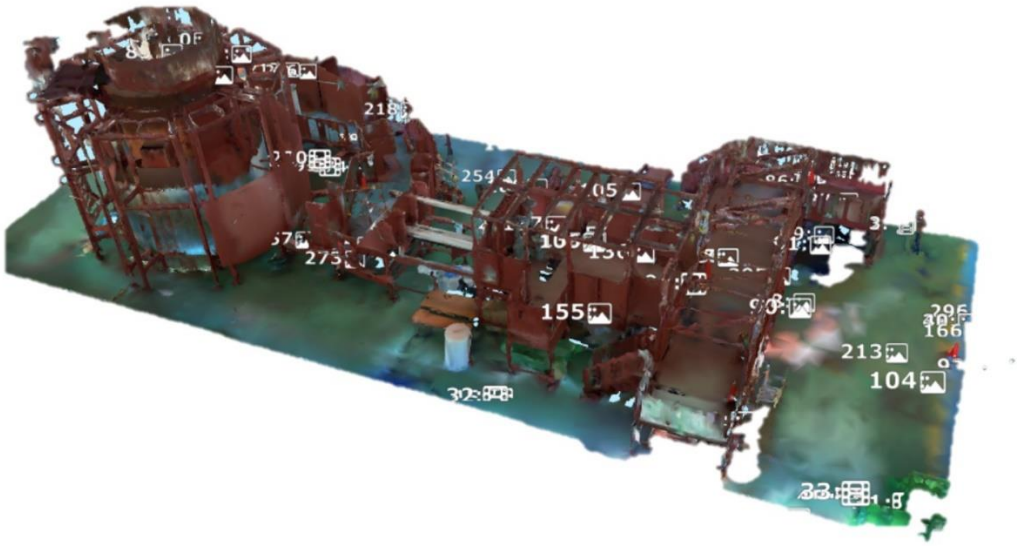
News Release

HITACHI
Inspire the Next

FOR IMMEDIATE RELEASE

Hitachi develops Worksite-Augmenting Metaverse, a fusion of worksite data-collection technology and generative AI

Improved operational efficiency verified in the relocation work of a full-scale model of a nuclear power plant, showing potential for implementation in diverse industrial fields



Full-scale model of a structure in a nuclear power plant replicated in a metaverse space*1 (aerial view)

*1 Built with a grant from the Agency for Natural Resources and Energy

Tokyo, December 18, 2023 – Hitachi, Ltd. (TSE: 6501, "Hitachi") has been engaged in the development of metaverse technology to expedite worksite operations and improve information sharing and consensus building between stakeholders off-site (design, quality assurance, management, etc.) and on-site (construction, manufacturing, etc.) in construction, manufacturing, and maintenance worksites in the energy and transportation sectors. Hitachi is pleased to announce Worksite-Augmenting Metaverse ("the technology"), a fusion of technologies developed over the past years, for the application in industrial sectors.

Hitachi has applied the technology in the relocation work of a full-scale model of a nuclear power plant (a "mock-up") in collaboration with Hitachi-GE Nuclear Energy, Ltd. ("Hitachi-GE Nuclear Energy") and Hitachi Plant Construction, Ltd. ("Hitachi Plant Construction"). Hitachi has confirmed that the technology is effective in improving operational efficiency, without the need for special digital equipment, by reducing backtracking due to interdepartmental knowledge gaps as well as shortening waiting time for the completion of other tasks.

Hitachi-GE Nuclear Energy and Hitachi Plant Construction will apply the technology to improving operational efficiency and safety, knowledge transfer and upskilling of workforce at nuclear power plants. Furthermore, Hitachi will contribute to the sustainable operation and management of global social infrastructure by collaborating with clients across a broad range of industrial sectors to improve worksite efficiency.

