環境未来都市 北九州市

City Of Kitakyushu,Office for Environmental Future City Promotion
Seiji ARATA

Overview of the Kitakyushu Smart Community Creation Project

1 Objective

Develop new industries to stimulate economic growth and promote actions that lead to new urban development to improve people's lifestyles and identify solutions to local issues, such as the development of new traffic systems and revolutionizing lifestyles, through the implementation of this project.

2 Implementing Body

Kitakyushu Smart Community Creation Project Committee (67 businesses and organizations)

3 Implementation Area

Higashida area, Yahatahigashi Ward, Kitakyushu (~120ha)

⇒ Concentrated area of factories, commercial establishments, residences, train station, amusement facilities, gas stations, etc.

4 Implementation Period: FY2010 – FY2014 (5 years)

5 Project Scale: 38 projects, ¥16.3 billion

Overview of Demonstration Area

Higashida area, Yahatahigashi Ward, Kitakyushu (~120ha)

Former site of Higashida No. 1 blast furnace
(Yawata Steel Works, Nippon Steel)

Factory complex

Gas station

JR Stn.

Amusement facilities

Large-scale commercial facilities

Museums

Residences

Target Image of the Kitakyushu Smart Community Creation Project (Energy Field)

- Consumers, such as local residents and businesses, **will modify their behaviors to become "pro-sumers," not simply energy consumers**, through the installation of solar power and independent energy saving

- **Cluster Energy Management System (CEMS) and smart meters** are mechanisms for discovering, sharing, and utilizing regional energy, including hydrogen by-products and steam in neighboring factory complexes, as well as solar and wind power.

- Actions that act in the own interests of the residents and businesses will build a mechanism that also simultaneously contributes to the local energy system by introducing "concentrated and visible" energy information for the area and **dynamic pricing**.

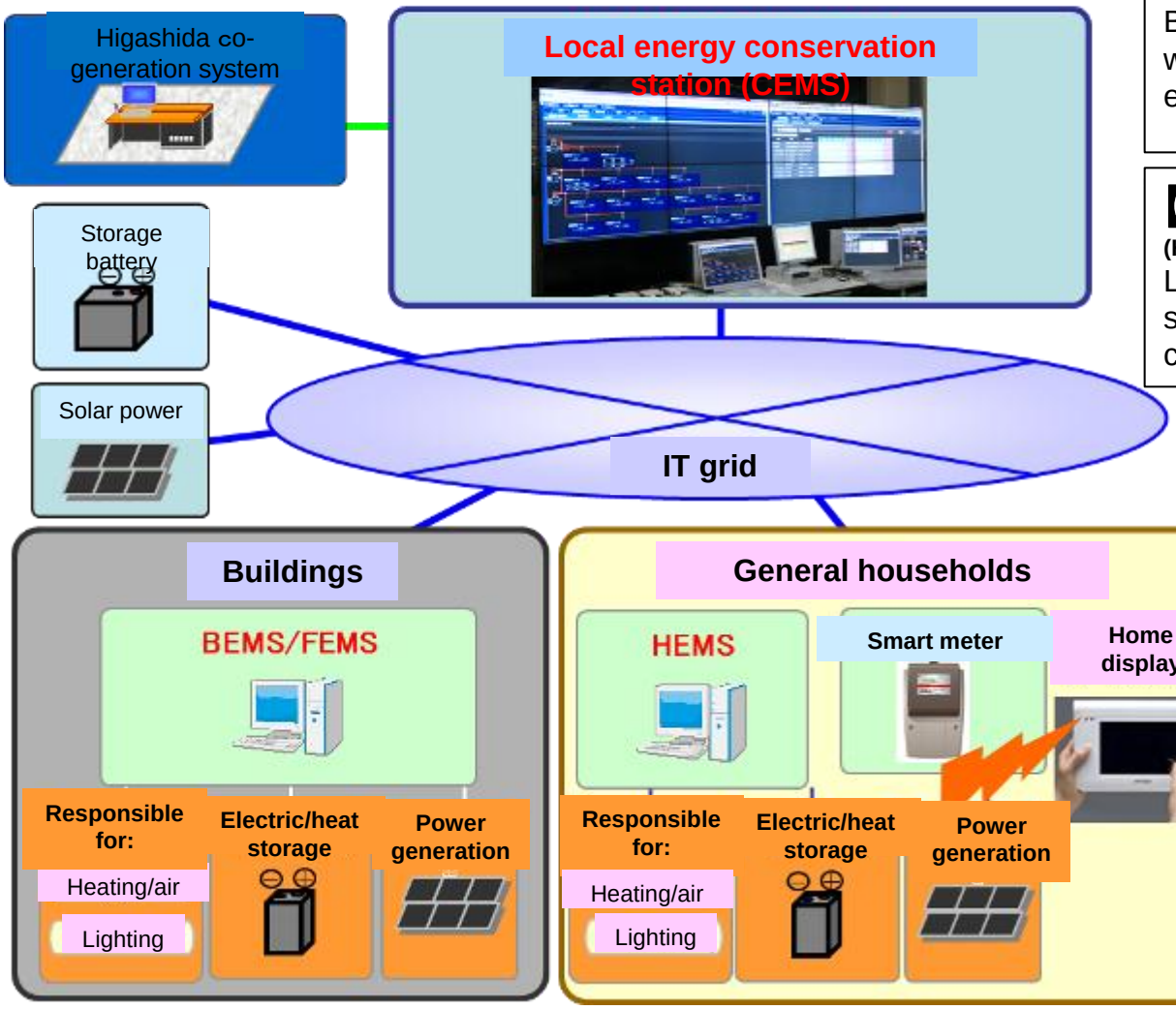
Residents and businesses alike create new energy system that incorporates "ideas and participation."

