

Creation of Smart Communities in Keihanna Science City - from demonstration to implementation -



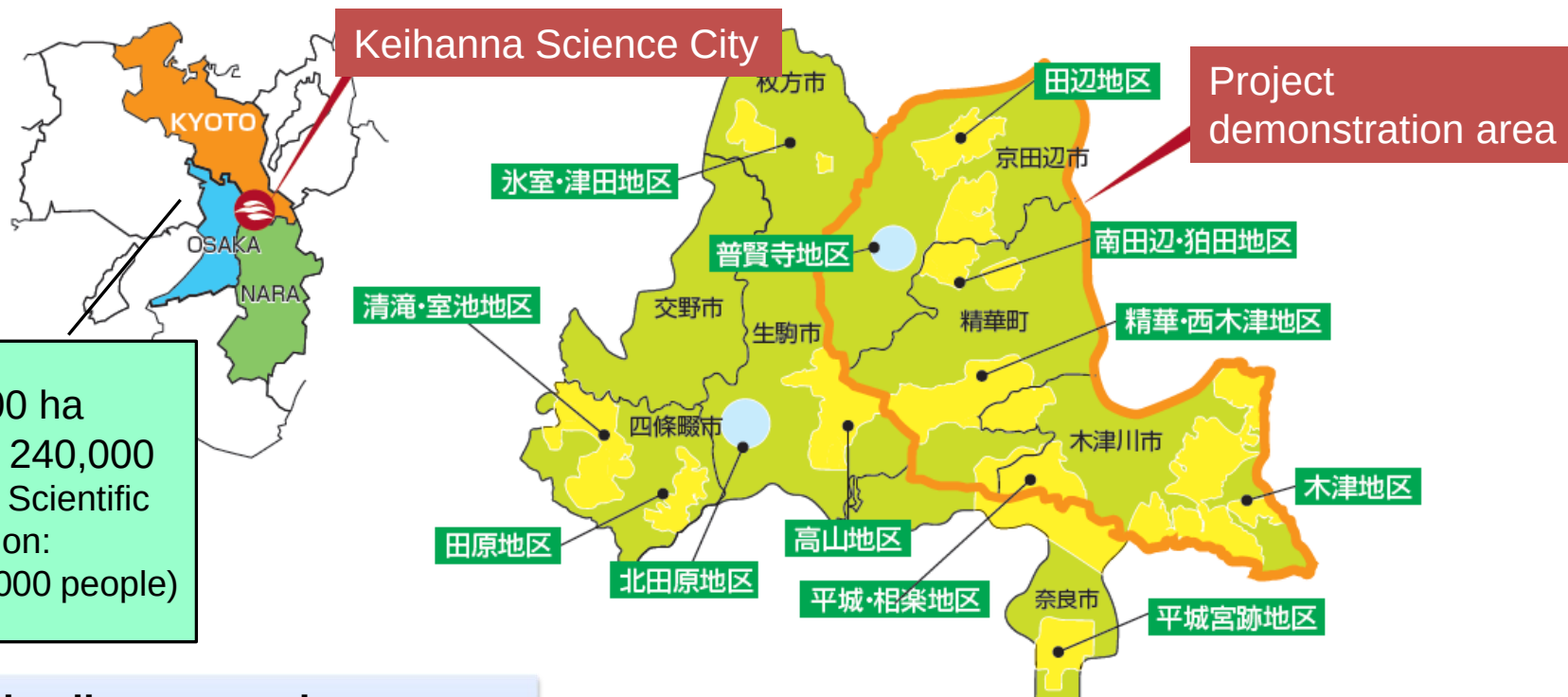
18th June 2015
Smart Community Summit 2015

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Department of Policy Planning
Kyoto Prefectural Government

Main points in today's presentation

- 1 Special features and potential of Keihanna Science City**
- 2 Keihanna Science City's mission and progress**
- 3 Results of the demonstration project's efforts**
- 4 Challenges to application into society and future developments**

- An international R&D hub symbolic of Japan (National project based on law)



