



Smart Community Activities in Japan

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New Energy and Industrial Technology
Development Organization (NEDO), Japan

Outline of NEDO



New Energy and Industrial Technology Development Organization(NEDO)

NEDO promotes research and development as well as dissemination of energy, environmental and industrial technologies.

Mission

- Address energy and global environmental problems
- Enhance Japan's industrial competitiveness



Ministry of Economy, Trade and Industry (METI)

Budget ↓ ↑ Coordination with policymaking authorities



Funding ↓

Consortium (Japanese)

Academia

Industry

Public research laboratories

I. NEDO's Past Activities and Achievements to Realize Smart Grid and Smart Community Systems

Three-phase Activities for Smart Grid Development and Deployment



Before 2005

FY 2006 2007 2008 2009 2010 2011



Demonstrative Project on Grid-interconnection of Clustered Photovoltaic Power Generation Systems (FY2002-FY2007)

Verification of Grid Stabilization with Large-scale PV Power Generation Systems (FY2006-FY2010)



Phase 1

- Promote introduction of renewable energy
- On supply side, build microgrids to facilitate interconnection between distributed power sources and power grids



Grand Lyon (France)

Demonstration of a new urban lifestyle through redevelopment of an existing city combining an EV system and energy saving (FY2011-FY2015)

Malaga City (Spain)

Construction of a new community lifestyle through infrastructure renovation that includes large-scale EV introduction (FY2011-FY2015)



Phase 2

- Develop related systems on demand side
- Utilize IT and energy storage to optimize and reduce energy consumption across a wide range of areas, including homes, offices, commercial facilities, transportation, etc.

Phase 3

- Accelerate smart community projects in revising energy policies and changing lifestyles based on experience of March 11, 2011



Ota City Demonstration Site

- Development of new inverter to detect islanding
- Development of battery storage operation and network voltage distribution
- Development of simulation technologies

Number of PV-equipped houses: 553

Total PV capacity: 2,129 kW

Average capacity per house: 3.85 kW

Verification of Grid Stabilization with Large-scale PV Power Generation Systems (FY2006-FY2010)



Wakkanai site



◆ Wakkanai site

5 MW: Most PV cells are crystalline
NaS battery: 1500 kW 7.2hrs

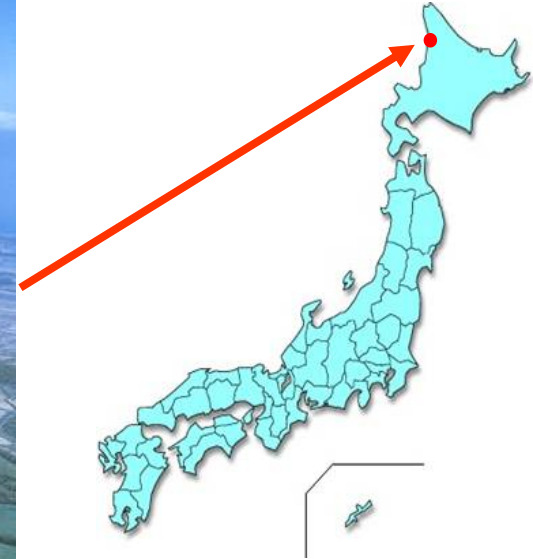
◆ Hokuto site

1.8 MW: 27 types of modules

Hokuto site



- Technology development to reduce battery voltage and frequency fluctuation
- Development of a new inverter suitable for a megasolar plant
- Testing of various types of PV modules



- Development of battery and control technologies to stabilize wind farm output
- Development of simulation technologies

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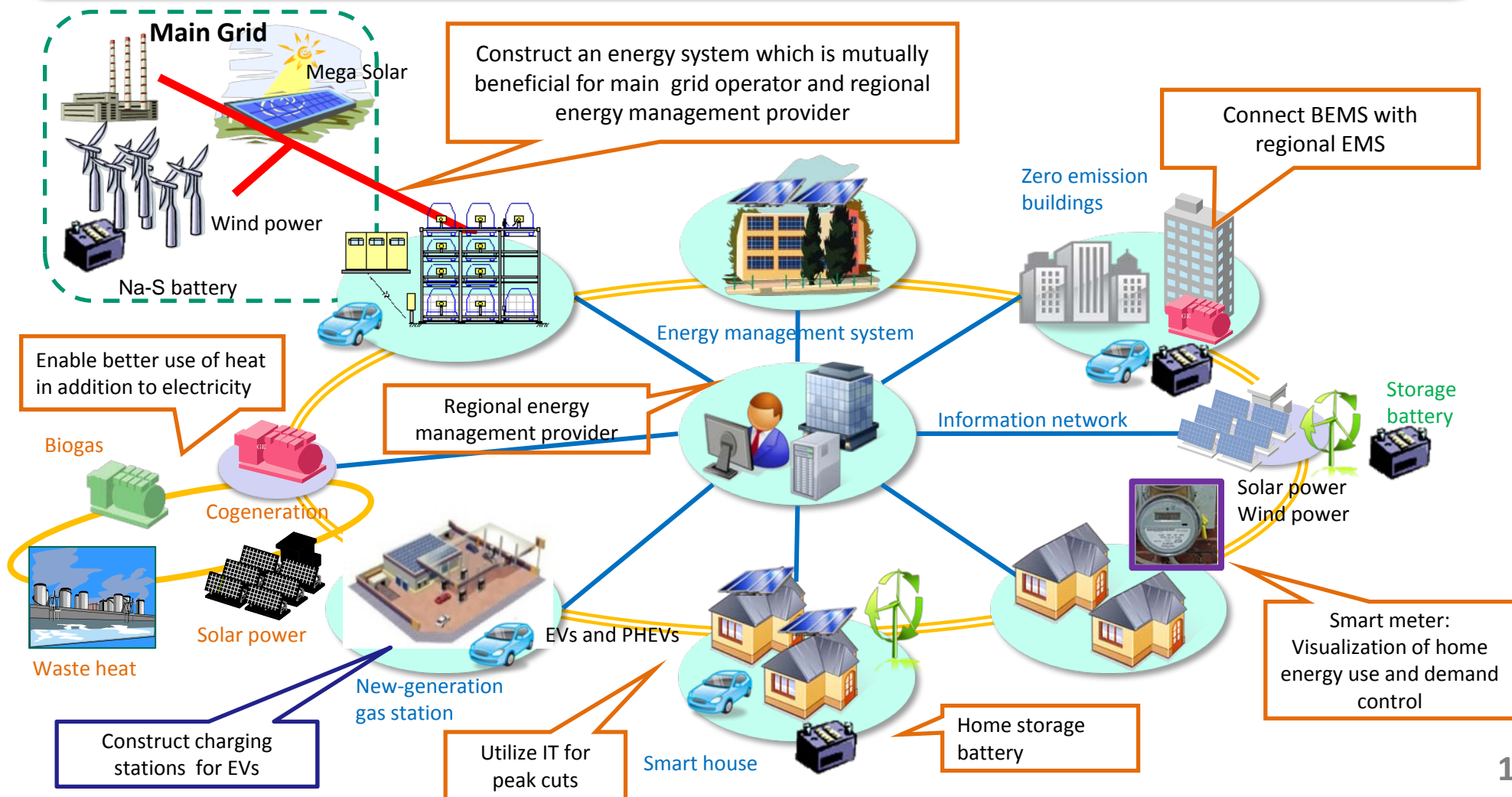
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II. Smart Community Concept and NEDO's Domestic Smart Community Projects