Overall Structure of Kitakyushu Smart Community Creation Project (Energy Field)

環境未来都市 北九州市

【Smart Meters】

Conducts two-way communication with local energy conservation station, sends notifications about electric bills, and transmits information on the amount of electricity used



【Local Energy Conservation Station】

(CEMS: Cluster Energy Management System)

Connects renewable energy in the area, BEMS, HEMS and basic electric power with the IT grid to promote optimal energy management.

【HEMS】

(Home Energy Management System)

Links with local energy conservation station and automatically controls power consumption in homes.

【BEMS】

(Building Energy Management System)

Links with local energy conservation station and automatically controls power consumption in buildings.

【FEMS】

(Factory Energy Management System)

Links with local energy conservation station and absorbs power shifts particular to natural energy and factories to ensure power stability.

Basic Approach to Dynamic Pricing

【Basic Approach】

Fluctuates power rates daily, predicts time periods in which demand may exceed supply, and promotes energy saving actions by power consumers in response to changes in supply and demand due to weather and temperature.

① Power/energy savings
Peak cuts

② Optimal use of renewable energy and power

③ Town management
(Sustainable model)

Social model for excesses in power supply and demand

① Basic pricing (Higashida pricing by season/time)
→ Leveling the system power base
② Real time pricing
→ Fine power load leveling (actual/predicted demand) and power oriented operations
③ Critical pricing
→ Control of demand on specific days

Social model for introducing large amounts of renewable energy

① Power rates based on introduction of (prospects for) renewable energy
② Power rates based on use of renewable energy/storage batteries

Independent local conservation power station model

① Town management
② Examination of business models

Effects of Dynamic Pricing

環境未来都市 北九州市

- June-Sept 2012: Implemented 40 days, 180 samples
- Fluctuate prices in four stages between 13:00 and 17:00 on weekdays for days when temperatures exceeded 30℃ and verification of effects of power savings in pricing.

Effects of dynamic pricing only		
Level 1	¥15/kwh	Base price
Level 2	¥50/kwh	−9.0%
Level 3	¥75/kwh	−9.6%
Level 4	¥100/kwh	−12.6%
Level 5	¥150/kwh	−13.1%

