

Expanding the Future of Energy Utilization

High-capacity
Nickel-metal Hydride Battery

GIGACELL®

Compact and High-performance
Offering Vast Possibilities for Energy Use.



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High-capacity Nickel-metal Hydride Battery GIGACELL®

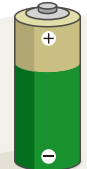
GIGACELL® is a next-generation Ni-MH battery. Designed to be eco-friendly, GIGACELL® commits to the efficient use of energy and carbon footprint reduction.

Received 2009 Japan Minister of the Environment Award for Achievements in Reducing Global Warming

Received the Grand Prize for the 19th Global Environment Award (Hosted by the Fuji Sankei Communications Group)

FEATURE
High Scalability


Conventional Battery



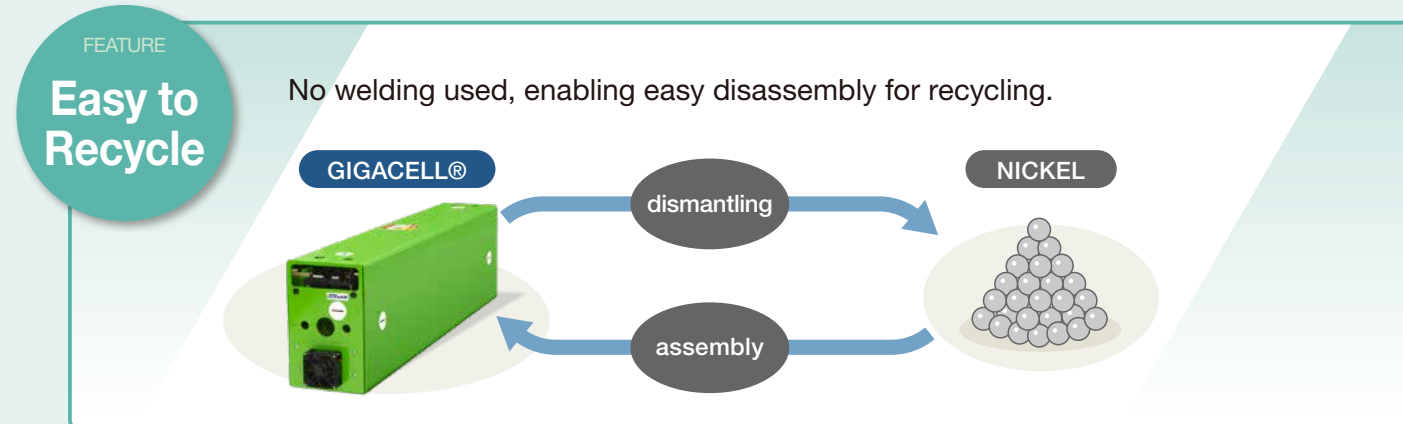
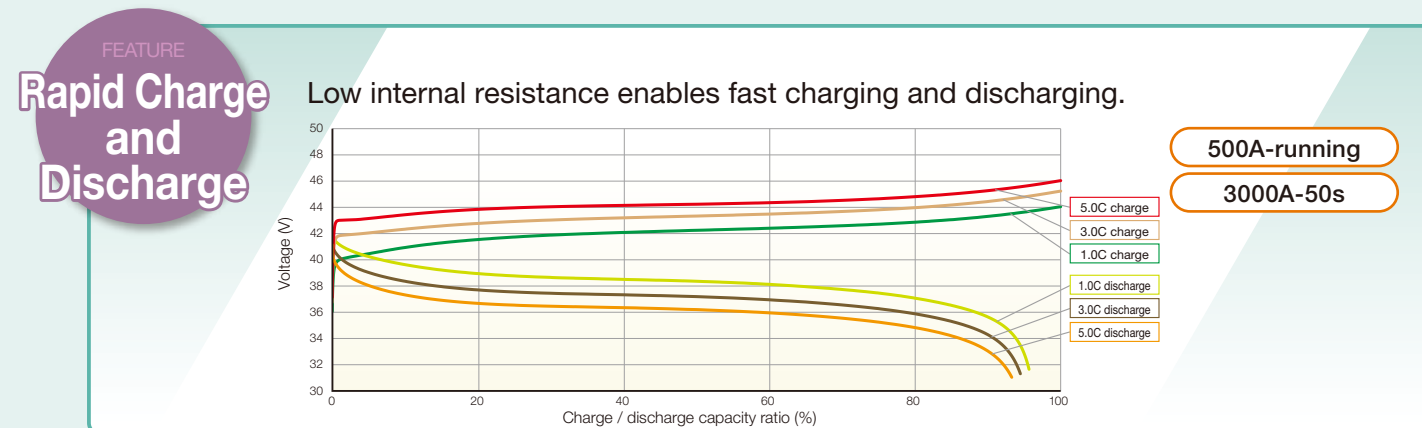
AA Type : 2Ah 1.2V 2.4Wh

→ × 2,250

GIGACELL®




150Ah × 36V = 5,400Wh



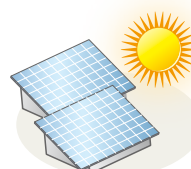
FEATURE
Excellent Cycle Durability

Designed to withstand frequent cycles of short, rapid charging and discharging.


