

# Experience of Sendai Microgrid and Next Challenge

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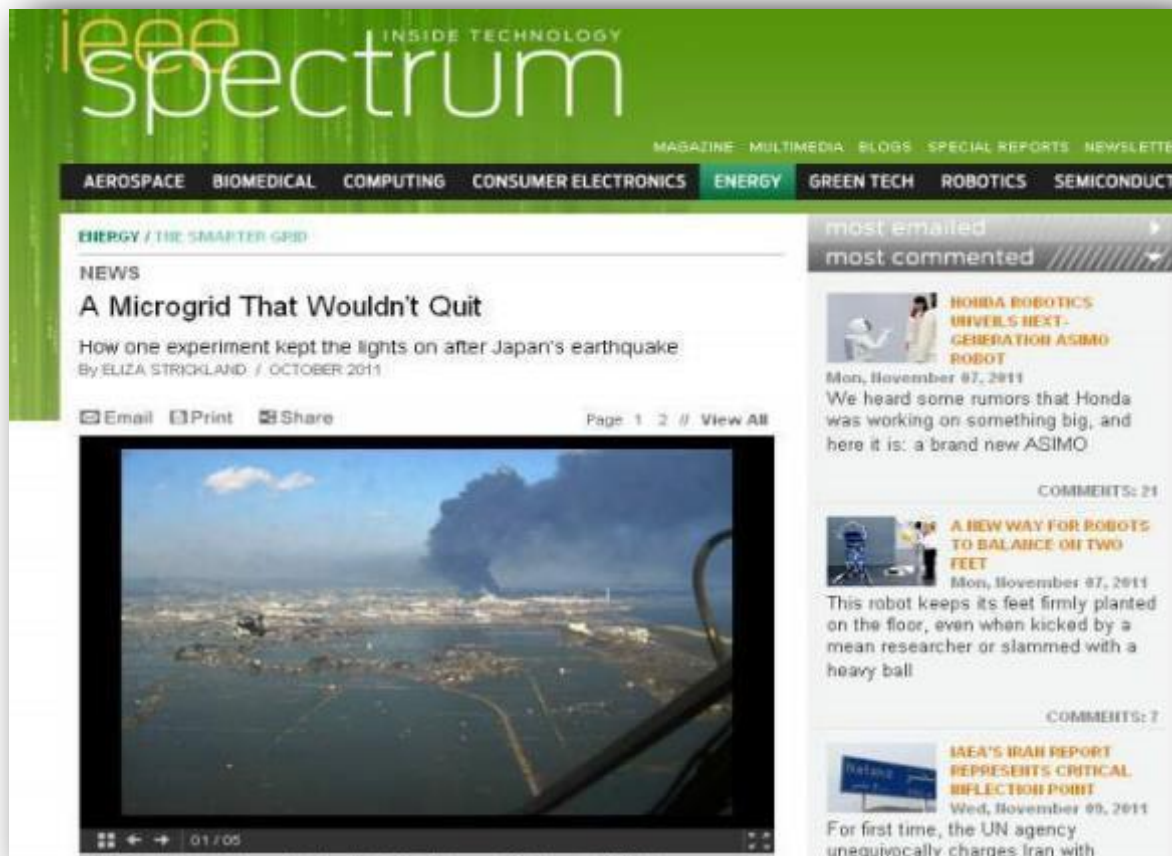
**NTTFACILITIES**



