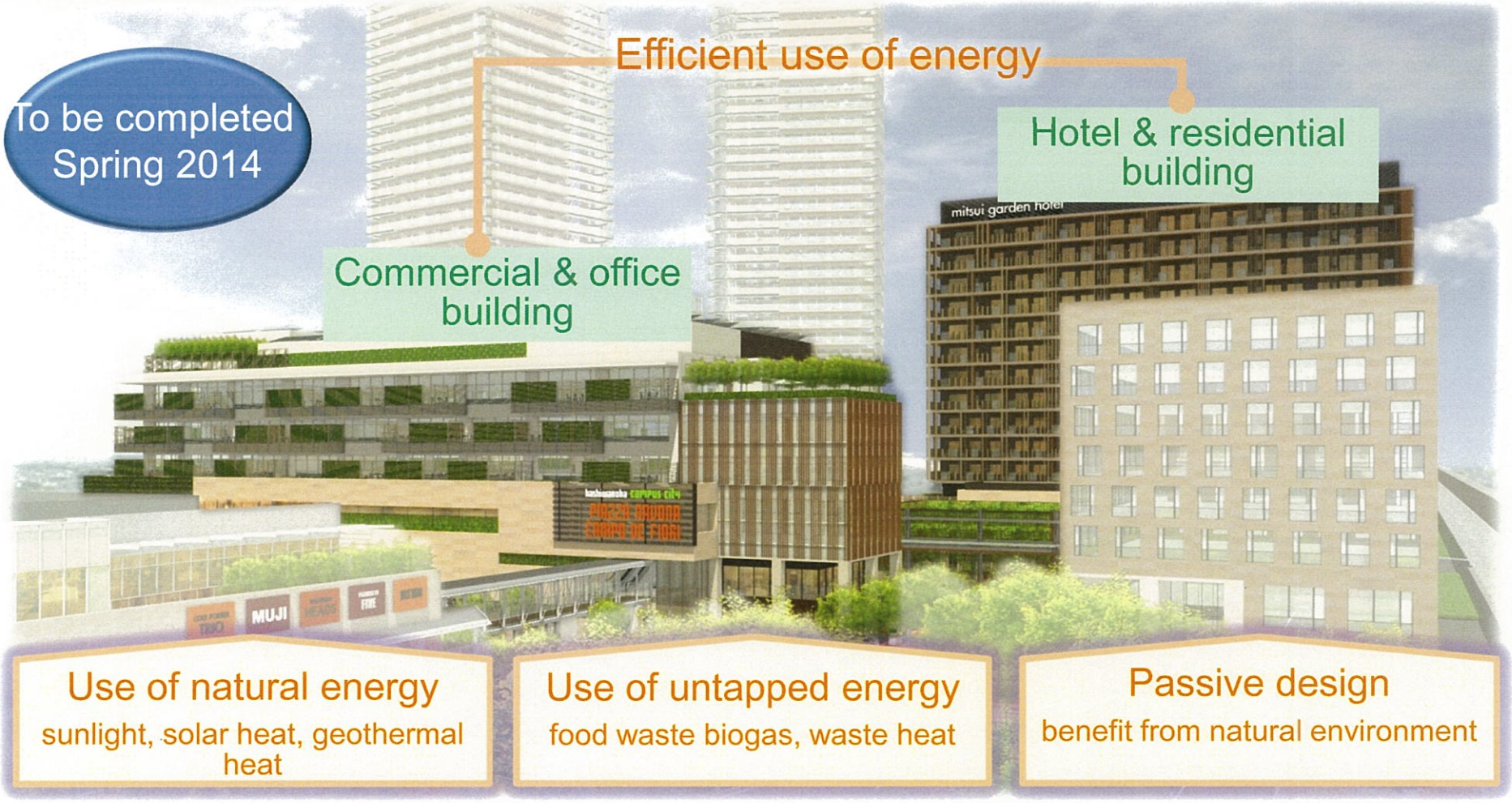
148th Block (Complex Building) Smart Center