Image of Smart Community

A smart community is an urban area in which residents, workers and business enterprises carry out sustainable earth-friendly action autonomously, thereby improving the local infrastructure and social system.



Kyoto Keihanna District

Kyoto Prefecture, Kansai Electric Power, Osaka Gas Kansai Science City, Kyoto University

CO₂ emissions: Residential 20% ↓ and Transportation 30% ↓ (compared with 2005 levels)

- Install PV at 1,000 homes, EV car-sharing system
- Management of grid connected PV and fuel cells in houses and buildings (visualization of demand)
- Grant “Kyoto eco-points” for green energy usage

Yokohama City

Yokohama City, Toshiba, Panasonic, Meidensha, Nissan, Accenture, others

CO₂ emissions: 30% ↓ by 2025 (compared with 2004 levels)

- Energy management system that integrates HEMS, BEMS and EVs
- PV (27,000 kW)
- Use of heat and unused energy
- 4,000 smart houses, 2,000 EVs

Kitakyushu City

Kitakyushu City, Fuji Electric Systems, GE, IBM, Nippon Steel

CO₂ emissions: 50% ↓ (compared with 2005 levels)

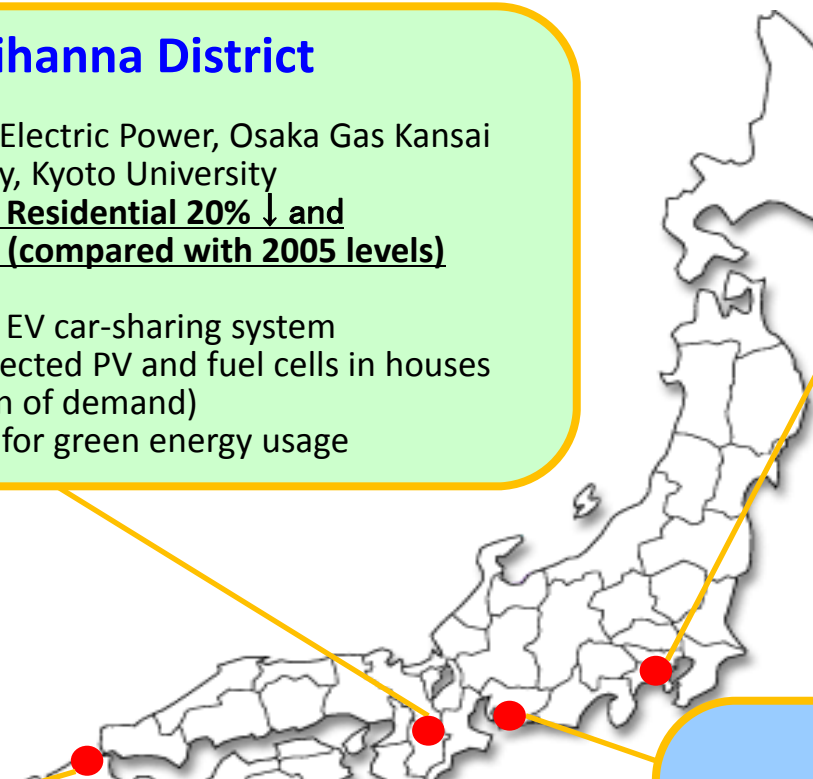
- Real-time management at 70 companies and 200 houses
- Energy management using HEMS and BEMS
- Energy system that coordinates demand side management with overall power system

Toyota City

Toyota City, Toyota Motor, Chubu Electric Power, Toho Gas, Toshiba, Mitsubishi Heavy Industries, Denso, Sharp, Fujitsu, Dream Incubator, etc.

