Sumitomo Electric 120 Year Journey

To Become a "Glorious Excellent Company"

Opening Remarks

In April 2017, Sumitomo Electric Industries, Ltd. celebrated its 120th anniversary. I would like to express my sincere gratitude to our stakeholders for their cooperation and support, thanks to whom Sumitomo Electric has continued its operations for many years since the establishment of its predecessor, Sumitomo Copper Rolling Works, in 1897.

This booklet is published as an anniversary project. It is the first such publication since the 100th anniversary of Sumitomo Electric, and therefore focuses on the most recent 20 years.

Sumitomo Electric's business, which began from the production of electrical wire and cable, has steadily expanded together with its group companies. The company has diversified and globalized while persistently tackling technological development, contributing to the growth and advancement of society worldwide.

The past 20 years has mostly coincided with the so-called "the lost two decades" since the collapse of Japan's economic bubble. However, since the company's formation, it has developed its business based on the Sumitomo Spirit, and continued to promote innovation to create a prosperous and hope-filled future.

Moving forward, the company will leverage its technological capability accumulated to-date and its diverse product line-up, innovating and fusing them to respond to new needs that arise from changes in society, to create outstanding new and original technologies, thereby contributing to the development of society.

The company is aiming to achieve its ideal state of becoming a "Glorious Excellent Company." "Glorious" refers to implementation of the Sumitomo Spirit, while "Excellent" refers to refining the three bases of human resources and organization, manufacturing, and finances to grow the company, and achieve the aims of the mid-term management plan.

Under the new mid-term management plan "VISION 2022," the company continues to fulfill its social responsibility through its business, positioning the Sumitomo Spirit and Sumitomo Electric Corporate Principles as our key management value.

In the mobility, energy and communications fields, where the company has focused, there will be remarkable innovation and a fusion of technologies to inaugurate an era of great transformation. By considering this an opportunity for growth, the company will provoke innovation with its concerted efforts, providing new products and services with the aim of further growth.

The Sumitomo Electric Group has been united for 120 years in creating communications technology and fostering connectivity. With our synergy in purpose and spirit, we would like to continue to make great contributions to the betterment and advancement of society.

We hope that this booklet can help you to gain a greater understanding of our company, and we also hope for your continued guidance and encouragement.

November 2018

Osamu Inoue
President & COO
Sumitomo Electric Industries, Ltd.

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1. In principle, the scope of descriptions and information compiled in this publication covers until July 2018.
   Where necessary, notes or data of more recent matters have been added.
2. In principle, location names are those used at the time of events with current names added where necessary.
3. In principle, excluding descriptions of company establishment, "Co., Ltd." and other corporate statuses are omitted.
   Company names are those used at the time of events with current names added where necessary. Abbreviated forms are used where appropriate.

Chapter 1

From Formation Until the War's End—The Name "Sumitomo" Reverberates in Modern Japan

1897–1945

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Sumitomo acquired Nihon Seido Co., Ltd. on April 1, 1897, establishing Sumitomo Copper Rolling Works, the predecessor to Sumitomo Electric, as one of its businesses. Head office was established in Ajigawa-kamidori (in present-day Kita-ku, Osaka City), and it began the production of copper wire, plate, and rod, with the aim to "produce and sell copper plate, wire and rod using copper from Besshi Copper Mine as raw material." In 1911, the electric wire business was separated from Sumitomo Copper Rolling Works, and established as an independent business, Sumitomo Electric Wire & Cable Works, which was the direct predecessor of Sumitomo Electric. It was incorporated in 1920, and renamed the present name, Sumitomo Electric Industries, Ltd. in 1939.

The period from World War I until the end of the Pacific War was an era of turbulence. However, Sumitomo Electric actively worked to develop business, embarking on the products such as covered wire, the first domestically-produced high-voltage underground transmission cable, enamelled wire, cemented carbide tool "IGETALLOY," and piano wire for aircraft engine valve springs. The 1923 Great Kanto Earthquake destroyed the plants of electric wire manufacturers in the Kanto region and the price of raw materials including copper skyrocketed. Amidst this, as the only major manufacturer able to supply the electric wire and cable needed for reconstruction, Sumitomo Electric fulfilled its responsibility by offering products at the pre-Earthquake prices.

1 Establishment of Sumitomo Copper Rolling Works in Ajigawa, Kita-ku, Osaka City (formation of the company)

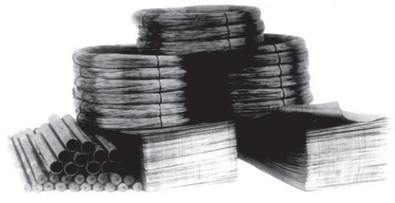
April 1, 1897 marks the start of Sumitomo Copper Rolling Works, the predecessor to Sumitomo Electric.

