J-Power Group's Technological Development

The Group's research and development activities focus on the two items of "creating new value" in order to promote the realization of J-POWER "BLUE MISSION 2050" and "strengthening existing businesses" in order to respond to changes in the business environment and continuously strengthen competitiveness while utilizing knowledge cultivated in the electric power business.

Through the development of these technologies, we will contribute to achieving materiel issues such as supply of energy and response to climate change.

Priority items and major areas of research



Intellectual Properties

For outcomes achieved in technological development and other activities, we continuously seek to acquire their intellectual property by, for example, filing for patents. We hold 170 patent rights in Japan as of the end of FY2023.

• Number of patents held in Japan



Examples of patents acquired through technological development and other activities

Shape design technology for water turbine blades

Through in-house design, we have developed a new type of water turbine with high power generation efficiency. The complex shape of a water turbine blade has been optimized by employing fluid dynamics technology to investigate the causes and to reduce losses from water turbines. The turbine will be introduced as the first commercial system to Suezawa Power Plant, which is now under repowering work (scheduled to start operations in 2024). By increasing the efficiency of power generation from renewable energy sources, we expect the technology to contribute to the realization of a decarbonized society. *Patent No. 6271658: Francis turbine



Novel CO₂ storage technology using hydrate* mechanism

CO₂ injected into the sub-seabed bedrock in a low-temperature, high-pressure environment will form CO₂ hydrates, which themselves serves as a sealing layer to prevent leakage of CO₂. The technology is expected to contribute to increasing the number of suitable locations and capacity for CO₂ storage in the waters around Japan.

*Hydrate: A clathrate hydrate with a lattice-like crystal structure, formed through the bonding of two or more molecules, including water (H₂O).
*Patent No. 7149712: Underground Storage Method for Carbon Dioxide and Underground Storage Device Therefor

Topics Voice of the researcher

For CO₂ storage, underground storage in aquifers*, which requires a geological structure as found in conventional oil and gas fields, is becoming increasingly adopted worldwide. However, it is uncertain whether storage in aquifers alone can provide sufficient storage locations in Japan, a country with few oil and gas fields. To cope with such situations, we have devised and patented a CO₂ underground storage method using the "hydrate mechanism" which emerges in a low-temperature, high-pressure environment, taking advantage of the deep waters in the seas around Japan. When put into practical use, we expect this method to greatly increase Japan's CO₂ storage capacity, in addition to aquifer storage. The main research objective is to confirm through experiments and simulations that hydrated CO₂ will not clog the practical application of the technology by getting over hurdles one by one.







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Technology Development and Intellectual Property/Promotion of Innovations

Promotion of Innovations

The J-POWER Group is taking on the challenge of promoting innovations and capturing new business domains by integrating the assets and know-how, which were accumulated mainly in the power generation business, with the technologies and ideas of startup companies and other organizations. So far, we have invested in two funds and 12 startups.

In 2018, we set up an organization within the Corporate Planning & Administration Department to take charge of new business exploration, and have worked to build external networks and strengthen internal collaboration. In April 2024, we evolved this organization to newly establish the Innovation and New Business Development Department.

Mission

The Innovation and New Business Development Department undertakes exploration and business development activities in a wide range of areas, encompassing existing businesses and their peripheral and "enclave*" areas. Focusing mainly on decarbonization and carbon neutrality, decentralization, and digitalization, the department aims to launch new businesses that will become the company's new revenue streams, and to expand and evolve existing businesses.



*New businesses non-contiguous with existing fields

Major portfolio startups

PowerX, Inc. (Domain: storage batteries)

In addition to producing high-performance and competitively priced Japan-made battery products, PowerX is promoting a battery tanker project in which batteries will be mounted on ships to carry electricity. We are considering using the storage battery technology and services developed by PowerX, and supplying our renewable energy power.



WOTA CORP. (Domain: decentralized/water treatment)

Aiming for fundamental solutions to water-related environmental issues, WOTA has developed WOTA BOX, a portable decentralized water reuse system that can be used during water supply outages, and WOSH, a water reuse hand-wash stand, among other products. WOTA'S WOTA DX is used in our on-site water purification plants to ensure optimal operation and monitoring of the plants.

AREANO INC. (Domain: decentralized/local community engagement)

AREANO mainly operates the Style Cabin business engaging in planning, design, manufacturing, and sales of trailers in attractive locations in the region. By supporting initiatives for utilizing trailers for BCP and local production for local consumption, we aim to contribute to value enhancement of local communities, with an eye to utilizing trailers in areas where our power plant are located.

Nippon Fiber Corporation (Domain: decarbonization/ recycling)

Nippon Fiber has technology to manufacture a continuous filament fiber BASHFIBER, a material with potential applications in a wide range of fields due to its high strength, heat resistance, and chemical resistance. Since the fiber is made from coal ash and slag, byproducts of coal-fired thermal power generation or integrated gasification combined cycle, we are considering launching a joint venture with Nippon Fiber that includes the supply of coal ash.

Examples of New Business Development

Fistulifera solaris and *Mayamaea* sp. strains of microalgae (collectively called "sola-luna"), on which we have been conducting research and development, are high in oil content, and can be cultured in seawater. Since April 2023, we have been promoting the commercialization of value-added products using the *solar-lunar*, such as soaps and cosmetics, in collaboration with circuRE act Co., Ltd.