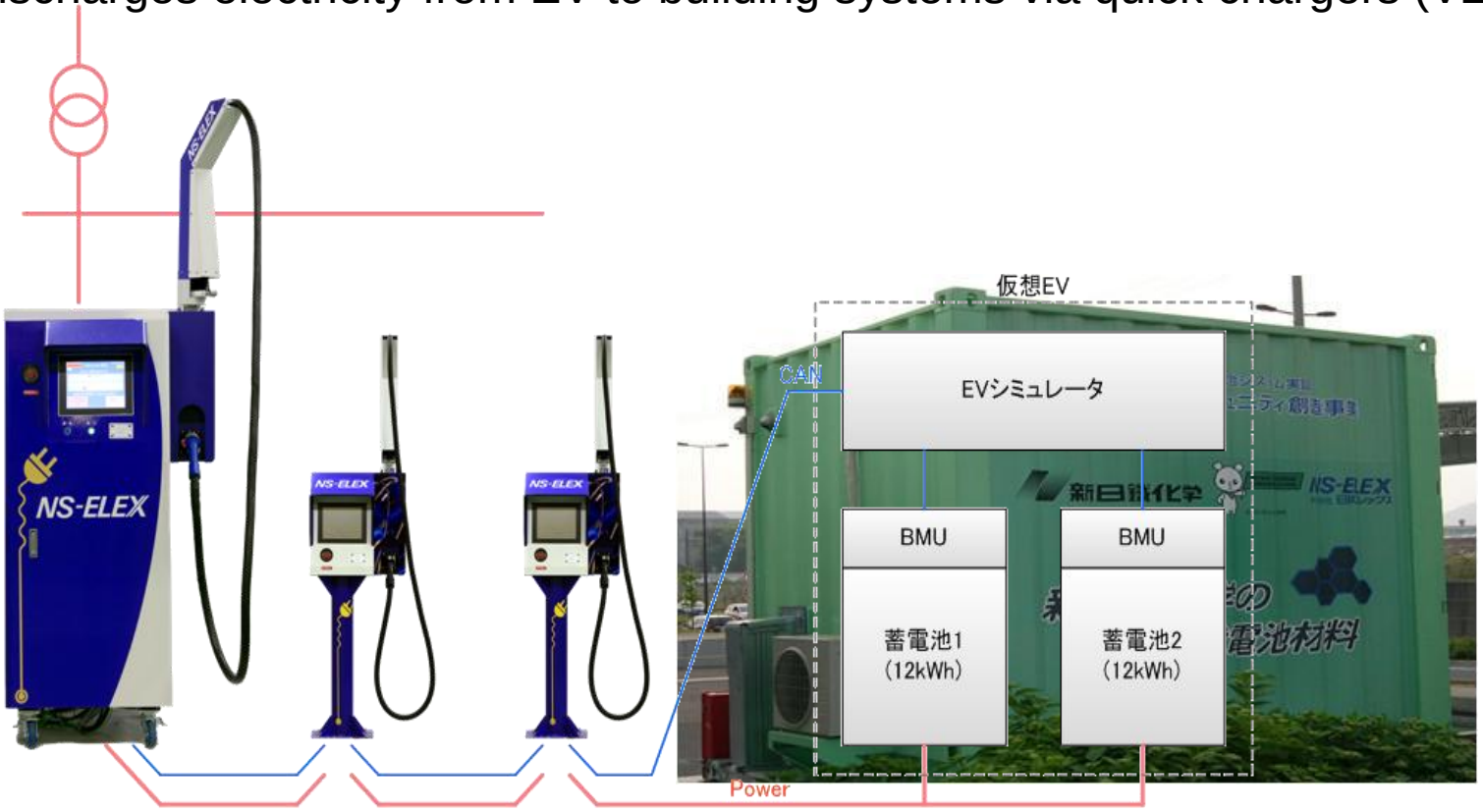
【Reference】 **Revised effects of dynamic pricing with the addition of seasonal and time specific pricing (TOU)**		
Level 2	¥50/kwh	
Level 3	¥75/kwh	−18.7%
Level 4	¥100/kwh	−21.7%
Level 5	¥150/kwh	−22.2%

- Peak cuts from effects of dynamic pricing exceeded maximum of 10%.
- Peak cuts from added TOU effects exceeded maximum of 20%.
- The higher the price, the larger the effect of peak cuts.

V2B (Vehicle to Building) Demonstration

- Used as EV infrastructure storage battery in buildings with large power demand
- Utilizes EV as storage battery in times of excessive demand and emergencies