Its establishment came during the recession in reaction to the boom in new businesses following the Sino-Japanese War (1894–1895) when, in March 1897, the Sumitomo family purchased Nihon Seido Co., Ltd.[1] (established in May 1895), which had fallen into financial trouble. The Sumitomo family also acquired approximately 12,500 m^2 of the company's property (Shimofukushima-mura, Nishinari-gun, Osaka Prefecture; present-day Fukushima-ku, Osaka City) and plant facilities and equipment for 175,000 yen, also taking on all 70 or so of the factory staff, thereby establishing Sumitomo Copper Rolling Works.

The operational aim of Sumitomo Copper Rolling Works was to "produce and sell copper plates, wire and rod made using copper from Besshi Copper Mine as raw material," and its head office was located at 1-22 Ajigawa-kamidori (present-day Kita-ku, Osaka City). The company's main products at the time included copper plate and rod for boat, building eaves, and copper plate for gutters. Like brass wire, most copper wire was for handiwork, and little was produced as electric wiring.

Later, during tough financial times, the company focused on its sales channels expansion, particularly overseas, pioneering direct export routes. In addition, it successfully secured orders from the Japanese Imperial Army for its Osaka Artillery Arsenal and the Kure and Tokyo armories, demonstrating the strengths of direct ties with the Besshi Copper Mine, and steadily developing the business.

1 The former manager of the Besshi Copper Mine, Taira Hirose, was appointed president, and in December 1896, the company began copper rolling and other operations.



Copper plate and copper wire from the time (photo supplied by Sumitomo Historical Archives)

2 Start of silicon copper wire production

The impetus for Sumitomo Copper Rolling Works to become significantly active in the electric wire manufacturing field was the acquisition, in March 1899, of Osaka Seido KK[2] (established March 1881). The company had contributed to the start of domestic copper production for the ship building industry, however business was faltering due to factors such as increasingly fierce competition and the loss of demand for coinage for Korea (1896). The Sumitomo family purchased approximately 9,500 m^2 of property, almost the entire copper rolling works, including buildings, machinery, offices, and warehouses, at a cost of 171,050 yen.

The plant began operation that November as the Sumitomo Copper Rolling Works Nakanoshima Branch Factory, making products including Japan's first machine-drawn copper wire. Along with the former-Nihon Seido which it had acquired, Sumitomo Copper Rolling Works became a leading rolling copper plant in Japan at the time in terms of both equipment and scale.

Sumitomo Copper Rolling Works received orders from the Ministry of Communications for the production and supply of silicon copper wire, which it had begun research and development, and then production, at Nakanoshima Branch Factory one or two years earlier. Following the many instances of disconnection of overhead telephone wiring following heavy snows in Tokyo in 1898, the Ministry of Communications planned to proceed with a full-scale switch to silicon copper wire, which offered greater tensile strength than conventional wire.

In order to produce silicon copper wire, which Sumitomo Copper Rolling Works had no experience in, the president himself read original texts from Britain to study the techniques, and taught the manufacturing methods, achieving a better quality product than its competitors'. Record showed that, when they delivered the finished product to the Ministry in April 1900, the Ministry was satisfied with its examination results and sent three engineers to inspect the factory of Sumitomo Copper Rolling Works. Sumitomo's electric wire business undeniably lagged behind that of other companies, however for some time, it held a virtual monopoly in regards to silicon copper wire.

2 The first president was Saihei Hirose, head of Sumitomo's board of directors, who had been involved in the management of Besshi Copper Mine. A British-made copper production machine was installed at the site of the former Takamatsu clan's rice warehouse across the Dojima River to the west from Minamizume of Nakanoshima Tamae Bridge, Osaka, and copper rolling and copper products manufacturing began in May 1882. In those days, Osaka Seido was the first private company in Japan to have a molten copper rolling facility equipped with full-fledged Western technology.

View of the entire Sumitomo Copper Rolling Works at Ajigawa (photo supplied by Sumitomo Historical Archives)

3 Start of power cable production

In September 1906, Sumitomo Copper Rolling Works employed a British engineer for the full-scale launch of its communications cable production business. With the end of the Russo-Japanese War, military demand abruptly fell and economy looked depressed. Under this circumstance, Sumitomo Copper Rolling Works production of materials for weapons suddenly declined however there was vigorous demand for electric wire and other products in electric business related areas. In 1907, plans for secondary expansion of telephony were confirmed,

which added to the momentum. Above all, there was strong demand for covered wire and cable, and because the Ministry of Communications could not source high-quality Japanese cable, imports continued to increase each year, therefore the Ministry encouraged electric wire manufacturers to engage in research and production.

Sumitomo Copper Rolling Works, having incorporated British technology, embarked upon the production of covered wire and cable that was more advanced than conventional copper wire and silicon copper wire. The company bought land adjacent to the western side of the main plant at Ajigawa, and built a cable plant in January 1908. The plant, a wooden building with a floor area of approximately 1,600 m^2, incorporated five factories (rubber, covered wire, braiding, twisted wire, and cable) arranged like saw-teeth. As the first rolling works powered by electricity, it was equipped with a 150 kW on-site generator. Test Operations began in stages from June 1908, achieving full operation from October.