Wind power generation



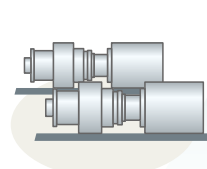
Solar power generation



Railway

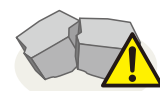






Gas turbine






FEATURE
Environmentally Friendly

No lead, mercury, cadmium or other toxic materials are used.

Lead	Lead oxide	Cadmium	Mercury	Sulfuric acid
No	No	No	No	No
				

FEATURE
Simple and Safe

Low operating temperature; water-based electrolyte eliminates risk of fire.

organic solvent	metallic oxide	Lithium hexafluorophosphate
No	No	No
		

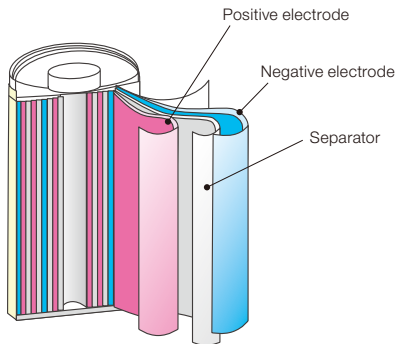
Innovative Design

Bipolar enables GIGACELL®’s high capacity and rapid charging

Conventional cylindrical Ni-MH batteries consisting of rolled electrodes and separators heat up during rapid charges and discharges. These batteries also have limited scalability due to the energy loss created in their connections. In addition, their welded structure complicates recycling procedures. In the GIGACELL®, cooling fans that send air through the structure prevent overheating. The bipolar structure minimizes energy loss between cells and actualizes greater capacity. GIGACELL® is highly recyclable because of its non-welded structure.

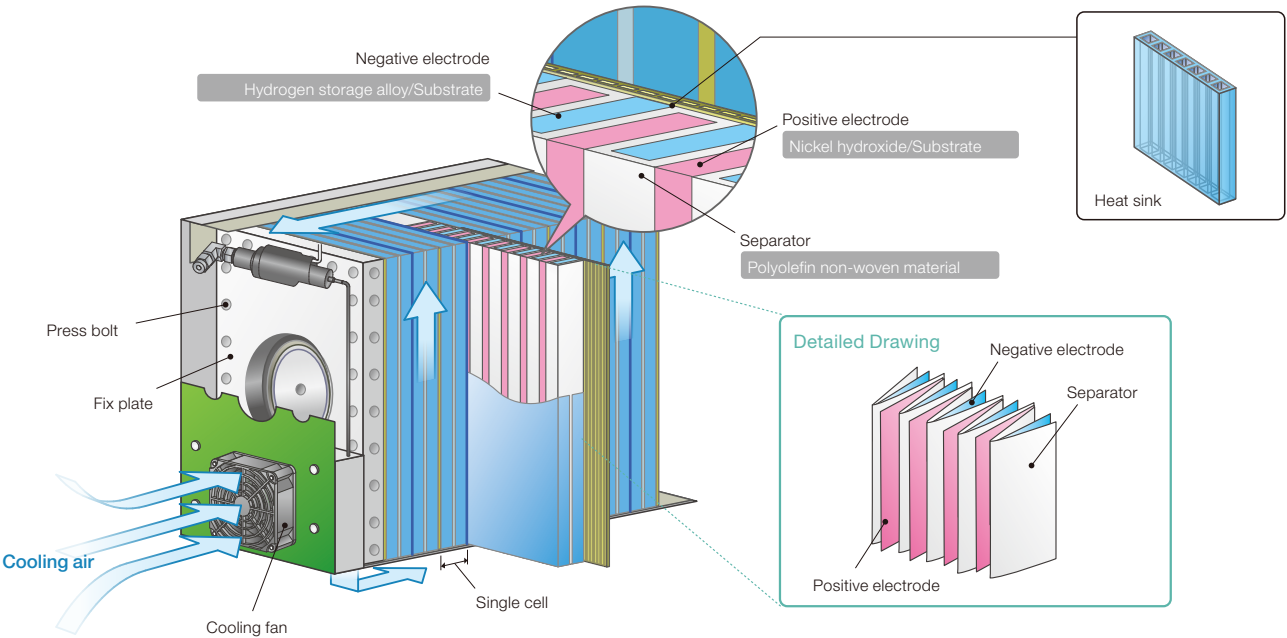
Comparison of Conventional Ni-MH Battery and GIGACELL®

