

Fully Automated Control System for Grid-Scale Energy Storage Station sEMSA-ESS

1. Overview

With the expanding introduction of renewable energy (hereinafter referred to as “renewables”), stabilizing the power grid and securing balancing capacity have become critical challenges. Grid-scale storage batteries are being introduced as equipment that contributes to stable grid operation by charging during renewable energy surplus and discharging during supply-demand tightness. Their operation requires an energy management system (EMS) that coordinates with markets and controls multiple sites.

Sumitomo Electric’s EMS, Sumitomo Energy Management System Architecture (sEMSA), has been delivered to a wide range of aggregators as a virtual power plant (VPP) system responsible for power supply-demand balancing, building a strong track record. As a new addition to the sEMSA product lineup, we have begun offering the Energy Storage Station (sEMSA-ESS) for grid-scale storage batteries. This system formulates charge/discharge plans based on electricity market information and battery status, and automatically controls multiple storage stations to enable integrated operation supporting multiple markets and multi-site management for grid-scale storage batteries.

2. Background

Driven by institutional developments such as the balancing market and capacity market, grid-scale storage batteries are expected to serve as resources for supply-demand adjustment of the power grid and as a means for operators to generate revenue across multiple markets. However, utilizing grid-scale storage batteries for these purposes requires more than just equipment installation. A system is needed that formulates charge/discharge plans based on trading data and instructions from each market, and controls and monitors the equipment according to those plans. Furthermore, as the number of storage stations increases, a framework is required that enables centralized visibility across multiple sites and supports both the introduction and operation of the entire system composed of multiple devices, including storage batteries, power conversion systems (PCS), and substation equipment.

3. New Product Introduction

3-1 Overview of sEMSA-ESS

Sumitomo Electric’s sEMSA series consists of sEMSA-AC, which links with electricity trading market systems; sEMSA-ESS, which formulates operational plans for grid-scale storage batteries; and sEMSA-FactoryLite, installed at each storage station to control and measure local equipment. This integrated system realizes seamless market linkage through to on-site operation (Fig. 1). Among these, sEMSA-ESS functions as a Resource Aggregator (RA) server, formulating charge/discharge

plans based on grid-scale storage battery status and electricity market information, and enabling multi-use operation across multiple markets and efficient management of multiple sites.

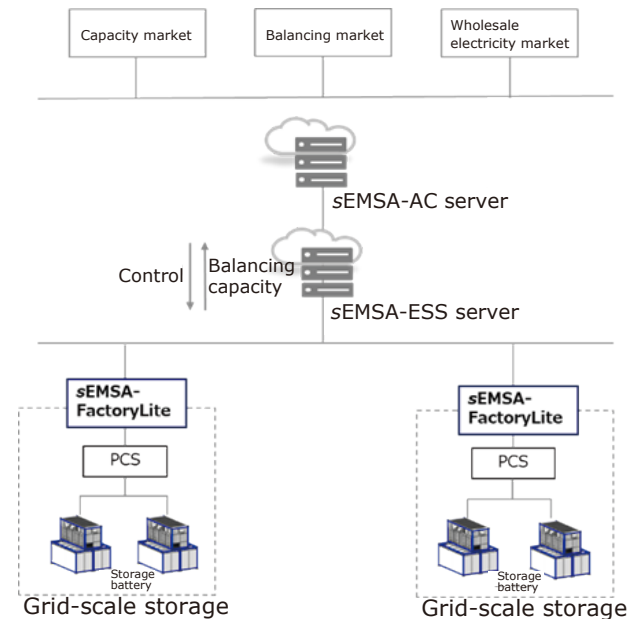


Fig. 1. System configuration diagram of sEMSA for grid-scale storage batteries

3-2 Features of sEMSA-ESS

(1) Multi-use operation supporting multiple markets

To maximize the utilization of grid-scale storage batteries, sEMSA-ESS realizes multi-use operation across multiple electricity markets. Such operation requires formulation and monitoring/control of complex charge/discharge plans that meet varying control requirements depending on each market and product. sEMSA-ESS is equipped with algorithms that automatically calculate charge/discharge plans tailored to the requirements of each market and product, leveraging insights gained from past demonstrations and commercial operations. Specifically, sEMSA-ESS formulates operational plans that accommodate products requiring minute-level responses based on market award data and dispatch instructions from markets, products requiring responses within seconds for frequency regulation, and operations that switch between charging and discharging according to conditions. sEMSA-ESS automatically controls battery systems across multiple sites on a minute-by-minute basis. Additionally, the system features a real-time web browser display of each site’s status (SoC, alarms, actual operating data, etc.), effectively supporting site monitoring and providing useful information for bidding decisions.