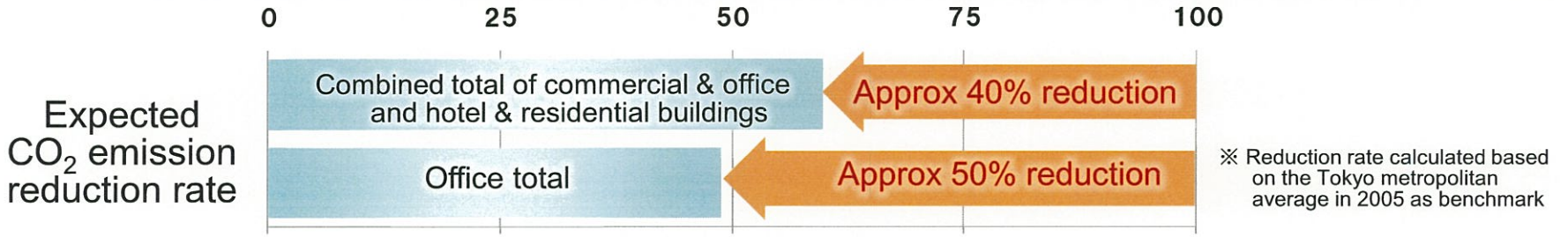
Area Energy Management system (AEMS)

Smart meter/HEMS

BEMS・BAS

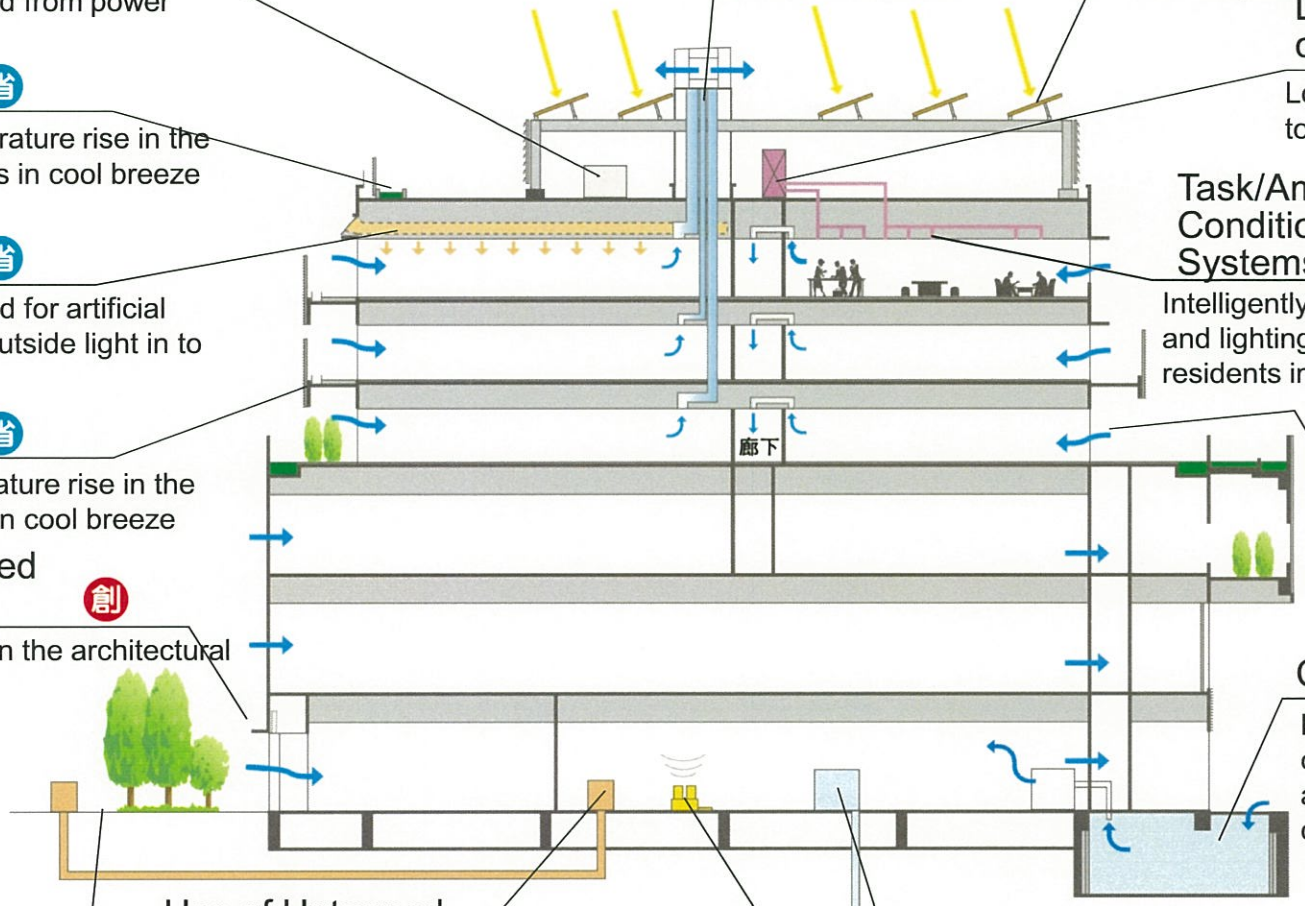
148th Block – Leading district of Kashiwa-no-ha





