Special Feature

By leveraging the proprietary technology we have accumulated over many years with technologies acquired through M&A activities, we are working to

Become a Top Global Supplier in the Field of Superconductors.

Furukawa Electric has conducted R&D in the field of superconductors since the 1960s, and has amassed some of the world's leading technologies in this sector.

In February 2012, we acquired SuperPower Inc. of the United States, one of only a few companies in the world currently manufacturing second-generation high-temperature superconductor wire materials. We converted this company to a subsidiary in order to bolster our competitiveness in world markets.

Successes Based on a Half Century of R&D Have Led Us to Possess Some of the World's Leading Technologies in the Superconductor Field.

Against the backdrop of increasingly severe global warming and electric power risks, throughout the world interest has grown in the practical application of superconductor technologies to use energy more effectively. Since the 1960s, Furukawa Electric has the leading role in R&D of superconducting technologies. Over that time, our efforts have included the spectrum of activity from low-temperature superconductivity using metallic materials to high-temperature conductivity with oxide materials. In the process, we have accumulated some of the world's leading technologies in this field.

Furukawa Electric's Efforts

1963
Commenced R&D on low-temperature superconductivity
Began industrial production of NbTi multicore wire

1973
Became the first in the world to succeed in producing ultrafine multicore wire using a compound of V3Ga and Nb3Sn

1980
Constructed a large-scale accelerator, developed a model coil for research into nuclear fusion, conducted superconducting generator verification testing and participated in other large-scale projects in Japan and overseas

1986
Commenced R&D into high-temperature superconductivity

2003
Delivered cables for the Large Hadron Collider at CERN*1, becoming the first company in the world to provide detection equipment for large-scale conduction
Based on this performance, won the Golden Hadron Award*2

2005
Performed field test on 500 m superconducting cable, the longest in the world at the time, at the Central Research Institute of Electric Power Industry*3

2007
Achieved the world's lowest transmission loss through application of ultrafine wire processing technology and cable forming technology that reduces the perpendicular magnetic field*4

2011
Developed the world's highest-voltage 275 kV superconducting cable*5

2012
Through the acquisition of a U.S. company, became the world's only integrated manufacturer of second-generation high-temperature superconducting materials

1960 | 1970 | 1980 | 1990 | 2000 | 2010

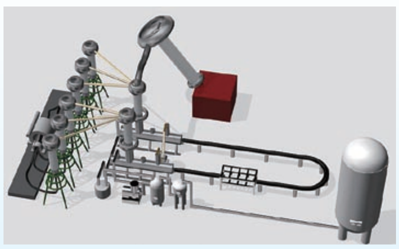
Worldwide Evolution of Superconducting Technologies

- **1911** Phenomenon of superconductivity first discovered at Leiden University in the Netherlands, using mercury
- **1953** Nb3Sn discovered to be a practical metallic superconducting material
- **1957** BCS theory proposed to explain superconductivity
- **1987** Yttrium superconductor material (2G HTS) discovered at the University of Houston, in the United States
- **2011** Marked the 100th anniversary of the discovery of the phenomenon of superconductivity. Ceremonies held in Japan and overseas

***1** The European Organization for Nuclear Research (CERN), which announced the discovery of the Higgs particle to a high degree of certainty in July 2012
***2** Golden Hadron Award: Prize awarded by CERN to manufacturers determined to have contributed substantially to the LHG plan
***3** NEDO "Project for R&D on Basic Technologies for Superconducting AC Equipment"
***4** NEDO "Project for the Development of a Technological Base for the Application of Superconductivity"
***5** NEDO "Technological Development of Yttrium-based Superconducting Power Equipment Project"

Commenced Verification Testing in China of the World's Highest-Voltage Superconducting Cable

In the Chinese city of Shenyang, the Furukawa Electric Group will conduct long-term loading cycle tests of the world's highest-voltage 275 kV superconducting cable in October 2012. This test was commissioned by the New Energy and Industrial Technology Development Organization (NEDO) as part of its "Technological Development of Yttrium-based Superconducting Power Equipment Project." By conducting verification testing in China, where demand for transmission infrastructure is rising sharply, we aim to demonstrate the technological superiority of superconducting cables and enhance our international competitiveness.



275 kV superconducting cable test layout

Meeting Expanding Demand for Superconductivity in Regions throughout the World by Using Smart Grids as Key Materials

Now that a century has passed since the phenomenon of superconductivity was first discovered, technological development and commercialization is accelerating. In particular, attention is focusing on the use of smart grids, which are anticipated for use in next-generation social infrastructures. By adding the second-generation high-temperature superconductor (2G HTS) wire production technology of SuperPower, Furukawa Electric plans to reinforce its lineup of technologies aimed at realizing smart grids. We provide advanced technologies and products in a host of fields related to the generation, transmission and storage of electricity.