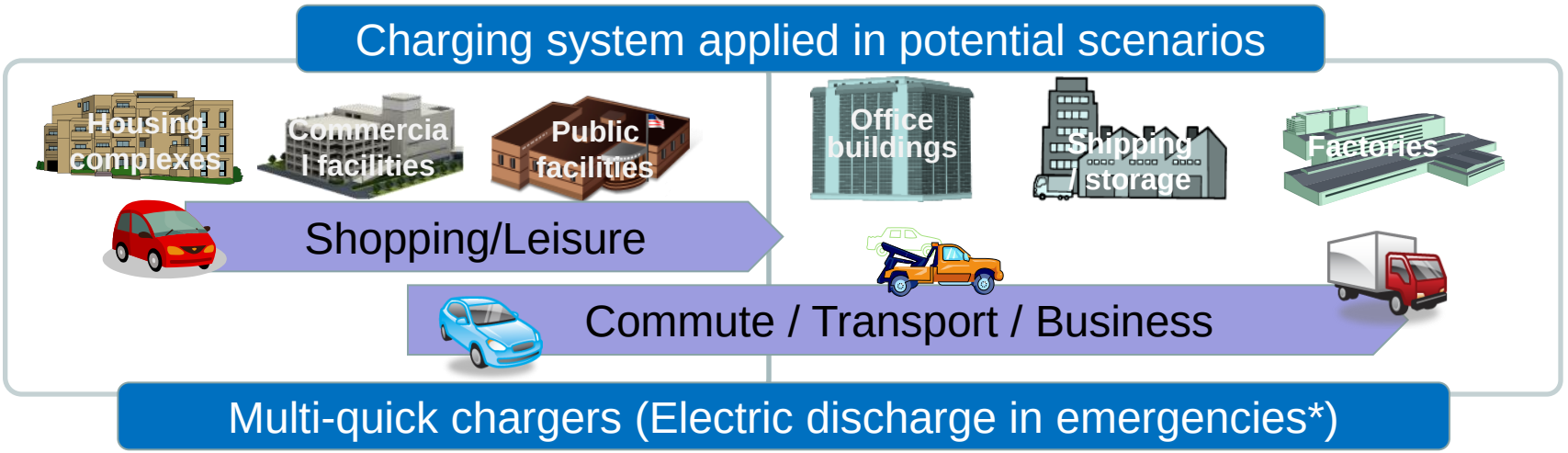
→ Discharges electricity from EV to building systems via quick chargers (V2B)



V2B (Vehicle to Building) Demonstration

環境未来都市 北九州市

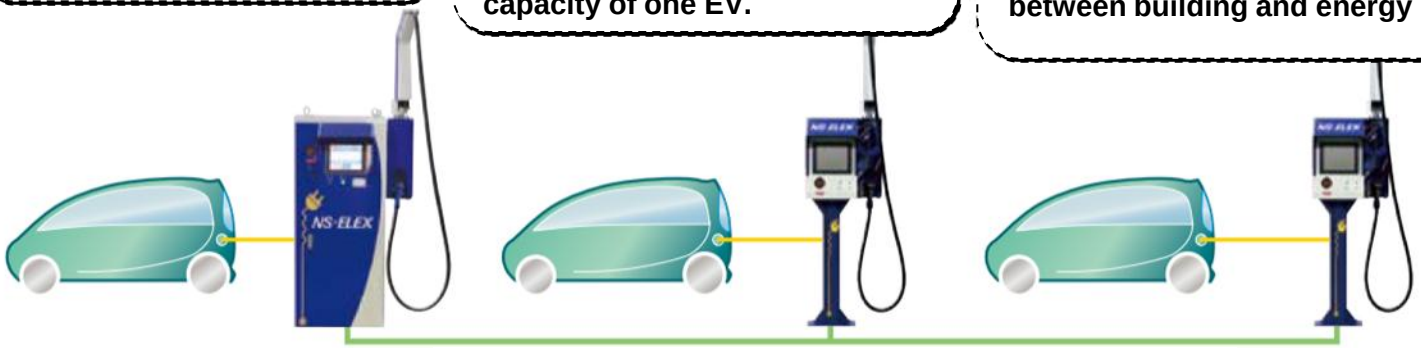
Multi-plug quick charger/discharger



1 Safe/stable design
Can also be used in residential environments

2 Low operating cost
Controls costs by achieving a maximum of ten sets for incoming power with the capacity of one EV.

3 Can be used in multiple scenarios
Charging congestion is eliminated with multi-plug connections and scheduling functions.
EV management is made possible with linkages between building and energy management systems.

