日本智慧城市的现状与未来
Situation and future of smart city in Japan

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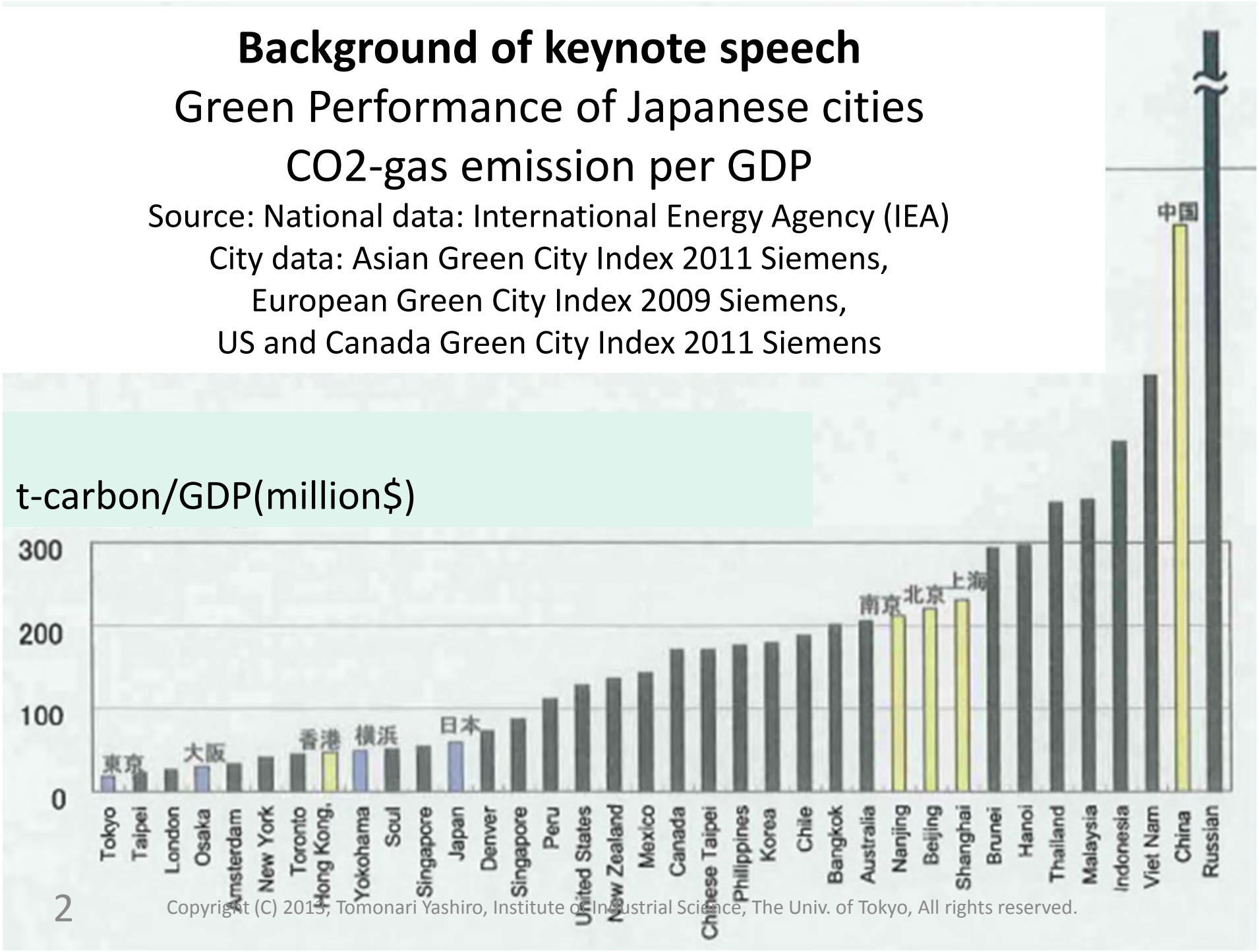
Background of keynote speech

Green Performance of Japanese cities

CO2-gas emission per GDP

Source: National data: International Energy Agency (IEA)
City data: Asian Green City Index 2011 Siemens,
European Green City Index 2009 Siemens,
US and Canada Green City Index 2011 Siemens



Agenda of the keynote speech

1. Different priorities and implication in each country and region
2. Excellency in system rather than in technical seeds
3. Operational management beyond turn-key procurement
4. Interoperability for open system approach

1. Different priorities and implication in each country and region

- Case1 Let New Town Development smart
  Kashiwa-no-ha Smart City, Kasiwa-shi, Chiba-ken
  千葉縣柏市柏の葉campus city

- Case2 Let Existing Mega City smart
  Yokohama Smart City Project 横浜市

- Case3 Let Local Community smart
  Nagasaki EVITS Project; Goto Islands, Nagasaki-ken
  長崎EV+ITS Project, 長崎縣五島列島

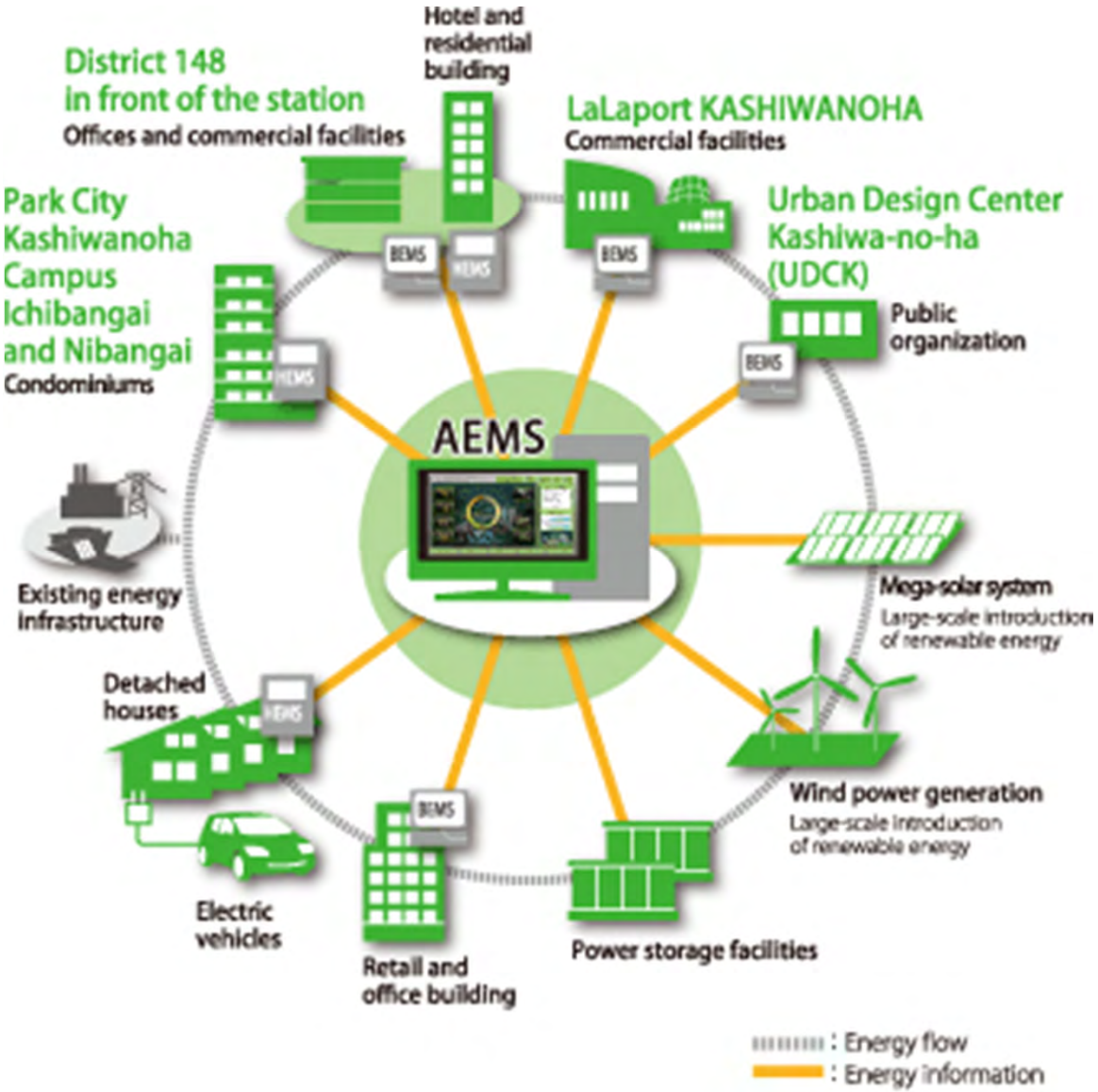
Case 1 Kashiwa-no-ha Campus city (New Town Development)

Suburban city around new campus of The University of Tokyo

Case 1 Kashiwa-no-ha Campus city
Suburban city around new campus of The University of Tokyo

Source; http://futurecity.rro.go.jp/pdf/torikumi/en/overview_image_kasiwanoha_en.pdf

Case 1 Kashiwa-no-ha Campus city (New Town Development)
Suburban city around new campus of The University of Tokyo



AEMS

Area Energy Management System

Integrated energy management by;

- Generation of energies
- Storage of energies
- Saving of energies

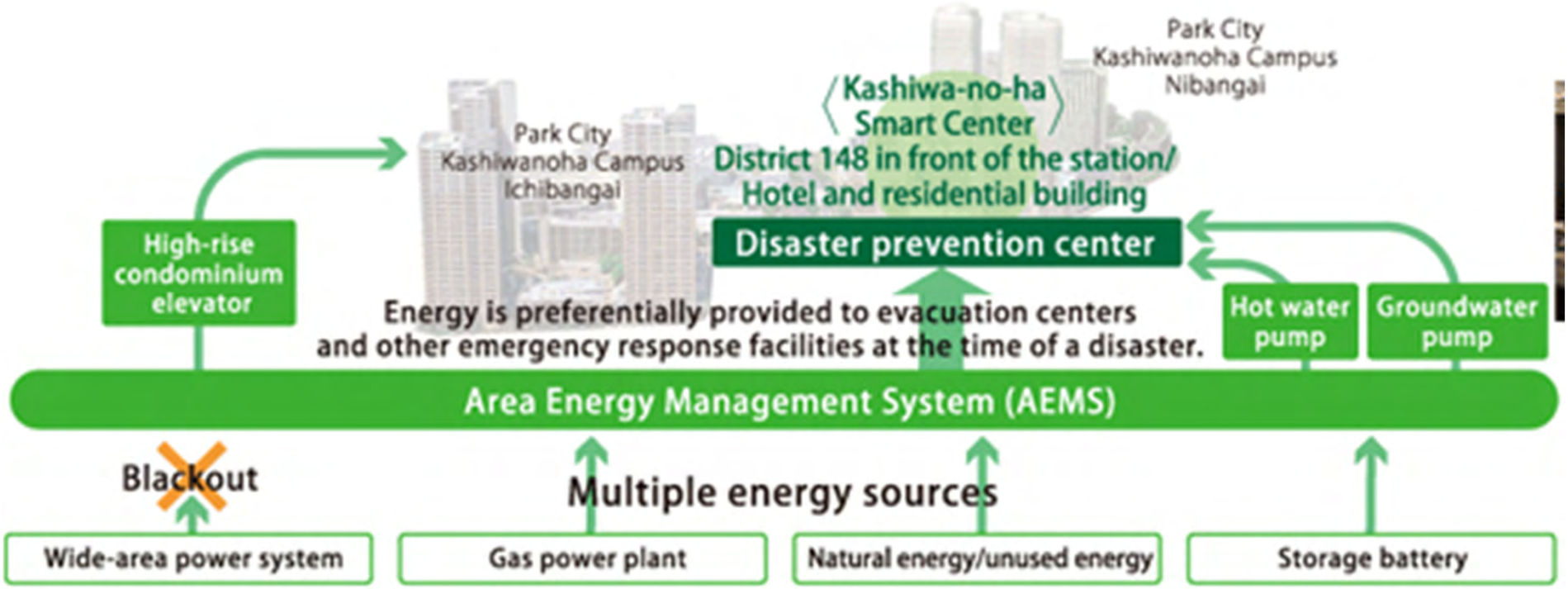
Multi-vehicle Sharing Program

Source; http://www.mitsuifudosan.co.jp/kashiwanoha/e/future/environment.html

Case 1 Kashiwa-no-ha Campus city (New Town Development)
Suburban city around new campus of The University of Tokyo