CO₂ emissions: Residential 20% ↓ and Transportation 40% ↓

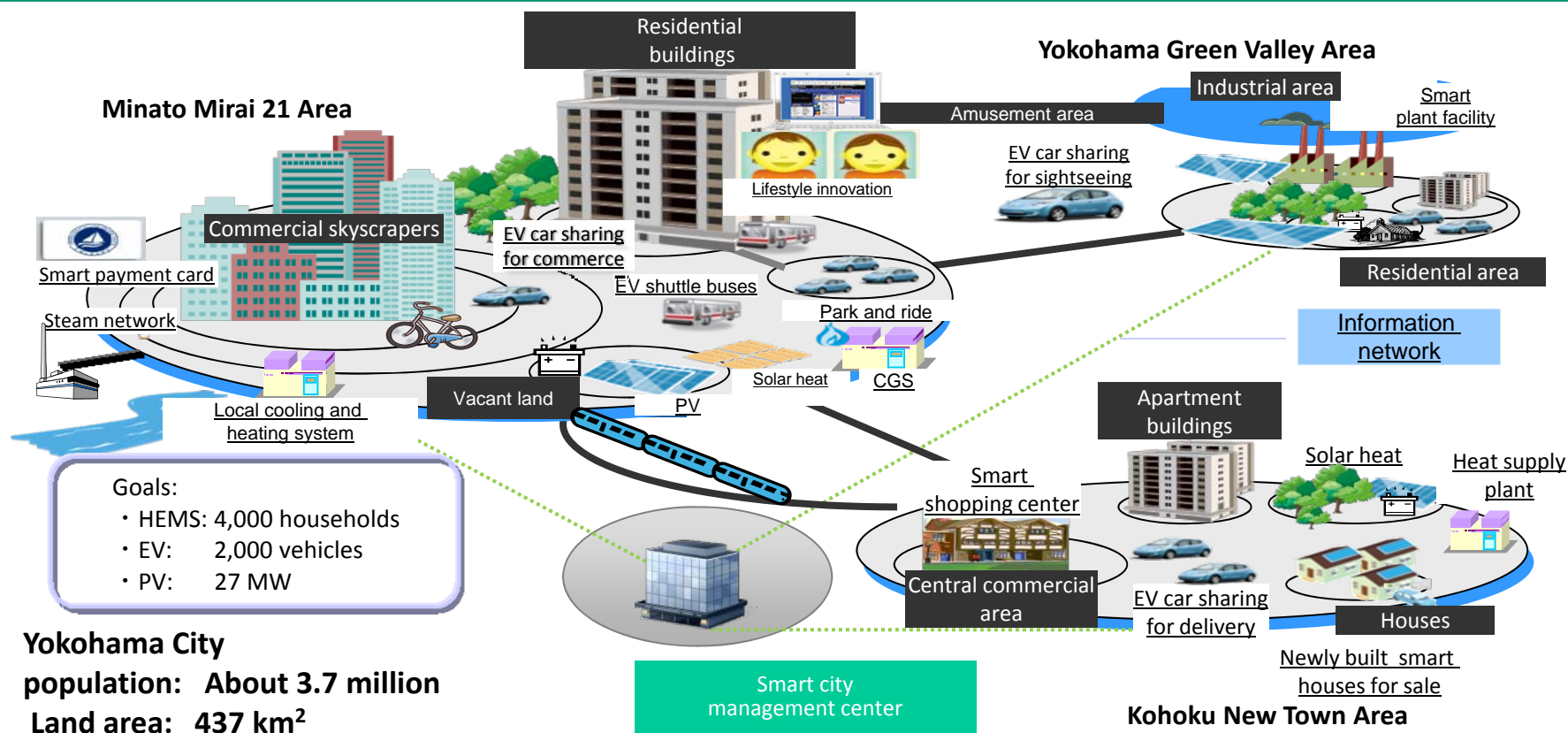
- Use of heat and unused energy in addition to electricity
- Demand response at more than 70 homes
- 3,100 EV, V to H and V to G



Background of Demonstration in Yokohama City, Japan

Project Characteristics

- The project is being carried out in the following three areas with diverse characteristics in Yokohama City:
 - Minato Mirai (operations and commercial area)
 - Yokohama Green Valley (residential and industrial area)
 - Kohoku New Town (residential area)Four thousand households in the three areas are participating in the project.
- The project is being deployed in existing cities where infrastructure cannot be easily modified.
- For example, PV power fluctuations can be absorbed through integration of **SCADA** storage, HEMS, BEMS and EV data centers.