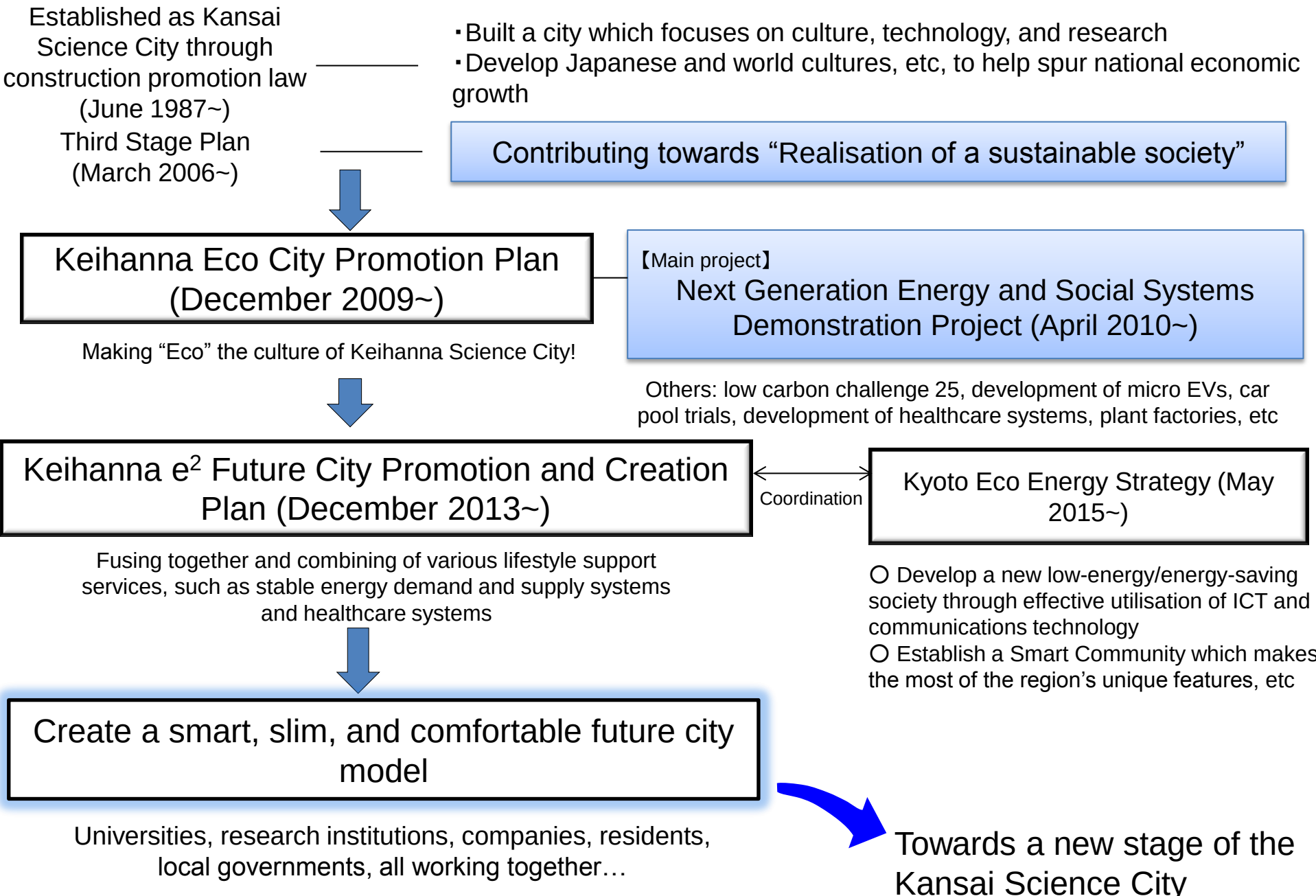
Area: 15,000 ha
Population: 240,000
(Cultural and Scientific
research region:
3,600 ha/90,000 people)

126* world leading research
institutions gathered, performing
research into information, robotics,
regional environment, etc

*As of March 2015

Surrounded by nature, this desirable
residential area is experiencing the
highest rate of population growth in
Japan

Perfect environment to introduce trials for ground-breaking technology
and new social systems, **together with local residents**



Keihanna Eco City Next Generation Energy and Social Systems Demonstration Project

Kita-Kyushu Smart
Community
Development
Project

Kita-Kyushu
City

Keihanna
Science City

Yokohama

Yokohama Smart
City Project

Toyota
City

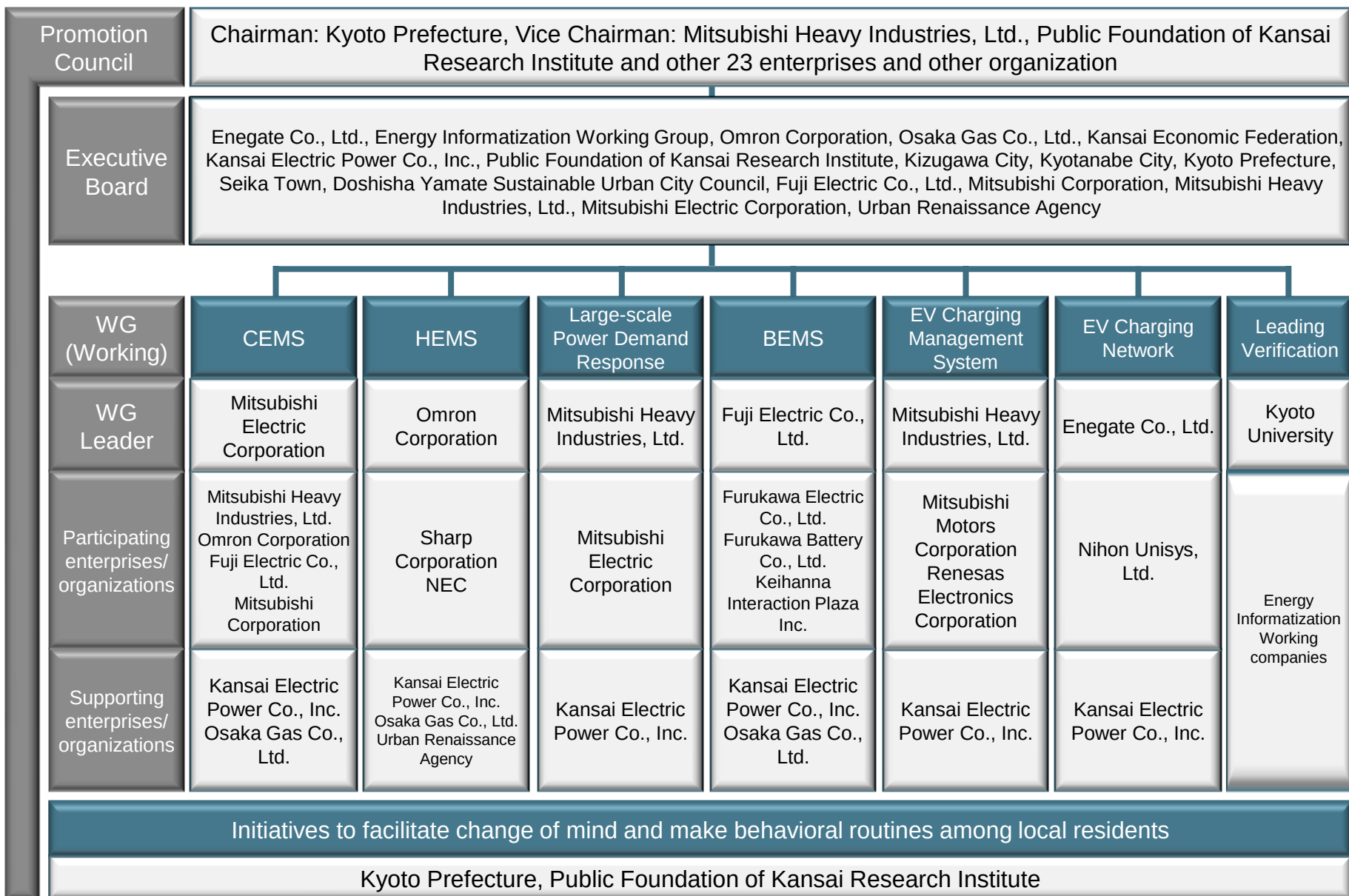
Toyota Low-Carbon
Social Systems
Demonstration Project