Initially, cable manufacture faced many struggles, losing around 50,000 yen every year from 1908 to 1910, however the executives had an insatiable appetite for instruction from British engineers, which inspired them to steadily boost their technical capabilities. In January 1909, the company succeeded in supplying cables to the Yokosuka Navy Arsenal for warships. Then, the display of copper wire, covered wire, and cable exhibited by the electric wire division of Sumitomo Sohonten at the Japan-British Exhibition in London in May 1910 attracted much attention, and the covered wire and cable business finally took off.

Copper Rolling Works Cable Plant (photo supplied by Sumitomo Historical Archives)

4 Start of telecommunication cable trial production

In 1909, soon after the establishment of the cable plant, Sumitomo Copper Rolling Works began test production of telecommunication paper-insulated cable under the guidance of British engineers. The following year, in 1910, the company successfully manufactured 50 pair cable. In the following six or seven months, efforts were made to reduce the outer diameter, and in October 1910, the company submitted 117 yards of 50 pair cable to the Ministry of Communications, and petitioned the Ministry to be their designated manufacturer. This positive achievement resulted in Sumitomo Electric Wire & Cable Works (which became independent from Sumitomo Copper Rolling Works in August 1911, see next section) supplying 23,000 yards of cable in 1912. In May 1913, it was temporarily designated as the manufacturing facility for purchases up to 50,000 yards, and in February 1914, the company was designated along with Yokohama Electric Wire Manufacturing Company (present-day Furukawa Electric) and Nippon Electric Company, Limited (present-day NEC). As a result, Japan, which had previously relied on telecommunications paper-insulated cable from overseas, was able to switch to using domestic product.

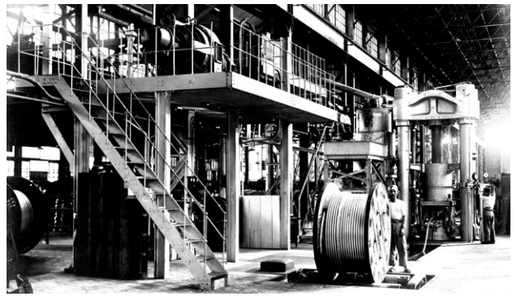
5 Establishment of Sumitomo Electric Wire & Cable Works (foundation of the company)

In August 1911, the electric wire business of Sumitomo Copper Rolling Works was separated and made independent by establishing Sumitomo Electric Wire & Cable Works, in an effort to further develop the business. Also that year, the government established and enforced a new Electricity Business Law, and the Ministry of Communications began implementing the plans for tertiary expansion of telephony. The advancement of power transmission and communication technology led to remarkable demand for various wires and cables. Rivals were also establishing independent electric wire companies and constructing new plants.

Sumitomo Electric Wire & Cable Works took over the assets of the Copper Rolling Works, including buildings, machinery, raw materials, partially-finished or finished products and accounts receivable, and also liabilities such as accounts payable, together with just under 200 staff. The building contained a 1,580 m^2 covered wire plant and a 565 m^2 bare wire plant. Offices and packing areas were shared with the Copper Rolling Works. Because the Copper Rolling Works remained responsible for casting and rolling electrolytic copper into copper rod, Sumitomo Electric Wire & Cable Works took supply of copper rods for a fee, but bought most raw materials other than copper directly.

Products at that time included one million circular mil[3] or under rubber wire or lead covered wire for electric bulbs, electric power, telephones and other telecommunications, armored wire for light bulbs and electric power, cotton-covered wire, silk-covered wire for miscellaneous purposes, paraffin wire, and bare stranded wire for electric power (up to 400 strands, up to two million circular mil). In bare wire, the company also produced copper wire, as well as brass wire for handiwork and aluminum wire.

3 Circular mil is a unit of cross-sectional area, equal to the area of a circle with a diameter of one mil (one thousandth of an inch).



Lead sheathing machine at Sumitomo Electric Wire & Cable Works

6 Supply of the first underground high-voltage (11,000 V) cables made in Japan

In autumn 1911, Sumitomo Electric Wire & Cable Works was the first in Japan to successfully commercialize lead-covered paper-insulated cable for electrical power, proving the company's advance to the next level of technological capability. Kyoto Dento, which established a thermal power station in Fushimi as a drought countermeasure, ordered Sumitomo Electric Wire & Cable Works to manufacture high-voltage underground cables to use as power transmission lines from the power plant to Kyoto City. Earlier, Tokyo Dento and Kobe Dento had installed high-voltage underground cable, but both of them used imported cable, while this was the first occasion when Japanese cable was used.