1. The Great East Japan Earthquake and Sendai Microgrid
2. Our smart community project by DC power
3. Summary

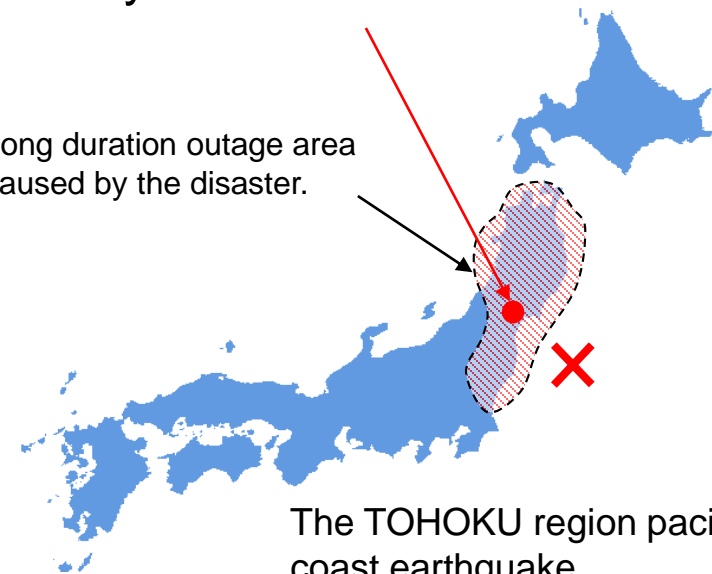
## The Great East Japan Earthquake on March 11, 2011





## SENDAI microgrid by NTT FACILITIES

Long duration outage area caused by the disaster.

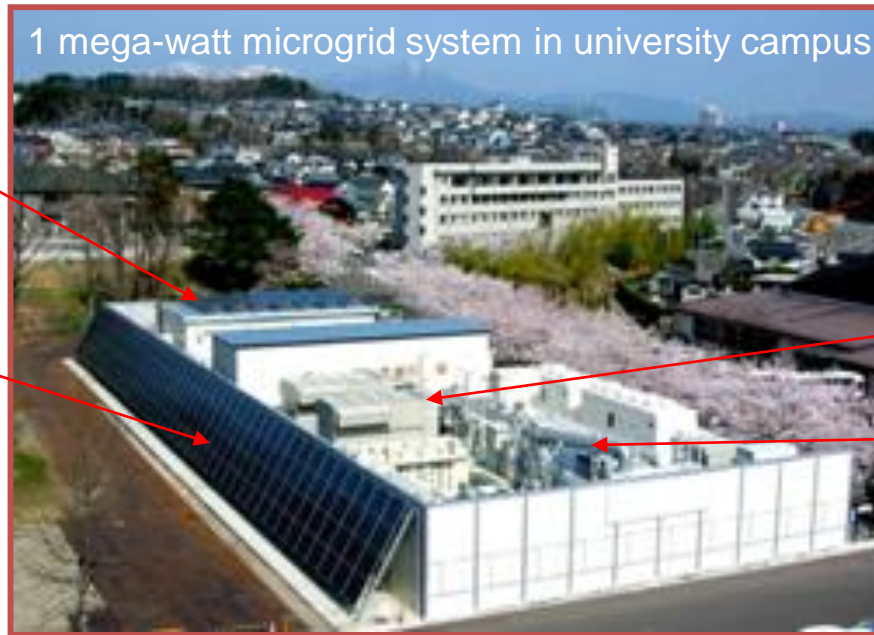


The TOHOKU region pacific coast earthquake, March 11, 2011

Source: <http://spectrum.ieee.org/energy/the-smarter-grid/a-microgrid-that-wouldnt-quit/0>

# SENDAI Microgrid System

➤ We constructed micro grid in Sendai city to supply high quality power for mission critical loads.