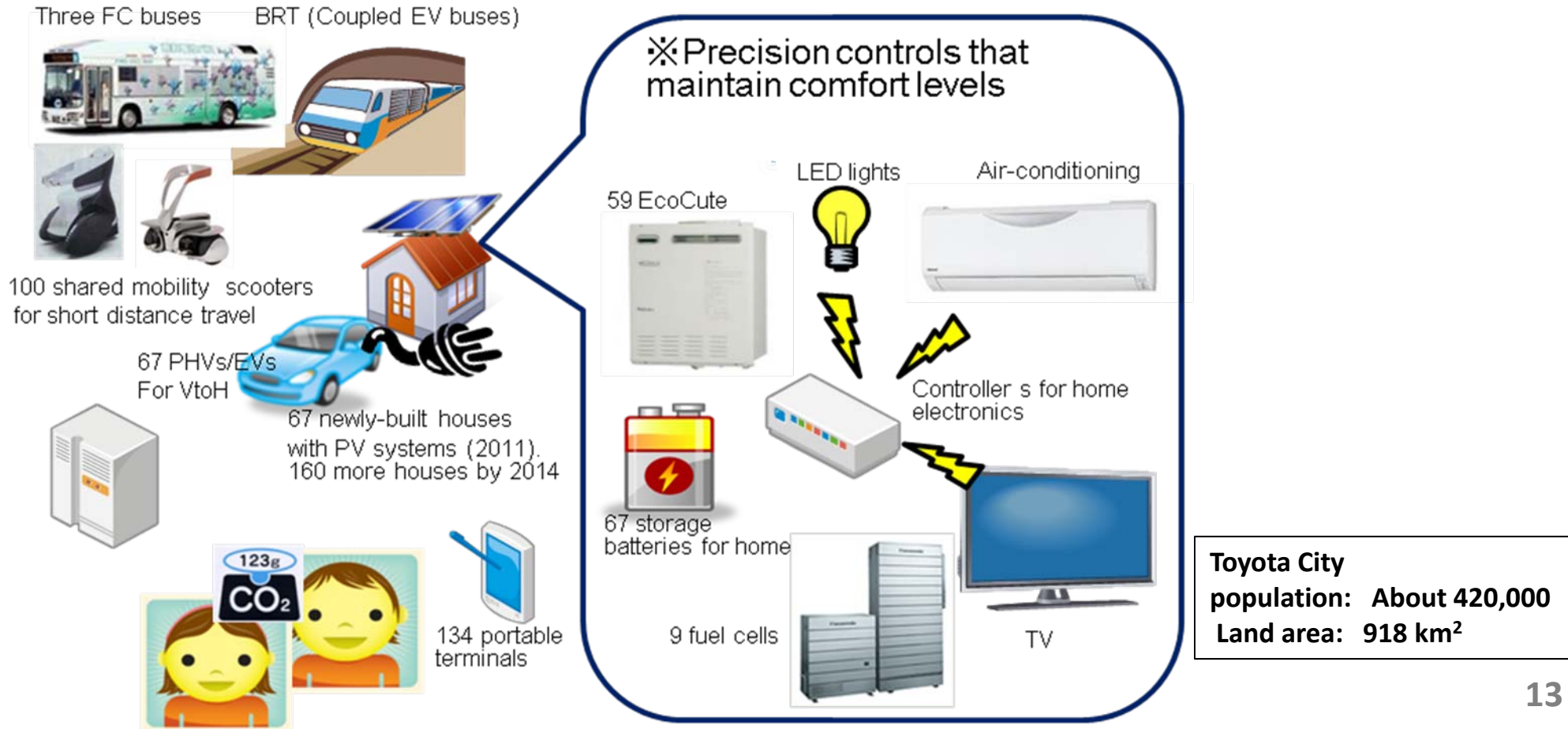


Background of Demonstration in Toyota City, Japan



Project Characteristics

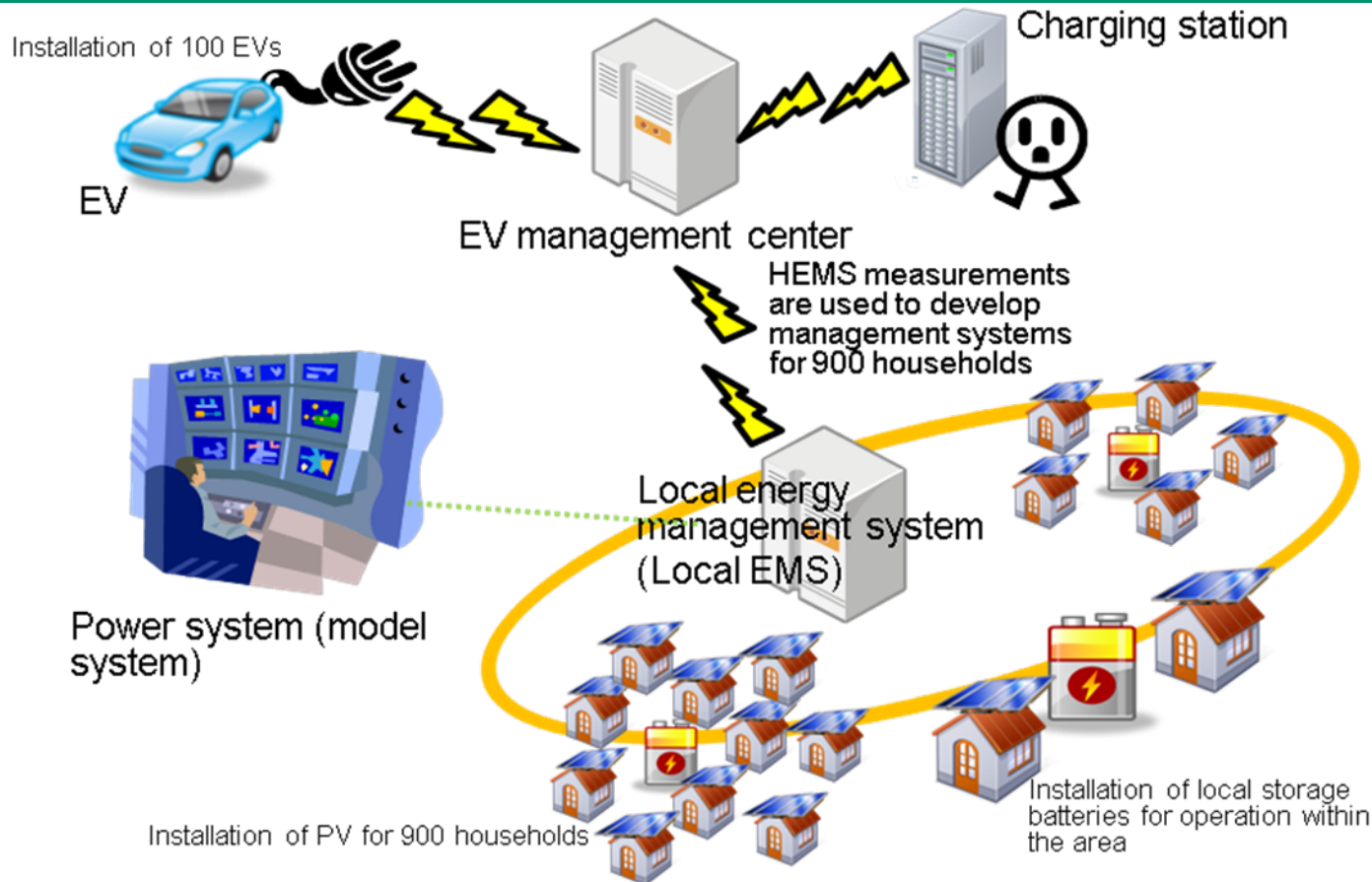
- The project site is located in the suburbs of Toyota City, where vehicles are the primary means of transportation. The project aims to demonstrate energy utilization for vehicles and homes and will be carried out in 67 newly-built houses.
- Widely introduce new-generation vehicles that are linked with public transportation; carry out an advanced transportation demonstration in “Motor City Toyota”



