

Energy
Green Energy & Mobility

#Co-creation and Open Innovation #Sustainability #Generative AI #Digital twins/Simulation #IoT/Data Utilization #Digital Solutions #Energy

1. One-stop Solution for Accelerating Customer Decarbonization

While the social importance of decarbonization continues to grow, companies face challenges in making investment decisions for CO₂ reduction equipment if their efforts to cut emissions do not effectively appeal to the market.

Hitachi Power Solutions Co., Ltd. offers a one-stop solution in collaboration with Earth hacks & Co., Ltd. that supports the planning and implementation of CO₂ reduction measures, quantifies the achievements, and promotes them effectively.

Hitachi Power Solutions analyzes energy consumption and facility operation status at customer sites through Energy & Facility Management as a Service (EFaaS),*1 developing and implementing measures to reduce CO₂ emissions and operational costs. Earth hacks visualizes the contribution to decarbonization by quantifying the achieved CO₂ reductions using the “Decarbo Score”.*2 This helps promote customers’ products and services by showcasing their decarbonization efforts to consumers.

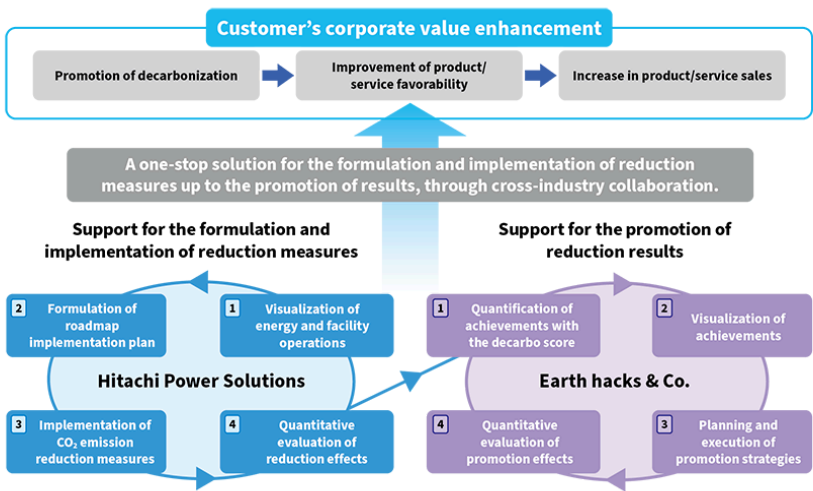
This collaboration between engineering and advertising industries enhances the added value of products and services offered by customers in the manufacturing and distribution sectors, thereby contributing to improvements of customers’ corporate value.

(Hitachi Power Solutions Co., Ltd.)

*1 A service that combines energy management and facility management, digitally overseeing the entire operation to enable energy-efficient equipment operation, high-efficiency utilization, and CO₂ reduction. This environmentally conscious approach to management also facilitates long-term operational optimization and streamlines related tasks.

*2 A metric provided by Earth hacks that displays CO₂ emissions over the entire lifecycle of environmentally conscious products and services, comparing them with traditional materials and methods and showing reduction rates.

[1] Roles of Both Companies in Enhancing the Customer’s Corporate Value



2. Reduction of CO₂ Emissions and Construction of Decarbonization Models

As the social importance of decarbonization activities increases, Hitachi Power Solutions has introduced the first off-site physical corporate Power Purchase Agreement (PPA)*1 in Japan within the Hitachi Group as part of its efforts toward the reduction of CO₂ emissions and the construction of decarbonization

models.

In this initiative, Mitsubishi HC Capital Energy Inc. has installed a solar power plant on idle land at Hitachi Ltd.'s facility in Hitachi City, Ibaraki Prefecture. The electricity generated from renewable energy (hereinafter referred to as "renewable energy power") is transmitted through the general transmission network to Hitachi Power Solutions' Katsuta Office, located approximately 23 km away in Hitachinaka City. This renewable energy power is procured by Hitachi Ltd. at a stable price from TEPCO Energy Partner, Inc., a retail electricity provider, and is fully allocated to Hitachi Power Solutions' Katsuta Office. It has been operating since February 2025.

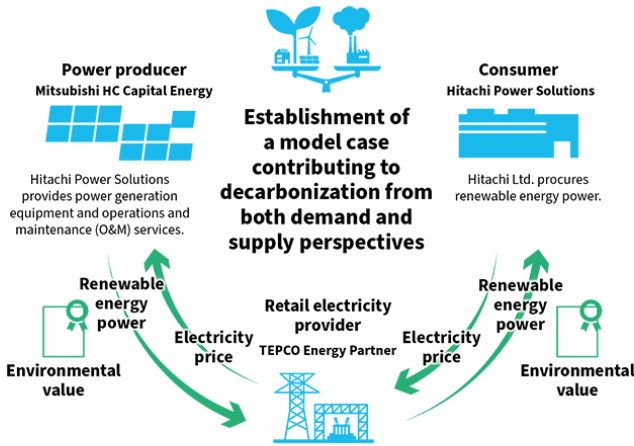
This initiative is expected to reduce approximately 1,100 tons of CO₂^{*2} annually, and will deploy the decarbonization model as an effective solution that meets the needs of society and the environment.