Conventional Ni-MH Cylindrical Battery



- Cooling Fan** Powerful and efficient cooling enables charging / discharging at high amperages.
- Non-welded** With no welding processes during its production, disassembly and recycling processes are facilitated.
- Fully Sealed** The GIGACELL® is fully sealed, needing no maintenance.

GIGACELL®



Bipolar

GIGACELL® modules are composed of individual cells that are connected in series by their cell walls, with the front and rear surfaces becoming positive and negative electrodes, forming the bipolar structure. The thin cell walls provide a large cross-sectional area that minimizes energy loss, which occurs when the cells are connected. Therefore, the large capacities of modules can be accomplished by increasing the number of cells connected in the bipolar structure.

Safety Tests

Overcharge Test



Battery for power storage system(JEAC 5006-2010) table 3-6-2 in Articles 3 to 6
2.5.3 Overcharge test based on Development of Energy Storage System for Grid-connection with Renewable Energy Resources
—Basic research for the fundamental study by NEDO

Vibration Test



JIS Z-0200JIS Z 0200
UN38.3 TestT.3Vibration(38.3.4.3.2)
2.5.7 Vibration Test based on Development of Energy Storage System for Grid-connection with Renewable Energy Resources
—Basic research for the fundamental study by NEDO

Drop Test



JIS C 8714 (Safety Tests for Portable Lithium-Ion Secondary Cells and Batteries For Use In Portable Electronic Applications)

Water Immersion Test (fresh water and salt water)



2.5.9 Immersion Test based on Development of Energy Storage System for Grid-connection with Renewable Energy Resources
—Basic research for the fundamental study by NEDO

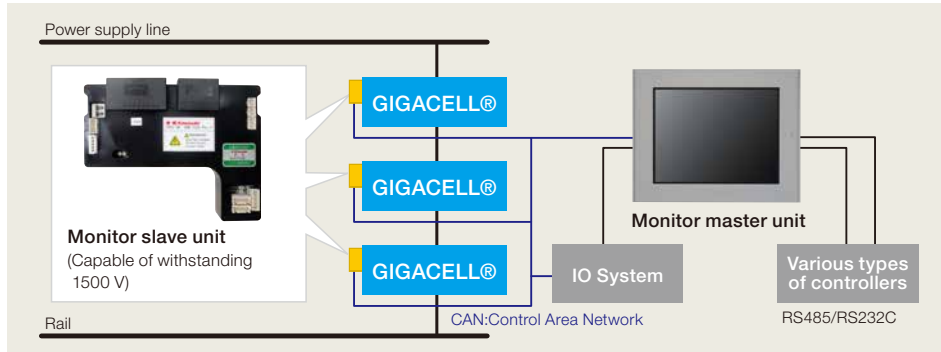
Battery Monitoring System



The Battery Monitoring System (BMS) that is installed on each module calculates the SOC* and uses this to determine if there are any abnormalities. BMS enhances the safety of GIGACELL®

Functions Calculates SOC, takes measurements of cell voltage, battery temperature and battery internal pressure, and outputs warnings as necessary.

* SOC: State of Charge, is the level of the charge in the battery



CHANGING THE FUTURE WITH
NEW APPLICATIONS

A Combination of Safe,
Reliable Rail Transport and Efficient Use of Energy

Battery Power System (BPS)
for Railways

BPS can provide all functions simultaneously

Energy Saving

Reducing overall energy consumption by encouraging regenerative braking and then "recycling" it.

No Regeneration Cancellation

Stabilized line voltage prevents regenerative braking failure.

Peak Shaving

Power discharged from the BPS reduces power demand at all times, including rush hours.