■ Research background

For worksites in the construction and manufacturing industries, as well as the social infrastructure, ensuring sustainable operation and maintenance hinges on sharing the expertise of skilled workers and streamlining maintenance and management so that limited workforce can perform the necessary tasks. These needs have spurred the development of digital twins and the use of generative AI across the globe. In contrast to the IT field, where most work takes place in cyberspace and the acquisition of operational data is relatively easy, there is room for improvement in the collection and use of operational data in industries where handling of actual objects at worksites is involved. Moreover, industry needs mechanisms not only to gather data but also to tie data back to spatial information of objects, such as where the data comes from and what facilities or equipment it relates to. Another vital element is a platform that enables stakeholders in remote locations to view and discuss collected data in real time. Unfortunately, there is a variety of reasons that inhibit the introduction of such mechanisms, such as difficulties in collecting large amounts of operational data, having data linked to the actual objects, efficiently accessing desired data from large volumes of data, and preparing necessary high-end hardware to view the data, including high-performance PCs, dedicated software, and virtual-reality (VR) goggles, along with the workforce who are able to use them.

Hitachi's answer to these problems is the metaverse technology, which enables users in remote locations to share the same virtual space, engage in conversations, and collaborate while viewing the same objects virtually. Leveraging the accumulated expertise in developing digital solutions for diverse industrial fields, Hitachi has established the metaverse space where a worksite can be rapidly replicated as a platform to build up and visualize the associated data by using AI technologies including generative AI, which allows even the customers unfamiliar with digital technologies to efficiently utilize data.

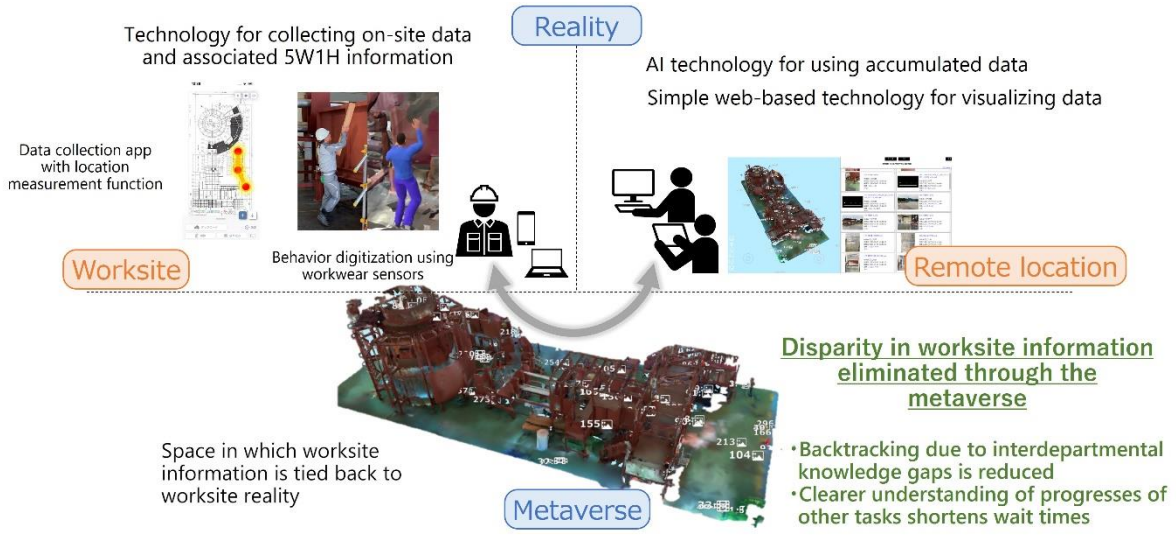
■ Features of the technology

The name "Worksite-Augmenting Metaverse" reflects its ability to make the worksite visible and intuitive, even to remotely located stakeholders. While in the past, physical limitations have made it impossible for off-site workers to attain a clear picture of site conditions, Worksite-Augmenting Metaverse removes those limitations by augmenting the worksite in a virtual space. The three key features of the technology are as follows.