※ Reduction rate calculated based on the Tokyo metropolitan average in 2005 as benchmark

Green technologies in commercial & office building of 148th Block



Air Tube 省
Natural ventilation to emit the air to the roof

Solar Panels 創
Generate electricity with high-efficiency solar panels

Cogeneration System 創
Utilizes heat wasted from power generation

Desiccant Air-conditioning System 省
Low-humidity conditioning to respond to wet climate

Green Roof 省
Holds down temperature rise in the building, and brings in cool breeze

Task/Ambient Conditioning & Lighting Systems 省
Intelligently regulate air-conditioning and lighting via IC tags carried by residents in the room

Solar Ducts 省
Reduce power used for artificial lighting by taking outside light in to the building

Natural Ventilation 省
Takes in outdoor air without ventilation system

Green Walls 省
Hold down temperature rise in the building, and take in cool breeze

Eaves-integrated Solar Panels 創
Panels integrated in the architectural design

Cool Tube 省
Reduces load of cooling/heating outside air by utilizing the consistent earth thermal

Water Retentive Blocks 省
Ease heat island phenomenon through evaporating moisture retained in voids over a long period of time

Use of Untapped Energy 創
Utilize biogas generated from raw garbage

BEMS 省
Cuts down power consumption by integrally managing the instrument and facility of building

Geothermal Heat Pump 創
Reduces energy consumption by utilizing consistent earth thermal for air-conditioning system

省: Energy-saving
創: Energy creation

**The diagram above is a plan drawing and subject to change*

Energy-creating technologies in 148th block

Solar power and solar hot-water systems

- Solar light generation panels on the roof (200kW) and eaves (6kW each)
- Solar thermal panels expected to generate 157MWh of power annually

<Solar panels in LaLaport Kashiwa-no-ha and Park City 2nd town

Geothermal heat and hot-spring heat

- Geothermal heat pump system with heat exchange calorimetry of 125kW
- Supply outside air warmed/cooled through piping in the ground
- Utilize hot-heat for large bath in the hotel to reduce environmental burden

<Digging hot springs on 148th Block>

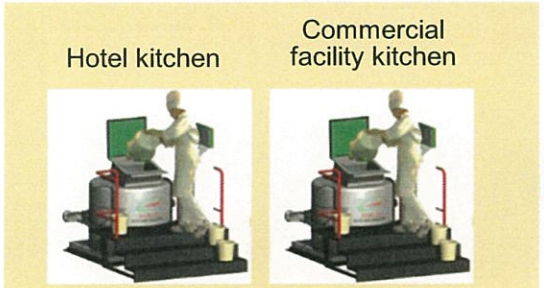
Electricity generation with raw garbage biogas

- Generate power using methane gas produced from raw garbage
- Utilize waste heat for hot-water supply

