News Release

HITACHI

Hitachi develops world's first insulated piping technology for 10 kV-class hydrogen production systems; successfully completes a dielectric withstand test

New technology reduces electrolyser footprint by up to 50%, enabling hydrogen production in urban areas and space-constrained existing plants

Tokyo, February 25, 2026 Hitachi, Ltd. (TSE:6501, "Hitachi") has developed the world's first[*1] insulated piping technology for electrolyser systems (hydrogen production systems) that is compatible with 10 kV-class (medium-voltage; commonly referred to as "high-voltage" in Japan) operation and successfully completed a dielectric withstand test using a prototype system. Applying proprietary insulated piping technology that leverages its expertise in high-voltage inverters and composite materials, Hitachi confirmed that no abnormalities, such as dielectric breakdown or leakage, occurred under 10 kV-class conditions in the presence of both hydrogen gas and water.

In conventional electrolysers, medium- to high-voltage grid power is stepped down in stages to low-voltage levels using power transformers, and the electrolyser stack[*2] is driven at voltages below 1 kV to produce hydrogen. With this newly developed technology, the stack can be supplied directly with 10 kV-class voltage, significantly reducing the number of power transformers required for voltage conversion. As a result, this technology is expected to reduce the installation footprint of electrolysers by up to 50%. Increased system design flexibility will broaden options for distributed deployment and enable flexible system installation tailored to conditions at individual sites. This will be particularly beneficial in urban areas by enabling limited space to be utilized more effectively. It will also help facilitate the phased introduction of hydrogen at existing plants in the steel, petroleum, and chemical industries by making efficient use of available space.

Going forward, Hitachi will work to develop and demonstrate this technology on large-capacity systems in the MW-class (megawatt-class) and above through collaboration with domestic and international partners and research institutions. In addition to deploying this technology in urban areas, Hitachi will expand the scope of application to a diverse range of sites, including renewable energy power plants, industrial zones, and manufacturing bases, contributing to the widespread adoption of green hydrogen[*3] and the realization of a carbon neutral society.

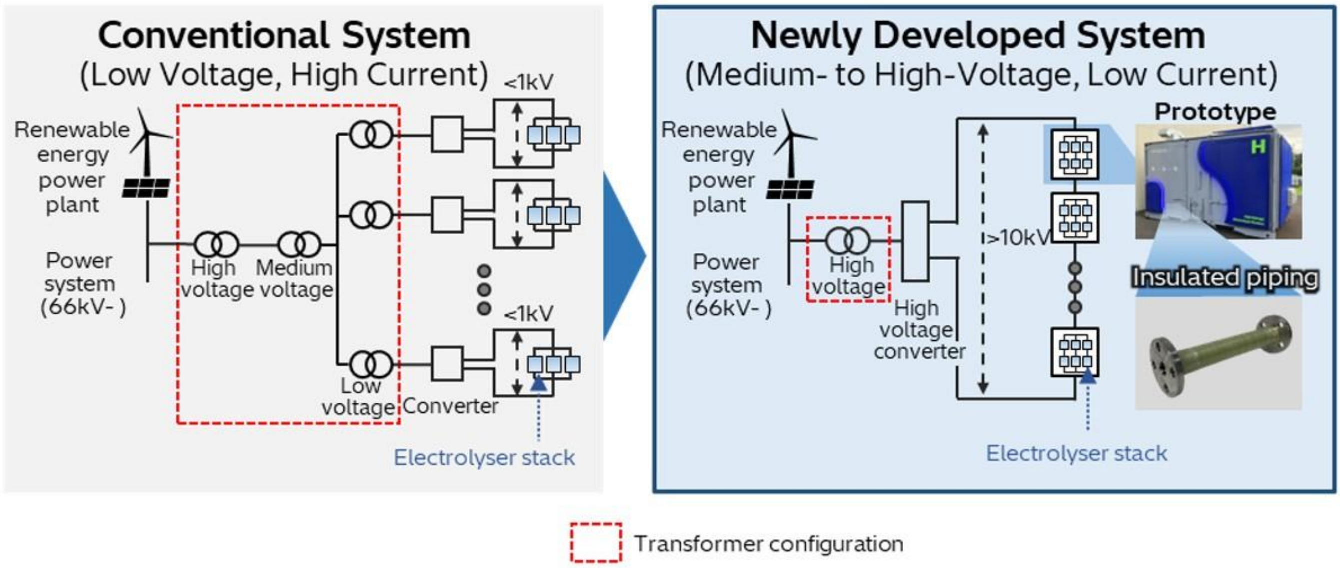

Figure 1. Comparison of a conventional electrolyser and Hitachi's newly developed system

*1 World's first: Based on a prior-art search conducted by a patent firm, no prior examples were identified, within the scope confirmed by Hitachi, of "insulated piping" for 10 kV-class electrolysers that can be used in mixed hydrogen gas/water environments and that possesses pressure resistance, heat resistance, corrosion resistance, and hydrogen gas barrier properties (survey by Hitachi; survey date: August 2025; scope of survey: patent information on domestic and overseas inventions published or registered in Japan). The "world's first" claim refers to 10 kV-class electrolysers. Application to higher-voltage classes will be pursued going forward.

*2 Electrolyser stack: A device in which multiple electrolysis cells are stacked and supplied with a direct current to split water into hydrogen and oxygen.

*3 Green hydrogen: Hydrogen emits no CO_2 at the point of use and can be utilized in a variety of industrial applications. Green hydrogen refers to hydrogen manufactured through methods with extremely low greenhouse gas emissions, such as water electrolysis using electricity derived from renewable energy.