Robustness and Resiliency of energy system against natural disasters

- Diversity and redundancies of energy sources
- Smart Grid that enables complementary networking



Source; http://www.mitsuifudosan.co.jp/kashiwanoha/e/future/environment.html

Case 1 Kashiwa-no-ha Campus city((New Town Development)
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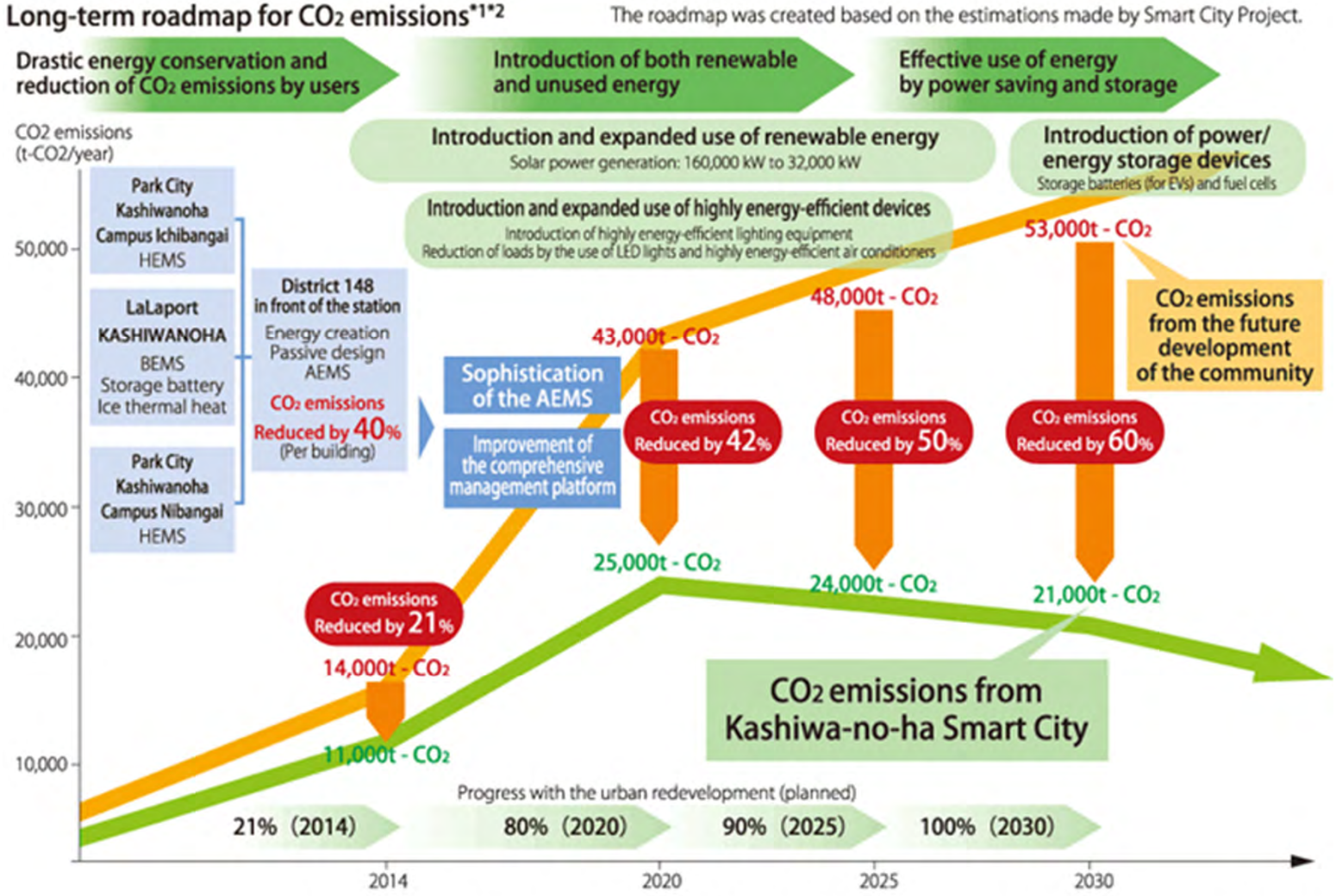


http://www.mitsuifudosan.co.jp/kashiwanoha/e/future/environment.html

※2. CO2 emission reductions: Calculated for offices and households (excluding emissions from the industrial sector, transportation sector, etc.)

Case 2 Yokohama Smart City Project (Existing Mega City)

Challenge by the second largest city in Japan

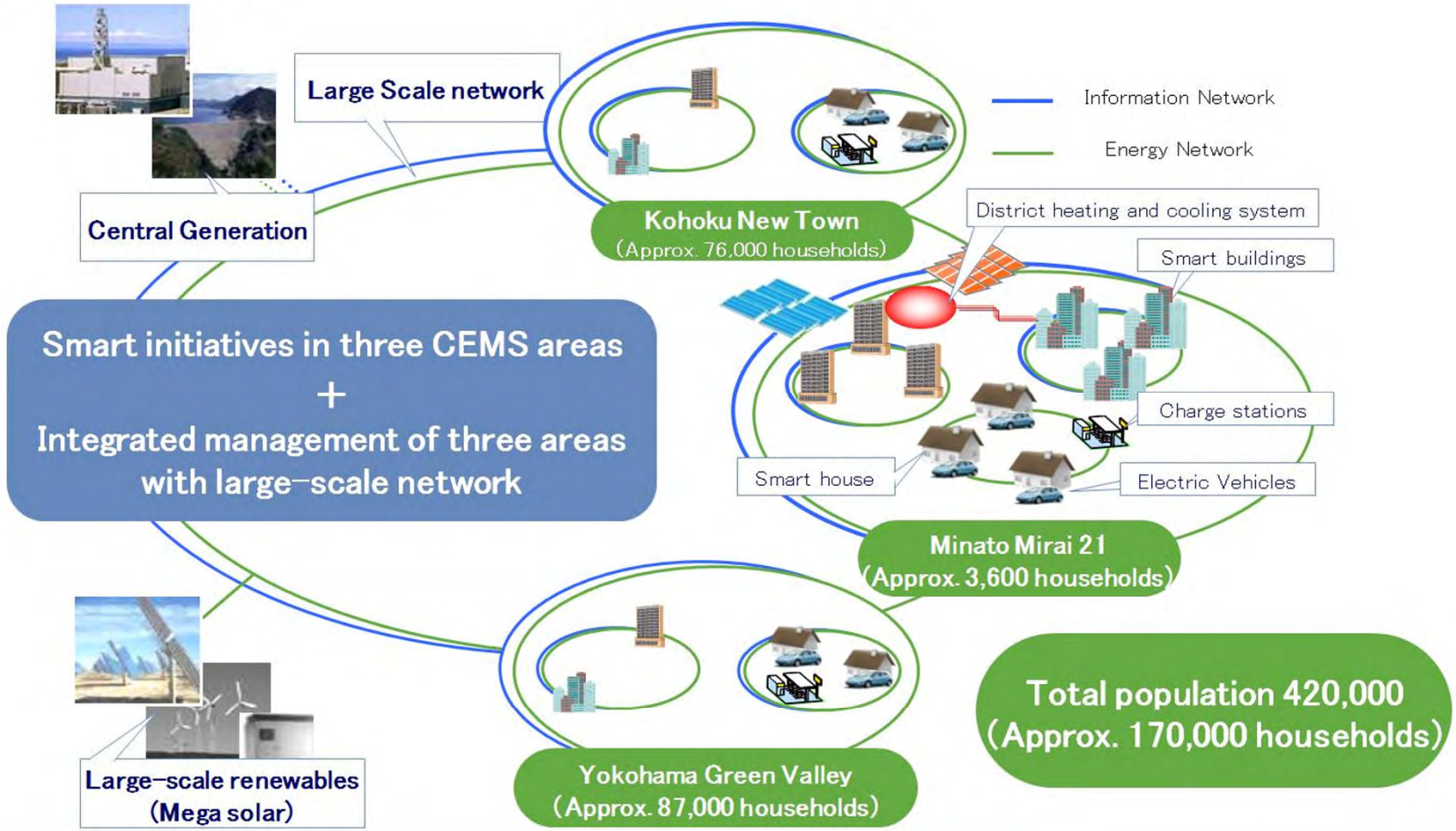
Source : slide by Tetsuya Nakajima, Climate Change Policy Headquarters, City of Yokohama for The University of Lyon – The Univ. of Tokyo – Yokohama Workshop on Sept. 6th and 7th, 2012

Regeneration of megacity by introduction of autonomy oriented energy system toward decentralized power supply

Community Energy Management System

OPEN YOKOHAMA

Absorbs power output fluctuation from renewables by integrating a stationary battery with HEMS and BEMS