(Hitachi Power Solutions Co., Ltd.)

*1 A power purchase agreement for renewable energy between power producers and consumers.

*2 The Hitachi Group's reference value for fiscal year 2023, calculated using a CO₂ emission factor of 0.43 tons of CO₂/MWh.

[2] Image of the Introduction of Off-site Physical Corporate PPA



O&M: operation and maintenance

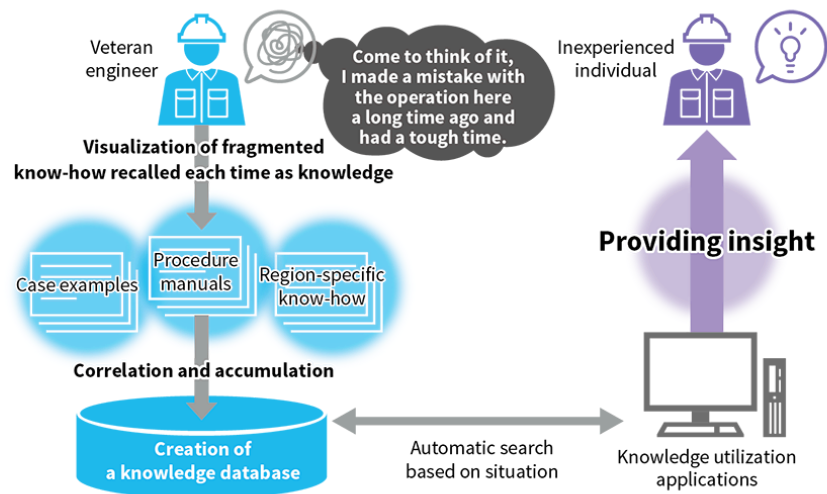
3. Support for Equipment Maintenance and Management through Digitalization of Equipment Structure, History, and Operational Know-how

In infrastructure equipment management, the aging of skilled workers involved in maintenance is progressing, creating an urgent need for technology transfer. Hitachi Power Solutions is addressing this challenge by developing a knowledge base construction technology utilizing its patented structured identifier management technology (SIMT). In addition to providing maintenance support tools, the company has also been solving issues related to technology transfer.

Furthermore, Hitachi Power Solutions is currently visualizing the know-how (tacit knowledge) of veteran engineers as knowledge (explicit knowledge) and developing systems for a usable knowledge base. These systems are integrated with a connect center that collaborates with remote maintenance personnel and a portal site that field engineers can use on-site. In the future, Hitachi Power Solutions plans to add and consolidate knowledge as content within the system, linking it with various types of information. By creating screens that enable troubleshooting and extracting necessary information from the accumulated knowledge when needed, the company aims to provide high-level support for management tasks that require 24/7/365 availability.

(Hitachi Power Solutions Co., Ltd.)

[3] Visualizing the Know-how of Veteran Engineers as Knowledge



4. Site Remix for Optimizing Spare Part Management for Production Equipment

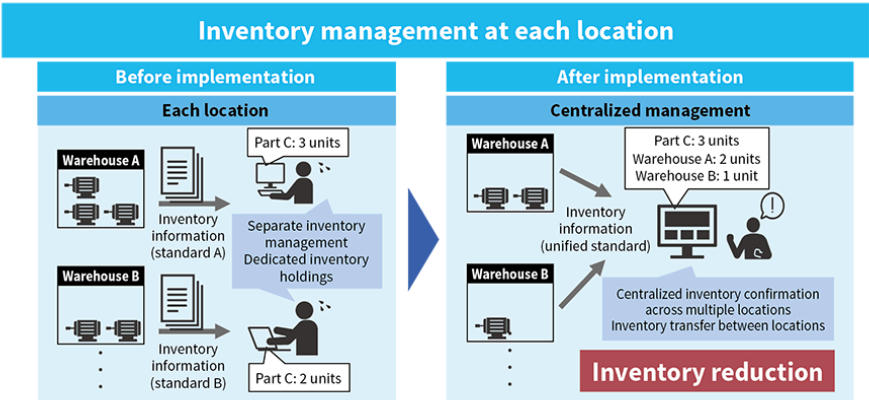
In the manufacturing industry, the management of production equipment is extremely important. A certain manufacturing company has been undertaking various initiatives to solve the challenges of improving production efficiency and optimizing costs for equipment maintenance.

Against this background, the company adopted the part management system of Hitachi Power Solutions' maintenance support solution, "Site Remix," at 25 of the company's factories. As a result, it became possible to centrally manage inventory parts that were previously managed individually at each factory, leading to better visibility of inventory and cost reduction. In particular, even during the semiconductor shortage period, this enabled rapid part supply, thereby contributing to improved reliability.

