Japan’s policy on Smart Community

July 27, 2015

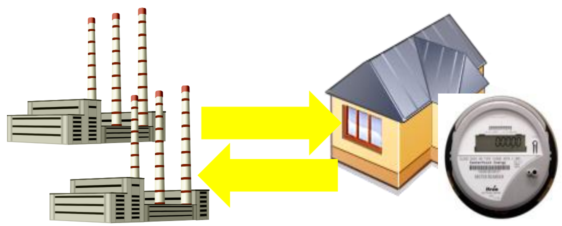
Smart Community Policy Office
Agency for Natural Resources and Energy, METI

Overview of the Smart Community Demonstration Project

Purpose: With a view of establishing a smart community as a distributed system enabling energy management in localities through the utilization of IT and storage batteries, the Project aims to verify related technologies and to build up a business model with the participation of local residents.
Execution period: FY2011 – FY2014

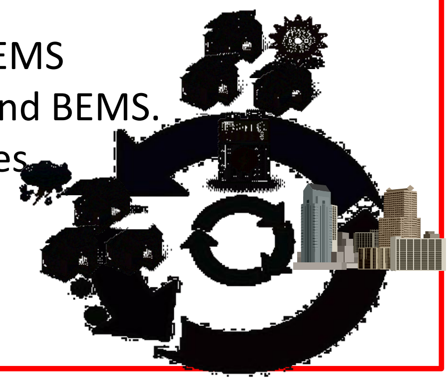
Keihanna Science City

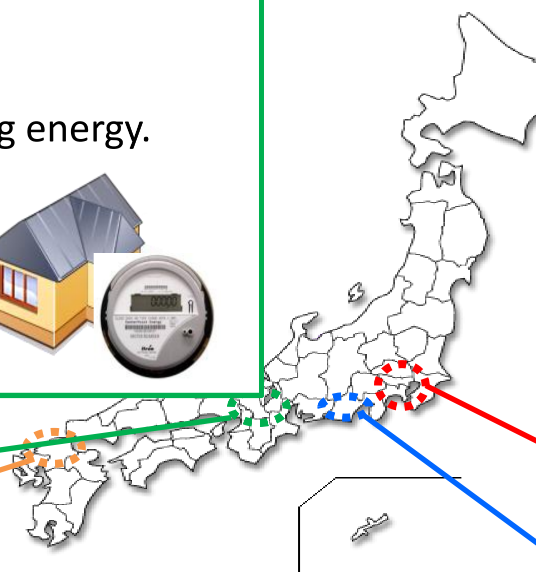
Housing complex
- 700 households and HEMS
- Consulting business about saving energy.



Yokohama City

Wide-area metropolis
- 4000 households and HEMS
- 10 large-scale building and BEMS.
- Multiple storage batteries





Kitakyushu City

Designated supply area
- Power is supplied by Nippon Steel & Sumitomo Metal Corporation.
- Dynamic pricing system for 180 households.

Toyota City

Separate housing
- local production for local consumption
- 67 households equipped with solar panels, household fuel cells , storage batteries.
- Advanced transportation system(EV, PHV)

Result of Demonstration projects 1： Establishment of Basic Technologies ⅰ

- Develop energy demand-supply management systems for each community such as CEMS etc. Additionally, build up a standard communication interface such as ECHONET-Lite etc. which is required to control each component.
- Through these efforts, it will be possible to control the demand-side equipment in an optimal manner in association with centralized energy systems.