1 mega-watt microgrid system in university campus

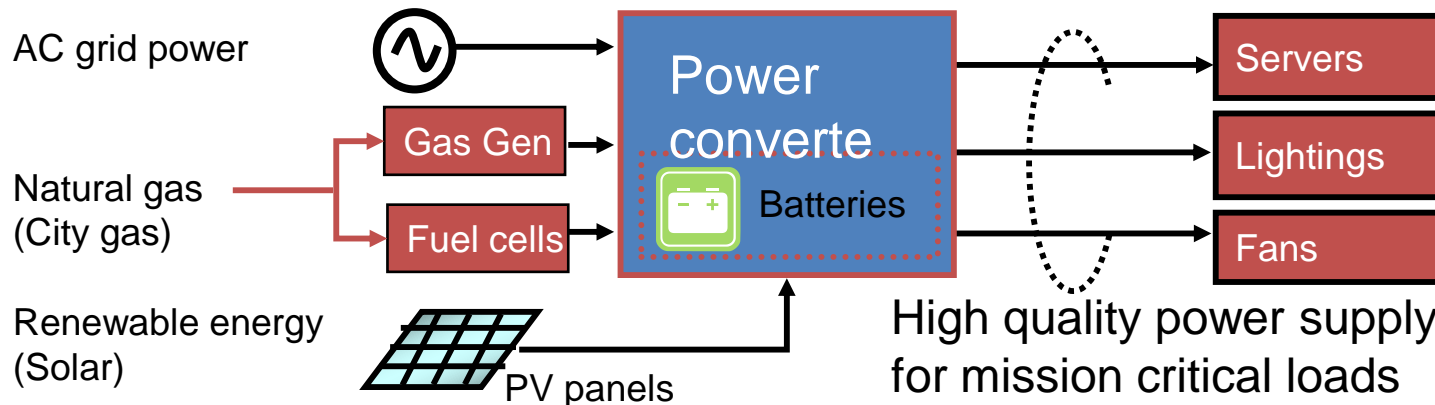


Power converters & batteries

PV panels