Sumitomo Electric Wire & Cable Works began making the first high-voltage 11,000 V three-core steel wire armored lead-covered paper-insulated cable. The company proceeded with the work based on British standard specifications, but it was extremely difficult to achieve optimal blending of insulating oil, and measurement and specification of mixture performance. Because cracks might appear with paper insulation 9 mm thick and lead covering, careful attention was needed, including checking one by one by placing a mirror under the outlet of the lead sheathing machine.

As there was no specialized machine for armoring iron wires, the company devised its own method to twist iron wire through multiple holes in three horizontal boards. After it passed through the holes in the wooden dies, the steel wire was stranded and armored. In addition, the company overcame various difficulties and failures in its first effort at installing and connecting underground cable, and completed the transmission line from the Fushimi power station to Kyoto City in November 1911. For many years thereafter, Kyoto Dento ordered all this cable from Sumitomo Electric Wire & Cable Works.

7 Opening of the Okijima new plant (present-day Osaka Works)

As production and sales steadily grew, Sumitomo Electric Wire & Cable Works urgently needed to relocate and expand its plant in order to keep up with competitors.[4] In May 1913, a part (approx. 39,600 m^2) of Minaminocho, Okijima (present-day Shimaya, Konohana-ku, Osaka City) was selected as a candidate for the new factory. Work began on landfill of the site for construction in August. The site is near Shorenji River, providing a waterway to transport raw materials such as copper ore, and the site was also serviced by roads to transport finished products. The location made it easier to source labor and it was less susceptible to sea breeze moisture and had less soot, making it suitable for electric wire production.

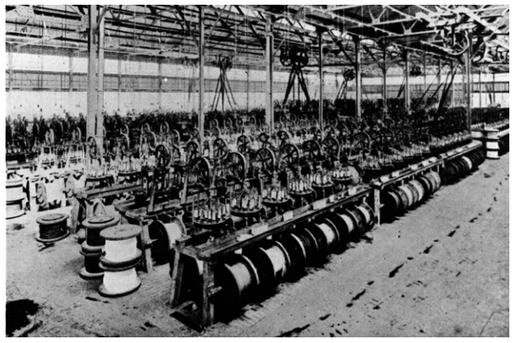
Construction was conducted in three stages with the first phase (11 buildings of the main factory[5] attached facilities) started in September 1915, and construction of the main factory was virtually finished by May 1916. Meanwhile, in 1914, World War I started, leading to increased demand in the wire industry both in Japan and abroad. The company needed to achieve relocation to the new factory without affecting production capacity. For this reason, preparations were made of facilities at the new factory, and production that it could handle was steadily transferred from the Ajigawa Plant.

The Okijima factory began operations in mid-July 1916, and was almost fully operational by the end of the year. Later, it was renamed the Osaka Works, which has undergone numerous expansions to reach its current form.

4 In 1912, Sumitomo Electric Wire & Cable Works' wire and cable output was worth approximately 700,000 yen. In contrast, Yokohama Electric Cable Manufacturing Company's output was worth 3.8 million yen, Fujikura Electric Wire Corporation's (present-day Fujikura Ltd.) was 1.5 million yen, and Nippon Densen Seizo (present-day MITSUBISHI CABLE INDUSTRIES, LTD.) was 1.2 million yen.

5 The plant comprised of a paper-insulated cable factory, two telephone cable factories, a paint factory, two braiding factories, Tokyo-sen Toryo factory, a rubber covered wire factory, a rubber production factory, a bare wire stretching factory, and a twisted wire factory.

Construction of Okijima Plant



Braiding Factory

8 Start of enamelled wires production

Magnet wire is electric wire whose conductor is insulated and horizontally wound with cotton, silk, paper, glass yarn or coated by burning enamel resin. It is used in devices such as motors, generators, and transformers.

In 1916, the company succeeded in developing an oleo-resinous enamelled wire baked with natural resin in Okijima Plant covered wire factory, ushering in the start of enamelled wire production. In 1939, magnet wire production doubled thanks to "MS Wire," an oleo-resinous enamelled paper-insulated wire jointly developed by customers. The magnet wire was an important munitions item, and the production facilities were evacuated in 1945, the war ended after just one month of production. After the war, the magnet wire factory was consolidated at the Nagoya Works and relaunched.

Around the time of the start of World War II, the progress of polymer chemistry led to a succession of developments in synthetic enamel resin worldwide. In 1940, the company began developing polyvinyl formal. It stopped research during the chaotic period around the end of the war, but successfully commercialized black formal wire (product name: FORMET wire), using the company's

proprietary technology, in 1950, which marked the birth of Japan's first synthetic enamelled wire. Its performance was equal to or above that of U.S. firm GE. Electric efficiency, mechanical strength, and heat resistance all remarkably improved compared with an oleo-resinous enamelled wire, and it had significant historical value due to its contribution to the miniaturization of electric equipment. Other Japanese companies in the industry used the amber-colored resin of GE, and people were hesitant to use it because it differed from the black of Sumitomo Electric. Consequently, the company was able to maintain a significant market share for many years. This is a good example of how the company's preeminence in research was a major strength. In 1952, the company also received orders from overseas, as news of its high quality spread around the world. In 1955, the company received an inquiry from British company Standard Telephone and Cable (STC), and was able to export one of its proprietary FORMET baking furnaces. At a time when most technology was being introduced from abroad, this was a rare case of exporting of technology. Later, plants were also exported to Taiwan and the Soviet Union.