Over the 5 years from 2010 to 2014, trial projects have been underway to develop regional energy management systems which utilise each region's fundamental features and cultures

【Associated costs of the Next Generation Energy and Social Systems Demonstration Project】

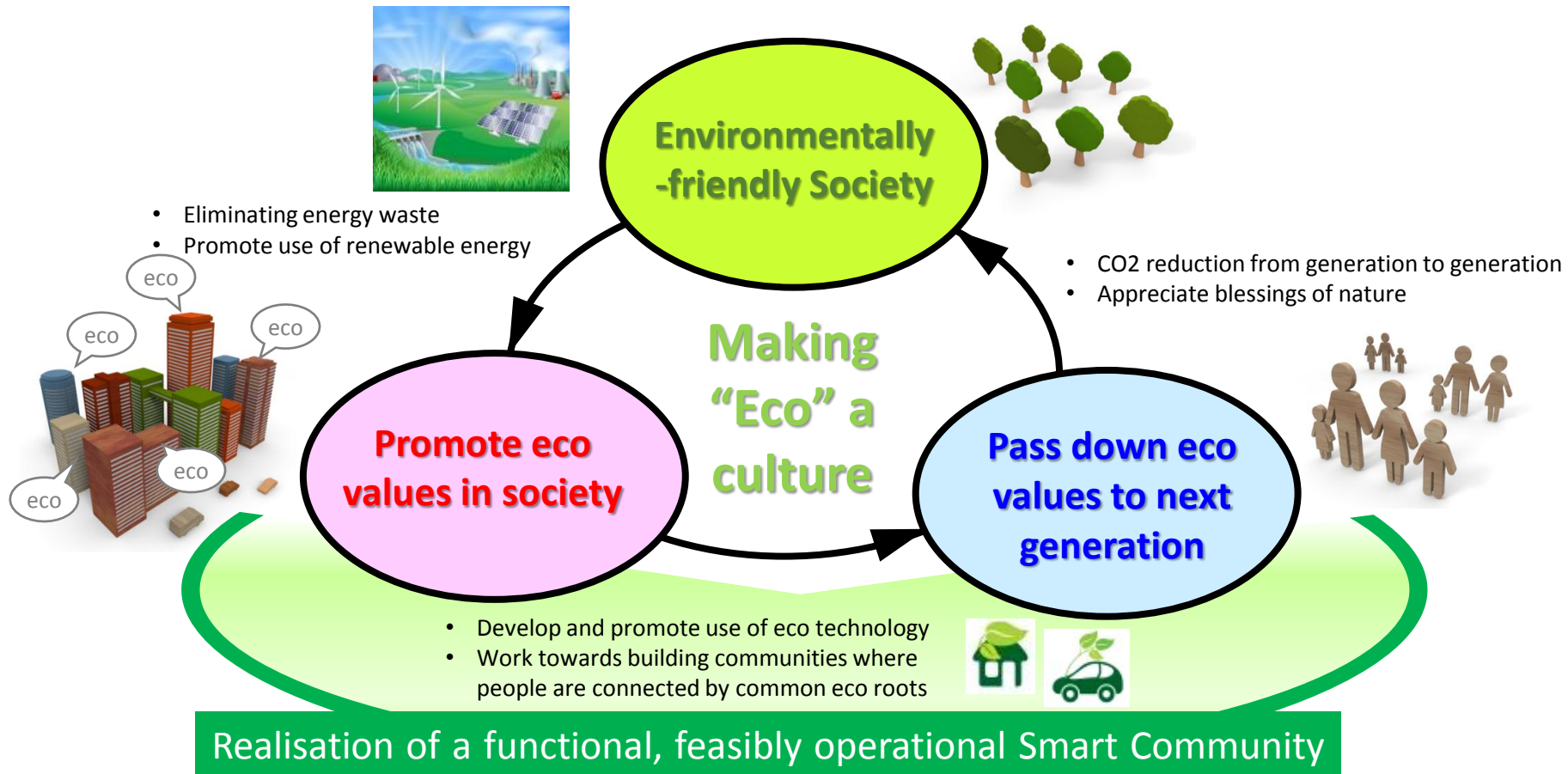
■ Project costs (in JPY): 2010→500million; 2011→1.5billion; 2012→900million; 2013→400million; 2014→200million
⇒ **Total approx 3.5billion**