Gas Gen-sets

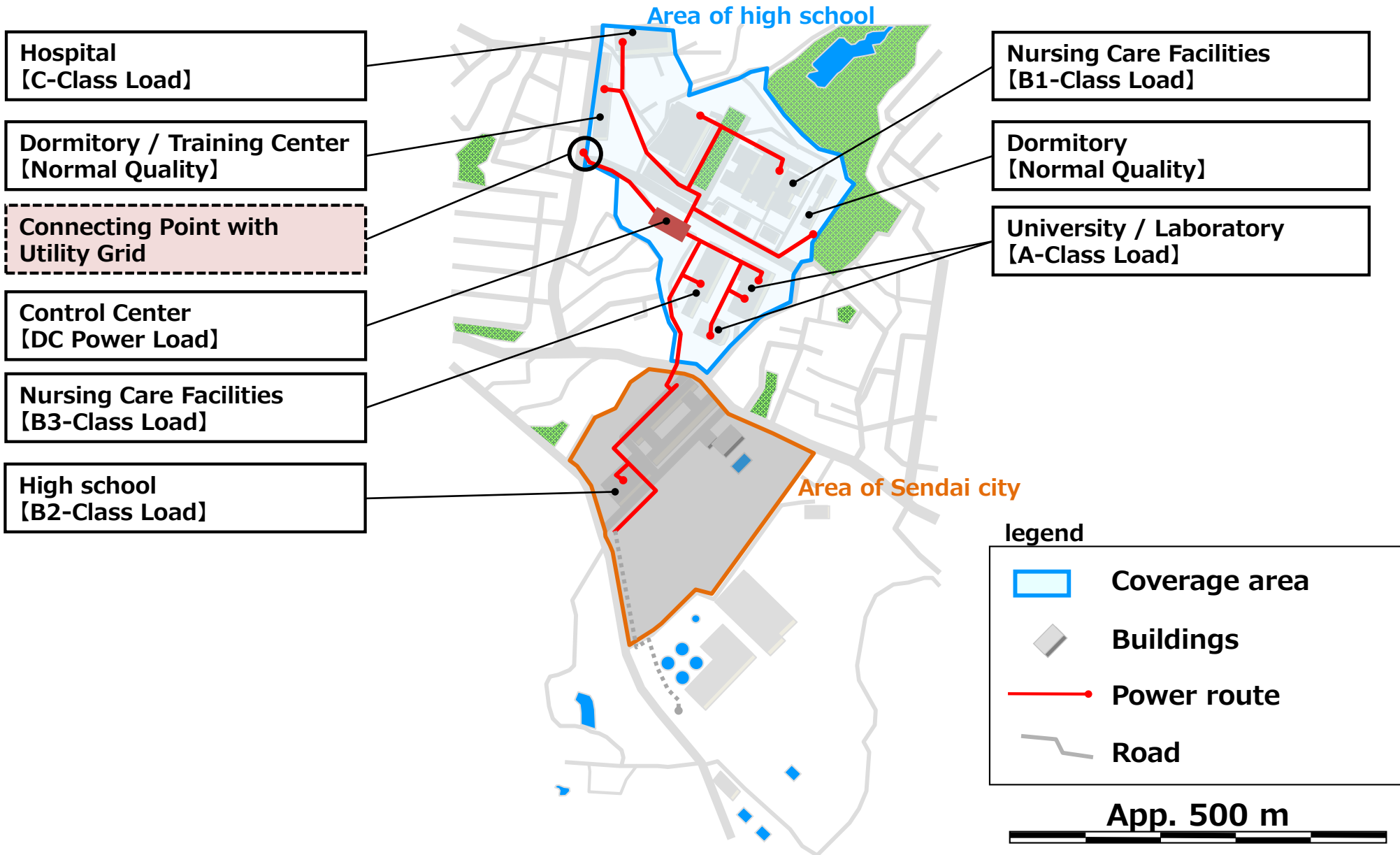
Fuel cells





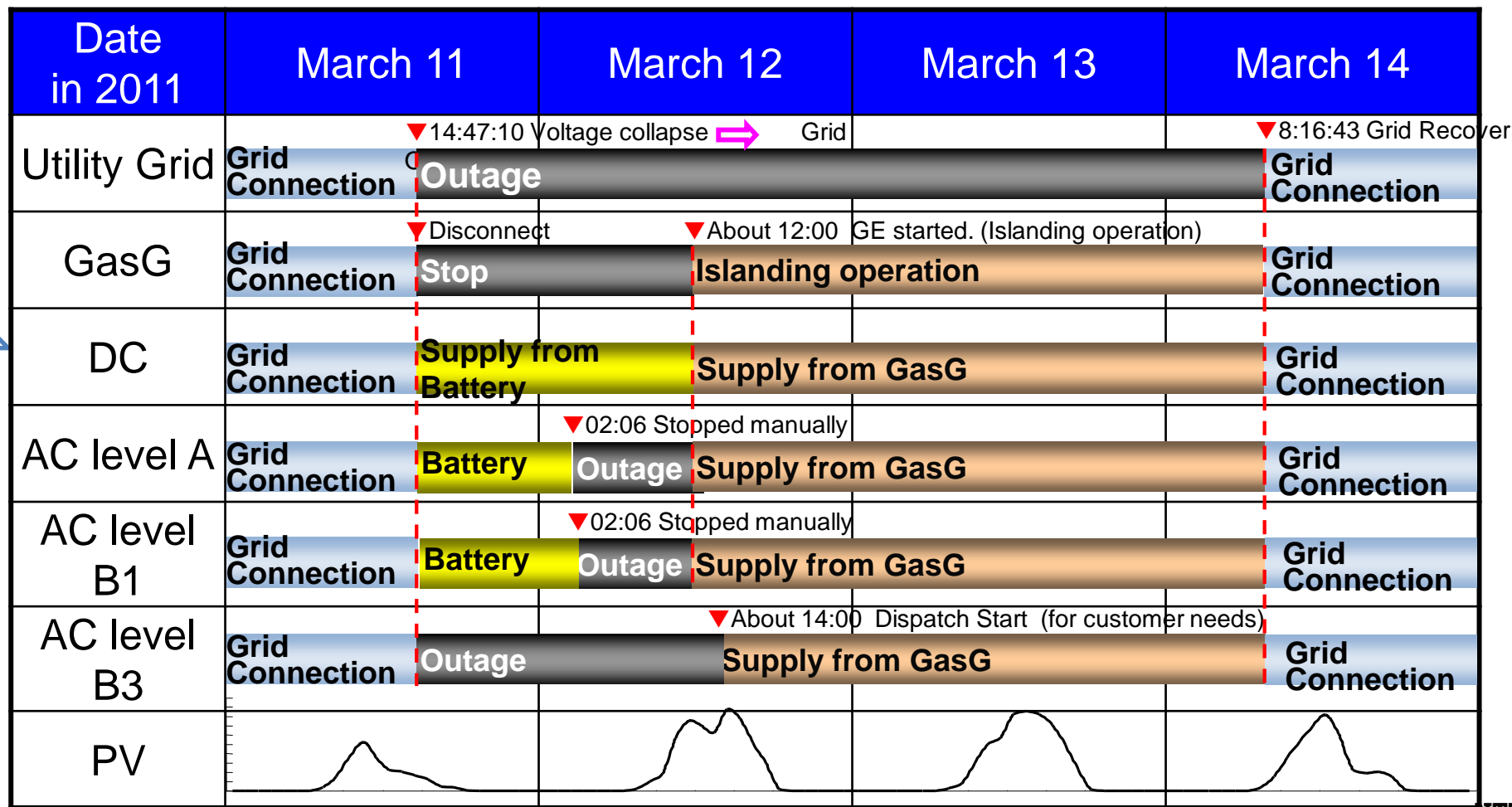
# Layout of "Sendai micro-grid"