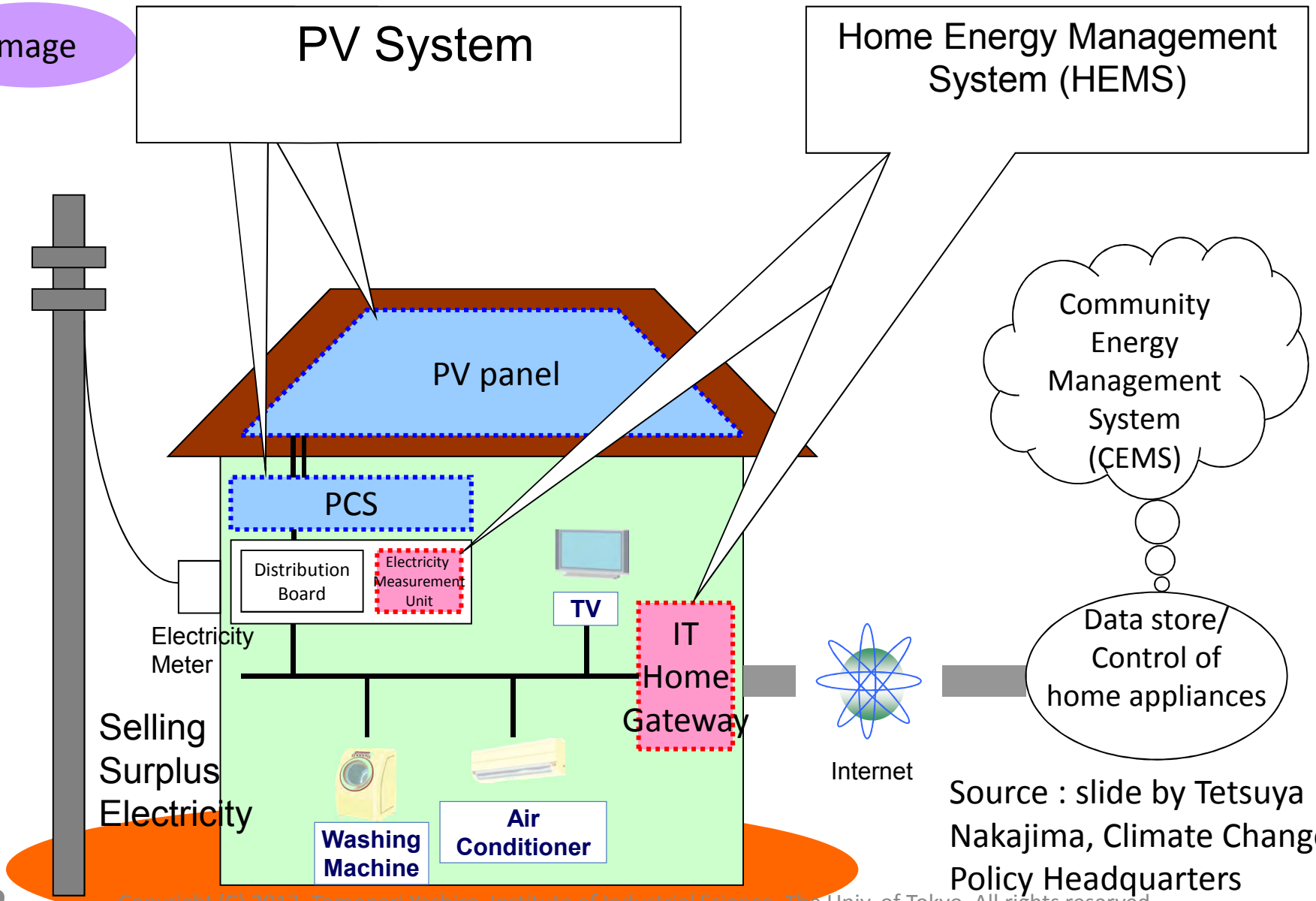


Achieves efficient energy management by managing both demand and stationary energy storage

Source : slide by Tetsuya Nakajima, Climate Change Policy Headquarters, City of Yokohama

Yokohama Green Power (YGP)

Image



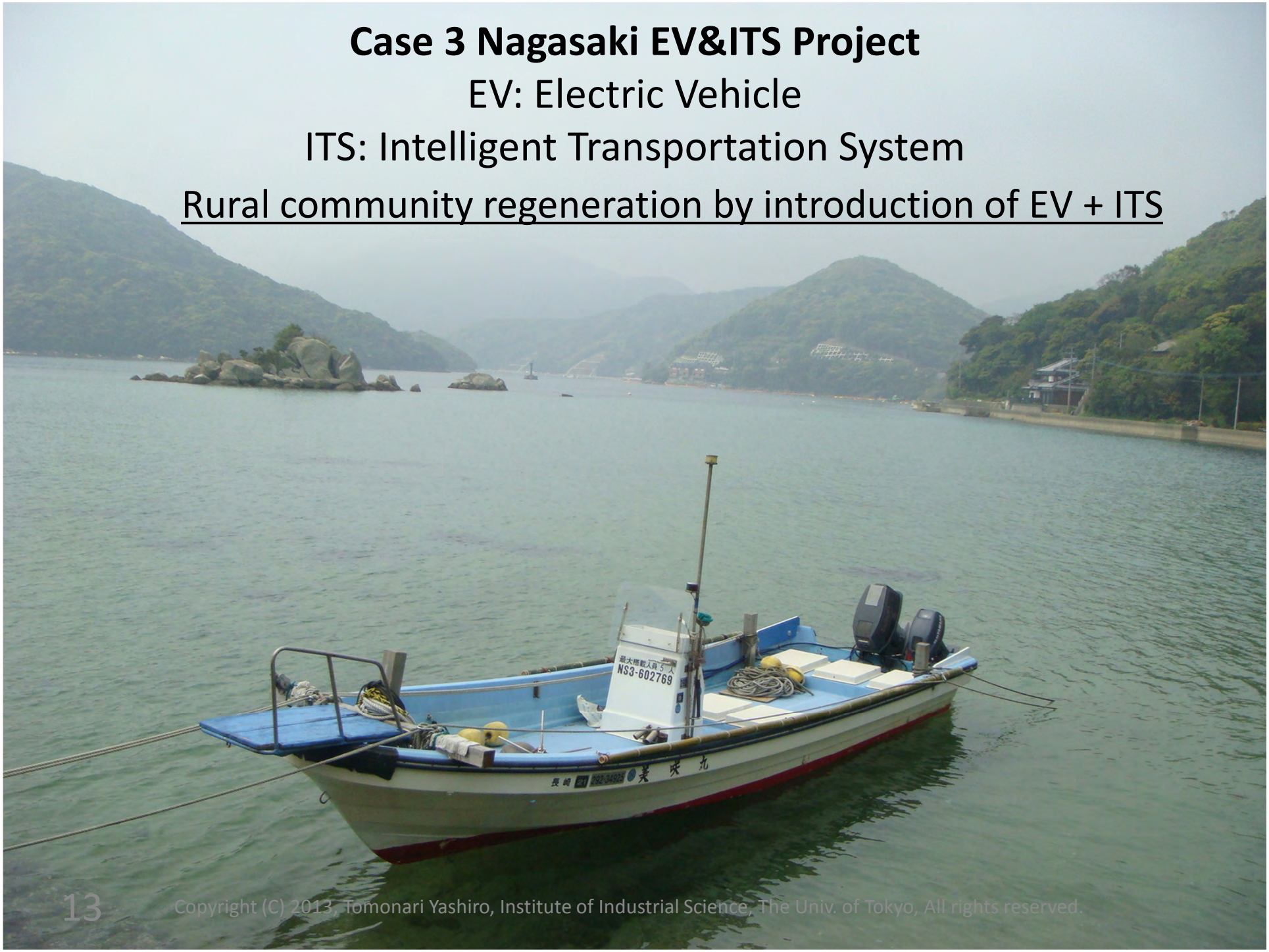
Source : slide by Tetsuya Nakajima, Climate Change Policy Headquarters City of Yokohama

