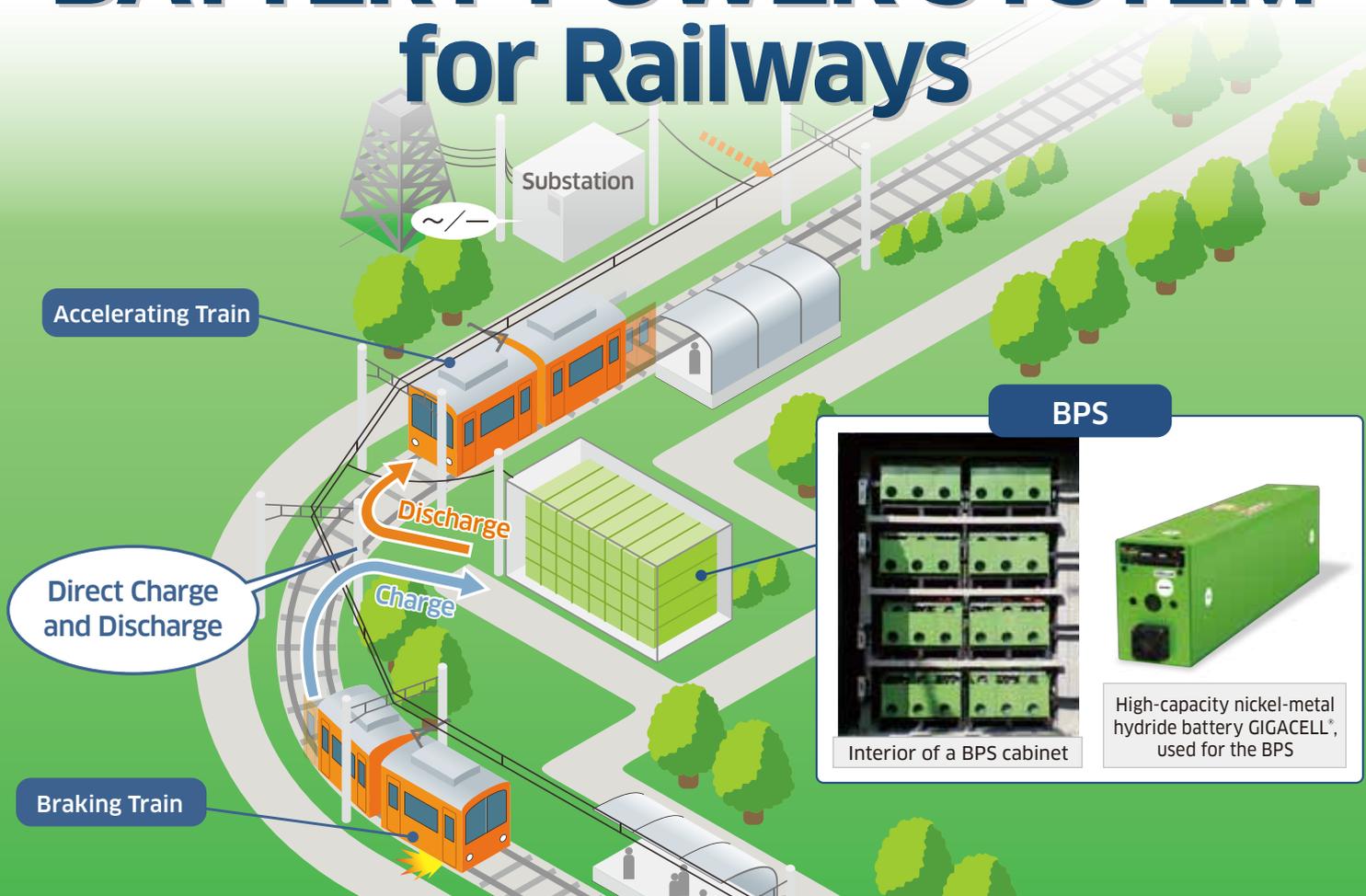


BATTERY POWER SYSTEM for Railways



Benefits

Energy Saving

No Regeneration Cancellation

Peak Shaving

Emergency Runs

Line Voltage Stabilization

Alternative to Substations

Installed BPS



Osaka Subway

Location Osaka Supply year 2011
Battery capacity 205kWh Use BPS



Osaka Subway

Location Osaka Supply year 2013
Battery capacity 204kWh Use BPS



Tokyo Monorail

Location Tokyo Supply year 2013
Battery capacity 203kWh Use BPS



Tokyo Monorail

Location Tokyo Supply year 2014
Battery capacity 203kWh Use BPS



Sapporo Subway

Location Hokkaido Supply year 2013
Battery capacity 204kWh Use BPS

Verification Tests



Washington D.C. Subway(WMATA)

Location Washington D.C. Supply year 2012
Battery capacity 385kWh Use BPS



New York Subway

Location New York Supply year 2010
Battery capacity 367kWh Use BPS

Benefits of the BPS

Energy Saving

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

BPS accumulates excessive electricity when there are no powering trains nearby, enabling trains to fully utilize their regenerative braking function and maximize energy savings.