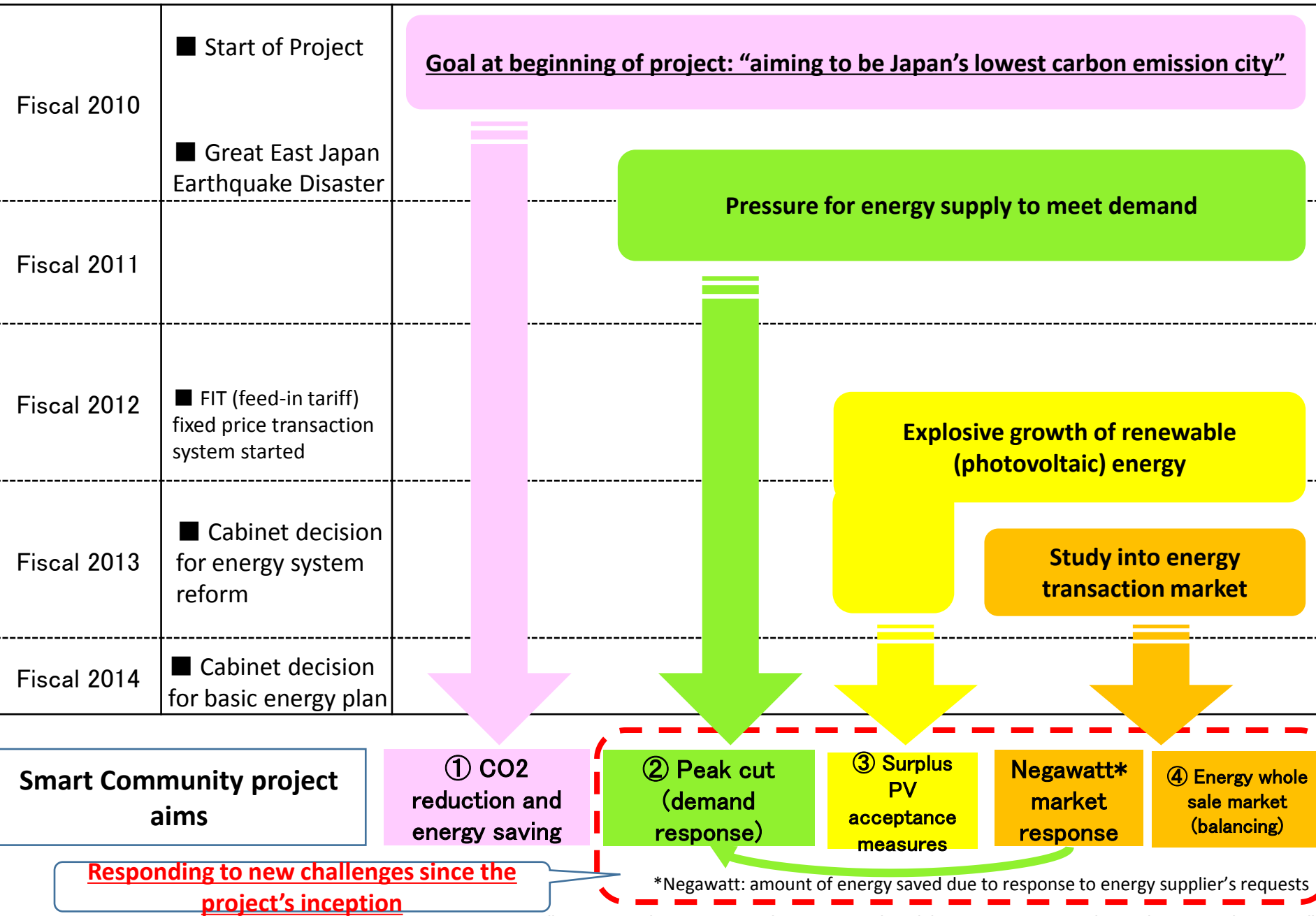
■ Kyoto Prefecture has had the following budget for solar power generation, EV promotion, co-generation, and other subsidy schemes (in JPY): (2011→60million; 2012→50million; 2013→20million; 2014→20million)



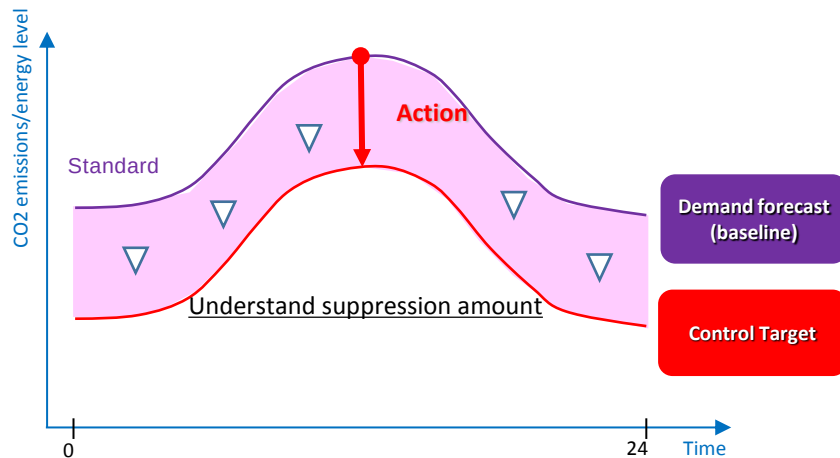
Making “Eco” the culture of Keihanna through realisation of a Smart Community

- Begin demonstration project to aim for the establishment of a community with a next-generation cycle in place, including CO2 reductions and efficient use of renewable energy.
- Through effective use of ICT and without sacrificing Quality of Life (QOL) or convenience, establish people’s “Eco Awareness and Behaviour” and develop a sustainable “Eco Cycle”.
- Develop Smart Community as a feasible operational community to ensure its sustainability.



