

# 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

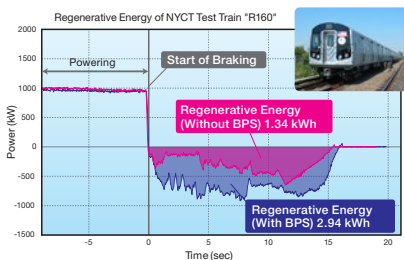
BPS will assist in feeding power to accelerating trains, reducing voltage sags and enabling optimum train operation.

### Alternative to Substations

The BPS can serve as an alternative to substations

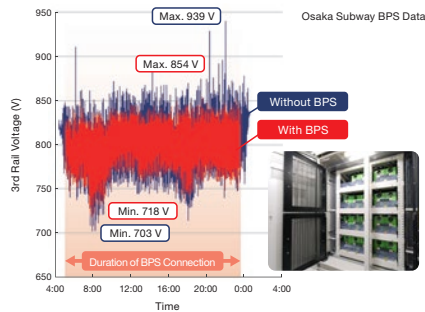
BPS will support traction power and enable downsizing of substation facilities.

#### Enhances Generation of Regenerative Energy

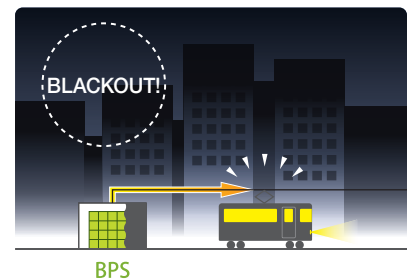


An extra 1.6 kWh saved per every stop

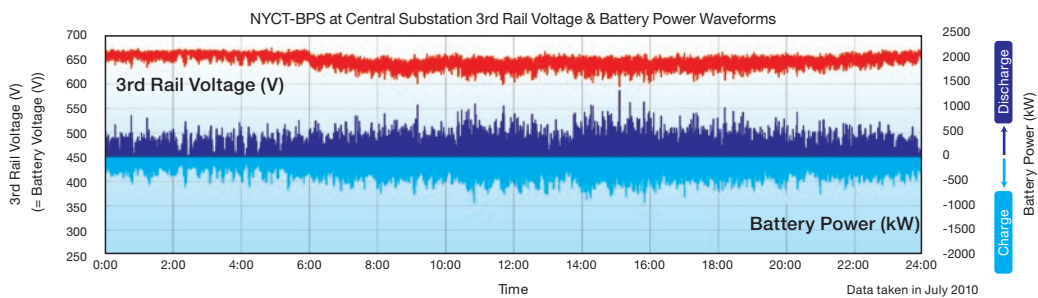
#### Voltage Stabilization



#### 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

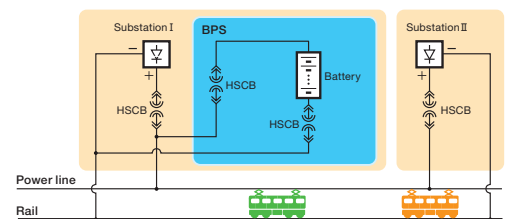
### High Efficiency

No loss through controllers

### No EMI

No adverse effects to signal systems

#### System Outline



\* HSCB= High Speed Circuit Breaker

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