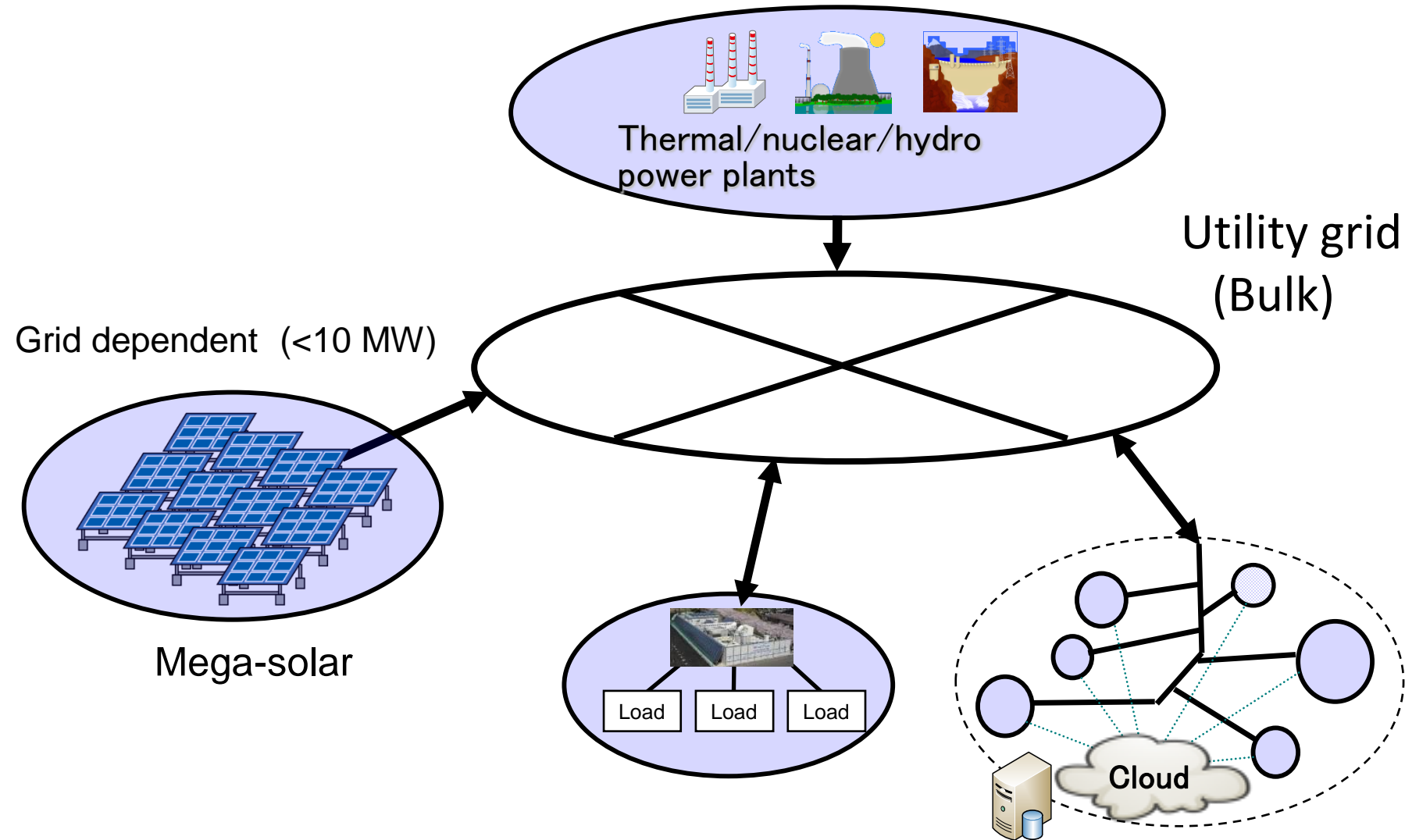
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# Condition of Supplying Power during March 11

- The system continued to supply DC, A, B1 without any interruptions for batteries and PV generation system.
- GasG supplied power for 43 hours during outage.