9 Incorporation of Sumitomo Electric Wire & Cable Works as a limited company (establishment of the company)

On December 10, 1920, the company was incorporated, becoming the Sumitomo Electric Wire & Cable Works Ltd. It was the third of the Sumitomo family's businesses to be incorporated, after Sumitomo Bank, Ltd. (1912) and Sumitomo Casting Works, Ltd.[6] (1915). The head office was located in Osaka City, with 10 million yen in capital. On December 20, the new company succeeded all rights and obligations of the former Sumitomo Electric Wire & Cable Works and external relations.

The incorporation of the company was triggered by expansion of business, and partnership with the Western Electric Company[7] in the United States. Collaboration with the company required capital tie-up, therefore by incorporating, it was possible to sell its shares to Nippon Electric Company, Ltd.,[8] in which the company had invested.

Shares from 1921

6 Later, Sumitomo Metal Industries, Ltd., presently Nippon Steel & Sumitomo Metal Corporation.
7 A telephone equipment manufacturer under the umbrella of AT&T. It supplied telecommunications equipment to AT&T and related telephone companies.
8 Established in 1899 by Kunihiko Iwadare and Western Electric Company (54% invested) as the first foreign-affiliated company. Later, management was entrusted to Sumitomo Joint-stock Company, leading to the formation of Sumitomo Group.

10 Success in manufacturing and installation of long-distance submarine electric cable

In October 1922 Sumitomo Electric Wire & Cable Works successfully manufactured and laid a 21 km long-distance submarine power cable, the world's longest submarine cable, connecting the Niihama, Ehime Prefecture to Shisakajima Island.[9]

The smelter[10] of Besshi Mining Company, on Shisakajima, a small, remote island, proved to be an inconvenient setting, particularly due to a serious shortage of water, necessary both for drinking water and in the refinery's thermal power plant boiler, requiring that water be shipped from Niihama at high cost. For electric power, although there was a hydropower plant on the opposite shore in Besshi, it was 20 km away, and consideration of power transmission line was postponed, because submarine over that distance was impossible with the technology of the day.

By 1918, thermal power plant on Shisakajima was seriously worn out, necessitating major renovation. As a result, the power transmission arrangement needed to be reorganized. A survey was conducted which concluded that expansion of the waterway at the hydroelectric power plant in Besshi Copper Mine and addition of a generator would enable transmission of electricity to Shisakajima at one fifth the cost of conventional thermal power generation. In response to a request from the Besshi Mining Company, Sumitomo Electric Wire & Cable Works undertook research into the production and installation of submarine power


Landing of the cable end at Shisakajima on August 10


Landing of the cable end at Niihama Isoura

cables. The company invited specialists with many years of experience in installing submarine cable from the Ministry of Communications. In addition, those responsible for manufacturing toured Europe and the United States from 1919 to 1920 to investigate and research such things as submarine cable use.

Meanwhile, Sumitomo Electric Wire & Cable Works began production of its propriety paper insulated lead-covered submarine cable, based on the rubber insulated submarine power cable[11] that it already manufactured, and the company gradually gained more experience and developed its technology in the submarine cable field. In October 1922, the company completed the production and installation of an 11 kV submarine cable with a total length of approximately 21 km. In the process of manufacturing, the company engineered measures to deal with breakdowns and to prevent inundation, and lengthened the sections to 910 m each to reduce the number of connections. In installing the cable, the company faced great difficulty in procuring vessels for cable transport and connection, and also struggled through storm. Finally, after more than 20 days, including overnight works, it was completed at 6 am on October 15. Based on this experience, Sumitomo Electric Wire & Cable Works made significant advancements in submarine cable technology.


The Shisakajima submarine cable

9 Shisakajima is the collective name for the four islands of Minoshima, Ienoshima, Myojinjima and Nezumijima.
10 During the Edo Period, final refining of copper from the Besshi Copper Mine was performed at the Sumitomo Copper Refinery at Nagahori in Osaka. The Sumitomo Copper Refinery was relocated from Osaka to Tatsukawayama-mura at the foot of the Besshi mountains in the early Meiji period. Then, in 1883, a western-style smelter was established at Niihama, and smelting operations were expanded. However, problems arose from the smoke caused by the increased volume of smelting. The company purchased the nearby uninhabited Shisakajima, around 20 km away, and built a new smelter, which began full-scale operation in 1905.
11 In June 1920, the company installed a 1,180 m three-core rubber-insulated 11 kV submarine power cable, Japan's first high-voltage submarine power cable across the entrance of Kojima Bay (Okayama). Then in 1921, the company manufactured and installed a rubber-insulated 3.3 kV submarine power cable over 2 kilometers from Takahama to Gogoshima (Ehime), as the company continued to demonstrate advancements in rubber-insulated submarine power cable technology.