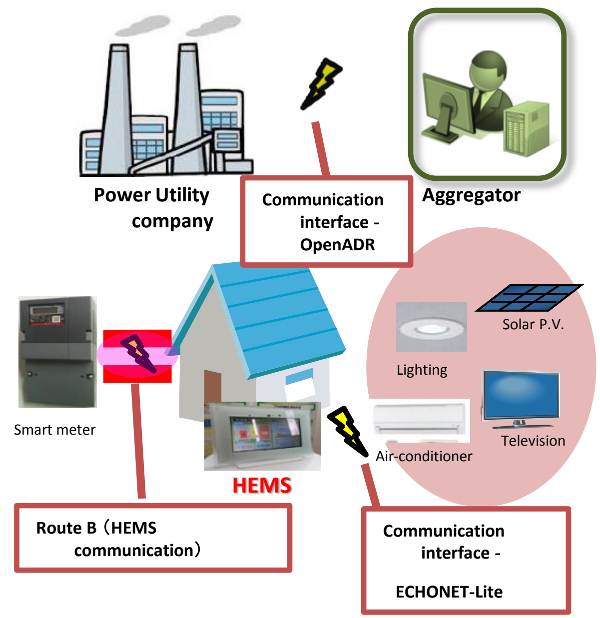
Ex. 1 Development of CEMS (Community Energy Management System)

- CEMS manages energy demand and supply efficiently for each community according to the power grid system and demand characteristic etc.
- Development of a control function of CEMS such as formulation of demand-supply plans for each community, set demand response into motion, and control for localized storage batteries etc.

【Source】 Kitakyushu Verification Project（Fuji Electric Co., Ltd.

Ex. 2 Build-up of a standard interface

- On the basis of OpenADR, formulate and standardize the communication interface for demand response between the power utility companies and consumers/aggregators in Japan.
- Formulate ECHONET-Lite as a communication interface between HEMS and household appliances.



Result of Demonstration projects 1 : Establishment of Basic Technologies ii

Ex. 3 Development of storage battery control technology

- We have made a proposal to IEC on an international standard of communication interface used for an integrated control system of storage batteries (Battery SCADA) , and are now participating in the international standardization activities.

An image of the control screen

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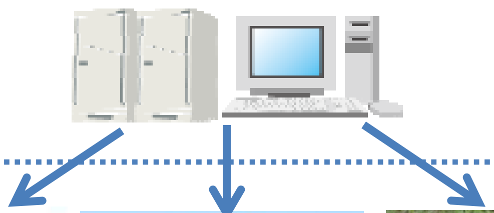
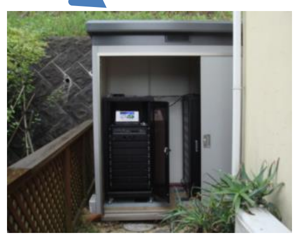


Large-scale storage batteries installed in TEPCO's Tsunashima Substation

Storage battery for plants



Storage battery for households

【Source】 Yokohama Verification Project (Toshiba)

Ex. 4 Development of power supply technology from vehicles

- Develop a DC power supply system from an EV to the internal device of a house and an AC power supply system from a PHEV to the internal device of a house. In May 2013, a V2H guideline was formulated on the electric connection between vehicles and the interior wiring etc.
- Power supply from fuel-cell buses to shelter houses etc. were demonstrated on the basis of the guideline.

■ Power supply from EVs/PHEVs to houses

【Source】 Toyota Demonstration Project (Toyota Motor Corp.)

■ Power supply from fuel-cell vehicles to houses

【Source】 Kitakyushu Demonstration Project (Honda Motor Co., Ltd.)

Result of Demonstration projects 2 : Demand Response

- Demonstarate the peak cutting effect etc. of a) the power rate-type demand response which controls the power demand by means of power rate setting, and b) the Negawatt transaction which urges consumers to control the demand in response to the request from the power utility company on the basis of the contract between the power utility company and the consumer.
- Confirmed that these types of demand response can be utilized as a new power source (="Negawatt") in terms of adjustment of demand and supply.

Ex. 1 Power rate-type demand response

- Confirmed that the peak demand can be continuously reduced by about 20% by the use of CPP (Critical Peak Pricing).
- Demonstrated the effect of shadow billing (electricity price notification when the consumer participates in another price menu) as an incentive for consumers to use a new electricity price menu, and the participation rate increased (e.g. 2-fold in the case of the Yokohama Demonstration Project).

