Introduction

After the Great East Japan Earthquake hit, there has been a demand to further conserve energy and use power more efficiently. Meanwhile, more and more backup mechanisms that can supply necessary power even after earthquakes and other natural disasters have been introduced.

1 Outline of the system

BPSs have the effect of conserving energy by making effective use of regenerative energy. However, we have an increasing number of projects in which BPSs are used to supply electricity to trains for travel when the power supply from power companies cuts off.

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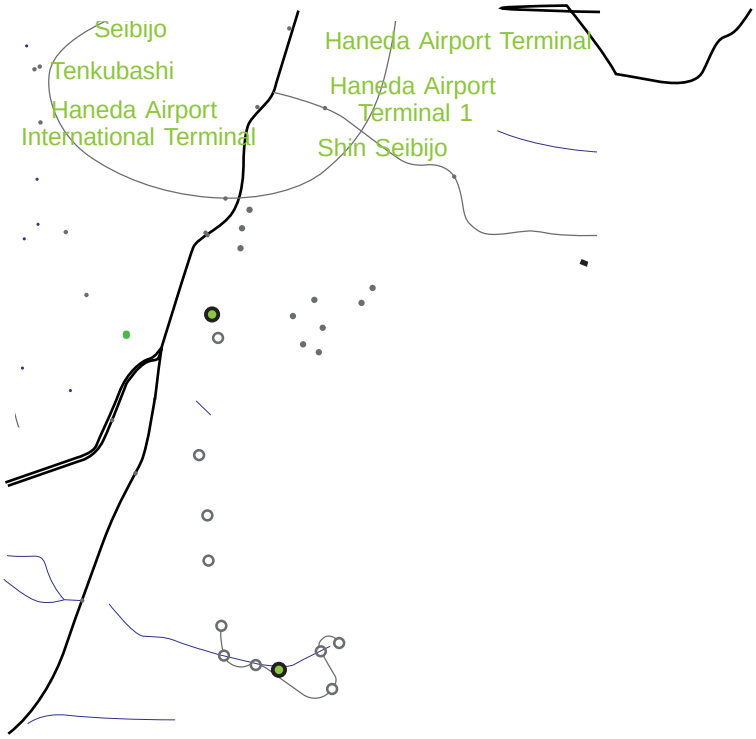

to run to the closest stations. The single BPS in each of the substations consists of two GIGACELL units. A single unit consists of 20 modules. The systems require no power conditioners, so they are directly connected to the feeders. The Shinagawa substation is located underground, so BPS and all other units related to it have been installed indoors. For the Tamagawa substation, only the storage battery board has been installed outdoors due to limited space in the substation.

Table 1 shows the specifications of the BPS installed in each substation. The BPSs delivered to Tokyo Monorail Co., Ltd. this time store regenerative energy from electric trains into high-capacity batteries to stabilize the voltage of the feeders. They use such stored electricity to operate other trains at the time of powering, which allows electricity to be used effectively and in turn possibly allows energy to be saved.

These systems are always monitored by the BPS monitoring and controlling function. If an error occurs, it is displayed on the master unit (monitor) of the BPS monitoring and control panel and alarm signals are sent to the electric power dispatch office in Showajima. In addition, the remote monitoring system displays the error on the remote monitoring device in our company. Figure 2 shows a BPS monitoring screen.

Table 1 BPS specifications

Battery type	Nickel metal–hydride battery
Rated voltage [V]	720
Rated capacity [kWh]	203
Battery module configuration	20 in series and 2 in parallel

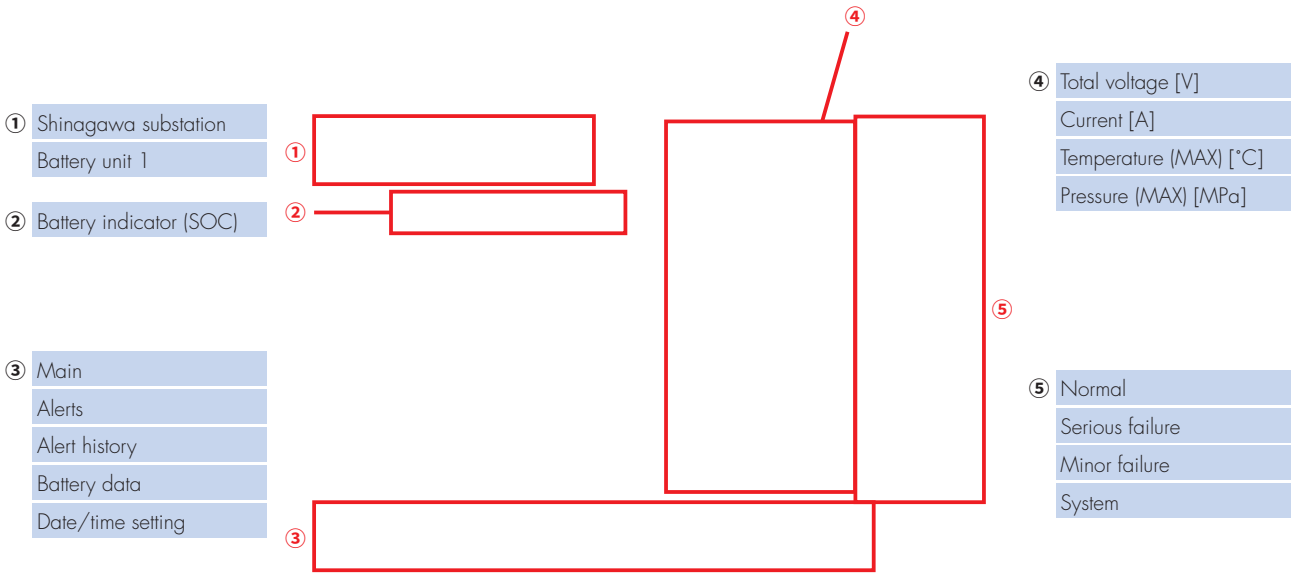

Fig. 2 BPS monitoring screen

2 Features

Figure 3 (a) is a photograph showing the appearance of the GIGACELL. Figure 3 (b)

As characteristics of the GIGACELL, internal resistance is large and its voltage remains almost constant throughout the wide-ranging state of charge (SOC), so the GIGACELL can be directly connected to feeders. The features of the GIGACELL are shown below.

- Does not require choppers that artificially create a certain level of voltage and current from supplied power

and other control devices, which can reduce costs for introducing them and footprint.

- Its charging and discharging is highly efficient because it has no control devices that cause efficiency loss.
- Capable of reducing power loss because there is no delays in recovering regenerative energy.
- Does not adversely affect signaling systems (e.g. does not cause electromagnetic interference) because it does not generate noise.
- Allows electricity used to be reduced throughout all

(2) Compensating feeding (total travel distance)

If all trains are to run to the closest stations during the morning rush hour for which the schedule is tightest, the estimated total distance is approximately 17 km. On the other hand, the total travel distance for which trains can run only by the BPSs is 25 km and that greatly exceeds the estimated distance of 17 km.

After the BPSs were delivered, Tokyo Monorail Co., Ltd. checked the effects of simultaneous operation and compensating feeding (total travel distance) above.

Conclusion

We will propose and deliver BPSs that can contribute to safety and energy conservation to railway companies in Japan and overseas.

We express our gratitude to Tokyo Monorail Co., Ltd. for adopting the BPSs and providing operation data.

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