11 Supply of electric wire and cable at pre-Earthquake prices

A violent earthquake of magnitude 7.9 shook the Kanto regions around the noon on September 1, 1923. The devastating quake left approximately 142,800 people dead or missing, around 447,000 houses were destroyed by the resultant fires and a further 130,000 homes collapsed or were lost to tsunami.

Fortunately, the Sumitomo Bank building in Hiramatsucho, Nihonbashi-ku (present-day Nihonbashi, Chuo-ku) did not collapse nor was it destroyed by fire. Most communications and transport systems were damaged or lost to fire and the city was paralyzed. On September 6, Sumitomo Joint-stock Company's Tokyo Sales Office, on the third floor of the same building, visited the Ministry of Communications, Ministry of Railways, Tokyo Shiden, and Tokyo Dento to inquire about requests for emergency items. The majority of electric wire and cable manufacturers in the Kanto area suffered damage from the earthquake,[12] and Sumitomo Electric Wire & Cable Works was virtually the only company able to supply cables.

As part of restoration work, Tokyo Sales Office first received an order from the Ministry of Railways for paper-insulated cables for the loop line, but the price quotation proved challenging. With exorbitant market prices for the raw materials for electric wires, such as copper and lead, a decree was issued to prohibit profiteering, and general prices rose to two to three times higher than pre-disaster levels. Against this backdrop, Sumitomo decided to supply its products at the pre-Earthquake prices, and undertook day and night production to reduce delivery time. Later, the company received a flood of inquiries, including from Tokyo Shiden and Tokyo Dento, but in general, the company maintained prices the same as before the disaster. This decision demonstrated the Sumitomo management principles passed from one generation to the next since the company's founding, prioritizing the Business Philosophy: to not pursue immoral business; always for the public interest; and mutual prosperity.

12 The newly completed Fujikura Electric Wire Corporation plant was completely destroyed by fire, and the covered wire and cable factories at Furukawa Electric Industry's Yokohama headquarters collapsed and covered wire factory was destroyed by fire. The only competitors that escaped damage in the Keihin area were Nippon Densen and some small factories.


The Sumitomo Bank's Tokyo Branch, where Sumitomo Joint-stock Company's Tokyo Sales Office was located (photo supplied by Sumitomo Historical Archives)

12 Delivery of Japan's first 66 kV OF cable

In 1927, after it received an order from Tokyo Dento, Sumitomo Electric Wire & Cable Works independently developed Japan's first high-voltage 66 kV underground power cable, and delivered it in 1930, inspired by the OF (Oil Filled) cable developed by Pirelli, Italy in 1923. OF cable, using oil-impregnated paper for insulation, and with oil running inside the cable, to prevent the generation of air bubbles and deterioration from high voltage, was a world-famous invention that would become part of the history of cables.

In 1928, Sumitomo Electric Wire & Cable Works signed agreements with STC and Pirelli for technology introduction

and, at the same time, invested significant capital. That same year, the company exhibited Japan's first 154 kV OF cable, with far greater capacity than the conventional 66 kV, together with other products, at the Tairei Kinen Hakurankai (Kyoto) and the Taiten Houshuku Hakurankai (Nagoya) expositions. In 1929, the company supplied OF storage battery to Nihon Denryoku. Later, OF cable was widely used in constructing the transmission grid during Japan's period of high growth, providing support for the country's power grid.

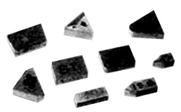
Japan's first single-core 66 kV OF 675 mm² cable

13 Start of cemented carbide tools, "IGETALLOY," production

Sumitomo Electric Wire & Cable Works established its Research Department in June 1930 and Sadatoshi Bekku,[13] of the Ministry of Communications' Electrical Testing Laboratory, was invited to be the department's first manager. The inauguration of this research department, promoted research and development for new products, especially non-electric wires. One of their outstanding achievements was cemented carbide IGETALLOY for machining tools.

Sumitomo Electric Wire & Cable Works had previously used special steel in dies for wire drawing and had undertaken extensive research to make improvements, such as for high-speed machines. However, with the release of tungsten carbide alloy WIDIA in Germany in 1927, the company began research in earnest. In 1928, the company succeeded in producing a prototype carbide wire drawing die. Then, in 1931, the company commercialized a tool for carbide cutting and began to sell it externally, including to the Yokosuka Navy Arsenal. Furthermore, it succeeded in developing IGETALLOY "S" cutting tool, with tantalum and titanium added to conventional hard alloy, and began marketing it in 1935.