Lowering Transmission Loss

Electricity transmission

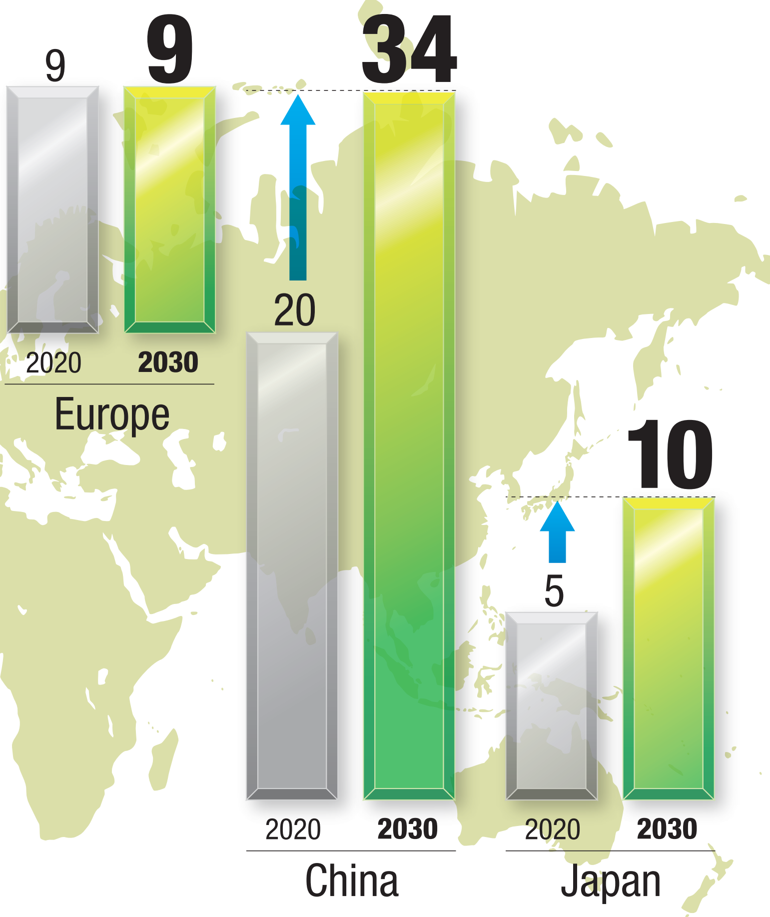
We help to transmit the electricity that power plants generate in a stable manner and without losses.

The electrical resistance of power cables means that some energy is lost when electricity is sent from power stations to locations where the power is used. In Japan, where reducing the use of electricity has become an important issue for society as a whole, approximately 5% of power is lost during transmission.

Cables that use superconducting technologies have no electrical resistance, so transmission losses are greatly reduced. By 2050, we estimate that approximately 4,000 km of copper cable will be replaced with superconducting cable, reducing annual power consumption by 3.1 billion kilowatts for every 2.6 million people. This equates to a decrease in the CO_2 emitted during generation of 1.06 million tons (based Furukawa Electric's calculations).

Combining SuperPower's technologies in the mass production and lengthening of 2G HTS materials with Furukawa Electric's technologies in power cables will enable the mass production of superconducting cables of higher quality and at a lower price. This combination should enable us to meet increasing global demand.

Superconducting Cable Demand Forecast
(based Furukawa Electric's calculations)
(Billions of yen per year)



Total
2020
¥64.0 billion/year
2030
¥102.0 billion/year

Storing **Large Amounts of Electricity** without Losses

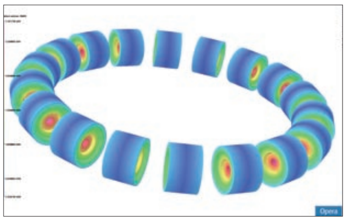
Electricity storage

We are using superconducting magnetic energy storage (SMES) to stabilize supply and demand for electric power.

To encourage the spread of generation from renewable energy sources such as solar and wind power, systems are needed to store excess energy and thereby offset natural fluctuations. Rapid charging and discharging was difficult for the storage batteries used in the past, so the industry was unable to overcome generation irregularities.

SMES, which allows large amounts of electricity to be charged and discharged instantaneously, can help to offset power fluctuations in real time. As a result, this technology is a subject of growing attention for use in electricity storage equipment at renewable energy generation facilities.

SuperPower's 2G HTS wires are ideal for the coils needed to generate the strong magnetic fields required by SMES. Therefore, we are collaborating with ABB, the University of Houston and Brookhaven National Laboratory to develop SMES systems.



SMES simulation model using a toroidal coil

Raising **Generation Efficiency**

Electricity creation

By raising generation efficiency and making generation equipment more compact and lightweight, we are contributing to the proliferation of wind power generation.