Gas co-generation system

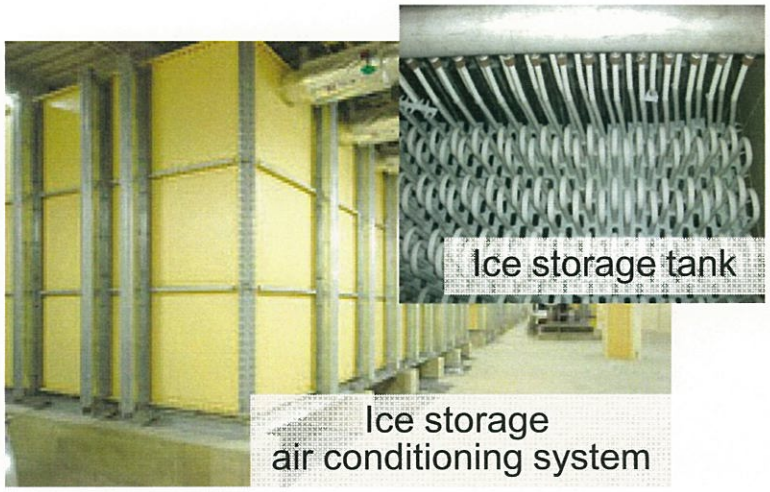
- Power generation using city gas (annual capacity: 620MWh)
- Using waste heat for hot-water supply and air conditioning (annual capacity: 1,050MW)

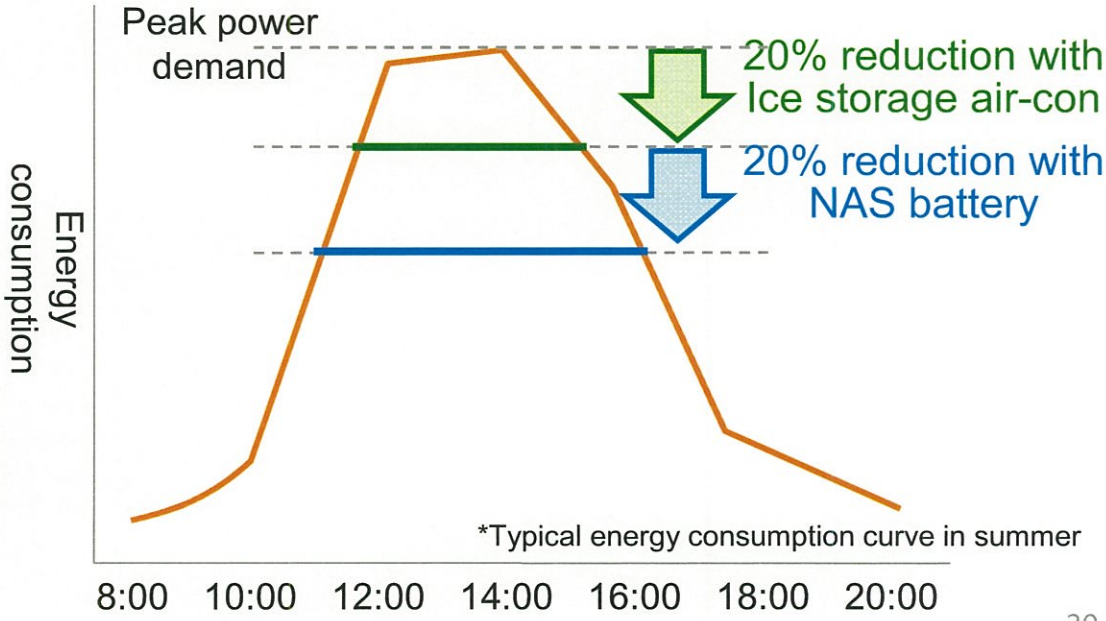
<System mode l of power generating with raw garbage biogas>



Energy storage technologies in LaLaport Kashiwa-no-ha

- Cut peak power consumption using ice thermal storage air conditioning system and NAS battery
- First commercial facility in Japan certified according to CASBEE S-grade