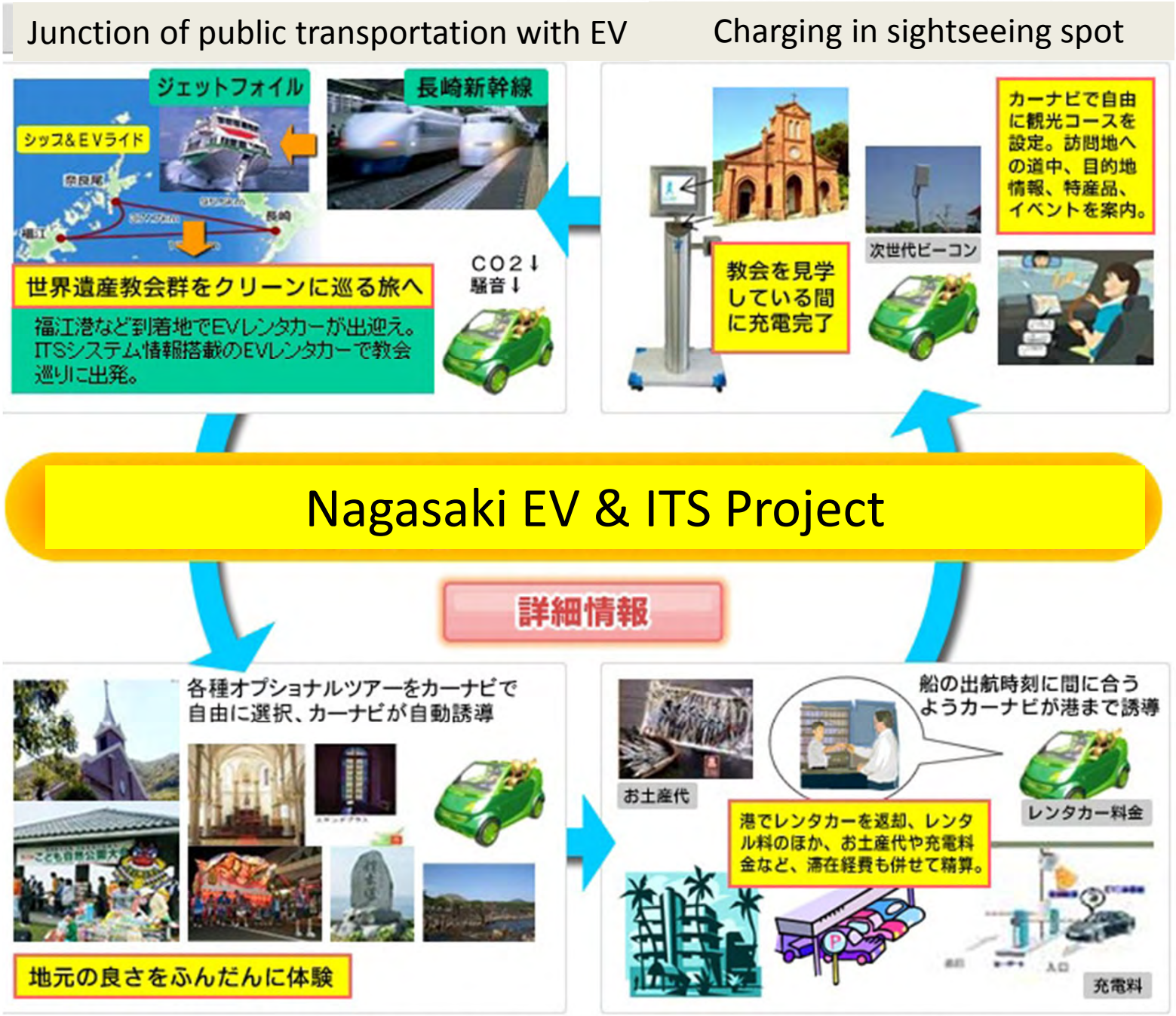
Case 3 Nagasaki EV&ITS Project

EV: Electric Vehicle

ITS: Intelligent Transportation System

<u>Rural community regeneration by introduction of EV + ITS</u>



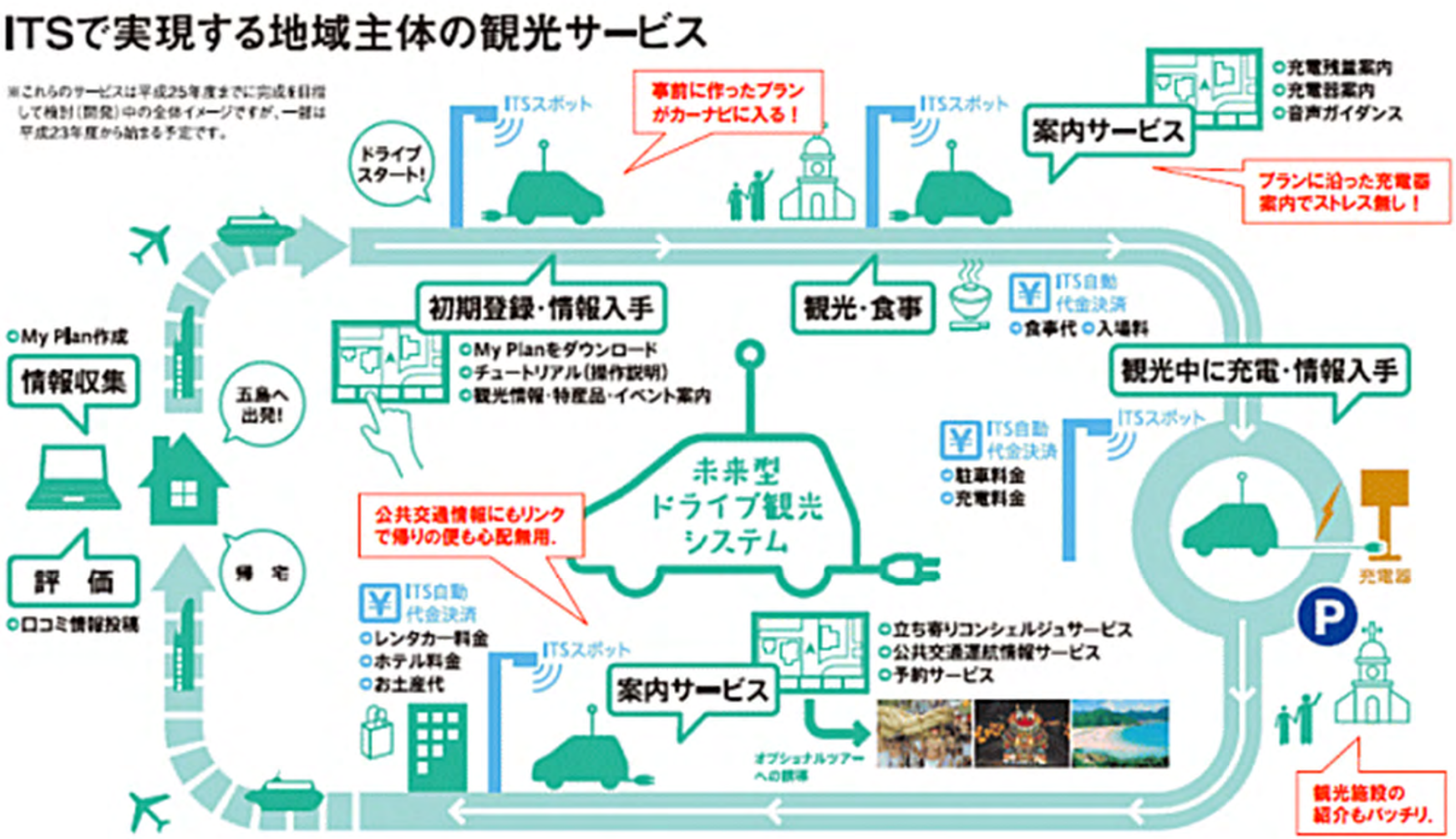


Partnership among; Local governments, ITS Japan (industry association) & the University of Tokyo

Source; http://www.pref.nagasaki.jp/ev/ev&its/project/index.html

Enhanced value creation of sightseeing by ITS

http://www.pref.nagasaki.jp/ev/ev&its/project/index.html



Implication

Show case of rural community regeneration,

and

Social experiments to review;

- Appropriateness of geographic distribution of charging devices
- Drivers' mode setting for charging
- occupancy rate of EV and charging devices
- Drivers' measures against battery out
- Effectiveness of provision of information through car navigation system

etc.

中日联合汽车先端技术研究中心”在东京大学正式签约

2011年3月2日，由同济大学汽车学院和东京大学先进运动中心联合成立的“中日联合汽车先端技术研究中心”在日本东京大学举行了签约仪式。联合研究中心由汽车仿真技术研究所所长吴光强教授和先进运动中心主任须田義大教授共同发起，并得到了余卓平院长的大力支持

吴光强
同济大学
汽车学院教授，
东京大学
生产技术研究所
客员教授

2. Excellency in system rather than in technical seeds

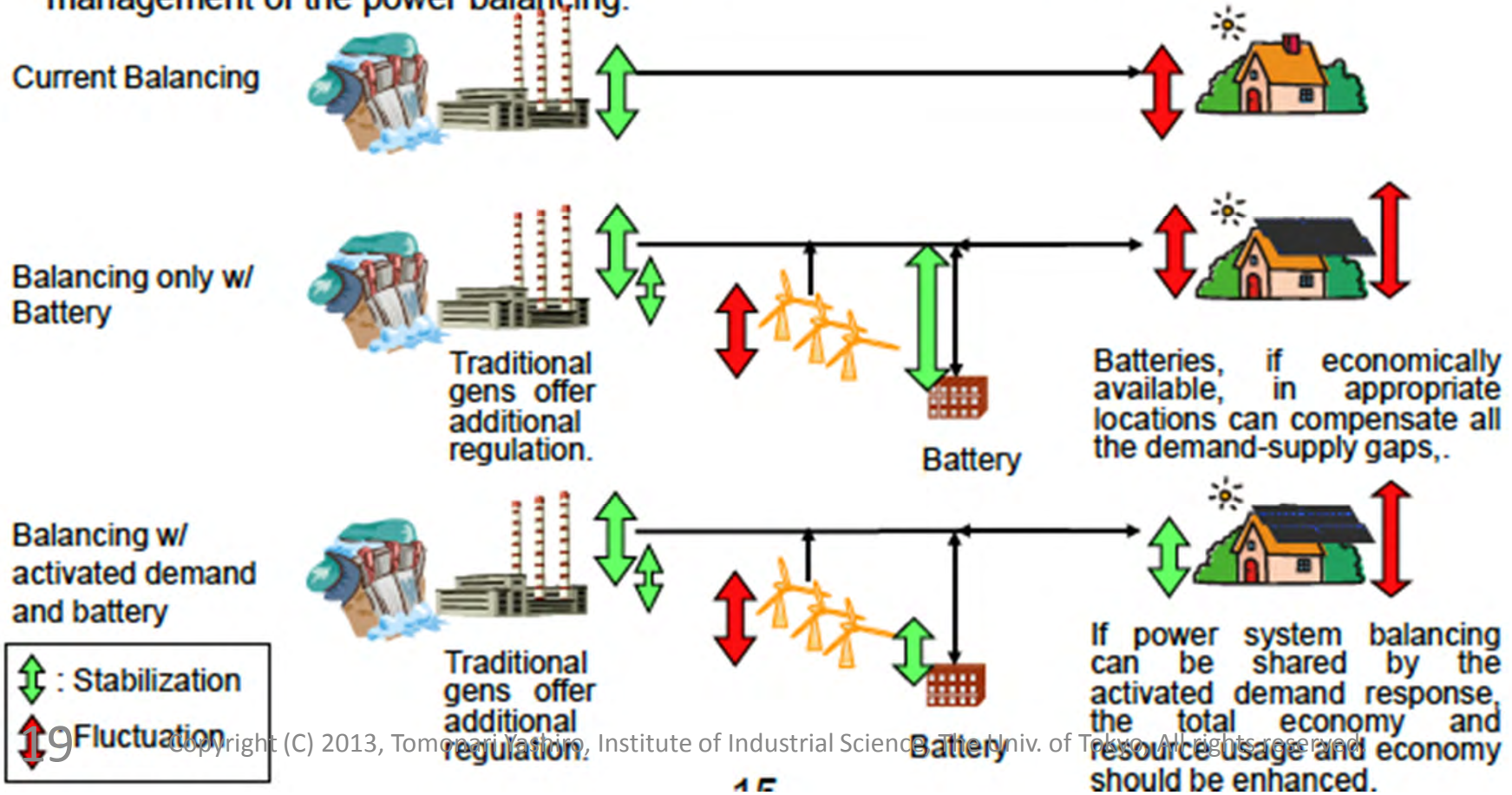
Technical seeds for smart city

1. User interfaces for users
   - Smart phone, smart meter, and whatever as you like in cloud computing environment
2. Infrastructure of ICT for cloud computing
3. **Methodology for optimize operation by data collection → aggregation → analysis → feed back/feed forward**
   - Real time based data collection
   - Framework for Integrated inter-sectorial utilization of varieties of data
   - Methodology of data analysis
   - feed back/feed forward proactive control by data analysis

Source Prof. Kazuhiko Ogimoto, IIS The University of Tokyo, "Power System Evolution System wide issues related to massive penetration of PV in the electricity systems" IEA PVPS Joint Workshop of Task 1 and 14 "PV in Tomorrow's Electricity Grids: Problem or Panacea?" Session 1: Technical Barriers to realize high penetration PV

Role of Activated Demand and Storage

The demand-supply balance in a power system is now managed by centralized energy management using major generation units. In the future, when renewable energy generation penetrate into the system and the regulation capacity of existing , the distributed energy management using activated demand is expected to share the management of the power balancing.



