

Experience of NEDO Smart Community Demonstration

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What is NEDO (New Energy and Industrial Technology Development Organization) ? Mission:

- Addressing energy and global environmental problems
- Enhancement industrial technology development
- Organization: Established in 1980; NEDO is organization operated under the Ministry of Economy, Trade and Industry of the Government of Japan
- Head Office: Kawasaki City, Japan
- Personnel: About 900
- Budget:Approximately 129.8 Billion yen
(≒ 1.05 B €) (FY2016)Chairman:Mr. Kazuo Furukawa



Definition of Smart Community



Smart Community means Network involving smart supplier and smart customer. Early stage of demonstration, this system was tested in limited area as local community. However, this trial system is expanded into wider society now.



Smart Community related activity in Japan





4 Smart City Projects in Japan (2010-2014) Next Generation Energy-Social System Demonstration Project



YOKOHAMA project

- To achieve into low-carbon and comfortable city, CEMS is introduced as the best energy management system.
- HEMS to households, BEMS to office /commercial buildings, FEMS to factories and

EV & charging station to transport sectors are introduced too.

achieved

• By collaborating them to each other, reduction of the peak demand and energy savings will ne





KITA-KYUSHU project



NEDO Smart Community International Demonstration Projects (Sep. 2016)



EDO

New Mexico Smart Grid Demonstration (2009-2014)



http://www.nedo.go.jp/english/news/AA5en_100001.html



Distribution Feeder Micro-Grid Demonstration in Los Alamos (NM Demonstration)

NEDO House

HEMS. 3kWPV

4kwh Heat Energy Storag

Price Signal

Smart meter at residences

PV output real time

control using battery for grid stabilization.



By introducing Micro-EMS on the feeder in Los Alamos, Battery storage absorbs fluctuation of photovoltaics and demand, and achieves flat flow injection from transmission system. It means that it is possible for distribution company to purchase energy strategically from whole sale market.

Demand/response signal

PV output Monitoring

uEMS

Micro Energy Management Syste

Tieline monitoring for power flow control

Small-scale buildings

Micro-Grid

5MM

at the point of interconnection

Point of common

Transforme

coupling (PCC)

Battery charge / discharge commands for PV output control

PV system 1MW

Stationary Battery system

NaS or Lead batteries

Price Signal

PV system 1MW installed

by a company in US

Price Sign

Introducing; 1MW land fil PV system, 1MW NAS battery, 0.8 MW Lead Acid Battery, 1600 smart meters and Micro EMS.



900 Participants Demand Response Demonstration in Los Alamos (NM Demonstration)



Group	Flat	CPP	PTR	total
Opt-in CPP	132	233		365
Opt-out CPP	5	178		183
Opt-out PTR	5		173	178
Control	174			174
合計	316	411	173	900



Demand Response Trial From 2013-2014 2 Years 4 Seasons 15 demand response trials per one season.

	Group	ITT effect	TOT effect
Summer	Opt-in CPP	-6.90%	-10.49%
	Opt-out CPP	-4.59%	-4.71%
	Opt-out PTR	-4.06%	-4.17%
Winter	Opt-in CPP	-4.78%	-7.12%
	Opt-out CPP	-4.27%	-4.41%
	Opt-out PTR	-3.26%	-3.37%

* TOT effect : Treatment on the Treated. Net peak cut effect when a treatment was given.

* ITT effect : Intention to Treat. Choice probability x TOT effect.