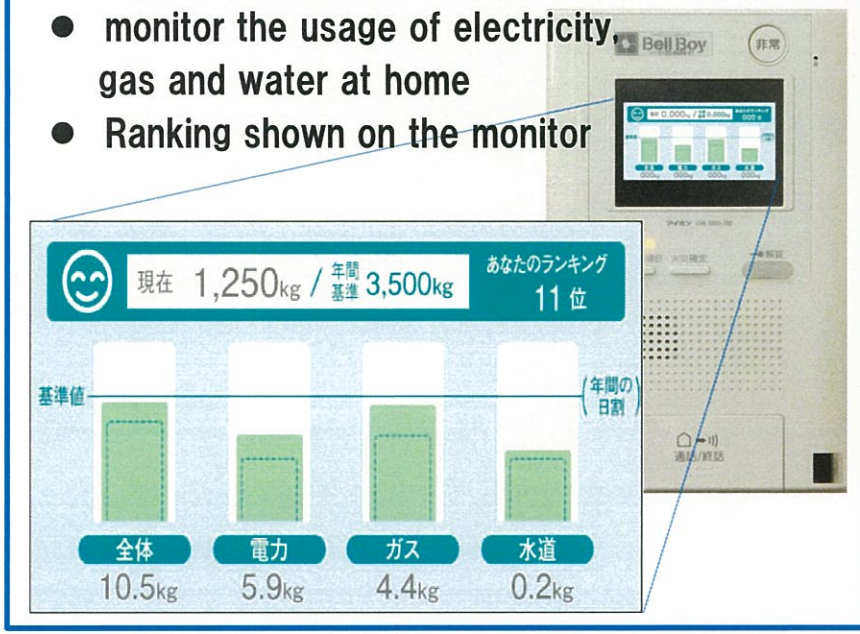


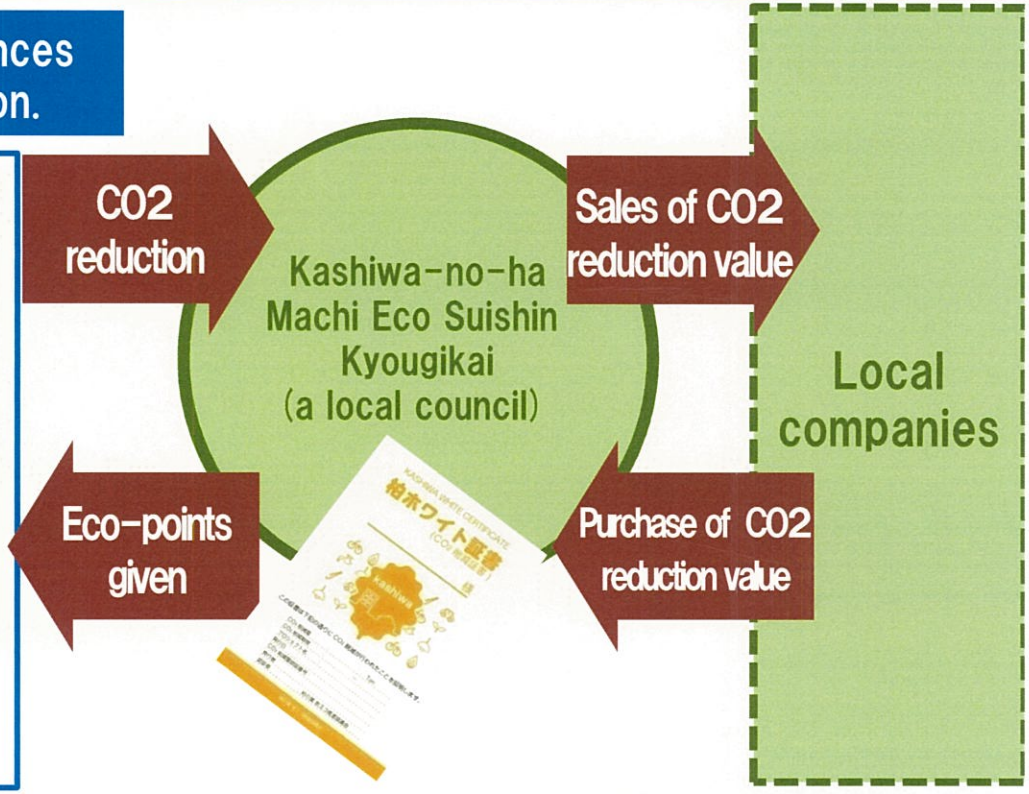


Visualization of residential energy use and Eco-points program

HEMS will be introduced into 2,500 residences around the Kashiwa-no-ha campus station.