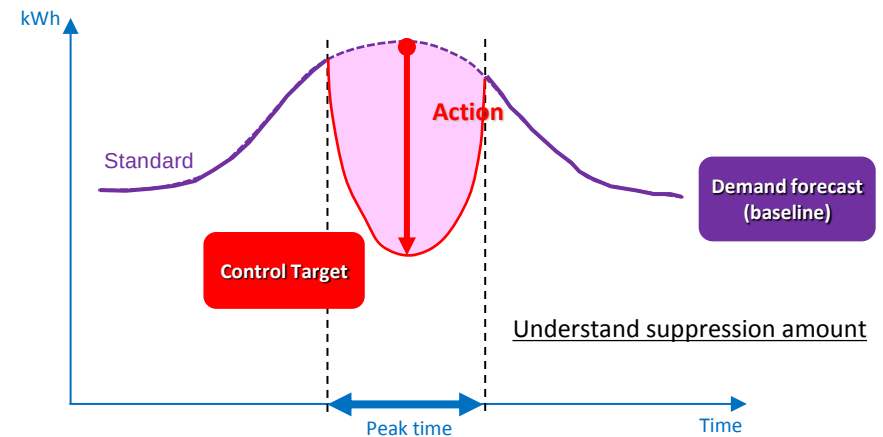


CO2 reduction and energy saving



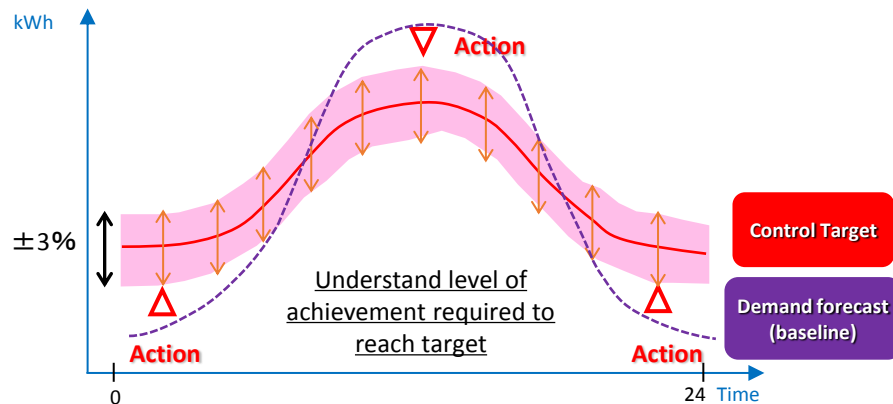
Verify the effects of the suppression amount required to decrease energy usage and CO2 emissions

Peak Cut measures



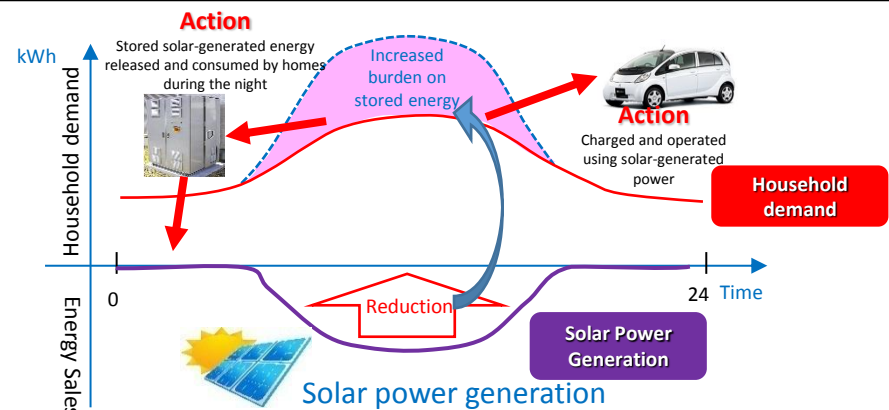
Verify the effects of the suppression amount required to reduce energy consumption during peak times in summer and winter

Balancing measures



In order to prevent blackouts from energy demand-supply imbalance, adjust for a $\pm 3\%$ demand-supply balance at 30minute intervals. As the grid operators incur a fee if there is an imbalance of more than 3%, verify the effects of the suppression amount required to achieve balancing.

Surplus PV acceptance measures



Understand household energy consumption rate and charging promotion status
When the amount of solar-generated power exceeds household demand, surplus energy can be sold to the grid. In order to reduce the burden on the grid, study the effects of actions take to minimise energy sales to the grid, such as storage in batteries for later household consumption, and charging EV batteries.

HEMS (14 homes)

- Measure energy consumption per appliance
- Use HEMS for energy and storage battery management

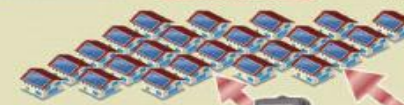
HEMS

With storage batteries:
10 houses
Without storage batteries:
4 houses



Household Sector

Large-scale verification experiment 700 houses



Smart meter

Community EMS (CEMS)



Network simulator

Local storage batteries

Transport Sector (EV)

EV Control Center



EV Charging Station

Business Sector (BEMS)



Keihanna Plaza

CEMS

- Understand status of regional energy demand and supply, including energy and gas usage statistics for households, buildings, and EVs in the region, as well as PV energy generation.
- In order to draft an optimal energy usage plan, develop each EMS and verify effects of DR and balancing measures.

Large-scale Demand Response (700 homes)

- Verify energy demand suppression effects of price-induction DR
- Verify effects of energy-saving consultations based on energy-usage data

Electric power company

EV charging management (100 vehicles)

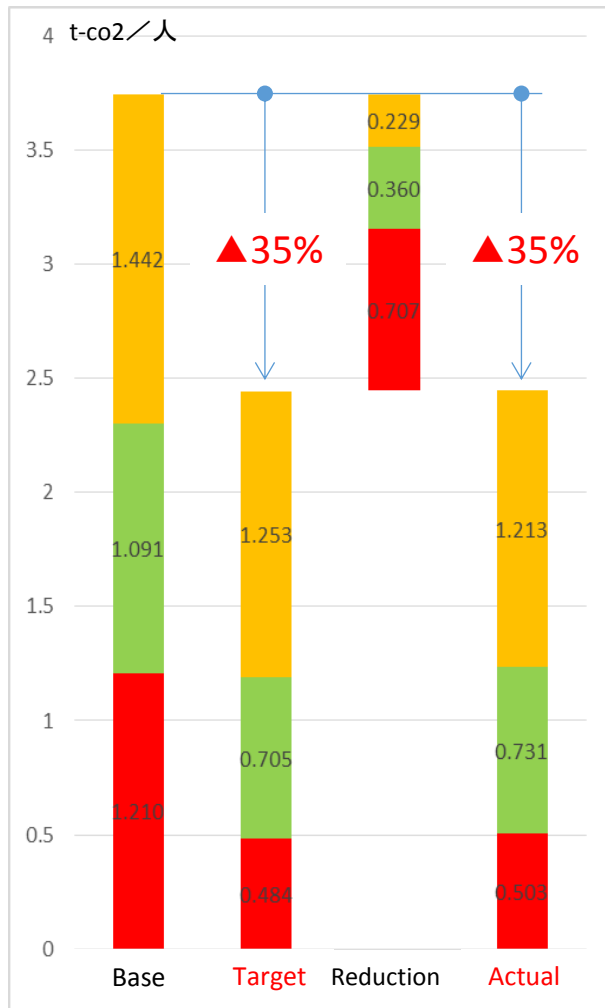
- Collect and manage EV position, battery level, and operation data
- Verify effects of charging and energy suppression in coordination with CEMS