Table 1. Markets and products supported by sEMSA-ESS

Market	Product
Capacity market	Main auction, etc.
Wholesale electricity market (JEPX)	Day-Ahead Market Intraday Market
Balancing market	Primary Reserve Secondary Reserve 1 Secondary Reserve 2 Tertiary Reserve 1 Tertiary Reserve 2
Other	Bilateral transaction

(2) Control and integrated management of multiple storage stations

As the number of storage stations grows with business expansion, checking each site individually becomes time-consuming and the operational burden increases, resulting in significant challenges. sEMSA-ESS enables centralized management of operational data from multiple storage stations, allowing operators to view and compare SoC and operating status across sites. This helps rapidly identify storage stations requiring urgent response, such as those with low SoC or equipment alarms, improving daily operational efficiency. Moreover, the system facilitates easy addition of new sites to sEMSA-ESS, providing an operational platform that supports phased expansion in line with business growth.

Table 2. Main functions of sEMSA-ESS

Function name	Overview
Integrated management function	Integrated monitoring of multiple sites and addition of new sites
Automatic control function	Automatic calculation of charge/discharge plans tailored to each market product
Monitoring function	Monitoring and web-based display of battery SoC, alarms, and operating status
Data storage function	Collection and storage of data at one-minute and one-second intervals

(3) Comprehensive support from introduction to operation

Grid-scale storage battery operation requires multiple functions including market coordination, plan formulation, and local control. When configured with products from different manufacturers, significant time and effort may be required for interface adjustments between systems. sEMSA-ESS can be introduced with interfaces already aligned with sEMSA-AC and sEMSA-FactoryLite, enabling smooth operational startup without interface adjustments (Fig. 2). Furthermore, necessary hardware for the grid-scale battery business, such as PCS and substation equipment, can be supplied by Nissin Electric Co., Ltd., one of our Group companies. The Sumitomo Electric Group can provide one-stop consultation and implementation support covering everything from hardware to software. After operation starts, we provide continuous support including handling inquiries and providing functional updates in response to changes in market rules and regulatory frameworks.

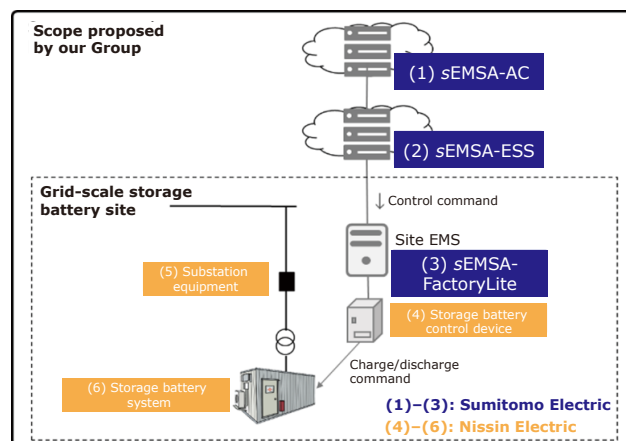


Fig. 2. Scope of the Sumitomo Electric Group's offerings in the grid-scale storage battery business

4. Conclusion

As grid-scale storage batteries become more widespread, operational plans accommodating multiple markets and efficient management of multiple sites are playing critical roles in ensuring sustainable business operations. sEMSA-ESS responds to these operator needs by realizing fully automated control and integrated management of multiple storage stations and is already in commercial operation with multiple operators. Moving forward, we will expand solutions not only for grid-scale storage batteries but also to meet the growing needs for batteries co-located with renewables and battery storage installed at customer premises.

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