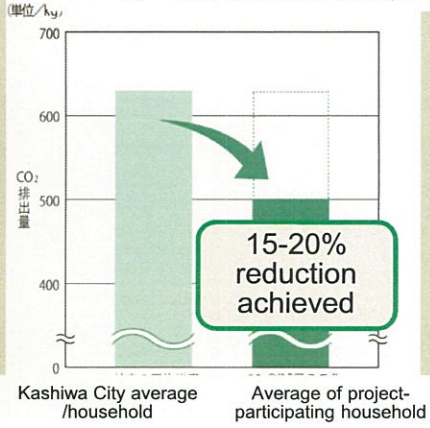
- monitor the usage of electricity, gas and water at home
- Ranking shown on the monitor





Promoted activities of "Eco Club", And helped increase residents' environmental consciousness

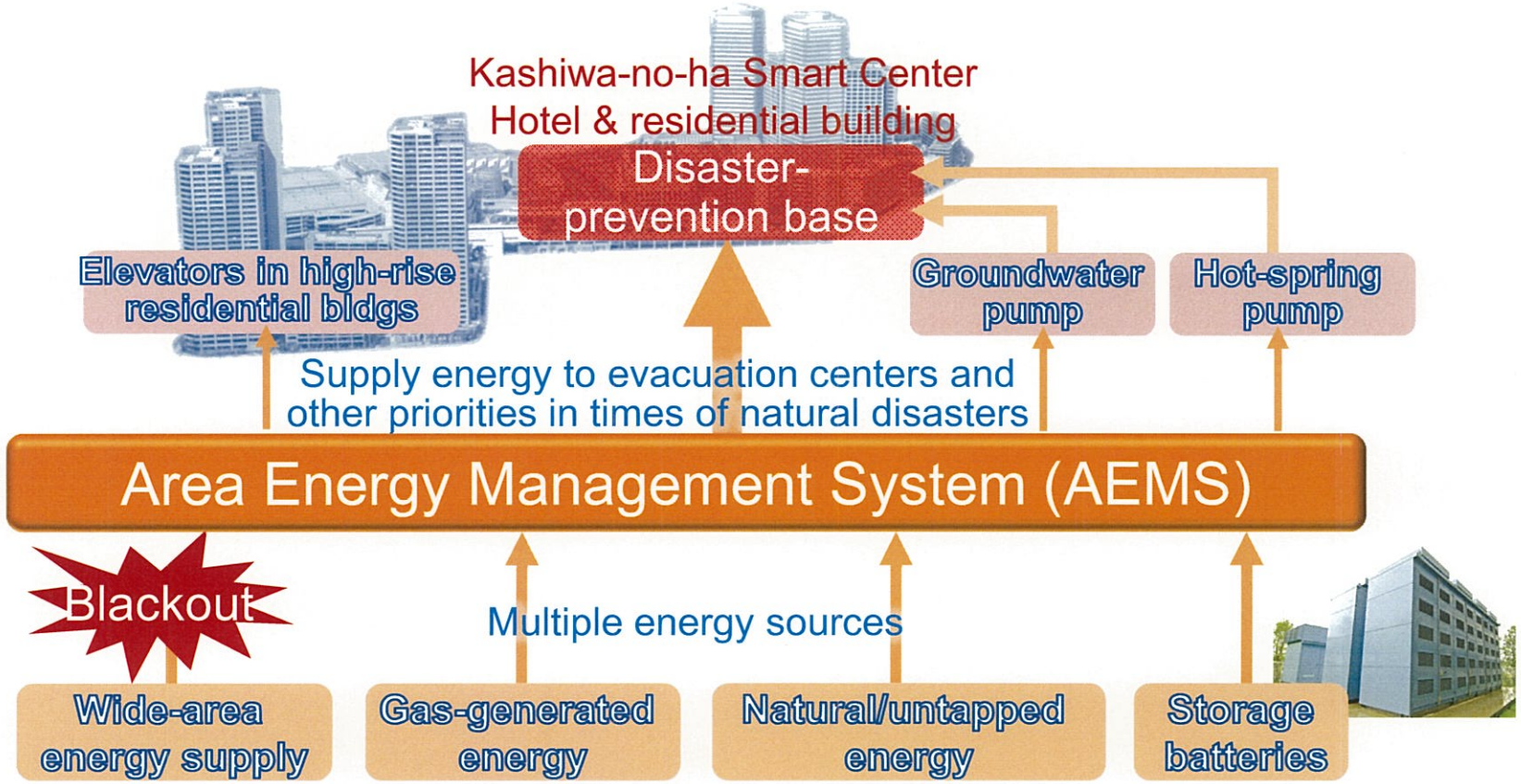
CO2 emission reduction effect achieved by "CO2 visualization project"