Background of Demonstration in Keihanna District , Japan

Project Characteristics

- A commuter town bordering Kyoto, Nara and Osaka with the highest population growth rate among newly built residential areas in Japan. The project is being carried out on 900 newly built houses.
- Achieve a self-sustaining energy system within the area by minimizing loads to the upper grid while maintaining dependence on power systems
- The project can be implemented in developing countries in Asia that are building both new towns and infrastructures.



Keihanna District
population: About 100,000
Land area: 7.7 km²

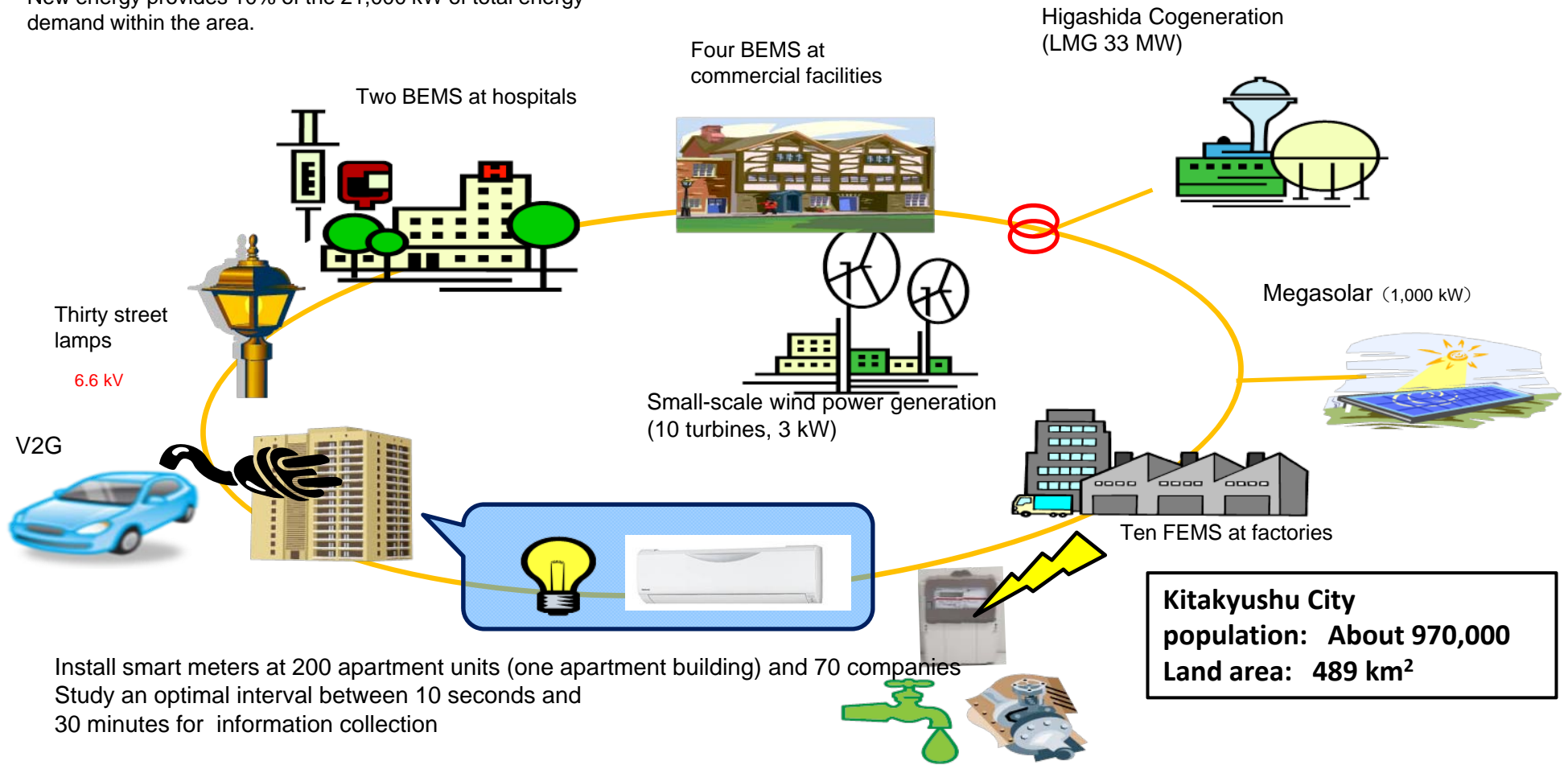
Background of Demonstration in Kitakyushu City, Japan



Project Characteristics

- The project is being carried out at 200 households and 70 companies in the Higashida area of Kitakyushu City.
- Nippon Steel Corporation supplies electricity to homes, offices and factories in the area.
- The project will demonstrate a new electricity pricing system that changes in real-time and an adaptable supply system through on-site cogeneration.

New energy provides 10% of the 21,000 kW of total energy demand within the area.



III. NEDO's International Smart Community Projects

NEDO's Global Smart Community Projects

Maui Island, State of Hawai'i (USA)

Construction of a low-carbon model city for remote islands using an EV charging control system on Maui, where the introduction rate of renewable energy is extremely high.

Gongqingcheng City (China)

Exhibition of a new model (to avoid urban growth problems that occurred during the development of cities in coastal areas) for small and medium cities in inland China.