BEMS (Keihanna Plaza)

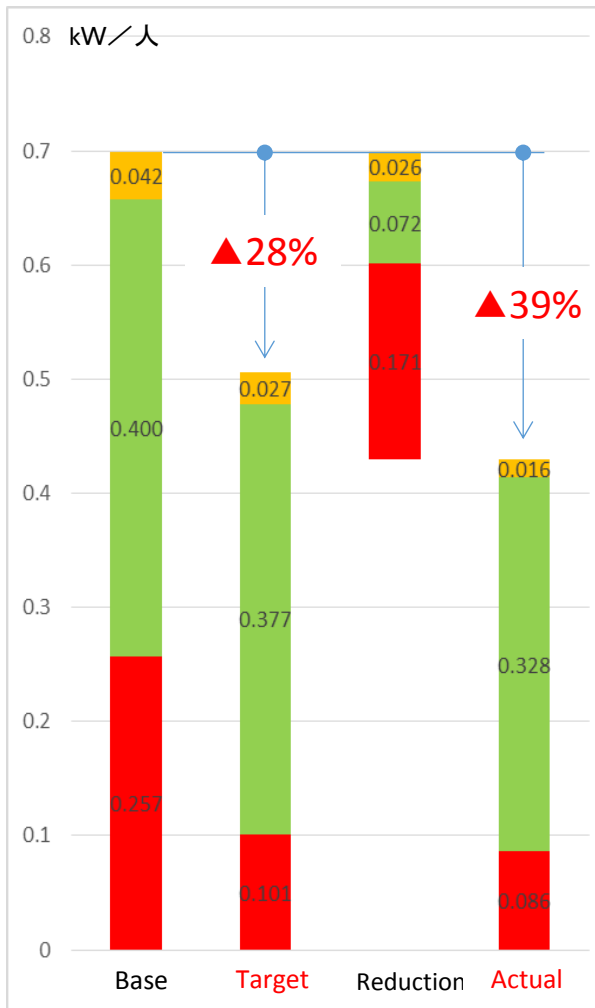
- Reduce CO2 emissions through fuel optimisation and suppression
- DR measures for building tenants (approx. 70) and common spaces
- DR for hotel guests/rooms

Working Groups	Project Aims			
	CO2 reduction/energy saving	Peak Cut	Balancing	Surplus solar power acceptance measures
CEMS	—	○ (Negawatt market)	○ (Energy wholesale market)	—
EV charging management	—	○	○	○
BEMS	○	○	○	—
HEMS	○	○	○	(○)
Large-scale DR	—	○	—	—

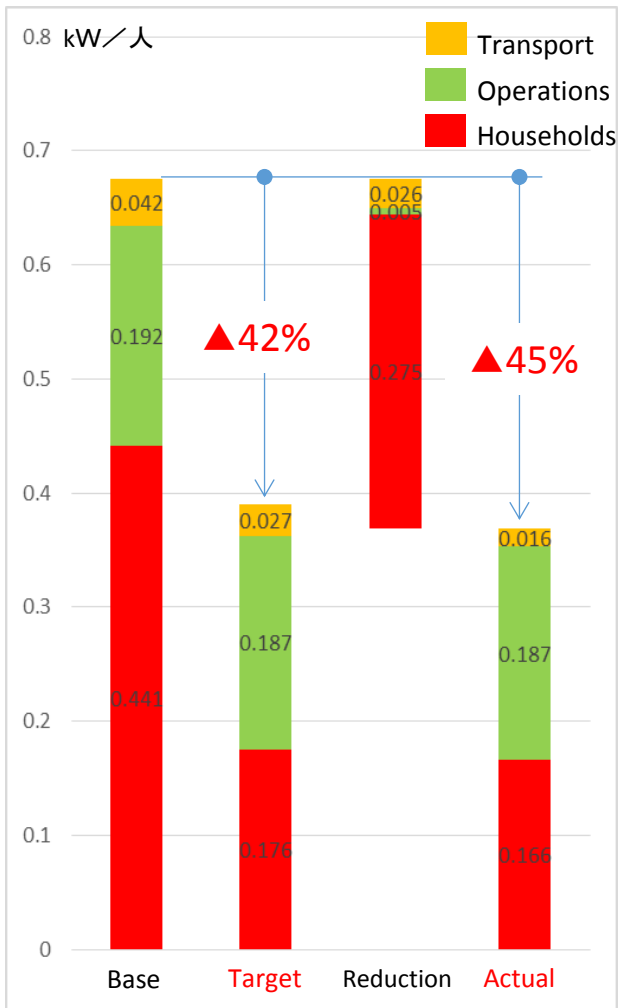
■ CO2 reduction



■ Peak Cut (summer)



■ Peak Cut (winter)