IGETALLOY "S" cutting tool


"SI" type with added tantalum and titanium


IGETALLOY "W" die

This tool had greater durability than conventional products and provided good results in heavy-duty cutting, such as vehicle tires, which had previously been impossible. In addition, it was about half the price of WIDIA. Meanwhile, in 1933, production of IGETALLOY was transferred from the Research Department to the Manufacturing Department Work Section, and was conducted at an independent factory.

In addition, in 1932, the company registered the product name of "#(IGETA)LLOY Hard Alloy," and the trademark was registered in 1938. In 1959, the name was changed to "IGETALLOY," trademark registration was completed, and it remains in use today.

13 President appointed in February 1943.

14 Start of special steel wires production

Sumitomo Electric Wire & Cable Works began research into special wire in 1927. At that time most of special wire was imported, and development and production of high quality Japanese product was urgently needed. With the launch of the Research Department in 1930, progress was made in research and development of special wire, which was the start of the manufacture and sale of various products.

After successfully developing prototype Monel metal wire of acid-resistant nickel-copper alloy in 1930, the company wove it into wire mesh, which was supplied for the ammonium sulfate crystal filter at the fertilizer manufacturing facility of Sumitomo Fertilizer Manufacturing Co., Ltd. (present-day Sumitomo Chemical Co., Ltd.) in 1932. This was the beginning of the special wire business. Later, the company began trial production of stainless steel wire, heating (Nichrome) wire, low-resistance (Manganin and Constantan) wire, starting on a small scale. In addition, following Germany's lead, it succeeded in producing wire from stainless steel, which had been considered impossible.

In 1937, in response to the request from the Navy, the company embarked upon research and development, in collaboration with Sumitomo Metal Industries (present-day Nippon Steel & Sumitomo Metal), towards the domestic production of piano wire (high-grade steel wire for the engine valve springs), which were needed for aircraft production, and for which Japan relied entirely upon imports. Both companies had trouble in obtaining the required quality of billet and wire rods. In 1939 they established a wire rod mill, installed a roll hole die especially for piano wire and succeeded in producing high quality piano wire, which they delivered to the Navy in March 1940.

Later, Sumitomo Electric Wire & Cable Works built a piano wire factory in conjunction with the IGETALLOY factory at the Itami Works, completed in 1941, with a monthly production capacity of 40 tons.

15 Renaming of the company to Sumitomo Electric Industries, Ltd.

On November 1, 1939 Sumitomo Electric Wire & Cable Works changed its name to the company's present name, Sumitomo Electric Industries, Ltd. In the lead up, in October, the company's capital was increased from 30 million yen to 50 million yen to use, among other things, for funding the establishment of Itami Works.

A major reason for renaming the company was that the business had expanded to fields other than electric wires and development was progressing in both quantity and quality. Consequently, the name was considered too limited in terms of future prospects. Although businesses other than the electric wire business were growing, they derived from electric wire manufacturing, and were related to wire and electric equipment, leading to the decision upon the current company name.

Changing the company name was closely related to the capital increase and establishment of Itami Works and this, triggered by the expansion of the business, led to further development of business development.

16 Start of operation in Itami Works

With the outbreak of the Sino-Japanese War, in 1939, the company planned construction of a new factory to respond to the rapidly growing demand for IGETALLOY, mainly for military purposes. Production was conducted in six specialized factories of the West Plant of the expanded Osaka Works (two alloy plants and four machining factories, with a total floor area of 3,967 m²), but there was no room for further expansion at the site.

Koya, Inanomura, Kawabe-gun, Hyogo Prefecture (present-day Itami City) was chosen as a suitable site. Land with an area of approximately 324,000 m² was purchased, and a ground-breaking ceremony was held in June. The new factory, named Itami Works, commenced operations with a ceremony in March 1941. Thereafter, employees from Osaka Works were transferred across in three lots, and the relocation was completed by August. Meanwhile, construction of the special wire factory was conducted in three phases.

Later, in February 1943, the company acquired the Kondo Cotton Spinning Co., Ltd. in Nagoya City, and opened the Nagoya Works in June.[14] Then, in 1941, the company issued its first corporate bonds. The funds were to go towards construction of the various factories at Itami Works, and for expansion of various rubber-wire-related factories at the West Plant of the Osaka Works. In September of the same year, the first 10 million yen of bonds were issued of the total amount of 30 million yen.


View over Itami Works

14 It closed in June 2004 after an operating history over 60 years.

17 Start of anti-vibration rubber and fuel tanks production

Rubber and plastic materials for insulation coating of electric wires and cables need to be of a superior quality in order to withstand severe conditions, such as extended exposure to sunlight, wind, and rain. Sumitomo Electric's rubber-related technology was of a high level from before the war, in response to such stringent demands.