Emergency Runs

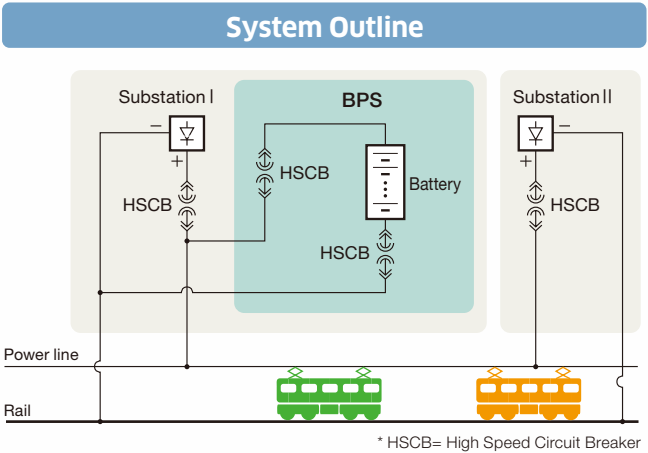
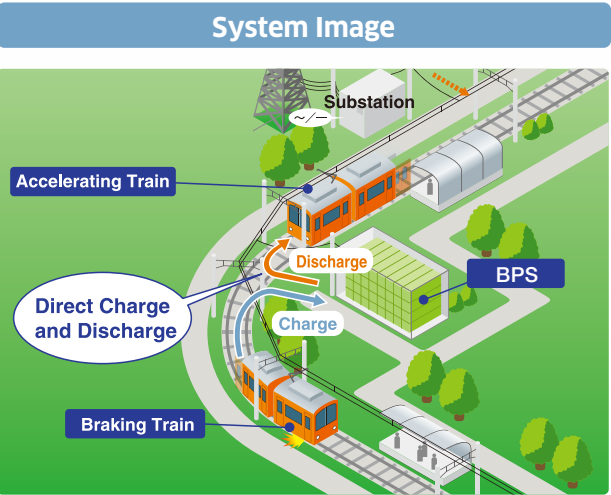
Batteries will power trains to the nearest station during a power outage.

Line Voltage Stabilization

Charging and discharging stabilizes line voltage.

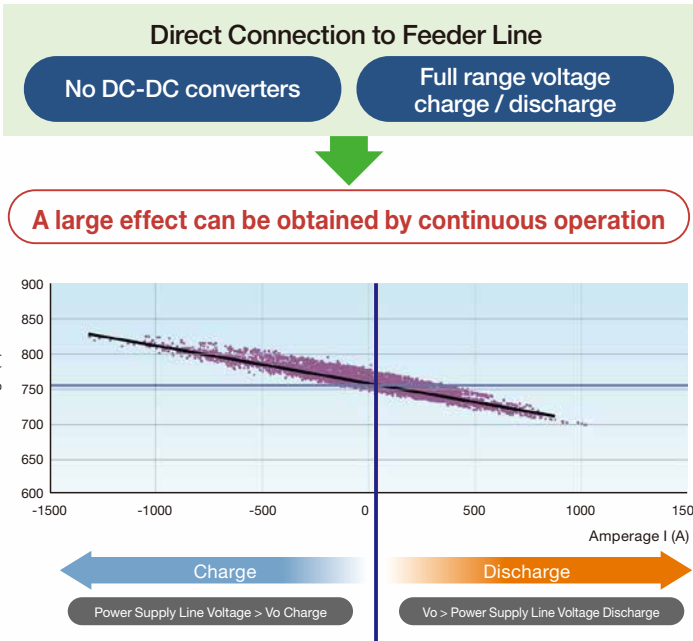
Alternative to Substations

The BPS can serve as an alternative where substations are difficult to install.