Grid independent systems are greatly needed!



1. After the Great East Japan Earthquake
- 2. Our smart community project by DC power**
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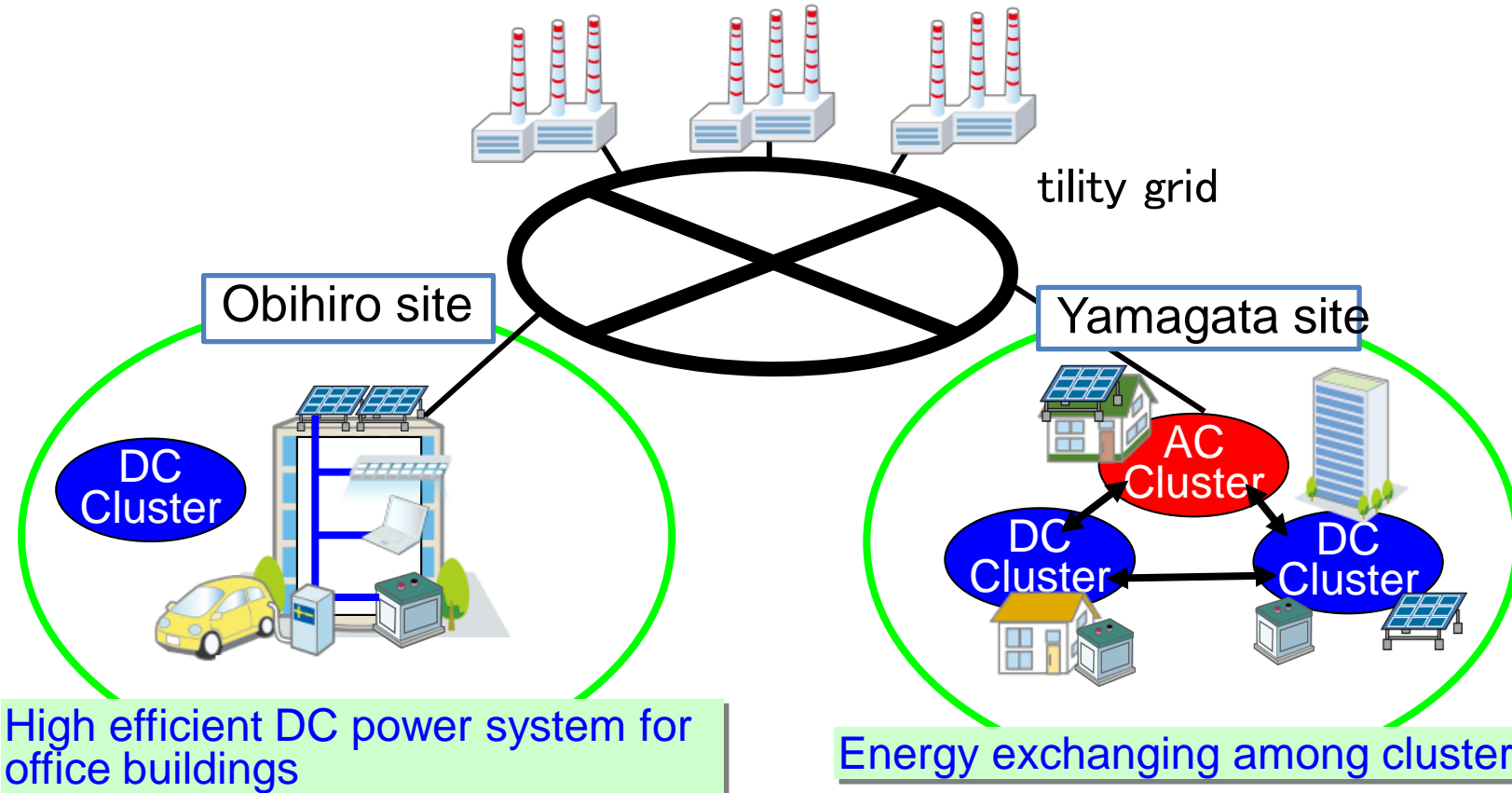
# New project supported by the MOE\*, Japan