No Regeneration Cancellation

Stabilized line voltage prevents regenerative braking failure
BPS's line voltage stabilizing effect prevents the trains' pantographs from rising to the regeneration cutoff voltage.

Peak Shaving

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

Heavy train traffic causes higher power demand. Discharge from BPS decreases the substation's power demand.

Emergency Runs

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

In an event of a power outage, BPS will feed power to move stranded trains and evacuate passengers to the next station.

Line Voltage Stabilization

Charging and discharging stabilizes line voltage

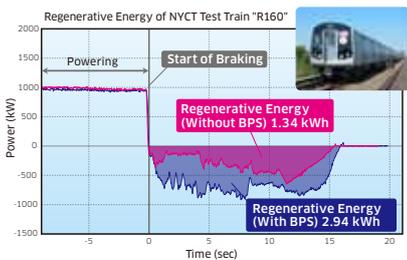
BPS will assist in feeding power to accelerating trains, reducing voltage sags and enabling optimum train operation.

Alternative to Substations

The BPS can serve as an alternative to substations

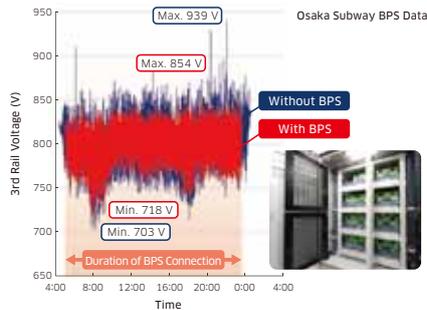
BPS will support traction power and enable downsizing of substation facilities.

Enhances Generation of Regenerative Energy

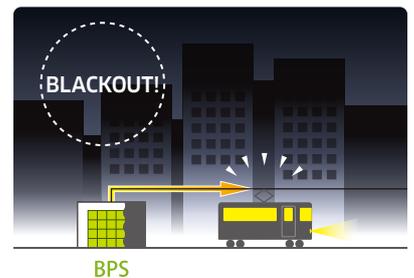


An extra 1.6 kWh saved per every stop

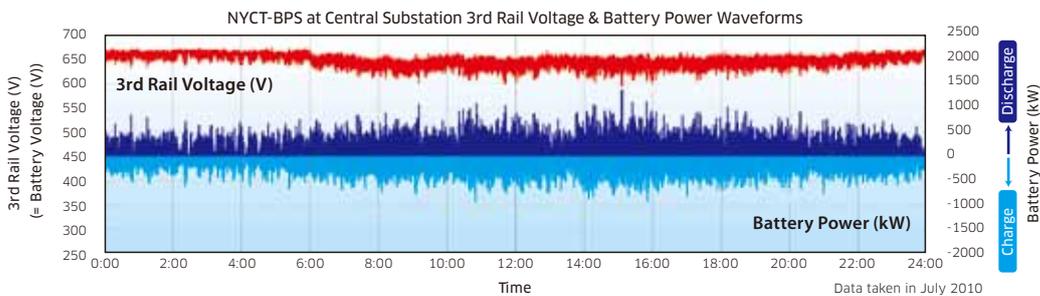
Voltage Stabilization



Emergency Runs during Power Outages



625 V DC Third Rail Voltage & Battery Power Waveforms



Direct Connection to System

Low Costs

No power controllers needed

No Delays and Losses

Max. use of regenerative energy

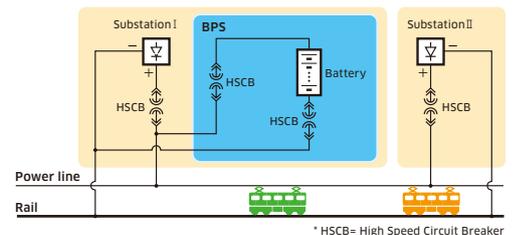
High Efficiency

No loss through controllers

No EMI

No adverse effects to signal systems

System Outline



* HSCB= High Speed Circuit Breaker

Kawasaki Heavy Industries, Ltd.

GIGACELL Battery Sales Sec., Machinery & Parts Sales Dept., Marketing & Sales Div., Rolling Stock Company

Tokyo Head Office 1-14-5, Kaigan, Minato-ku, Tokyo 105-8315, Japan Phone: +81-3-3435-2572

KAWASAKI RAIL CAR, INC. Building 4, 29 Wells Avenue, Yonkers, New York, 10701, U.S.A. Phone: +1-914-376-4700 <http://www.kawasakirailcar.com/>

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