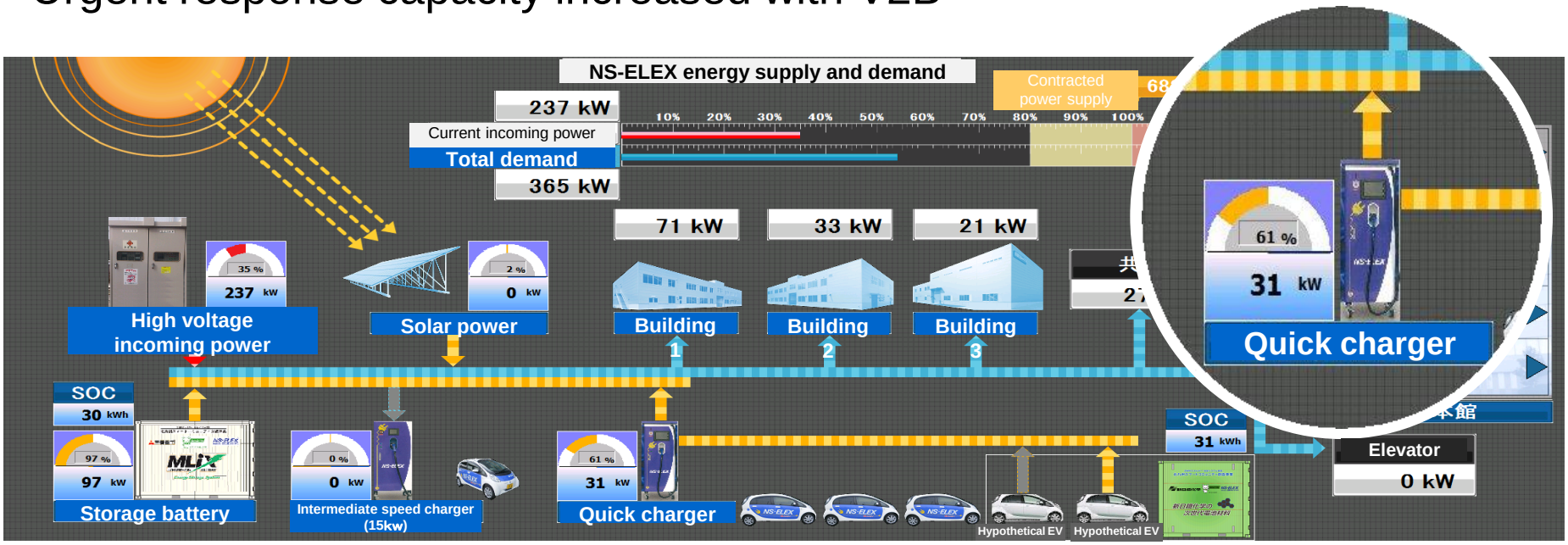


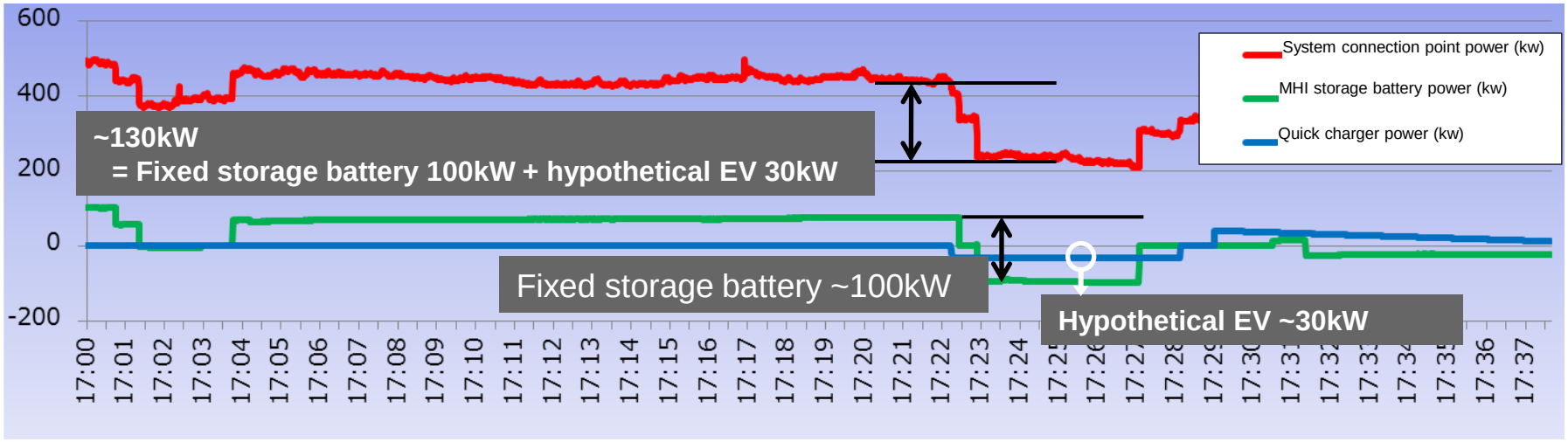
Maximum of 10 vehicles can be connected simultaneously