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\*Ministry of the Environment

## ◆ Purpose

The verification test to realize the distributed autonomous system by the direct-current system which utilized renewable energy



High efficient DC power system for office buildings

Energy exchanging among clusters

Cluster : minimum scale of micro-grid

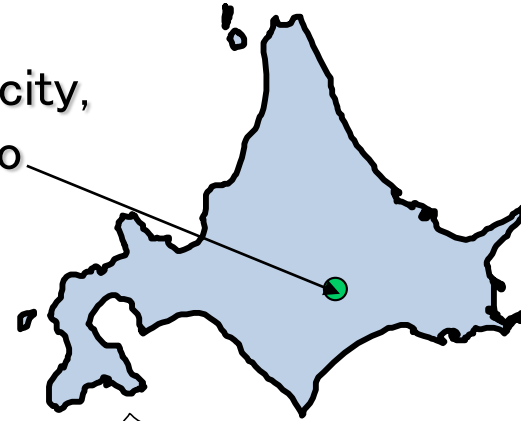
## Obihiro site

High efficient DC power system  
for office buildings



Obihiro Sanitation Center

Obihiro city,  
Hokkaido



Yamagata city

## Yamagata site

Energy exchanging among clusters



Yamagata Technical high School

Development of high efficient DC powering system for office buildings

## Study items

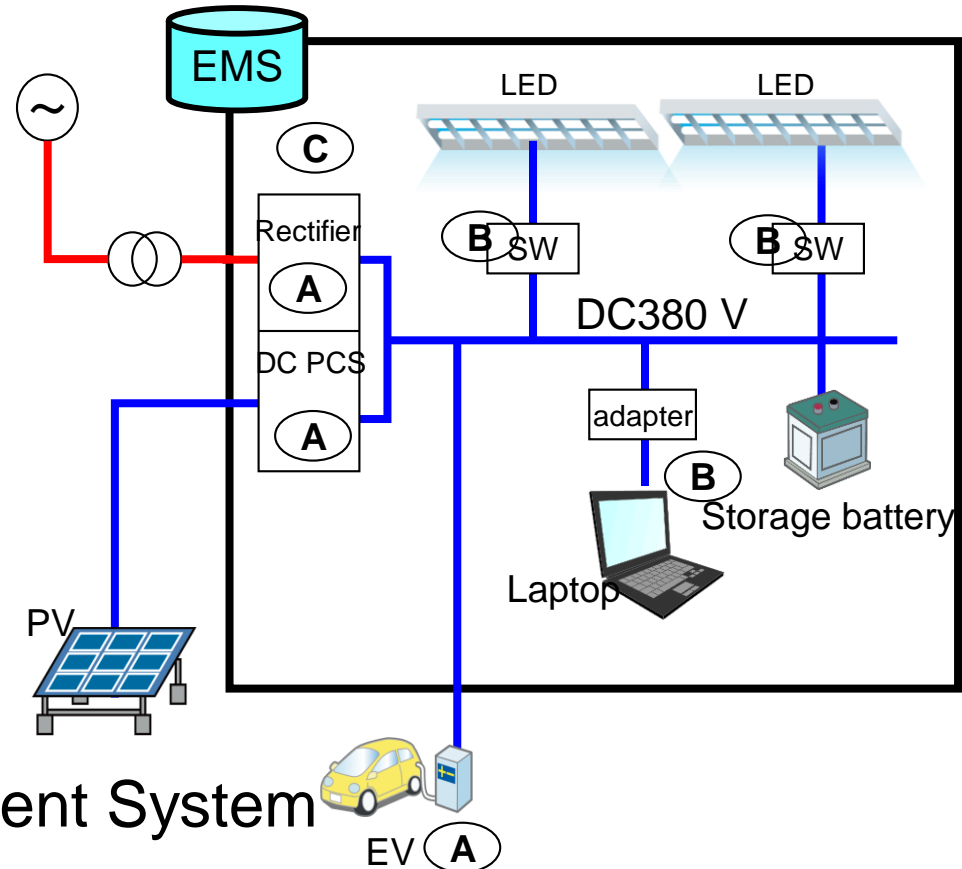
### (A) High efficient converters

- Rectifier
- DC PCS
- EV bi-directional charger

### (B) DC power feeding system and its components for office

- DC wiring method
- DC adapter for laptop PC
- DC switches

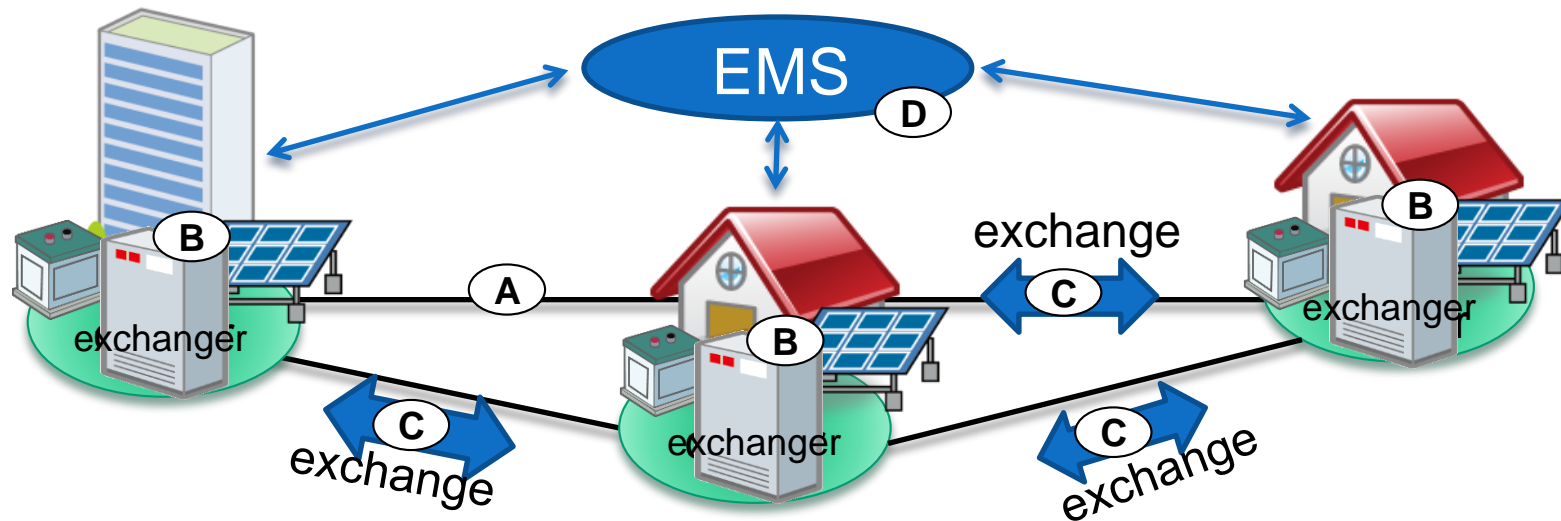
### (C) DC power Energy Management System



Development of energy exchanging system among clusters.

## Study items

- (A) Grid topology
- (B) Equipment for power exchange (Power exchanger)
- (C) Algorithm
- (D) Management



	FY2012	FY2013	FY2014	Target
Obihiro site	grand design	development of equipment construction	demonstration	Reduction in 50 % CO2 emissions
Yamagata site	grand design	development of equipment construction	demonstration	A 40% reduction in storage battery capacities





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- 3. Summary**

- Sendai Microgrid worked very well during the great east Japan earthquake. After the major event, the renewable energy and distributed power system were focused more and NTT-F have developed and demonstrated new microgrid systems.
- One of new distributed power systems includes the mutual energy exchanging system between (smaller scale) microgrids called “cluster”. Use of DC power is also focused.
- The smart community project is demonstrated in Obihiro and Yamagata for the purpose of the development of high-efficient system and the verification test to realize the mutual energy exchanging system between micro-grids using DC power. The project is supported by Ministry of the Environment, Japan.

***Thank you for your attention.***