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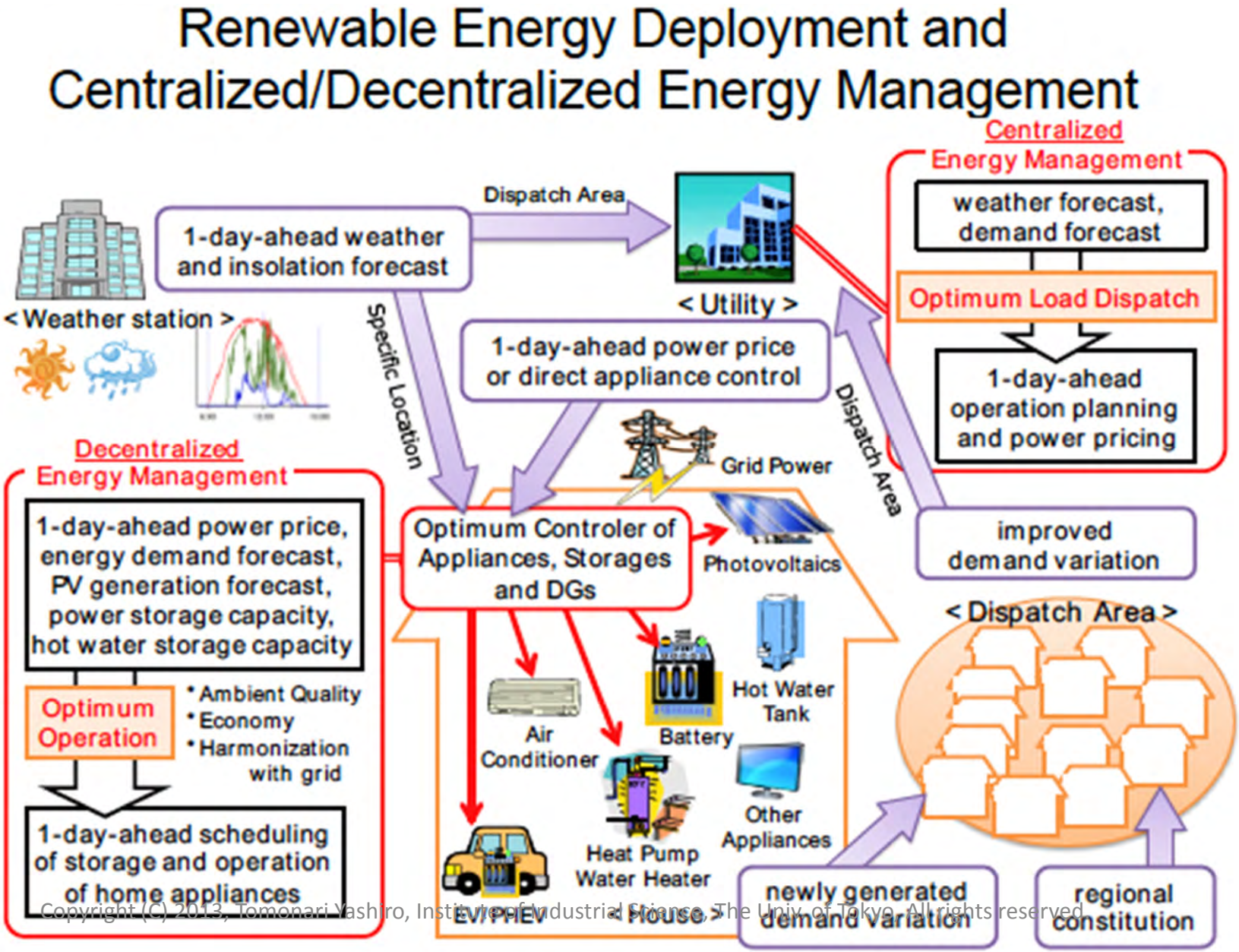
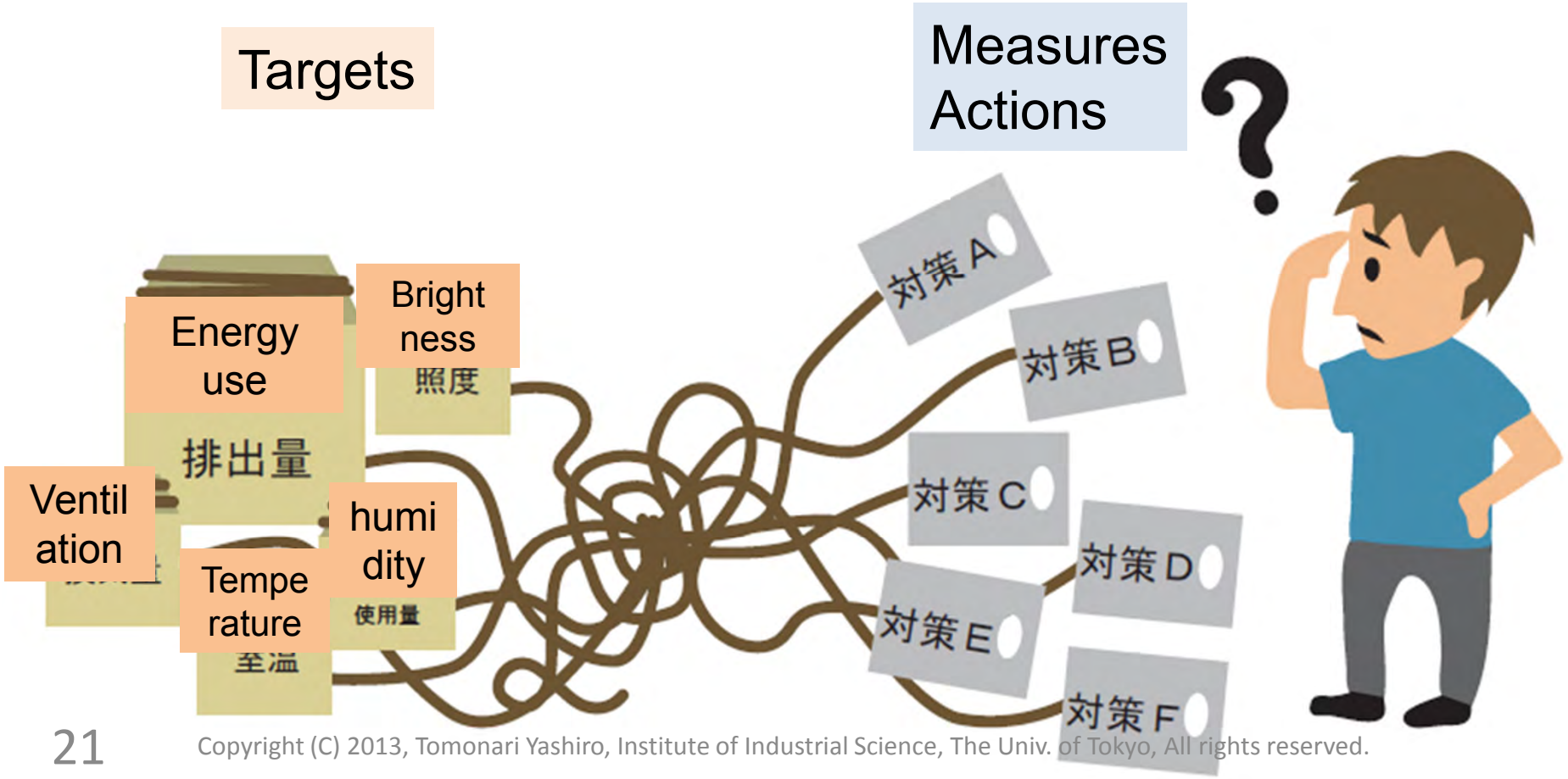


3. Operational management beyond turn-key procurement

Why?

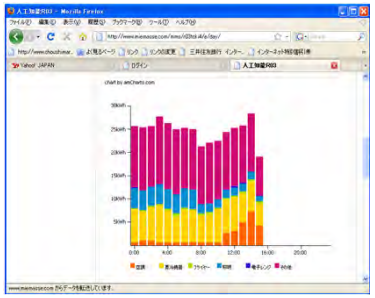
Difficulty to identify engineering model because of

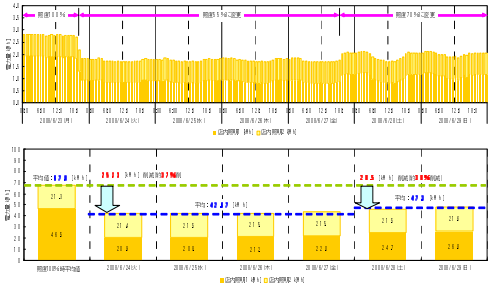
- complexity composed of various parameters
- uniqueness of individual conditions



Information embedded building

Temperature, humidity, illuminance,
CO2 Content, air flow, energy use, water use
motion monitor, etc.





Output
Visualization of
Environment related data

Installed sensors

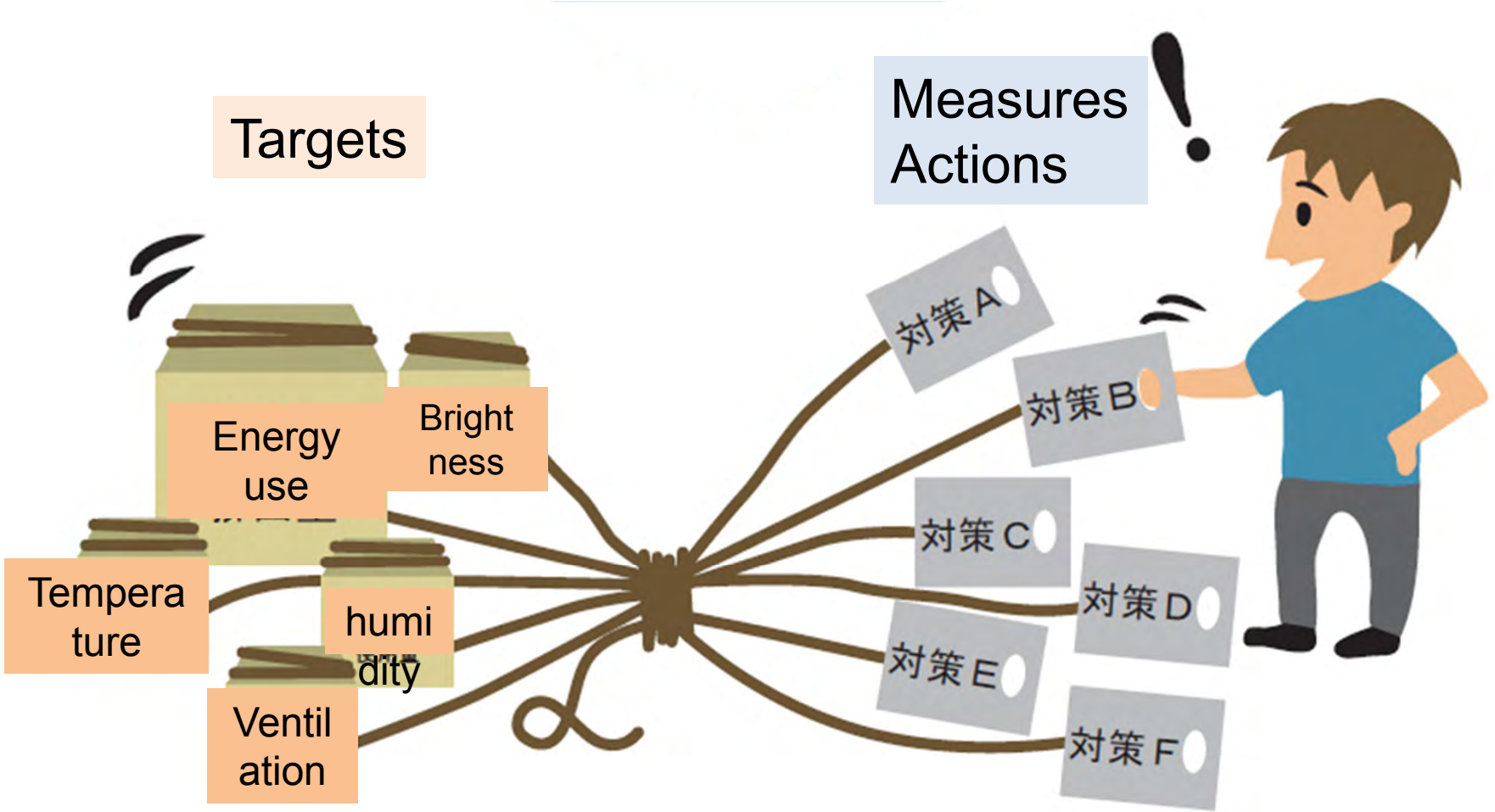
Web Server

Data Server

Control Unit

Internet

Information embedded buildings enables identification of engineering model that enhances controllability of building