State of New Mexico (USA)

Demonstration of smart grid systems that combine demand response, storage batteries and heat storage devices in a residential area introducing PV on a large scale.



Malaga City (Spain)

Construction of a new community lifestyle through infrastructure renovation that includes large-scale EV introduction.



Grand Lyon (France)

Demonstration of a new urban lifestyle through redevelopment of an existing city combining an EV system and energy saving.



Smart Community Project in Lyon, France

- (1) Demonstration of zero emission building technologies at P-plot building
- (2) Energy use monitoring and management for PV and EVs
- (3) Energy observation program in old districts
- (4) System to record and control energy usage in the community

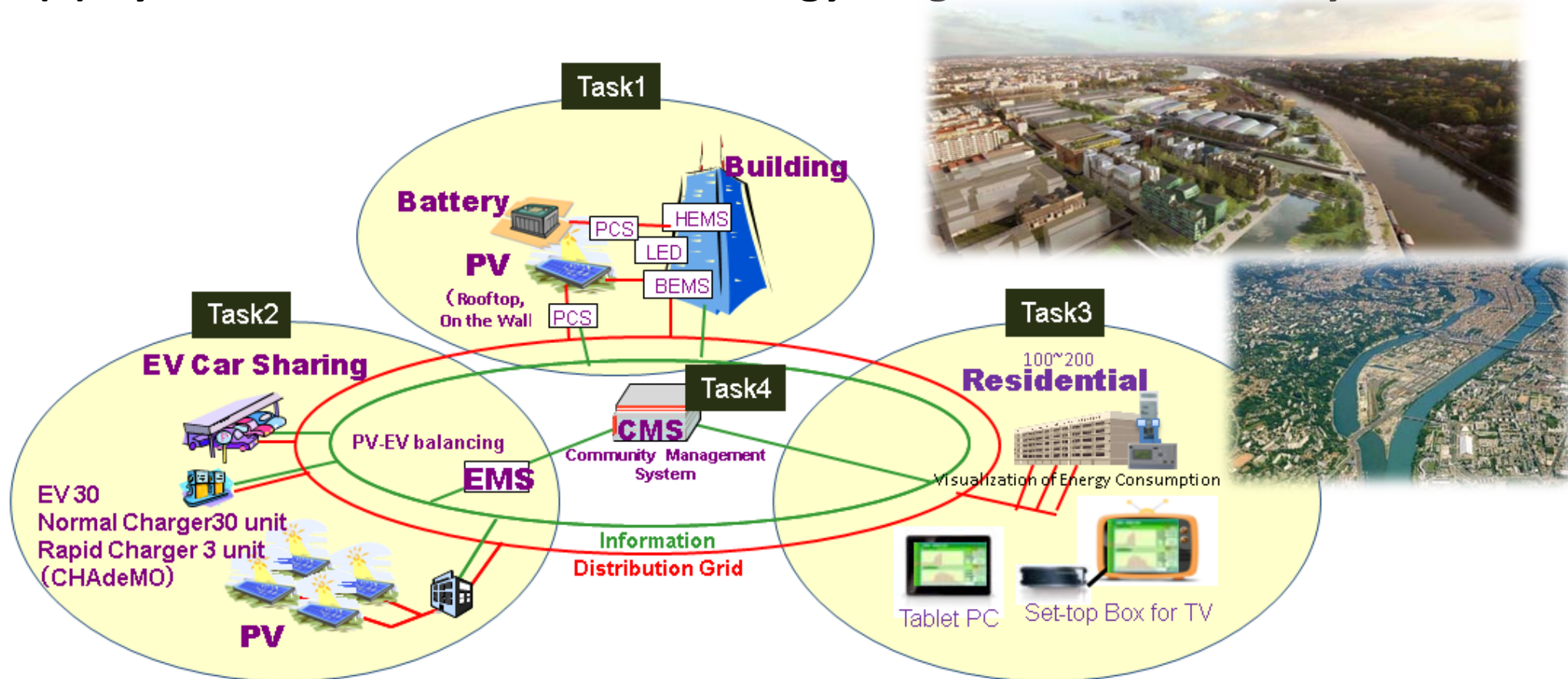
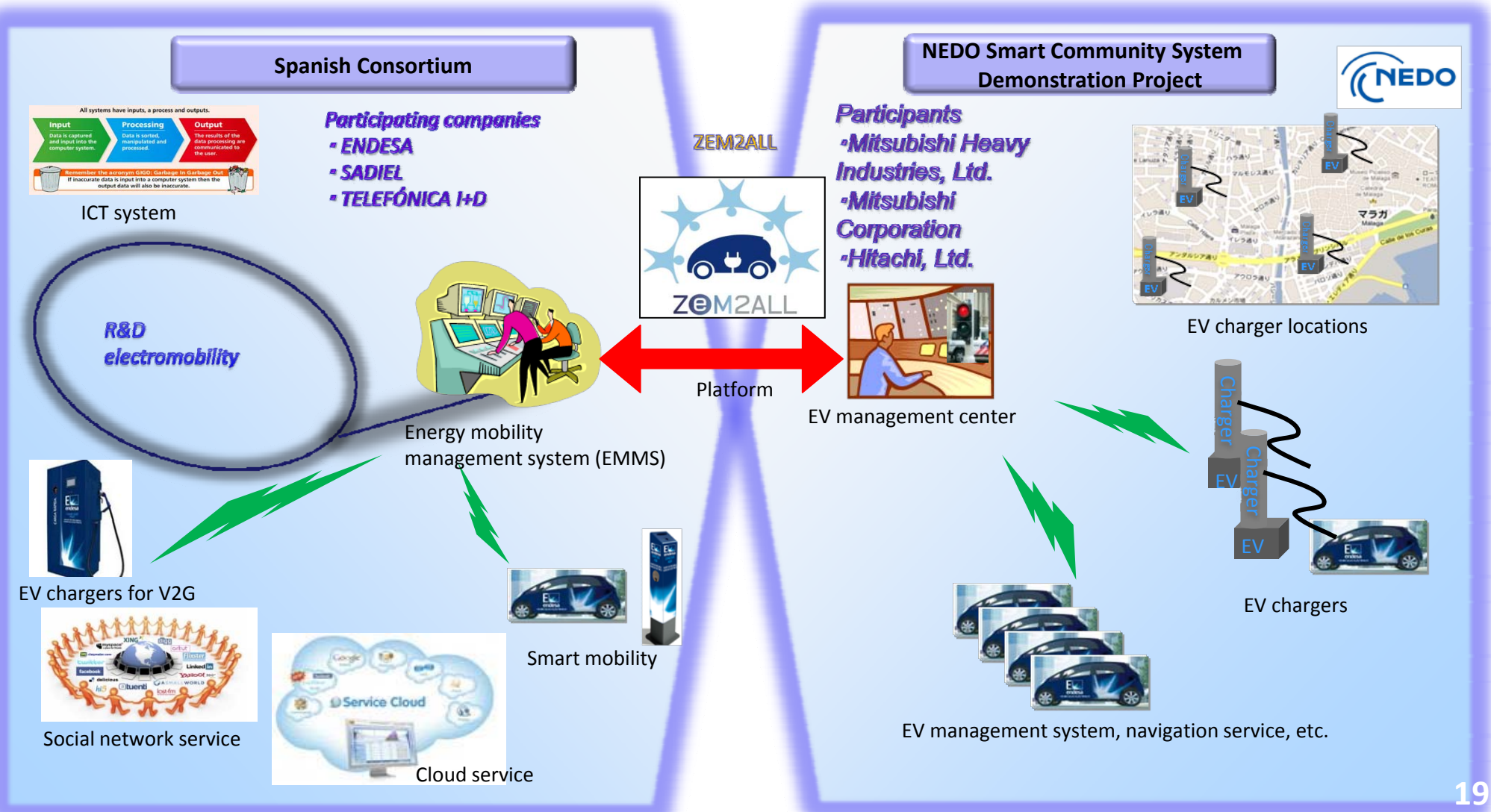