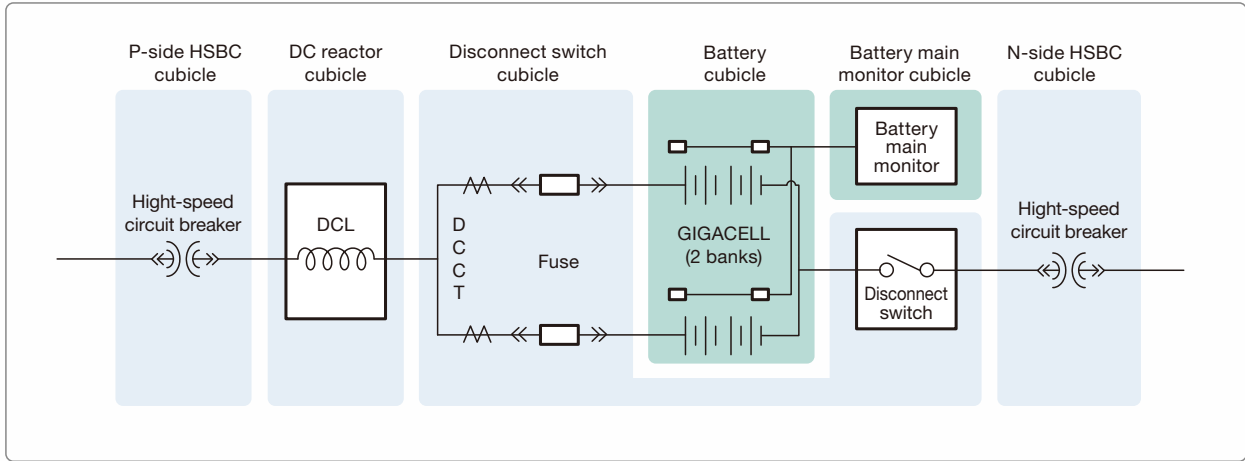


Direct Connection to System

- Low Costs**
No power controllers needed
- High Efficiency**
No loss through controllers
- No Delays and Losses**
Max. use of regenerative energy
- No EMI**
No adverse effects to signal systems



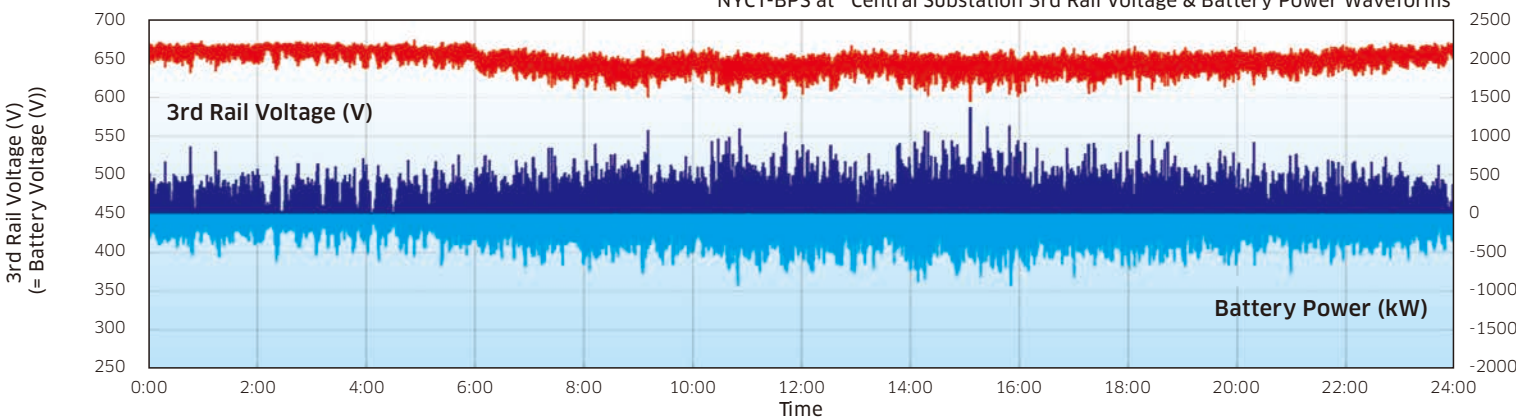
BPS System Diagram



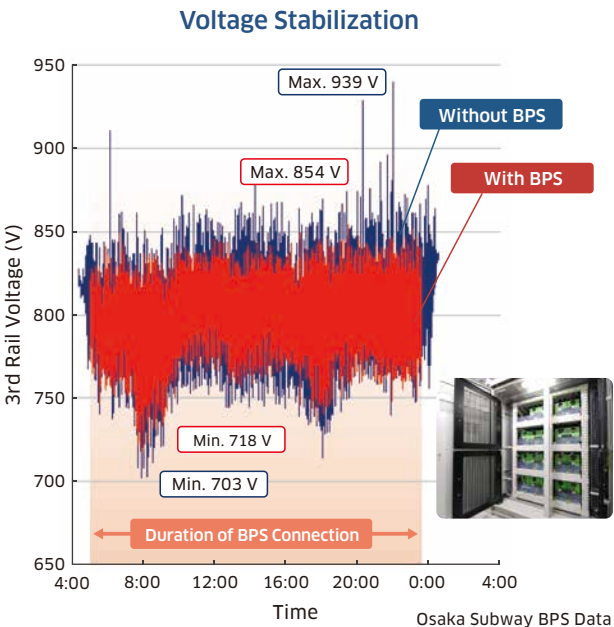
CHANGING THE FUTURE WITH NEW APPLICATIONS

