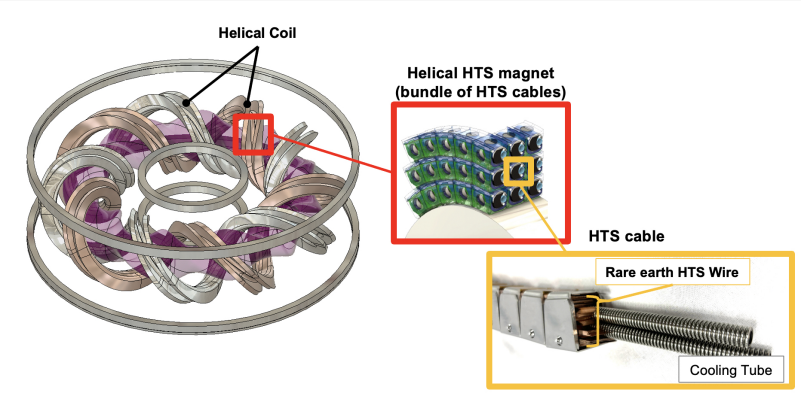
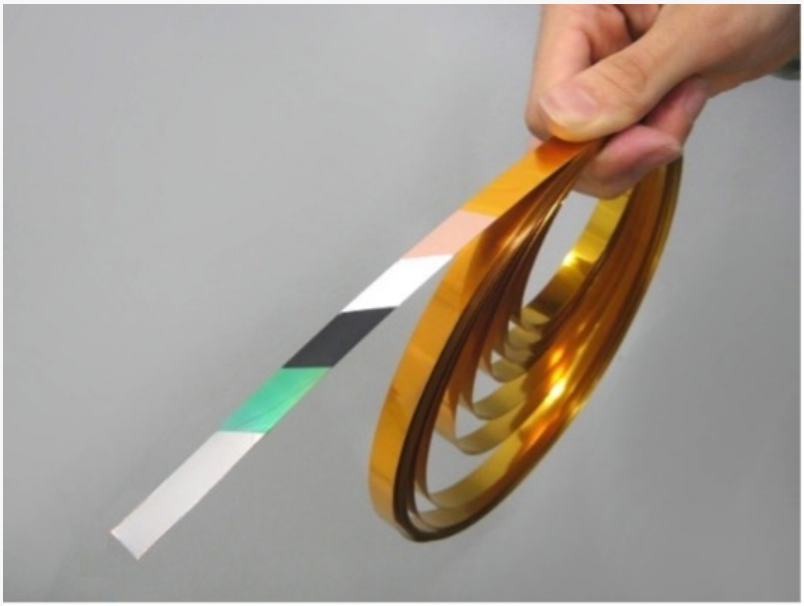
Helical Fusion Secures Supply of High-Temperature Superconducting Wire from Fujikura for Fusion Energy Commercialization

Japan's strengths in both materials development and manufacturing are being leveraged to establish a world-class HTS supply chain.

TOKYO, JAPAN, April 21, 2025 /EINPresswire.com/ -- Helical Fusion Co., Ltd. (hereafter "Helical Fusion"), dedicated to developing the world's first steady-state helical fusion reactor, has reached an agreement with Fujikura Ltd. (hereafter "Fujikura"), a global leader in rare-earth-based high-temperature superconducting (HTS) wire development, to procure additional HTS wires. These wires are critical materials for the HTS magnets, which play a pivotal role in fusion reactors. This collaboration leads to a strong supply chain of strategic materials essential for the advancement of fusion energy.



At the core of Helical Fusion's reactor, spiral-shaped high-temperature superconducting magnets confine the plasma. These flexible, high-performance magnets are uniquely developed using bundled HTS wires.



Rare-earth-based high-temperature superconducting wire developed by Fujikura.

-Significance of Helical Fusion's Fusion Energy Development

Humanity urgently needs a sustainable energy source, but current options—thermal power, nuclear fission, and renewables—are insufficient. Fusion energy, replicating the sun's power on Earth, offers the ultimate solution. Helical Fusion's vision is to deploy fusion reactors globally, collaborating with governments and power

companies to secure a stable, sustainable energy supply. By doing so, the company aims to address one of humanity's most pressing challenges: the need for clean and abundant energy.