Continual improvement process using digital sensor based energy monitoring system

Real time energy use monitoring

Plan of actions to reduce green house gas

Implementation of actions

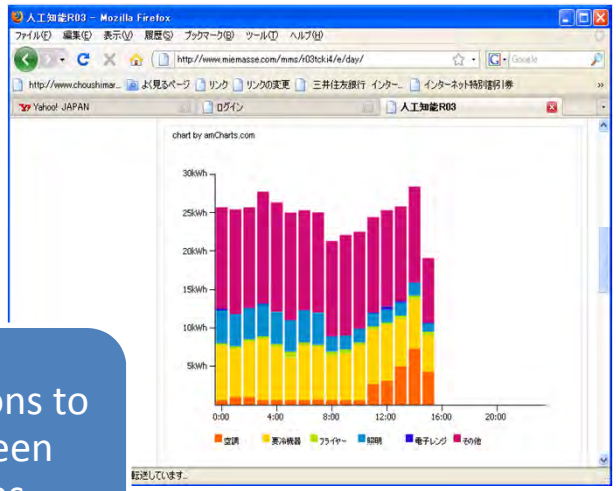
Review of green house emission In each building level

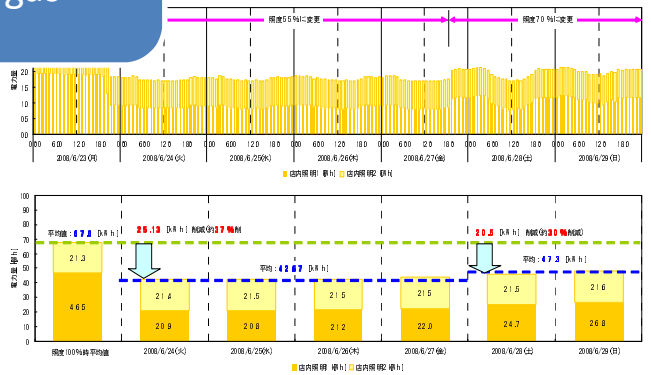
Review of green house emission In building groups level