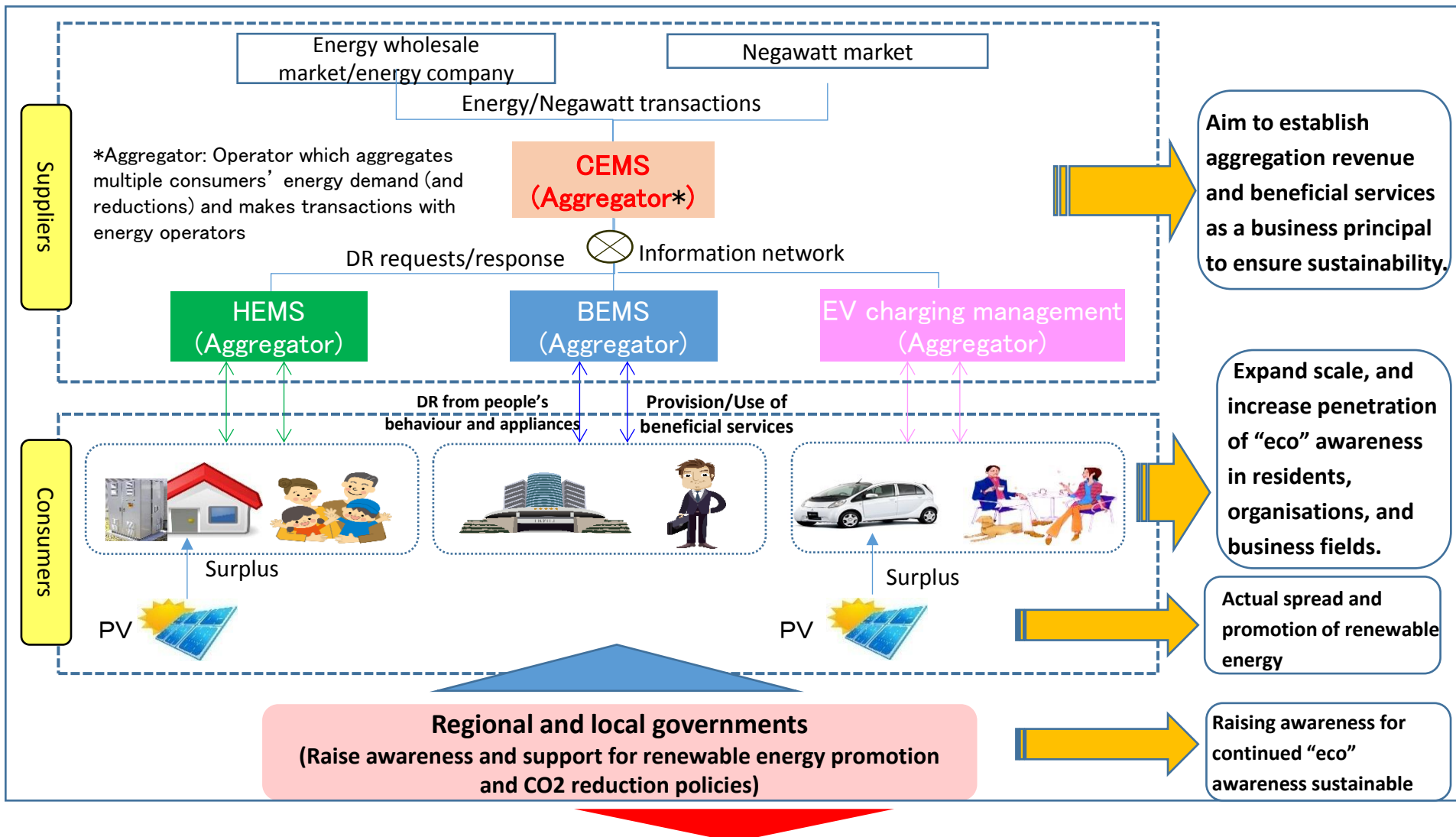


Meeting CO2 reduction and both summer/winter Peak Cut targets!

NB: Base values from fiscal 2007; targets and actual results from fiscal 2014

1. Consider Demand Response (DR) is a tool to be used to bring tangible effects and lower energy costs to the regional community. In order to further increase the effectiveness of DR, make DR requests to consumers at 1 hour intervals, and also use preliminary DR by fixing spot markets and other complementary policies to reduce risk of energy imbalance.
2. In order to minimise the burden shouldered by residents and participants, implement and install remotely-controllable household electronics and appliances on a wide-scale in homes and facilities for participating regions and consumers.
3. Use people's behaviour in response to DR to work towards engraining an eco awareness and way of thinking in people so that they pass it on to future generations. (Develop using tools closely-related to lifestyles of which people do not tire easily. Also use CO2 reduction and energy saving consultations as another tool.)
4. In an environment which is subject to fluctuations in demand and supply due to a large introduction of solar power generation and others, in order to not sacrifice quality of life or inhibit society's actions, make use of energy storage batteries, including EVs, to implement a buffer of surplus energy which can also be used to deal with Peak Cut measures and demand-supply balancing. (Promote PV solar power and storage batteries as a set.)
5. It is also necessary to establish demand-forecasting technology, taking into account weather and climate, in order to ensure a stable supply of energy to consumers and the community.