Energy Saving

625 V DC Third Rail Voltage & Battery Power Waveforms

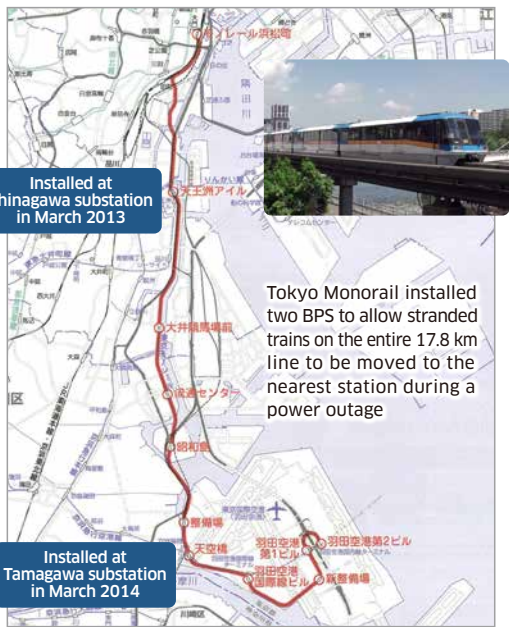


No Regeneration Cancellation, Line Voltage Stabilization

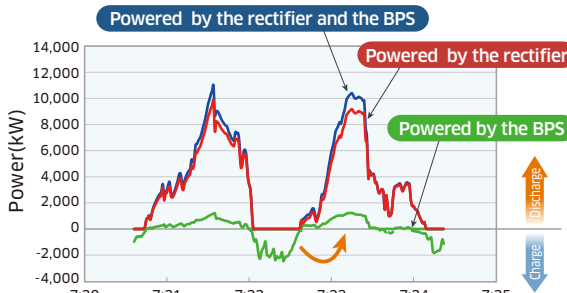


Emergency Runs

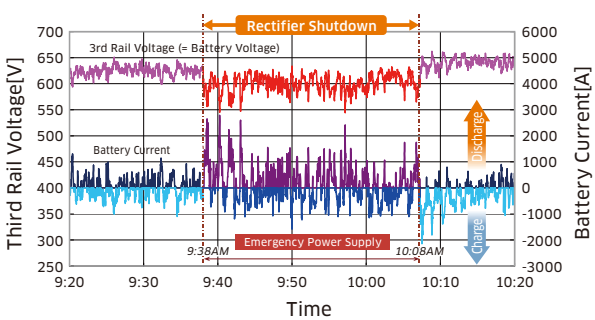
Location of BPS on Tokyo Monorail Line



Peak Shaving



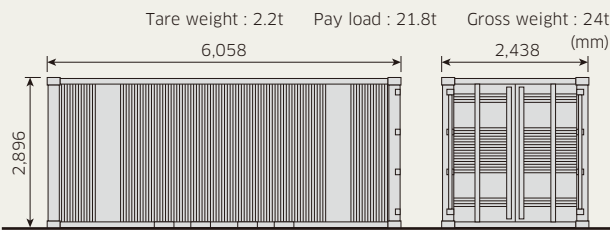
Alternative to Substations



Transportable BPS

It is available as a temporary substation, in case of the construction, maintenance, or expansion of a substation. High tension electric work is not needed, and the construction period can be shortened.

All in two 20ft-containers
Container A : GIGACELL (forty modules) + Battery Monitoring System
Container B : Circuit Breaker Panel, Disconnecting Switch Panel, etc