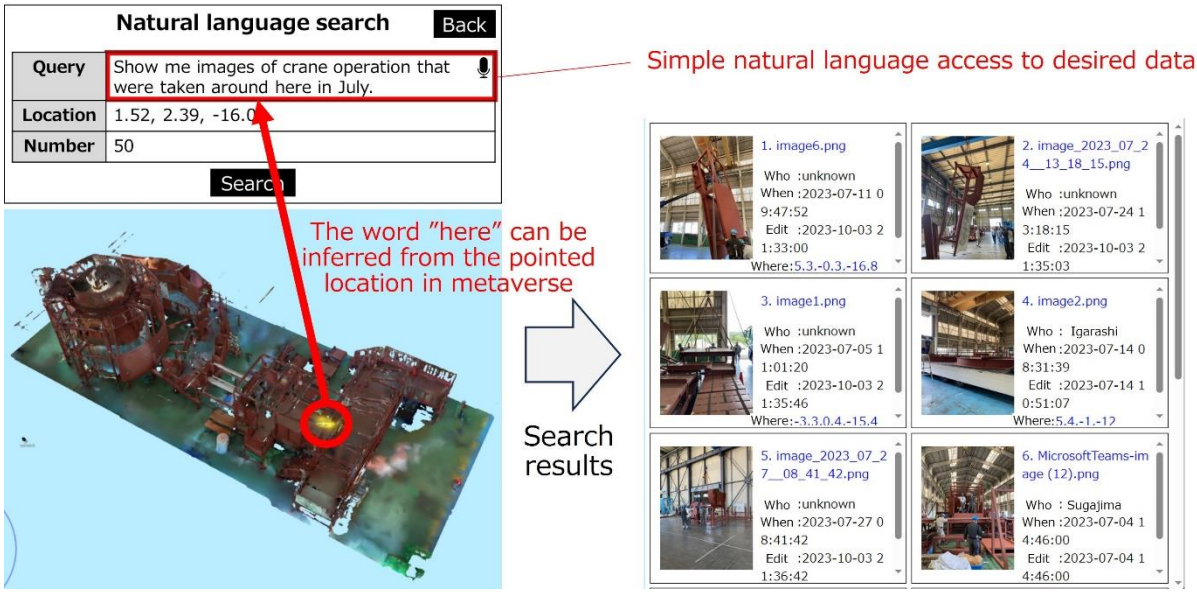
- Technology to rapidly gather worksite data and associated 5W1H[*2] information
  Hitachi has developed workwear sensors and smartphone apps that automatically identify where the data is acquired from and then easily and efficiently collect different types of data (images, videos, documents, sound, IoT data, etc.) about objects and people with associated 5W1H information.
  *2 When, where, who, what, why, how

- AI technologies for using accumulated data
  Large amounts of data accumulated with the above technology are analyzed via AI. The desired data can be rapidly accessed using keywords relating to 5W1H information and data types in a metaverse space, and generative AI can be used to extract the necessary information in a dialogue format.

- Simple and lightweight web-based technology for visualizing data
  Interaction with the metaverse as well as the accumulated data can be done on web browsers, a laptop, a smartphone, or similar devices without the need for expensive digital equipment, specialized devices, or dedicated software, meeting the needs for customers who are unfamiliar with digital technology.



Worksite-Augmenting Metaverse in actual construction work (ex.)



AI technology for using accumulated data

■ Verification of the technology's effectiveness

Hitachi, Hitachi-GE Nuclear Energy, and Hitachi Plant Construction collaborated in using a prototype of the technology in July through August 2023 for the relocation of a nuclear power plant mock-up. The three companies confirmed that remotely located stakeholders were able to share information and build consensus as much as those on on-site conditions using the prototype. In the relocation project, stakeholders used the prototype to convene daily remote evening meetings that would normally occur on-site. At the meetings, on-site conditions are visualized without the need for VR goggles, high-performance computers, or other specialized digital equipment. The companies also confirmed the technology's effectiveness in improving operational efficiency. For example, the technology enabled the timely issuance of drawings and efficient plan making based on on-site conditions, as interdepartmental knowledge gaps

were significantly reduced.