Wind power generation is a type of sustainable energy use that is gaining popularity throughout the world. At present, the largest wind power generators are around 5 megawatts in scale. Technological developments will be needed to increase this amount to 10 or 15 megawatts. With conventional technologies, increasing the amount of power generated required larger generators, which led to higher manufacturing and construction costs. However, using 2G HTS wire, which has zero electrical resistance and high current density, means that even very thin wires can transport a large amount of electricity. This situation results in more efficient generation and more compact and lightweight generation equipment.

At present, SuperPower is cooperating with TECO-Westinghouse and the University of Houston on research and development of 2G HTS wire for large-scale wind power generators of around 10 megawatts. Around the world, rising expectations are accelerating the uptake of large-scale wind power generation including conducting research that will contribute to the reduction of CO_2 emissions and the use of oil resources.

Through the Acquisition of SuperPower, Becoming the World's Only Integrated Manufacturer of Second-Generation High-Temperature Superconductivity Wire

Only two companies in the world are capable of mass producing second-generation high-temperature superconductor (2G HTS) wire. Furukawa Electric has acquired one of these, SuperPower, thereby turning the Company into the world's only integrated manufacturer of 2G HTS wire.

In this section, SuperPower's President Shirasaka, assigned from Furukawa Electric, and heads of the company's management and sales divisions talk about synergies and the benefits of collaboration between SuperPower and Furukawa Electric.

Combining SuperPower's Wire Production Technology with Commercialization Capabilities Developed by Furukawa Electric

Yusei: The most significant element in this acquisition was the addition of the 2G HTS wire production technologies possessed by SuperPower to the lineup of superconducting technologies that Furukawa Electric has cultivated over many years. As 2G HTS wire using rare earth-based elements can be produced at a lower cost than bismuth-based first-generation materials, they are gaining attention as the mainstream superconducting material of the future. However, as the technological hurdles to producing 2G HTS wire are high, only two companies in the world are currently capable of producing it in mass quantities. By adding one of these companies to the Furukawa Electric Group, we have become the only corporate group in the world able to supply mass quantities both 2G HTS wire and HTS-based equipment.

Art: I understand that Furukawa Electric has conducted research over a long period of time, from the era of low-temperature superconductivity. SuperPower's predecessor manufactured metallic superconductor wires as well, so I believe we have some points in common. If we can integrate the 2G HTS wire production technologies that SuperPower possesses with Furukawa Electric's technologies in power cables, wound wires and equipment development, we should be able to provide even more advanced superconductor materials to world markets.

Trudy: On the sales front, Furukawa Electric's global

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Yusei Shirasaka
Furukawa Electric Co., Ltd.
Executive Officer
Leader, High-Temperature Superconductivity Commercialization Team, R&D Headquarters

Senior Director, Marketing and Sales Division
Traute (Trudy) F. Lehner

Vice President, Finance and Administration
Arthur (Art) P. Kazanjian

network should be a major source of strength. Through this network, we will be able to provide even more detailed support services to our customers.

Aiming to Address the Issues Society Faces by Leveraging World-Leading Superconducting Technologies

Yusei: As the world's only comprehensive supplier in the 2G HTS arena, we have become highly competitive in world markets. Going forward, we will need to think about how to leverage this strength to meet society's needs.
Art: The benefit of superconducting technologies is that they offer zero electrical resistance, so current density is high. Superconducting technologies allow energy to be used more efficiently, so they should play a significant role in resolving energy and environmental problems.
Trudy: We are already progressing toward commercialization with applications for power cables and large-scale wind power generation equipment. For wind power generation in particular, superconducting technologies are gaining growing attention because they allow increases in generation efficiency and more compact equipment, which reduces construction costs.
Art: In non-energy fields, as well, metallic superconductor technologies are already being used in the medical field for magnetic resonance imaging and other applications. Switching over to the use of 2G HTS should result in higher-performance equipment that is more compact.
Yusei: The field of energy and the environment and the medical sector both involve some of the major issues that society is facing. We need to recognize that resolving these issues is one of our social responsibilities as a manufacturer.

Meeting Our Corporate Responsibilities and becoming a Trusted Corporate Group in Global Markets

Yusei: Being active in global markets requires competitive technologies and products; it also requires that a company be trusted by society. Furukawa Electric has been active in CSR activities for some time; what is the situation at SuperPower?
Trudy: Our headquarters and manufacturing operation are located in Schenectady, New York, and we contribute in many ways to the local community. I am on the board of directors of the Schenectady chamber of commerce. In 2010, the 10th anniversary of SuperPower's founding, we built and contributed an exhibit about superconductivity to the Schenectady Museum, where I am vice president of the board of trustees. We partner with local schools and universities to promote education in the area of superconductivity, including teaching courses in the field and hosting student interns.
Art: For a company to succeed, I believe that respect for diversity is important. The engineers at our company come from a range of different cultures and backgrounds, which leads to the development of more innovative technologies. The company also has two female managers, in addition Trudy, who is a company director.
Yusei: This is excellent. I am pleased to hear that we are likely to be sources of encouragement to each other on the social contribution front, in addition to the technology and business sides.