Kitakyushu Result of the FY2012 demonstration trial (Samples: 180) Result of the FY2013 (Samples: 178)

	FY2012 summer (Jun - Sep)	FY2012 winter (Dec – Feb)	FY2013 summer (Jun - Sep)
Electricity Price	Peak cutting effect	Peak cutting effect	Peak cutting effect
TOU	—	—	—
CPP＝50yen	—18.1%	-19.3%	-20.2%
CPP＝75yen	—18.7%	-19.8%	-19.2%
CPP＝100yen	—21.7%	-18.1%	-18.8%
CPP＝150yen	—22.2%	-21.1%	-19.2%

Keihanna Result of the FY2012 demonstration trial (Samples: 681) Result of the FY2013 (Samples: 635)

	FY2012 summer (Jun – Sep)	FY2012 winter (Dec – Feb)	FY2013 summer (Jun - Sep)
Electricity Price	Peak cutting effect	Peak cutting effect	Peak cutting effect
TOU (premium 20yen)	-5.9%	-12.2%	-15.7%
CPP (premium 40yen)	—15.0%	-20.1%	-21.1%
CPP (premium 60yen)	—17.2%	-18.3%	-20.7%
CPP (premium 80yen)	—18.4%	-20.2%	-21.2%

Ex. 2 Negawatt transaction

- Confirmed that, through Demonstration projects, it is possible to respond to a request for demand cut made 15 minutes before at the shortest.
- A guideline, for specific course of actions which stakeholders of the Negawatt transaction should refer to, was formulated in March 2015.

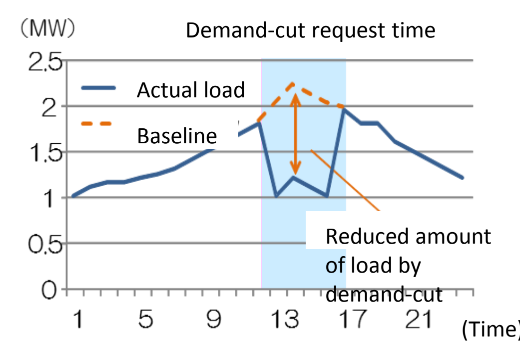
Major stipulations of the "Guideline on Negawatt Transactions"

(1) Method of setting the baseline
Method of estimating the power consumption when no demand-cut request was made

(2) Method of measuring the reduced amount of demand
Time divisions and data measurement units etc. targeted for evaluation

(3) Others
Measures etc. when a demand-cut effort has failed

＜Concept of baseline＞



Result of Demonstration projects 3 : A Model for efficient Use of Energy

■ Under the assumption of a variety of typical forms of energy use, carried out the development/demonstration of advanced electricity demand-supply forecast, optimal control of equipment (of solar panels, energy/thermal storage and energy conservation), and measures for demand response etc.

For households sector

■ Shared use of Ene-Farm at apartments

- Achieve high energy-saving effect and high energy self-sufficiency by means of the shared use of fuel-cell cogeneration systems for households.

【Source】 Tokyo Gas, JX

■ Shared use of batteries by detached houses

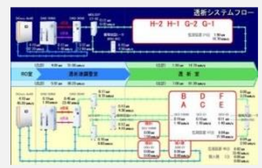
- Utilization rate of solar PV power was increased through solar power interchange by such means as the shared use of storage batteries among houses within each town.

【Source】 Sekisui Chemical Co., Ltd.

For commercial sector

■ Energy management system at hospitals

- Achieve energy-saving through the introduction of BEMS which controls air-conditioning units automatically, and visualization of data of energy amount and temperature/humidity.



【Source】 NIPPON STEEL & SUMIKIN TEXENG. Co., Ltd, Fuji Electric Co., Ltd.

■ Energy management system at hotels

- Carry out energy management for the guest rooms of hotels.
- Promote the reduction of energy consumption by visualizing electricity usage and hot water usage at each guest room.

【Source】 Fuji Electric Co., Ltd.