City function in times of natural disasters

Smart center functions as disaster-prevention base

- Kashiwa-no-ha Smart Center located in hotel & residential area of the earthquake-proof 148th Block
- Able to secure energy supply in case of power outage by diversifying energy source
- AEMS shifts to crisis mode in times of natural disasters



Local production for local consumption – A city coexisting with farming

Chiba University Plant Factory

- Largest plant-factory research hub in Japan
- Produces pesticide-free tomatoes and lettuce hydroponically
- Experimental study includes 60 companies participating and competing over yield and production costs

Plant factory with fully artificial lighting

Sunlight-based plant factory

Oak Village Kashiwa-no-ha

- New Japanese-style agri-tourism facility combining farming and entertainment
- Launched in April 2012 (produced by KCJ Group)
- Provides farming experience, farm weddings, farm restaurant and marché

Farming experience

City of Health & Longevity

Kashiwa-no-ha Tackles the Challenges of a "Super-Aging Society"

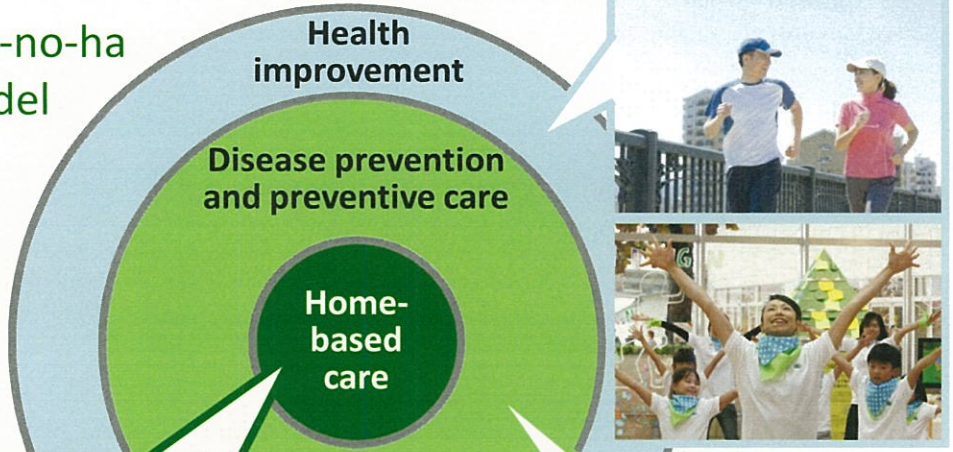
Health-centered urban development

Changing the focus from treatment and nursing care at hospitals and other facilities toward more proactive health improvement and disease prevention and preventive care

Conventional contemporary medical city approach

Medical treatment and nursing care within medical facilities

Kashiwa-no-ha model



A city in which everyone, including senior citizens, lead long and healthy lives and participate purposefully in the community

Reduce social security (medical and pension) costs
Stimulate economy through consumption by senior citizens

Social Experiment for Health Visualization Services

Analyze and visualize health data ⇒ Encourage voluntary health improvement and disease prevention

Obtain health data | Telecommunications infrastructure | **Analyze big data** | Telecommunications infrastructure | **Visualize health information**

Wristband activity meter

Obtain exercise and sleep data 24/7 with acceleration sensor

Fitness scale equipped with wireless data communications

Medical institutions database (medical checkup data & electronic treatment records)