Continuous brushing up of energy use model of buildings

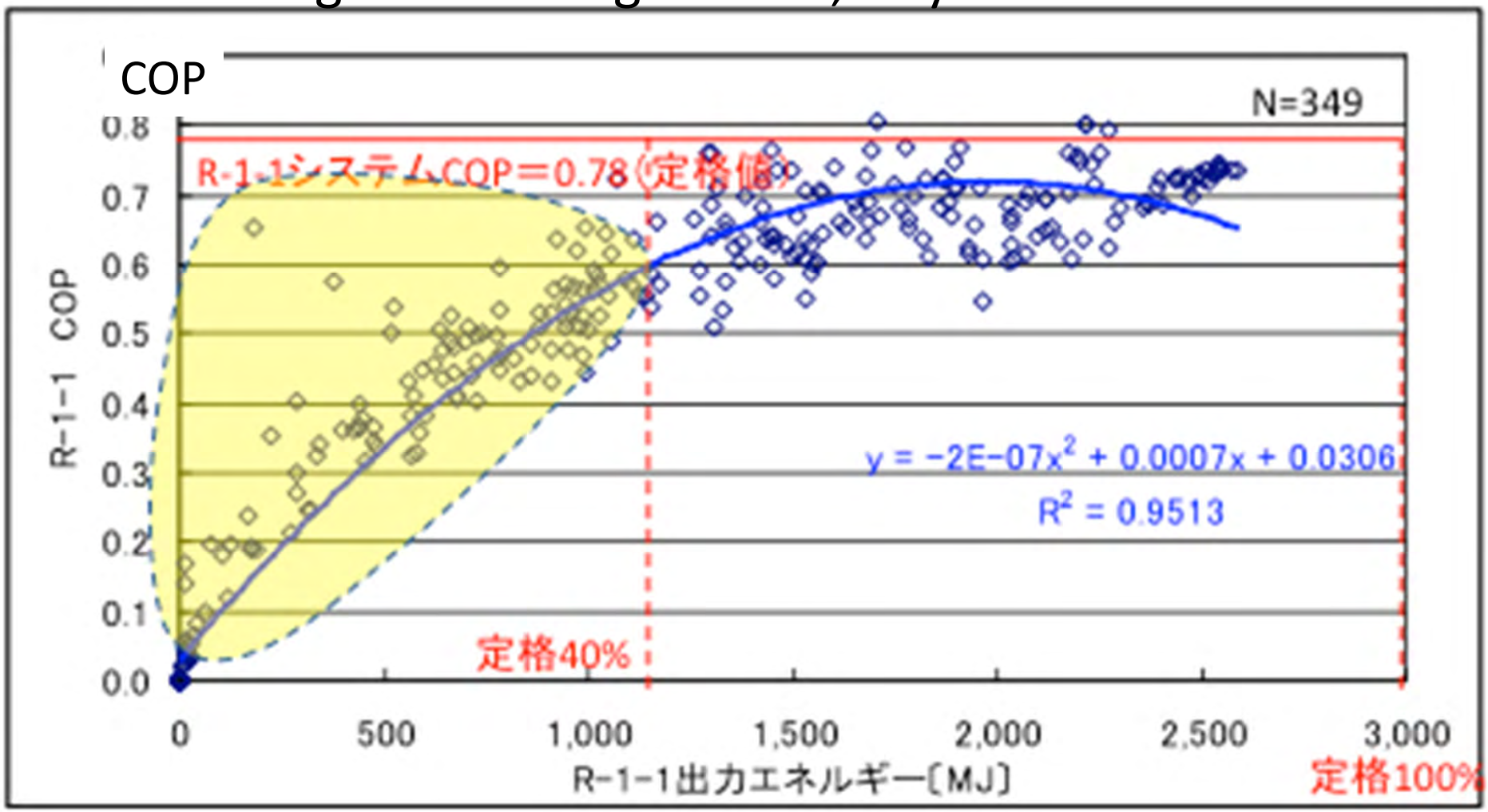
Learning process by users

Professional service is provided





Example of benchmarking
Isogo-Ku Borough Office, City of Yokohama



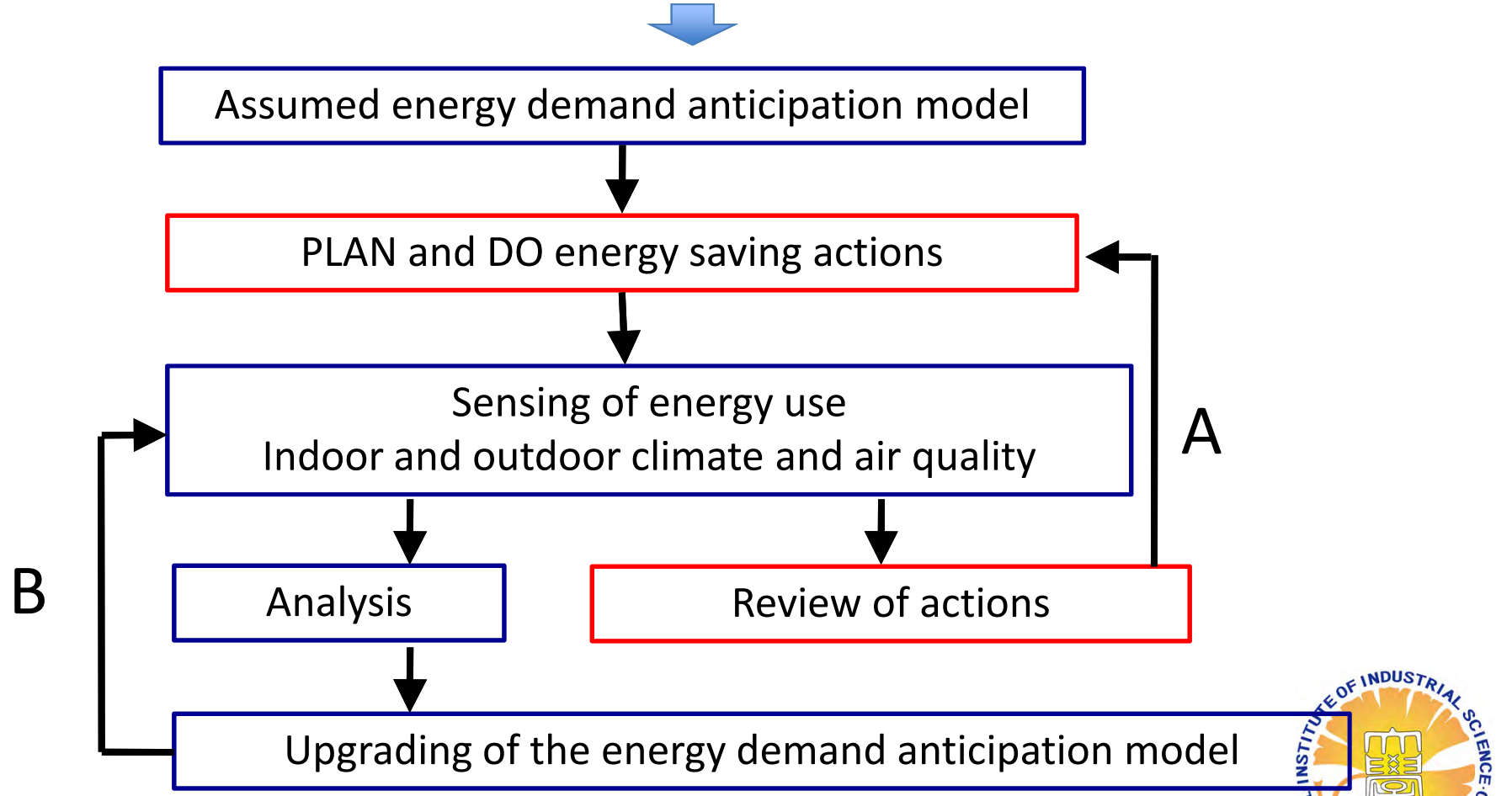
Generated Energy

Continual improvement of energy management using an energy monitoring system

Automated building operation

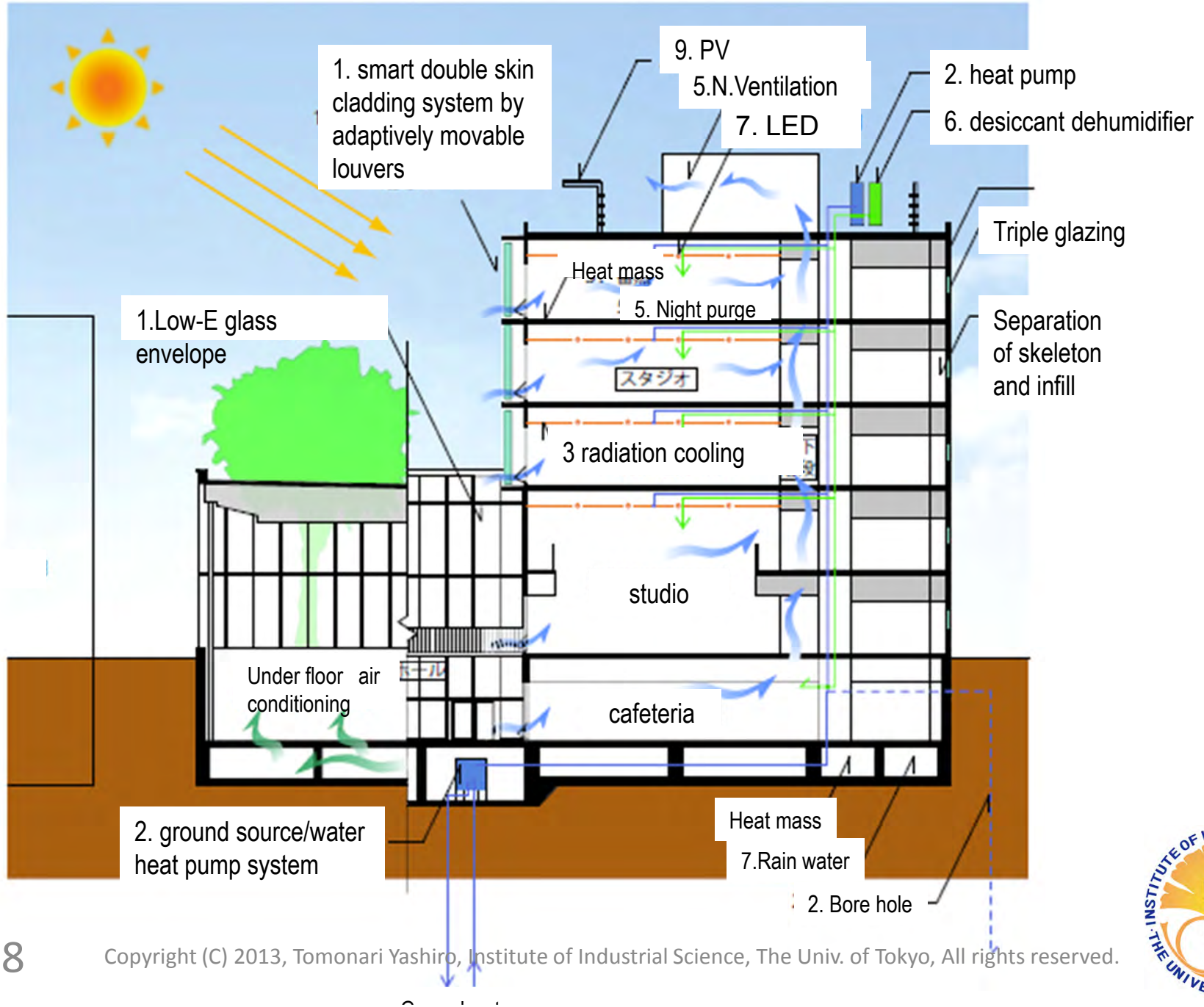
A. Continual improvement of energy saving actions

B. Improvement of engineering models



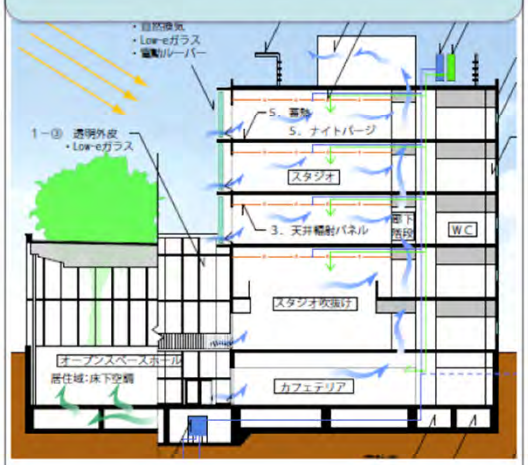
Zero Energy Building in the University of Tokyo

- KOMACEE 21 “Komaba Centre for Educational Excellence”
- Location; Komaba campus, the University of Tokyo.
- Five floors with one underground level floor.
- Total floor area ; 4,477m^2.
- several studios and convention rooms such as halls and meeting rooms.



Integrated building operation system by AI based control
(Developed by Magori, Sako, Yasuda etc.)