■ Future use

Hitachi will further verify the effects of the technology in collaboration with customers in energy, transportation, and other sectors to contribute to the sustainable operation and management of the global social infrastructure by improving the efficiency of worksite operations.

Hitachi-GE Nuclear Energy and Hitachi Plant Construction consider the technology as an extension of the important “three realities principle[*3] and will utilize it in various operations at nuclear power plants. For instance, the companies will be able to replicate worksites in a metaverse and use the space to log a variety of information about equipment specifications, operators, and projects, thereby ensuring a better understanding of actual on-site conditions. That will in turn enable safe and efficient execution of nuclear and other large-scale projects. Customers will also be readily able to confirm work plans and progress through shared replicated worksite in the metaverse and the relevant accumulated data. The technology will also benefit knowledge transfer and upskilling, which are important issues in the nuclear industry. By enabling experienced personnel to teach while looking at a worksite replicated in the metaverse, the system will help learners acquire knowledge and expertise more effectively.

*3 A concept that emphasizes awareness of reality by looking at real things in real worksites

- End

About Hitachi, Ltd.

Hitachi drives Social Innovation Business, creating a sustainable society through the use of data and technology. We solve customers' and society's challenges with Lumada solutions leveraging IT, OT (Operational Technology) and products. Hitachi operates under the business structure of “Digital Systems & Services” - supporting our customers’ digital transformation; “Green Energy & Mobility” - contributing to a decarbonized society through energy and railway systems, and “Connective Industries” - connecting products through digital technology to provide solutions in various industries. Driven by Digital, Green, and Innovation, we aim for growth through co-creation with our customers. The company’s consolidated revenues for fiscal year 2022 (ended March 31, 2023) totaled 10,881.1 billion yen, with 696 consolidated subsidiaries and approximately 320,000 employees worldwide. For more information on Hitachi, please visit the company's website at https://www.hitachi.com.

About Hitachi-GE Nuclear Energy, Ltd.

Hitachi-GE Nuclear Energy, as it pursues the construction of nuclear power generation facilities with a higher level of both reliability and safety, conducts operations in their entirety through a consistent organizational structure. This structure encompasses the planning and design of nuclear systems, the manufacture of main equipment, the construction of power generation plants, and the repair/maintenance of operating plants. Moreover, we actively support the use of cutting-edge technologies by promoting the implementation of advanced boiling water reactors (ABWR), robotics, and the construction and development of new materials and radioactive-waste disposal systems. For more information on Hitachi-GE Nuclear Energy, please visit the company’s website at https://www.hitachi-hgne.co.jp/en/index.html.

About Hitachi Plant Construction,Ltd.

Hitachi Plant Construction builds and connects the social and industrial infrastructure essential to people's lifestyles by delivering clean power plants without CO_2 emissions, substations broadly providing power from those plants, railroad equipment supporting society using that energy, and other equipment through engineering, construction, and services.

For more information on Hitachi Plant Construction, please visit the company's website at http://www.hitachi-plant-construction.co.jp.

Media Contact:
Hitachi, Ltd.
Research & Development Group
https://www8.hitachi.co.jp/inquiry/hitachi-ltd/hqrd/news/en/form.jsp

Hitachi-GE Nuclear Energy, Ltd.
https://www8.hitachi.co.jp/inquiry/hitachi-ltd/pi/energy/general/en/form.jsp

Hitachi Plant Construction,Ltd.
https://www8.hitachi.co.jp/inquiry/hitachi-plant-construction/en/general/form.jsp

---

Information contained in this news release is current as of the date of the press announcement, but may be subject to change without prior notice.