In the future, by offering mid to long-term planning services, Hitachi Power Solutions aims to promote the use of Site Remix as a comprehensive maintenance management tool that supports the reduction of manufacturing overhead costs and the improvement of cost competitiveness. Additionally, with expansion to the customer's group companies in mind, Hitachi Power Solutions will pursue more accurate part management and aim to become the main system for maintenance management while continuing to develop mechanisms for further improvement.

(Hitachi Power Solutions Co., Ltd.)

[4] Part Management System for Inventory Management



5. Battery Energy Storage System for Electricity Market Trading

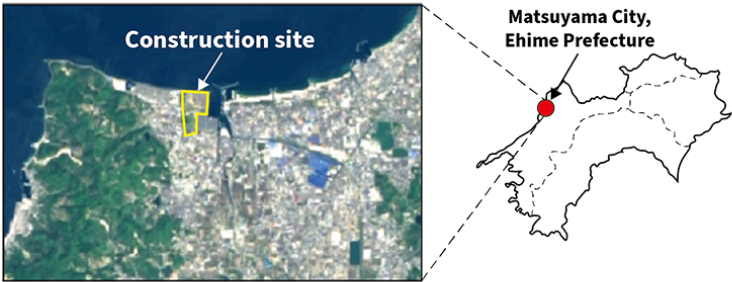
In July 2023, Hitachi, Ltd. received an order from Matsuyama Mikan Energy LLC for a complete grid battery energy storage system for the newly established Matsuyama Battery Energy Storage System in Matsuyama City, Ehime Prefecture.

Hitachi, Ltd., together with Hitachi Energy and Hitachi Power Solutions, will provide a complete battery energy storage system utilizing Hitachi Energy's "e-mesh PowerStore," a battery energy storage system with a proven global track record.

The Matsuyama Storage Plant is a battery energy storage system directly linked to a 66 kV power grid. It can participate in power trading within the supply-demand adjustment market (covering all products: primary, secondary 1 and 2, and tertiary 1 and 2), the Japan Electric Power Exchange (spot and intraday markets), and the capacity market.

Leveraging this order as a starting point, the Hitachi Group will support the transition to renewable energy as a primary power source in Japan while ensuring a stable power supply by providing battery energy storage systems with comprehensive support from design to maintenance.

[5] Matsuyama Battery Energy Storage System Installation Site

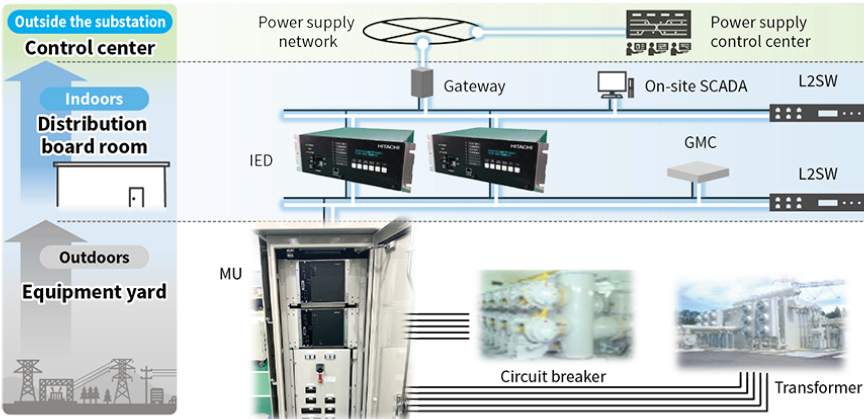


6. Full-digital Substation Network Technology for Protection and Control Systems

In recent years, there have been ongoing discussions in Japan regarding the introduction of domestic full-digital substation systems applying the international standard IEC 61850 for protection and control systems (hereinafter referred to as "full-digital substation systems"). In conventional protection and control systems, control cables are used for interfacing with substation equipment. However, in a full-digital substation system, intelligent electronic devices (IEDs), which perform computational processing, and merging units (MUs), which are input-output conversion devices, are used instead. A layer 2 switch (L2SW) is employed as an interface between the MU and IEDs, and an optical network is set up between them in the vicinity of the substation equipment. This approach significantly reduces the amount of control cabling and enables the handling of large volumes of data, making it possible to create new value.

On the other hand, the adoption of optical networks has raised new challenges, including the need to meet strict communication delay requirements for protection and control systems, as well as ensuring reliability in the event of network failures. Therefore, based on engineering expertise in protection and control systems, efforts are being made to define network requirements and design systems using network technologies such as quality of service (QoS) to guarantee communication quality and parallel redundancy protocol (PRP), a redundancy protocol for communication paths. This approach aims to ensure the development of a highly reliable full-digital substation system.

[6] Full Digital Substation System



SCADA: supervisory control and data acquisition
GMC: grandmaster clock

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