Idea to make Smart Community a feasible operation

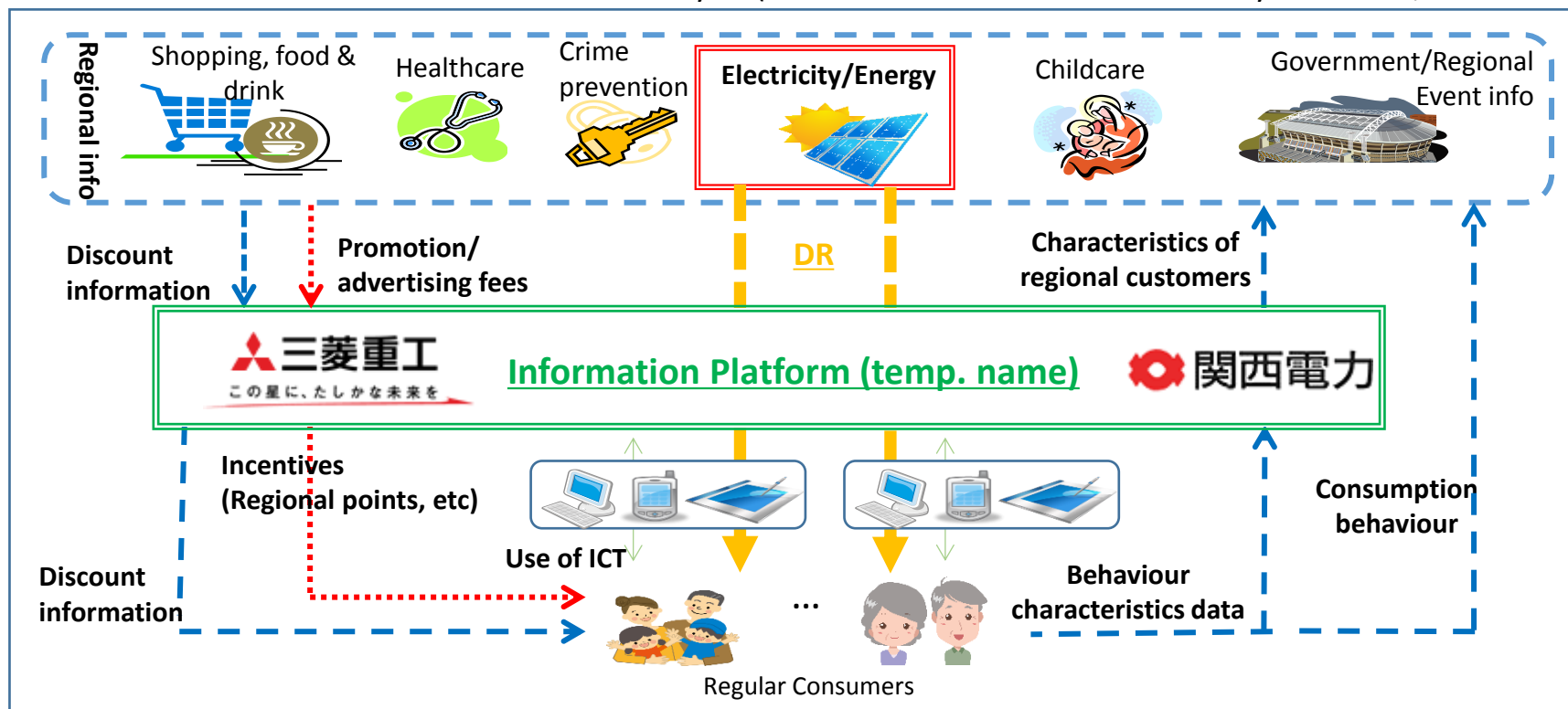


- Consumers: maintain quality of life through a combination of people's behaviour and Auto DR in response to CO2 reduction and DR requests
- Suppliers: aim to establish aggregation as a business, with increase scale and enhanced beneficial services as the principal.

By doing so, make it a feasible operation in order to reach this project's goal of developing an "eco culture"

Verifiable examples of applications of Smart Community are already appearing, building on Keihanna's projects.

■ Verification content of Takanohara Smart Community FS (Verification Office: Mitsubishi Heavy Industries, Kansai Electric)



Main study points

- Centrally accumulate and aggregate at the Platform any information closely related to lifestyles which revolve around energy, and by taking into consideration regular consumers' needs, provide the information to generate **further benefits for customers**.
- To work with this, aim to ensure a supply of revenue other than aggregation revenue (eg. promotion/advertising fees) to **develop a monetary flow system**.

Local governments, etc

Create an environment which is easy for service-providing operators to enter and for users to easily make use of the services

- ◆ Foster regional eco awareness, etc ◆ Coordination between researchers and local governments.
- ◆ Support operators' activities through subsidies and loosening of restrictions

Developing an international hub for open innovation

Research into creating next generation lifestyles



- ① Make the most of the Kansai Region and Keihanna Science City's potential
- ② Combine technology, research, and industry to create new values
- ③ Foster technology and cultural innovation

Expanding from
Keihanna to global
markets



Increased sharing of medical data
banks to extend range of preventative
treatment

Open lab for exchange among
researchers from across the world

Life fields

Energy and
ICT fields

High-performance fuel cells and
storage batteries

New nanotech materials

Realisation of Next-
Generation Smart City

Utilise ICT
systems base

Culture and
education fields

Agriculture
fields

Develop high-performance
vegetables and healthy food
products

Next-generation agriculture which
takes energy-saving and energy-
generation into account

Cultural properties
archives

Evacuation centre for cultural
properties in times of disaster

Cultural properties
restoration centre

KYOTO Smart City EXPO 2015



**KYOTO
SMART CITY
EXPO 2015**



May 20 [Wed.] – May 22 [Fri.]

Admission Free

May 20 [Wed.] **International Symposium**
Venue: Kyoto International Conference Center (Kyoto City)

May 21 [Thu.] **Smart City Messe in Keihanna**
May 22 [Fri.] Venue: Keihanna Open Innovation Center @Kyoto (KICK) and other locations (Kansai Science City)

“Keihanna e² Future Square” showroom

■ Tour visitors can see, touch, and experience

～See and experience actual home terminals, Evs and project content



Place: Keihanna Plaza, 1-7 Hikaridai, Seika-cho, Soraku-gun, Kyoto-fu

*Tour visit applications (reservation required): Reception Counter, Kansai Science City Promotion

TEL: 0774-98-2279

<http://kri-p.jp/e2miraisquare.pdf>

Thank you very much for your attention

Exporting the Keihanna Eco City Model as an environmental city package to the rest of the world!
Developing new Environmental and Energy industries in tech-savvy Japan!

From the birthplace of the Kyoto Protocol to the rest of the world!

Do you kyoto ?



KICK

“Do you Kyoto?” is a world-famous phrase meaning “Are you being environmentally-responsible?”