CHANGING THE FUTURE WITH

NEW APPLICATIONS

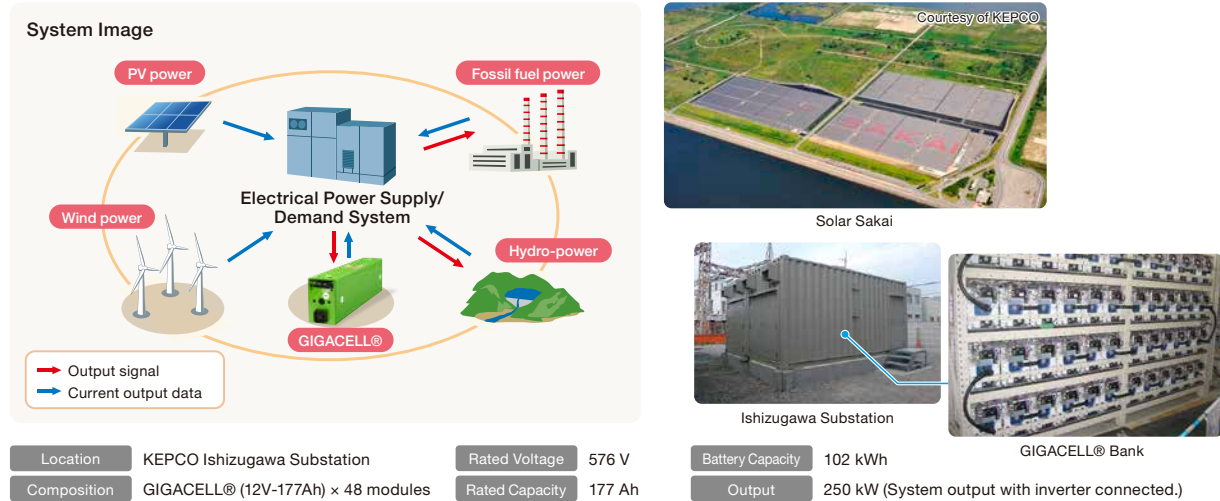
Grid Stabilization

Electrical Power Supply/
Demand System with GIGACELL®

Joint Development

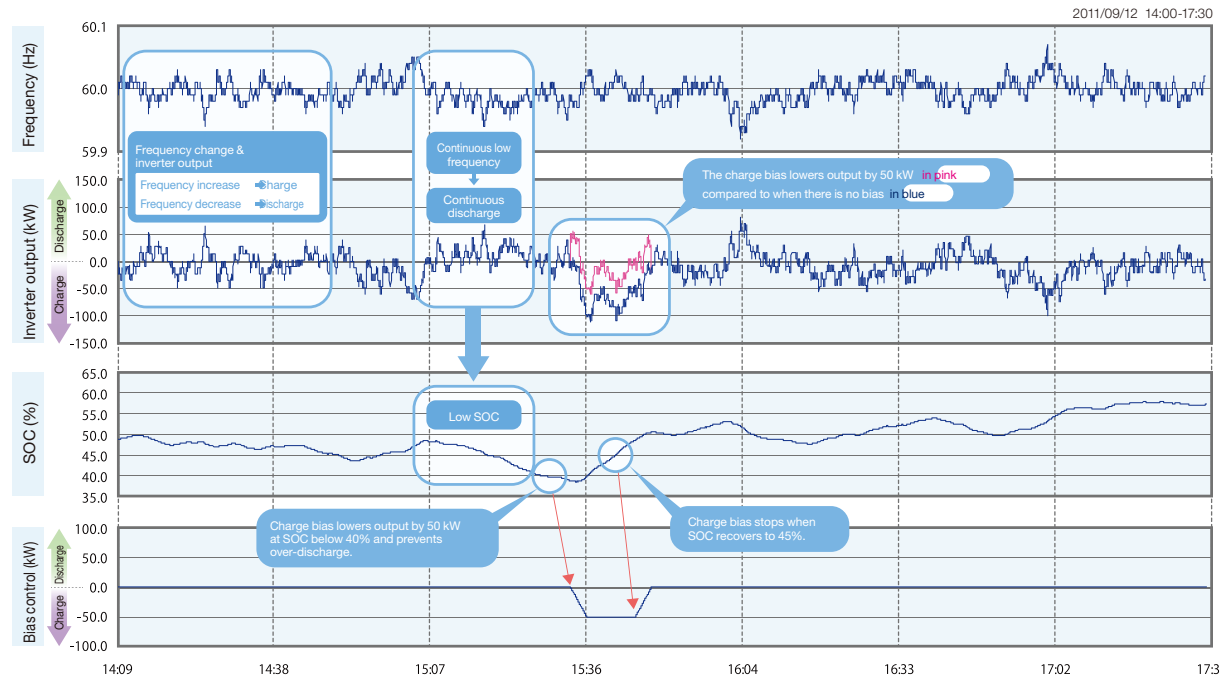
Kansai Electric Power Co., Inc. (KEPCO)
Nisshin Electric Co., Ltd.

A four-year joint development was conducted to study the usage of GIGACELL® for supply/demand control when more renewable energy is implemented in the grid. GIGACELL® was installed at a substation near a 10-megawatt PV generation plant.



Example of System Operation

Charging and discharging will occur when frequency exceeds or becomes lower than the standard frequency of 60 Hz respectively. At high and low SOC levels, the system will prevent over-charging/discharging of the batteries.