ICT-based data integration

Smartphones and PCs

Healthcare analytics server

Analyze exercise, sleep and fitness data

- Exercise frequency
- Calorie consumption
- Hours of sleep
- Exercise intensity (METs value)
- Number of steps taken
- Lifestyle rhythm
- Weight
- Body mass index
- Body fat percentage
- Base metabolic rate

Smartphones and PCs

Community Participation for Health & Longevity

Chiba Univ. College Link Program

Nature Kids Club

Hachimitsu Club
(honey-collecting club)

SMART COMMUNITY

Gardening Club

Marché Couleur

Kitchen Garden Farming Club

Innovative City for New Industry

Advanced technology line

- **Kashiwanoha;**
  - -Located midway between Akihabara(Central Tokyo) and Tsukuba, no more than 30 min.
- **TX line: Heavy concentration of most advanced technologies in Japan**
  - -20 national R&D centers
  - -More than 70 R&D centers of large corporations
  - -3 top class national universities

- The University of Tokyo (Kashiwa campus)
- Chiba University (Center for Environment, Health and Field Sciences)
- Tokyo University of Science (Noda campus)
- National Cancer Center Hospital East

- University of Tsukuba
- National Institute of Advanced Industrial Science and Technology (AIST) (Tsukuba Center)

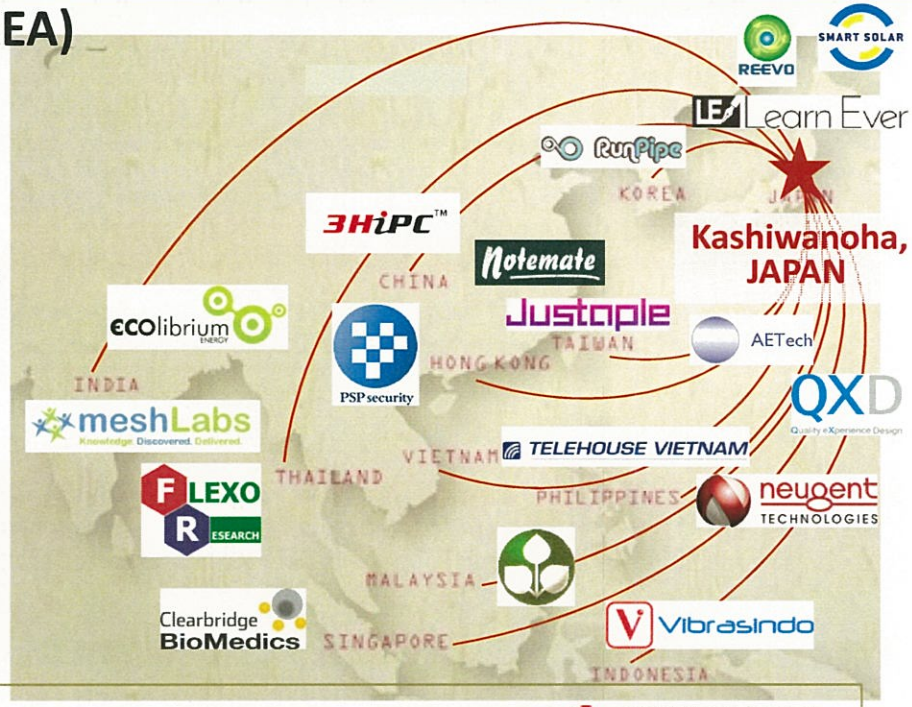
- The University of Tokyo (Hongo campus)
- Digital Hollywood University

Tsukuba Express(TX) Line

Hub of Asian Innovation

■ Asian Entrepreneurship Award 2012 (AEA)

-International business competition for 18 Asian start-ups from 12 countries and regions;
Korea, China, Taiwan, Hong Kong, Singapore, Thailand, Vietnam, Philippines, Malaysia, Indonesia, India and Japan
-May 9-11, 2012 at Kashiwanoha



[Host] FUTURE DESIGN CENTER

[Co-hosts] TEP, 東京大学 THE UNIVERSITY OF TOKYO, Chiba Prefecture, 三井不動産 Mitsui Fudosan Co., Ltd.

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Kashiwa-no-ha Campus City in 2030