Independent Operation of Smart House in Los Alamos (NM Demonstration)







Registration of Micro Grids Use Case to NIST-EPRI (NM Demonstration)



NEDO – BEMS Control of DERs and HVAC Equipment in a Commercial Building Which Enables Islanding Operation and Demand Response Albuquerque Smart Building

- NEDO Energy Management by Configuring a Virtual Microgrid Kyo-Tango Virtual Microgrid
- NEDO Equipment Control within Smart House by HEMS Los Alamos Smart House
- NEDO Sendai Microgrid Use Case Sendai Microgrid
- NEDO A1 Energy Management of Grid Connected Microgrid Aichi Microgrid
- NEDO A2 Autonomous Decentralized Microgrid Islanding Mode Aichi Microgrid
- NEDO H1 Energy Management of Grid Connected Microgrid Hachinohe Microgrid
- NEDO H2 Energy Management of Microgrid Islanding Operation Hachinohe Microgrid
- NEDO S1 Cooperative Control Among Smart Grid and External Area EPS Energy Management Systems Los Alamos and Albuquerque EMS





Discussion in IEEE P2030. 7 Standardization

Lyon Smart City Project (2011-2017)



http://www.nedo.go.jp/english/whatsnew_20111226_index.html



TASK4 Community Management System (CMS)

By visualization of social index, CMS supports promotion of local government's city development plan.

TASK1 HIKARI Building

By introducing BEMS, HEMS, PV resources, energy storage element and energy saving equipment, positive energy building is achieved.



TASK2 SUNMOOV

By introducing 30 EVs and charging infrastructure, car shearing and renewable energy charging system were demonstrated.

PV energy consumption rate was 82% in summer, 79% in autumn.

TASK3 Conso Tab.

By introducing energy audit system at the public apartment house, energy conservation was achieved in the exist residential houses.

3.9% saving in electricity consumption 0.5 % saving in gas consumption

Hawaii Maui Project (2011-2017)

(NEDO

http://www.nedo.go.jp/english/whatsnew_20111129_index.html

(I) EV Based Remote Island Smart Grid Model on Maui
(II) Smart Grid Model at a Substation with One Distribution Grid Level in Kihei
(III) Smart Grid Project for Low-voltage Transformer Level Systems
(IV) Comprehensive Research



Hawaii Maui Project (2011-2017)



Demand Response result using charging management for EV.



Malaga EV demonstration Project (2012-2016)

http://www.nedo.go.jp/content/100789468.pdf

Period : 2013 April -2015 Dec **Place: City of Malaga** Participants : 209 EV cars

- Demonstration of EV managing Center and Infrastructure
- Demonstration of M:N output allocation type Rapid Charger
- **Demonstration of Electric managing System**
- Integrated ICT Infrastructure
- Demonstration of total service.
- Grovel business vision and standard.













Trip length per one trip 40% 1-5kmが最も多く、10km以下の 30%



Trip hours per one trip





30%

25%

11-20Mml



Electric consumption per one trip

21.30kml, 0kml, 50kml, 0kml, 0km





Oshawa Ontario Residential PV system Demonstration(2015-2017)

NEDO

http://www.nedo.go.jp/english/news/AA5en_100025.html

NEDO Begins Its Demonstration Operations of a Hybrid Inverter System for Unified Control of Solar Panels and Storage Batteries. A Disaster-Resilient Housing Model that Coexists with Renewable Energy will be Established. This Systems are owned by utility and customer demand will be supplied by this system.



Heat Pump demand response Demonstration in Medo Manchester (2014-2017)

http://www.nedo.go.jp/content/100788809.pdf

NEDO will analyze best DR strategy by analysis of demand profile of water heater heat pumps of 600 residents.







Self Consumption HEMS Demonstration in Speyer. (2015-2017) http://www.nedo.go.jp/content/100788808.pdf

NEDO

NEDO will demonstrate self consumption system managed by HEMS with battery and heat pump.



Heat Pump unit (16kW)

2 system

Big Data Analysis in EV related demonstrations



IEDO

Big Data Analysis in HEMS and Home Appliances









- NEDO experienced several type of smart community demonstration.
- Mainly purpose of demonstration is showing solution against high penetration of renewable energy.
- Some type of demonstrations include big data analysis which is useful for understanding large number of customer of energy and motorization.
- Those kind of demonstrations will contribute creating new business, new rule of public service and high ICT application service to customers.





Thank you for your attention!