Helical Fusion Logo

The company stands apart with its expertise in the "Large Helical Device" (LHD), developed at the National Institute for Fusion Science (NIFS). The LHD holds the world record for continuous plasma operation of 3,000 seconds—far surpassing other leading facilities—proving the unparalleled stability essential for commercial fusion power.

Helical Fusion is moving forward at the fastest possible speed with the commercialization of this groundbreaking technology, building on the vast knowledge of a government-led R&D project over several decades and billions of US dollars of investment.

-Importance of HTS Magnet Development

One of the few remaining challenges is the development of HTS magnets capable of efficiently confining the plasma where fusion reactions occur. Compared to conventional low-temperature superconductors, HTS magnets can operate at higher temperatures and generate stronger magnetic fields. This enables the construction of more compact and efficient fusion reactors, bringing commercialization closer to reality. Successful implementation of HTS magnets could also lead to applications in aerospace, medical MRI, and high-efficiency power transmission cables. Recognizing the significance of this development, Helical Fusion's program was selected for the Ministry of Education, Culture, Sports, Science and Technology's SBIR Phase 3 grant in 2023.

-Development of Superconducting Cables by Helical Fusion

While helical fusion reactors are suited for steady-state operation and considered appropriate for commercial reactors, manufacturing the helical (three-dimensional spiral structure) superconducting magnets has been a challenge. Overcoming this requires the development of cable-type HTS magnets that are both flexible and manufacturable. Helical Fusion has devised a unique structure by layering HTS wires and bundling them within flexible tubes, resulting in a highly bendable and manufacturable superconducting cable. The core material used in this cable is the HTS wires, and securing a stable supply chain for this material is crucial for future demonstrations and the deployment of commercial plants.

-Supply Chain of Rare-earth-based High-Temperature Superconducting Wire

For the demonstration and commercialization of fusion energy, establishing a supply chain for HTS wires is vital. Japanese companies have been global leaders in the development of superconducting wires. If a stable mass production system can be established, ensuring consistent pricing and supply volumes, it will directly contribute to optimizing fusion reactor construction costs. However, continuous demand from users is necessary to achieve this. Helical Fusion plans to procure several tens of thousands of kilometers of HTS wires and will continue to

collaborate closely with manufacturers like Fujikura to build and strengthen the overall supply chain.

-Key Points in HTS Magnet Development
Developing HTS magnets requires flexible design adjustments and rapid verification, necessitating advanced expertise and an agile development and testing framework. Since March 2024, Helical Fusion has partnered with NIFS, which possesses world-class experimental facilities and specialized personnel in this field. The collaboration, centered around the "HF Joint Research Group," focuses on advancing HTS magnet development. Furthermore, establishing strong partnerships with Japanese manufacturing companies that have advanced processing technologies, as well as suppliers like Fujikura with expertise in high-performance material development and mass production, is essential. The recent procurement agreement serves as a significant boost to the development efforts.

-Future Outlook
Helical Fusion aims to achieve steady-state operation of a net power-generating prototype reactor by 2034 and plans to conduct integrated demonstrations of all elemental technologies by 2030. The development and testing of HTS magnets are scheduled to be completed within the next few years, with a circular magnet demonstration experiment planned for later this year. This experiment aims to achieve high-current demonstrations, reinforcing Helical Fusion's position as a frontrunner in the global development race.

-About Fujikura Ltd.
Since its founding in 1885, Fujikura Ltd. has been a global company contributing to solving social issues through its "Tsunagu" (connecting) technology, cultivated through the research, development, and manufacturing of electric wires and cables. The company has been a top runner in the industry, continuing research and development of rare-earth-based high-temperature superconducting wires for over 30 years, providing HTS wires to domestic and international research institutions and startups advancing fusion reactor development. Additionally, Fujikura participates as a board member in the Fusion Energy Industry Council (J-Fusion), established based on the Japanese government's "Fusion Energy Innovation Strategy."

naho yoshimura
Helical Fusion Co., Ltd.
email us here
Visit us on social media:
Facebook
LinkedIn
YouTube

we have missed, please do bring it to our attention. Your help is welcome. EIN Presswire, Everyone's Internet News Presswire™, tries to define some of the boundaries that are reasonable in today's world. Please see our Editorial Guidelines for more information.