V2B (Vehicle to Building) Demonstration

環境未来都市 北九州市

Urgent response capacity increased with V2B





Eco-Drive Total Support Systems in Next-Generation Service Stations

環境未来都市 北九州市

Overview and Objective

1. Eco-Drive Support Functions for Electric Vehicles (EV)

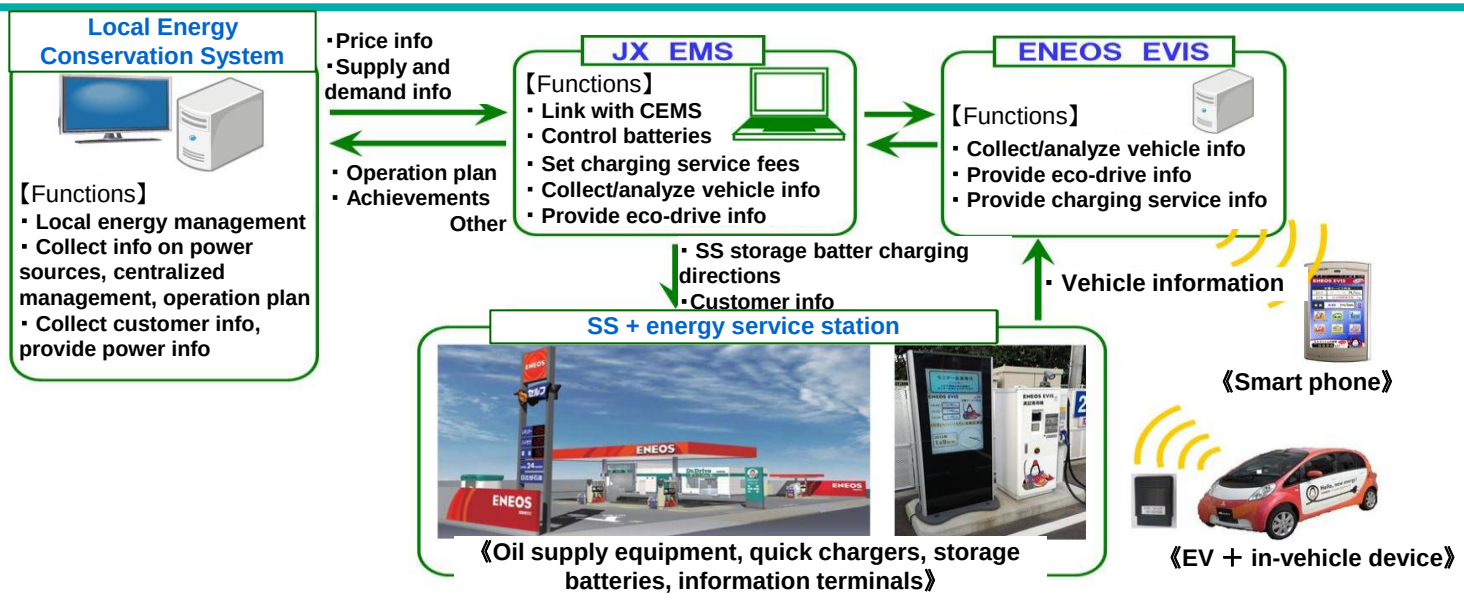
- Collect vehicle information with SS, analyze eco-drive support functions (ENEOS EVIS), and provide eco-drive information.
- Provide information in order to utilize renewable energy in quick chargers.

➡ **Reduce environmental impacts of energy used by EVs**

2. EV Quick Charger and Storage Battery Functions Linked with Local Energy Conservation Systems (CEMS)

- Adjust local supply/demand for storage batteries by linking with CEMS; effectively utilize storage batteries for EV chargers.
- Introduce pricing system for power charging linked to dynamic pricing, guide power charging timing to EVs, and connect to adjustments to supply and demand in the area.