Image of Demonstration Project in Malaga, Spain

The project will construct infrastructure such as an EV management system, EV chargers and charger stations, and an information service that will respond to a large-scale introduction and diffusion of EV. In coordination with a Spanish consortium, service utilizing an EV and power management system will be demonstrated.



Needs



EV user

- Quick and full charging
- Navigation to available charging stations
- Service that only EVs can provide



EV charging service company

- Advice regarding charging station site locations
- Efficient operation with no waiting in line or vacant stands



Power company

- Specific investment plan
- Balanced demand at peak times
- Efficient utilization of renewable energy

Solutions



EV user

- Convenience improvement
- Efficient navigation to a charging stand
- Reasonable pricing

Appropriate navigation for each user
Offer incentive

Data collection
Customer responses

Smart Community System
Demonstration Project
in Spain

Power demand information
Equipment operation
status information

Operation status
information
Service information



Power company

Power supply
information

Charging point
guidance



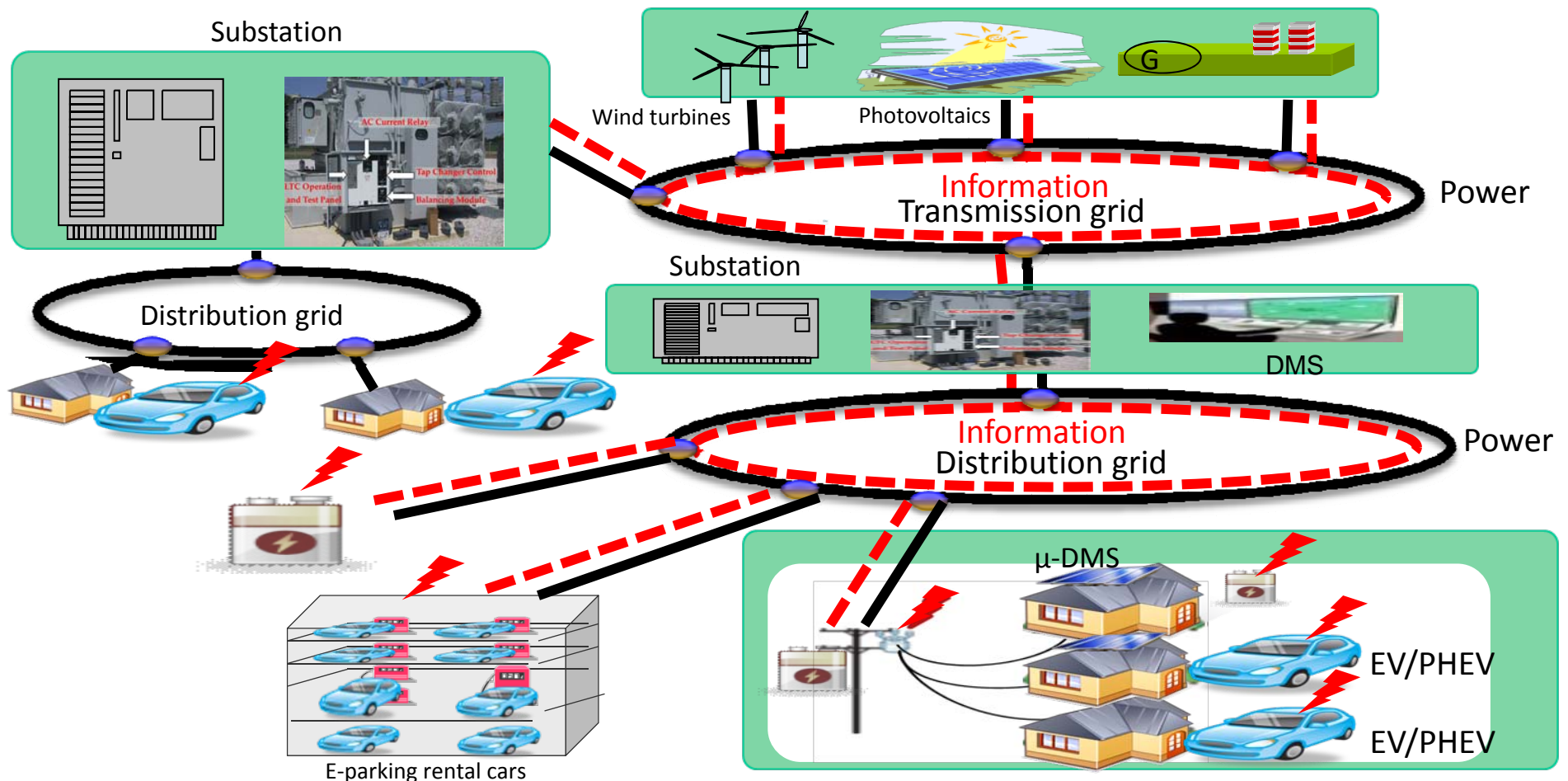
EV charging service company

- Minimum investment in grid
- Promotion for use of renewable energy

- Consultation regarding charger installation