PREDICTION

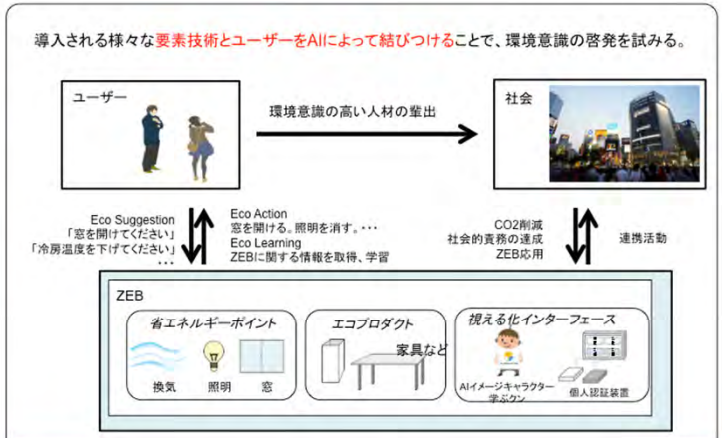


PROACTIVE CONTROL

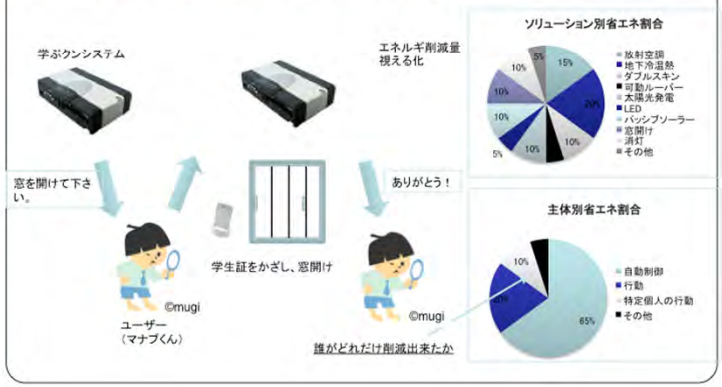
VISUALIZATION

ICT based monitoring Automatic Diagnosis

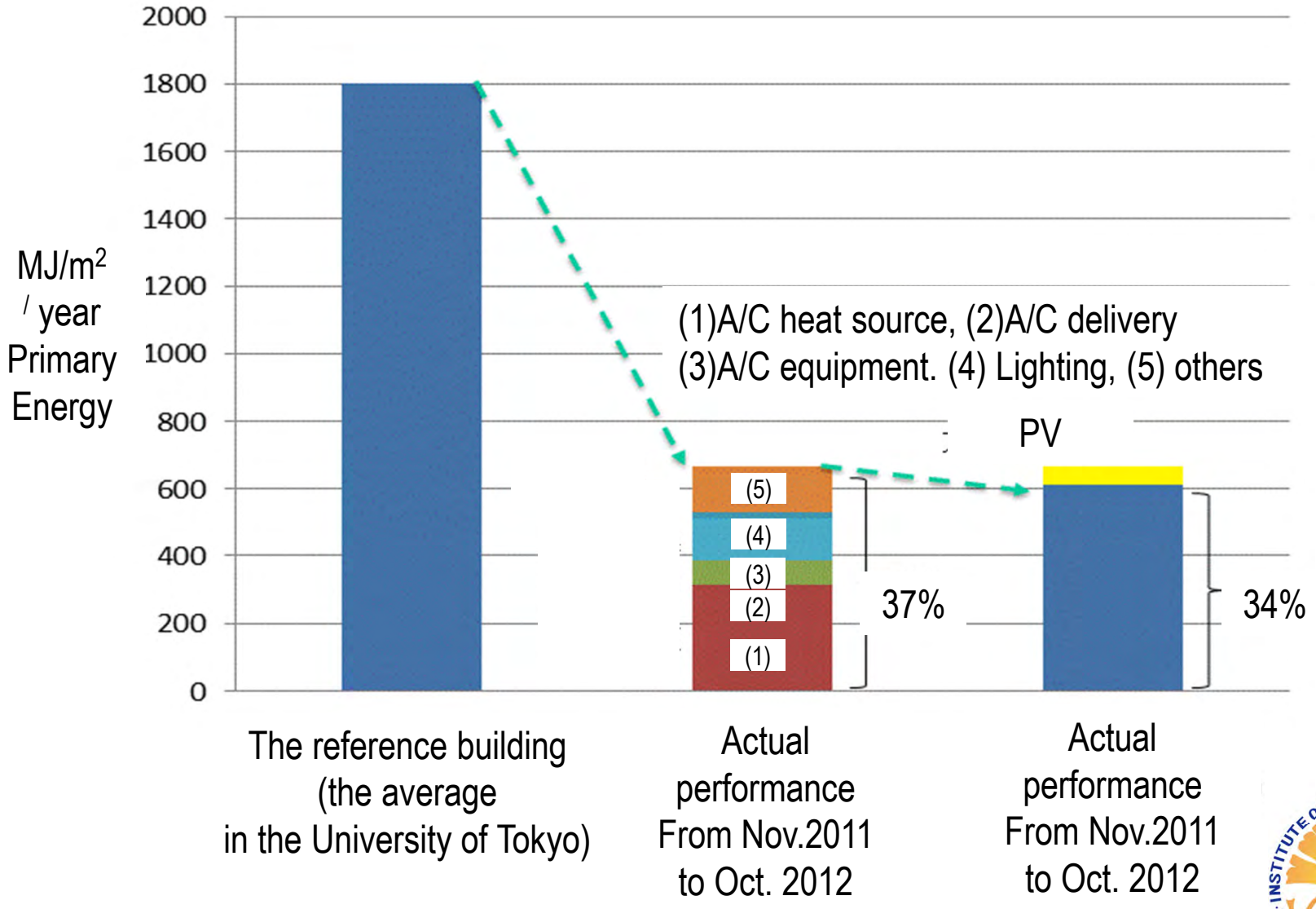
WATCHING NOTIFICATION REPORT



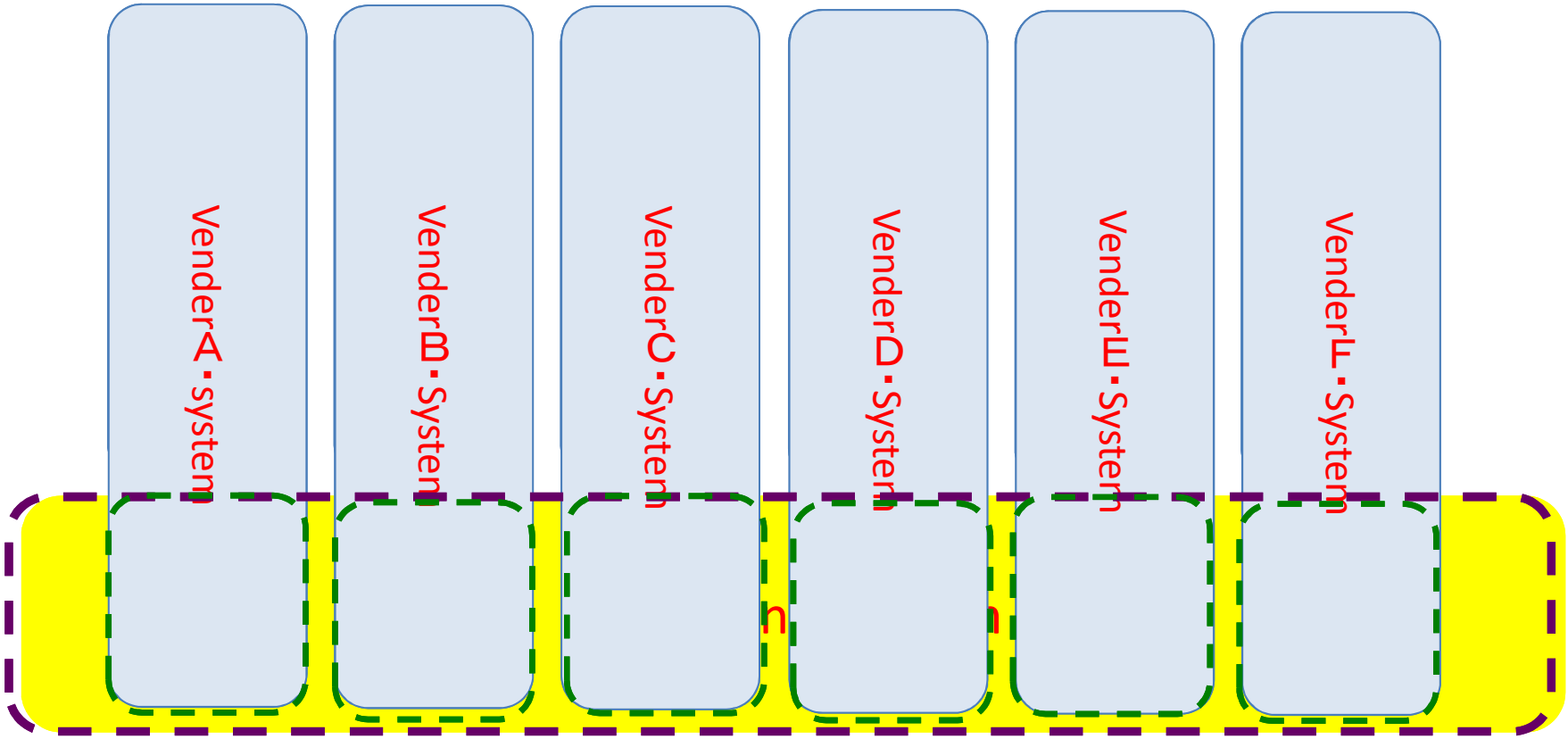
ACTION (Support learning by users)



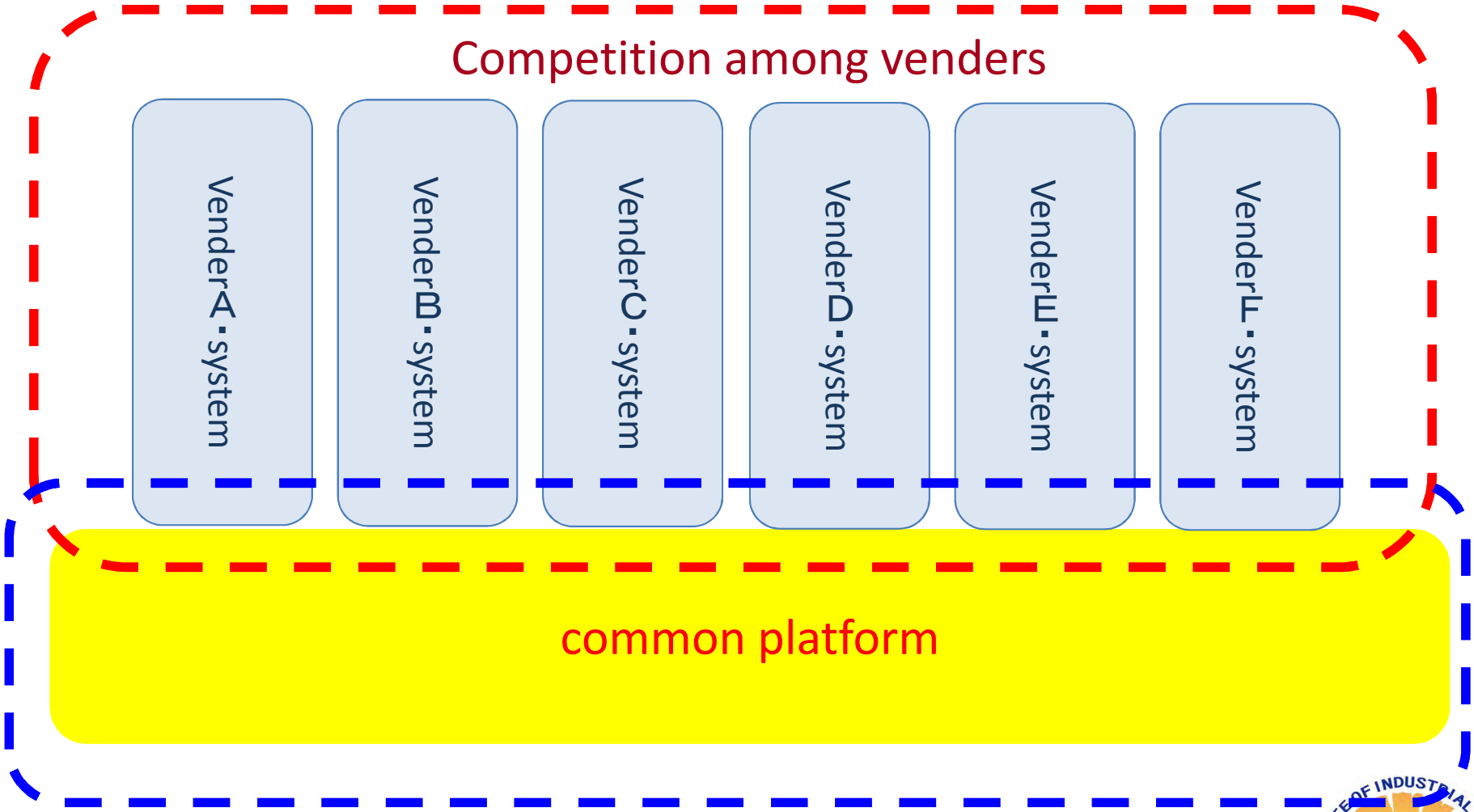
Actual performance 2011-2012



4. Interoperability for open system approach why?



De Fact Standard for platform is very important
Potential area for Japan-China Alliance because of common interest



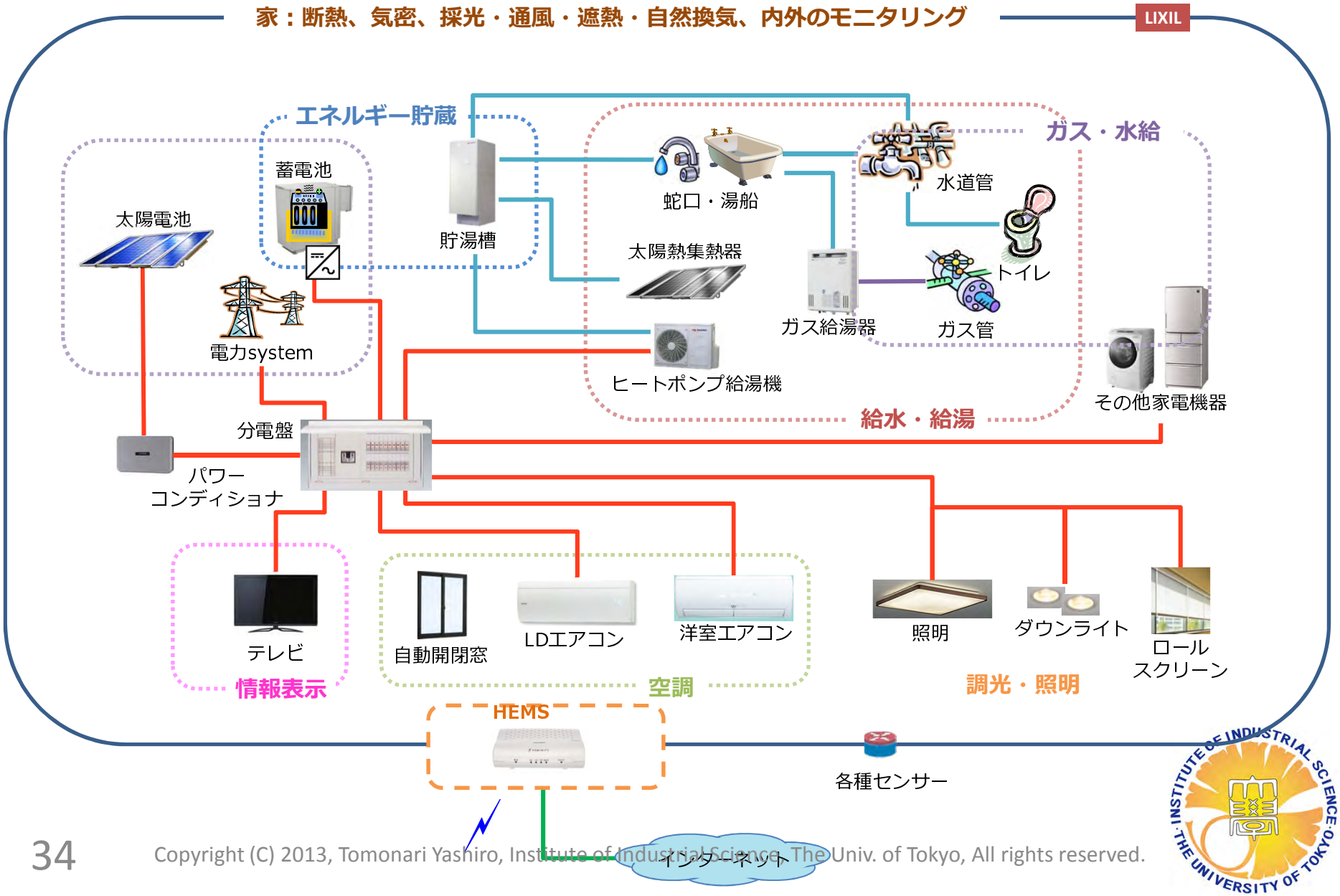
Comma House Project in Institute of Industrial Science
東京大学生産技術研究所

Provision to industrial partners to brush up platform to enhance interoperability

Sponsored by LIXIL Group

Comma house Project

Open system to attract multi vendors by assurance of interoperability



Concluding comments

1. Significance of local context
   - Local diversity in critical issues and available resources
2. Integrated solution for end-users
3. Operational management is significant
   - Long term partnership rather than turn key contract
   - Methodology of proactive demand control
4. Potential collaboration of platform for interoperability

Thanks for your kind attention