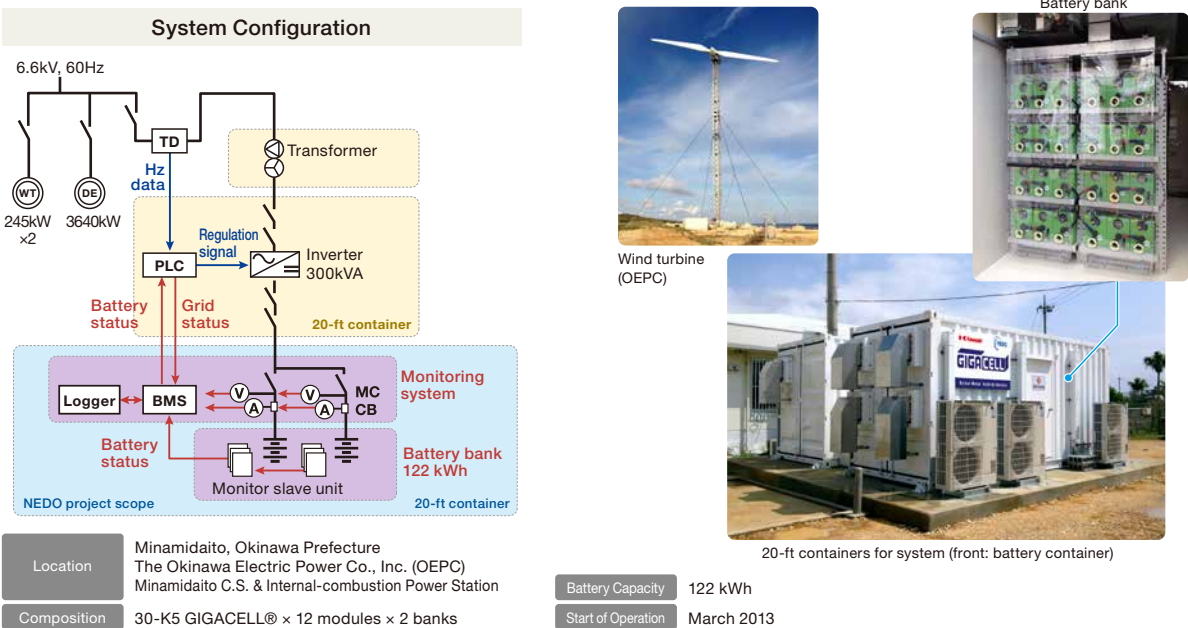
Grid Stabilization

Remote Island
Frequency Regulation

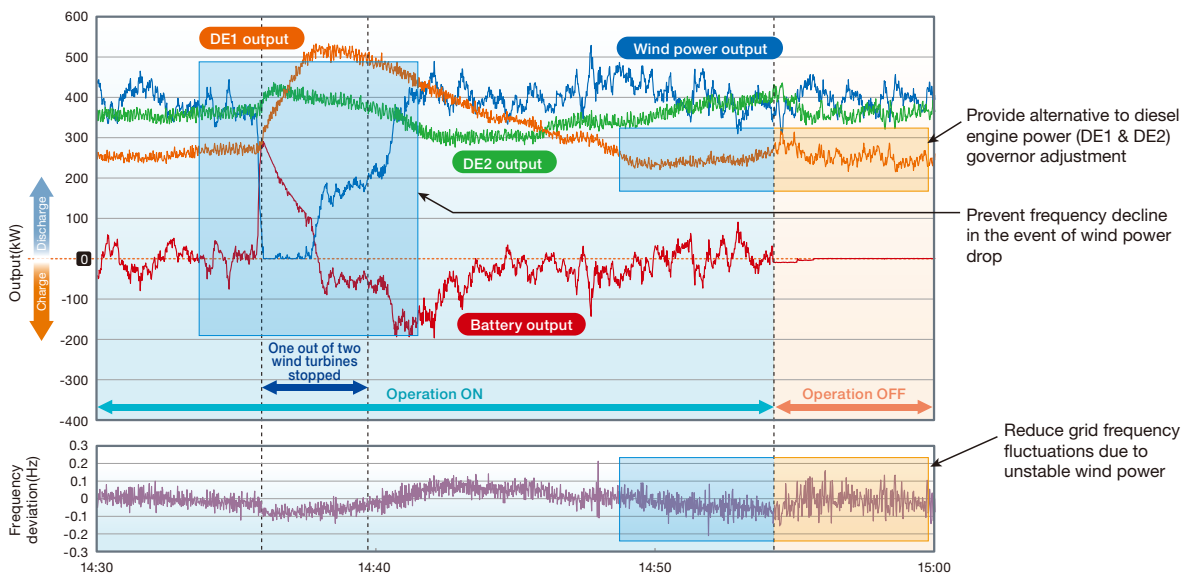
NEDO*
Subsidized Project

Development of a Large-scale Energy Storage
System with High-safety and Cost Competitiveness

Installing renewable energy on remote islands with relatively small grid capacity can potentially increase frequency fluctuations. The GIGACELL® system can control these fluctuations, reducing the need for diesel generators to adjust their output.



Demonstration Data & Benefits



* New Energy and Industrial Technology Development Organization