- Operation management

Japan– US Island Grid Project in Hawaii, USA

- (1) Direct control technology demonstration using EVs/PHEVs
- (2) D-EMS demonstration by controlling demand and PVs under substation
- (3) Micro D-EMS demonstration by controlling demand and PVs under pole transformer



Smart Grid Demonstration Project in New Mexico, USA



- (1) Microgrid demonstration in Los Alamos
- (2) Smart house demonstration in Los Alamos
- (3) Building microgrid demonstration in Albuquerque
- (4) Research studies



Integrated battery storage



Los Alamos County



Demand response with home energy management system (HEMS)

Absorption of fluctuating PV output by management of micro-EMS for distribution system



Demand response with building energy management system (BEMS) and DGs



Albuquerque

Collaboration with Worldwide Network



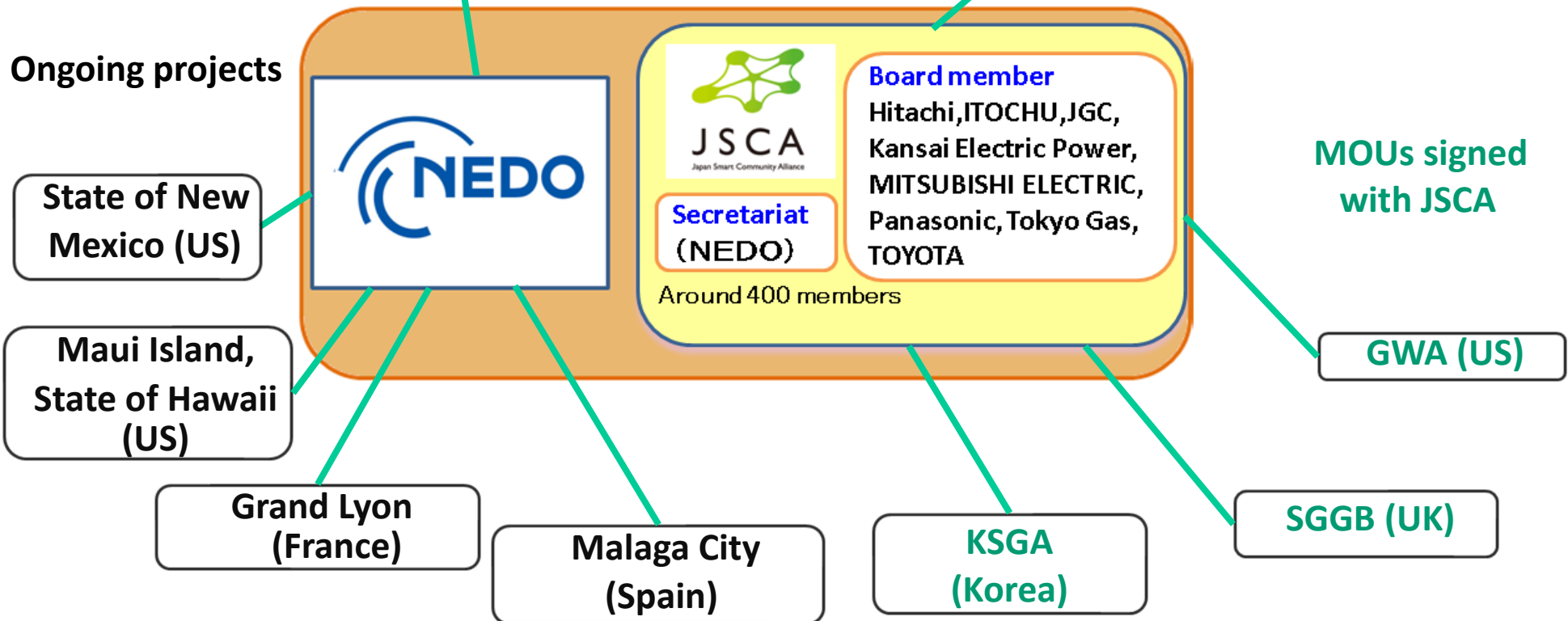
Government side framework



Private sector network



Ongoing projects



“Memorandum of Understanding” on cooperative information exchange between NEDO and SPIRIT Slovenia (TIA at the time) (October 24, 2012–)



The fundamental survey has been started by Hitachi Research Institute. (December 25, 2012–March 17, 2013)



Together let's think about a smart community suitable for Slovenia!



<http://www.nedo.go.jp/english>

Thank you for your kind attention!

Hvala za vašo pozornost!