➡ **Carry out effective adjustments of supply and demand of local energy and promote introduction of renewable energy**

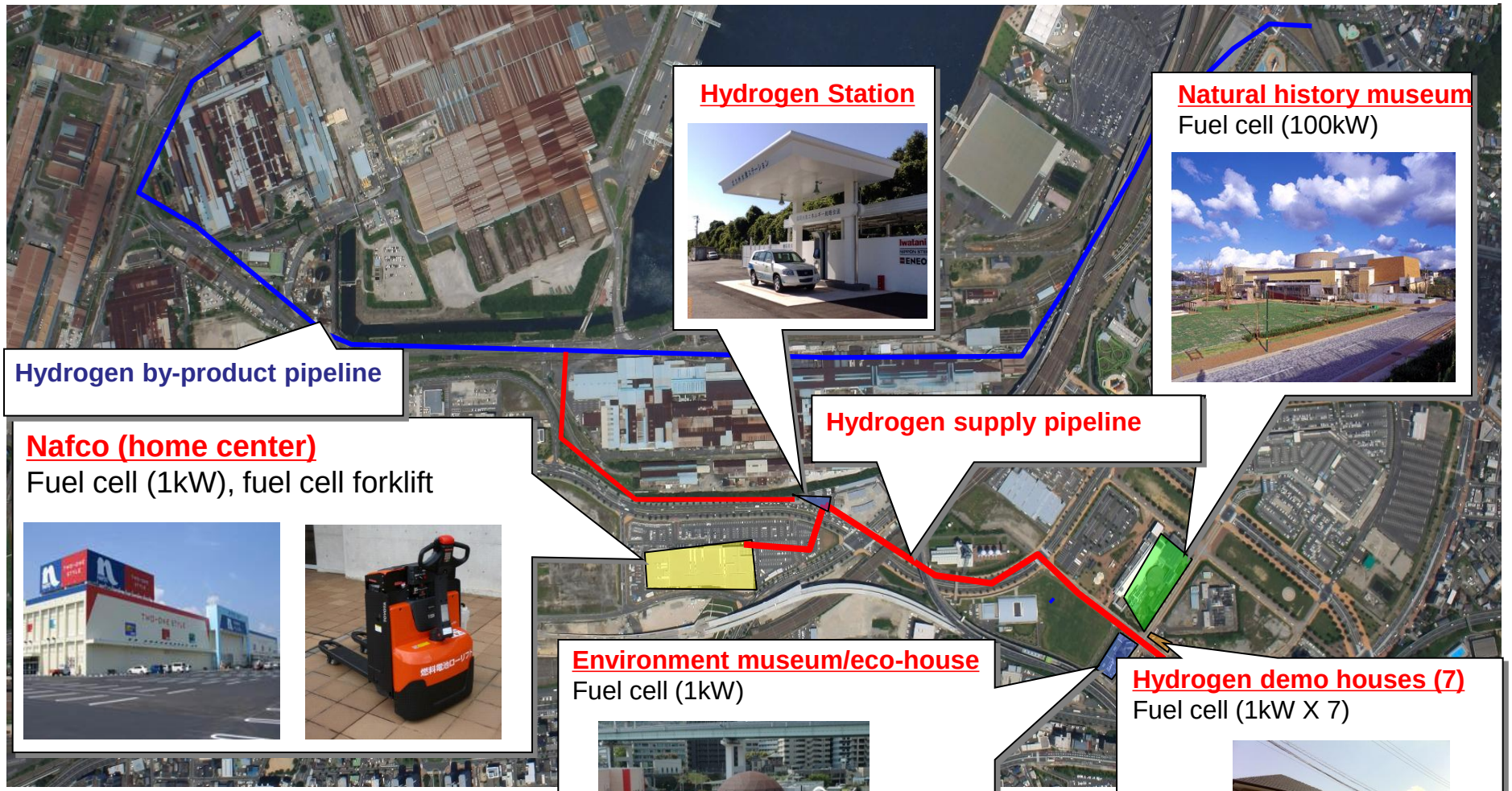


※EMS：Energy management system ，EVIS：Energy and Vehicle Information system

Overview of Kitakyushu Hydrogen Town

Build model town based on hydrogen energy (demonstration project started Jan 15, 2011)

- ○ Supply hydrogen by-product generated at factories to city area (Hydrogen Town) via pipeline
- ○ Use fuel cells in homes and public facilities to generate power and hot water supply from hydrogen
- ○ Employ forklifts and motorbikes to carry fuel cells