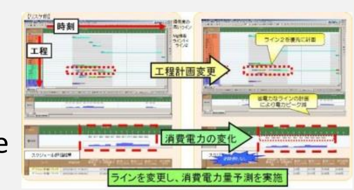
For industrial sector

■ Energy management system through change in production plans

- Verify how much adjustment can be made to actual production plans by means of shifting the production process itself and rearranging the production process etc. in response to the request for demand response.

【Source】 TOYODA GOSEI Co., Ltd, Toyota Industries Corp.

- Verify the peak shifting/peak cutting effect and CO_2 reducing effect through the change in production plans.



【Source】 Yasukawa Electric Corp.

【Reference】 Significance of Establishing a Smart Community

■ "As Smart Community is introduced on a larger scale, a more efficient energy supply will be pursued through demand response etc. In addition, by supplying various energy sources according to the demand, it will be possible to realize significant energy-saving at ordinary times and to ensure the energy supply in an emergency within the entire community, while at the same time Smart Community is expected to support community infrastructure and to have an effect of enhancing the business continuity of companies etc."("Fourth Strategic Energy Plan"(Cabinet Decision on April 11, 2014))

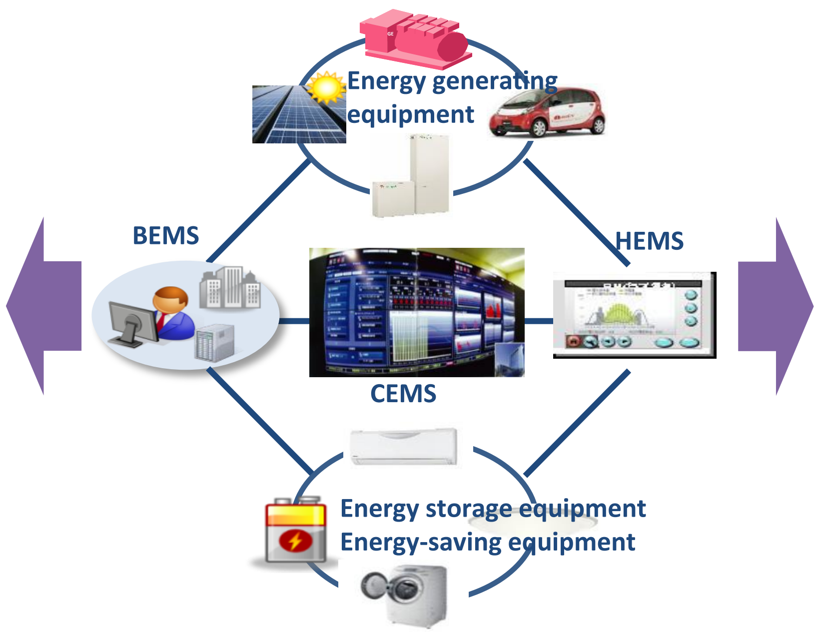
Expected effects of establishing Smart Communities

More efficient supply of energy
Demand and supply can be adjusted by urging electricity-saving etc. at peak hours through demand response etc. without generating more electricity by thermal power plants.

Energy-saving at ordinary times
Optimal operation of energy generating, energy storage and energy-saving equipment etc. according to the situation of demand and supply without impairing comfort.

Ensuring energy supply in an emergency
Energy supply can be achieved within the community by distributed energy system such as renewable energy and cogeneration system etc. in time of disaster.

Effective utilization of energy generating equipment introduced on the consumer side



Efficiently control the demand

<Contribution to the wider introduction of renewable energy>

Response to insufficient adjusting capability
It is possible to mitigate insufficient frequency adjusting capability caused by a sudden output fluctuation, through controlling energy generating/ storage/ saving equipment etc. according to the demand-supply situation.

Response to insufficient capacity
It is possible to mitigate the rise in voltage and suppress reverse power flow by generating demand during light load period utilizing surplus power on the principle of local production for local consumption through controlling energy generating/storage/ saving equipment etc. according to the demand-supply situation.