Background and issues

In recent years, a number of hydrogen-related projects have advanced, supported by government policies in several countries. The market is now transitioning from the concept stage to implementation, with practical considerations underway tailored to specific applications and regions. Demand for hydrogen is expanding, particularly as a means to achieve carbon neutrality in industrial processes such as steel and chemical production where direct electrification is difficult, as well as for use as an industrial feedstock, including as a raw material for chemicals. In addition, hydrogen is increasingly being adopted for small-scale applications in order to enhance sustainability and added value. In particular, there are expectations that green hydrogen produced using renewable energy-derived electricity can enable surplus renewable electricity to be utilized effectively as well as serve as a means of balancing supply and demand in the power grid.

Features of the technology and solutions developed to address the issues

Hitachi developed the insulated piping required to make 10 kV-class electrolysers feasible by leveraging its wealth of expertise in high-voltage inverters and insulation technologies, including piping material design. A major challenge during development was selecting composite materials capable of simultaneously satisfying multiple performance requirements in addition to insulation, such as pressure resistance, heat resistance, corrosion resistance[*4], and hydrogen gas barrier properties[*5]. To address this challenge, Hitachi measured and evaluated the characteristics of each material, such as insulation resistance and gas permeability, and derived the optimal material composition based on accumulated test results. Through these efforts, Hitachi achieved both outstanding insulation performance and mechanical strength—which had proven difficult to realize in conventional ceramic piping—and successfully developed insulated piping that can be safely used in 10 kV-class environments.

*4 Corrosion resistance: Resistance to electrolytic corrosion and the ability to maintain performance over long-term use.
*5 Gas barrier properties: The ability to prevent gases such as hydrogen from permeating through the material.

In testing using a prototype unit, a voltage of 10 kV was applied to the piping section, and actual operating conditions were simulated, with both hydrogen gas and water present. These tests confirmed that no abnormalities such as dielectric breakdown or leakage occurred during operation. Going forward, Hitachi will further evaluate the durability and long-term reliability of this new technology in order to achieve safe, reliable electrolyser operation—an accomplishment that had previously proven difficult in medium- to high-voltage operation—enabling stable hydrogen production over extended periods.

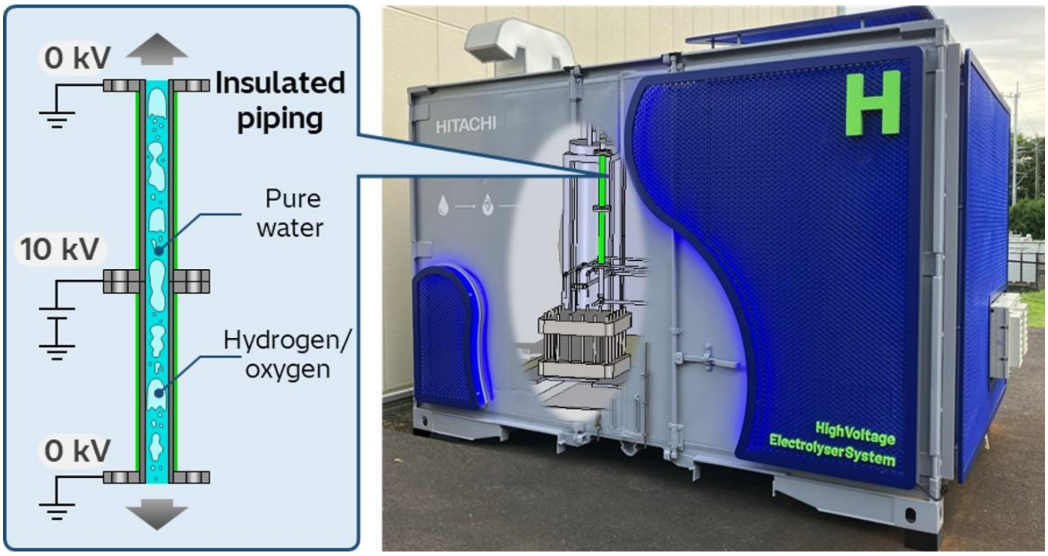

Figure 2. Detailed view of the newly developed insulated piping

Future outlook

Based on the demonstration results obtained during this trial, Hitachi will proceed with the phased system verification of medium- to high-voltage operation, including electrolyser stacks, and accelerate efforts toward the commercial deployment of MW-class and larger electrolysers. Hitachi will also progressively integrate functions to support supply–demand balancing in power grids with large-scale renewable energy integration by utilizing the power control performance of high-voltage power converters. In the future, Hitachi aims to integrate data obtained from medium- to high-voltage electrolysers with the domain knowledge it has cultivated through plant and power system operation, and develop this technology into one of the core technologies of "HMAX by Hitachi," a suite of next-generation solutions that brings the power of AI to social infrastructure. Going forward, Hitachi will continue striving to maximize the value of electrolysers by providing digital services such as optimized operations and predictive maintenance. Through these initiatives, Hitachi will contribute to the widespread adoption of green hydrogen and the realization of a carbon neutral society.

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Through its Social Innovation Business (SIB) that brings together IT, OT(Operational Technology) and products, Hitachi contributes to a harmonized society where the environment, wellbeing, and economic growth are in balance.

Hitachi operates globally in four sectors – Digital Systems & Services, Energy, Mobility, and Connective Industries – and the Strategic SIB Business Unit for new growth businesses. With Lumada at its core, Hitachi generates value from integrating data, technology and domain knowledge to solve customer and social challenges. Revenues for FY2024 (ended March 31, 2025) totaled 9,783.3 billion yen, with 618 consolidated subsidiaries and approximately 280,000 employees worldwide. Visit us at www.hitachi.com.

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