Hydrogen by-product pipeline

Hydrogen Station

Natural history museum

Fuel cell (100kW)

Hydrogen supply pipeline

Nafco (home center)

Fuel cell (1kW), fuel cell forklift

Environment museum/eco-house

Fuel cell (1kW)

Hydrogen demo houses (7)

Fuel cell (1kW X 7)

V2H (Vehicle to Home) Demonstration Project via FCV

環境未来都市 北九州市

FY 2012 Next Generation/Social System Demonstration Project

Name	Demonstration of effects of power leveling through V2H from electric vehicle fuel cells
Company	Honda R&D Co., Ltd.　Honda Motor Co., Ltd.
Area	Kitakyushu Eco-House (adjacent to Environment Museum), Higashida, Yahatahigashi-ku, Kitakyushu
Objective	Offer new value of fuel cell vehicles (FCV) to users by demonstrating external power supply from FCVs with the aim to expand the use of FCVs for creation of Hydrogen Town. Demonstrate new methods to level power to contribute to power supply to residences and peak cuts in smart communities through V2H, not only external power supply using FCVs during emergencies.

≪Project Details≫

•Expand use from V2L to V2H for FCV　⇒　Offer new value to FCV users

Develop demonstration system

Use as emergency power source

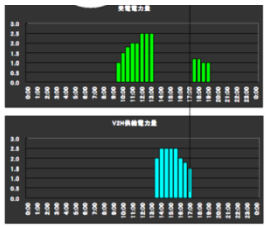
Progress

•Link with local power conservation station (CEMS)V2H data ⇒ Demonstrate effects of peak cuts in power demand

Local Power Conservation Station (CEMS)

Total area energy
Total management system

∗Link V2H data and CEMS



Higashida area, Yahatahigashi ward, Kitakyushu (~120ha)

Environment Museum
(Kitakyushu Eco-House)

∗Supply power to one residence from FCV

Future Developments

環境未来都市 北九州市

STEP 1

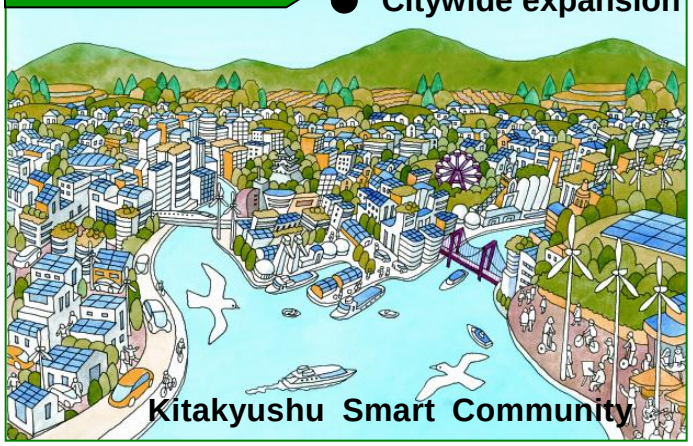
- Demonstration project in Yahatahigashi

STEP 2

- Promote low-carbon area (Jono area) development

STEP 3

- Citywide expansion



Expand throughout Japan and to Asia

- Promotion Council for the Low Carbon Cities

Established with objective to promote and develop outstanding actions by Eco-Model Cities (13 cities) and disseminate information throughout the world.

- Asian Center for Low Carbon Society

Transfer outcomes of demonstration project to Asia via business partnerships

Transfer low-carbon technologies to Asia

Develop package as high value-added solutions

Develop know-how/output from Smart Community project into business base


スマートグリッド

IT

Solar power

LED

EV (electric vehicles)

Hydrogen-based technology

グリーンIT

パワーエレクトロニクス

Role of EV/PVH in Achieving Smart Community

① Contribute to expansion of energy management

Easy to recognize vehicle use as using energy and make it possible to incorporate into energy management of the area.

- ○ Energy management of mobility becomes easier by changing the same medium (electricity).
- ○ Utilize storage battery functions as energy source for peak cuts and emergencies
- ○ Reduce environmental impacts by charging from renewable energies.

② Contribute to development of new industries

Tie into expansion of energy management-related industries.

BEMS, HEMS, ITS

Power charging (discharging) facilities/equipment

Hydrogen stations, fixed fuel cells, etc.