Examples of this were when, in 1941, the Acoustics Research Department at the Naval Engineering Research Institute requested Sumitomo Electric to develop anti-vibration rubber, for use in submarine machinery. Then, in 1942, the Army's Aerospace Exploration Agency requested the development of aircraft fuel tanks. Sumitomo Electric successfully developed an outside insulated tank and a bag-type fuel tank, and manufactured enough for about 400 aircraft.

Demand for both products vanished at the end of the war, but the laboratory continued research into anti-vibration rubber insulation in addition to covering materials for electric wires. The company received orders for anti-vibration rubber for railway carriages from Japan National Railways and other railway car manufacturers. Production was conducted at affiliate Asahi Kinzoku Seiko (present-day Sumiden Transmission and Distribution System Products, Ltd.). Meanwhile, in 1955, the Japan Defense Agency (present-day Japanese Ministry of Defense) asked the company to develop a fuel tank for aircraft, and the company started delivery for training aircraft in 1957, and fighter aircraft in 1958. Subsequently, the company has developed and manufactured a variety of fuel tanks for flying boats and helicopters, enhancing its technical capabilities through alliances with other companies. The company also developed pillow tanks for above-ground installation, which are used in PKO activities and for other purposes. From 1956, the anti-vibration rubber business was gradually transferred to Tokai Rubber Industries (present-day Sumitomo Riko).


Anti-vibration rubber

Chapter 2

From Post-war Reconstruction through the Period of High Economic Growth—Expansion into Other Fields Based on Capabilities in Electric Wire

1946–1972

1946 Establishment of Tokyo Branch Office (present-day Tokyo Head Office) 1
Order for Dissolution of Conglomerates
1947 Constitution of Japan enacted
Emperor Showa visited Osaka Works
1948 Start of sintered product sales 2
1949 Advancement into the field of overhead transmission line construction 3
Start of automotive wiring harness business 4
Exchange rate fixed at 360 yen to 1 U.S. dollar
1951 Peace Treaty with Japan and U.S.-Japan Security Treaty signed
1952 Start of prestressing steel production 5
1954 "Jinmu" economic boom (–1957)
1957 Delivery of Japan's first domestically produced television broadcasting antenna 6
1958 Start of air springs production for railcars 7
"Iwato" economic boom (–1961)
1960 Delivery of the first Japanese CV cable 8
1961 Opening of Yokohama Works 9
1963 Start of disc brake production 10
1964 Japan joined Organisation for Economic Co-operation and Development (OECD)
Start of electron beam irradiated tube and wire (IRRAX) products manufacturing 11
Tokaido Shinkansen high-speed rail inaugurated; Tokyo Olympics opening held
1965 "Izanagi" economic boom (–1970)
1968 Entry into the traffic control system business 12
Japan's GNP grew to second in the world, after the U.S.
1969 Establishment of the first overseas production base (for magnet wire; in Thailand) as Sumitomo Electric 13
Start of flexible printed circuits (FPCs) production 14
Start of steel cords production for tire reinforcement
1970 Start of compound semiconductors production 15
Japan World Exposition Osaka 1970 held
1971 Opening of Kanto Works 16
"Nixon Shock" and raising of the Japanese yen (308 yen to 1 U.S. dollar)
1972 Okinawa reversion; relations between Japan and China restored

After the war, Sumitomo Electric Industries, Ltd., needed to deal with air raid damage particularly at Nagoya and Osaka Works. Furthermore, it was also subject to an order by Commander General of the Allied Forces (GHQ) to dismantle Sumitomo head office. However the company overcome major crises including the retirement of the management team following their being purged from public office, and the company set off on its reconstruction plan. As progress was made on the reconstruction of production, improvements were also made to the internal structure.

Following the start of sintered products sales in 1948, the company promptly started manufacturing vinyl coated wire, focusing on superior features and PC steel wire, which it hoped would be a new construction material, and also entered the field of overhead transmission line installation. In 1949, it also began production of automotive wiring harness for Occupation Forces, which is one of the company's current mainstay products.

Later, as Japan continued to enjoy unprecedented rapid growth, Sumitomo Electric started supply of Japan's first domestic TV broadcasting antenna, and began production of electron beam irradiated cross-linked tube and electric wire widely used in electronic equipment and electrical appliances (IRRAX wire and tube). In addition, the company launched production of disk brakes with superior heat dissipation capabilities and stable braking performance, and engaged in the development of Japan's first flexible printed circuit (FPC). Sumitomo Electric thereby responded to the needs of the times appropriately and rapidly, and succeeded in the development of cutting edge products and products quickening the progress of the industry.

Meanwhile, in 1961, Sumitomo Electric established Yokohama Works, its first manufacturing base in the Kanto region to respond to increased demand for cable in the period of high growth. In 1969, the company opened its first overseas manufacturing facility, in the outskirts of Bangkok, Thailand, as it began to set its eyes upon global business expansion. That same year, the company began production of steel cords for tire reinforcement, and in 1970 it also worked to develop new growth fields, starting production of compound semiconductors.

1 Establishment of Tokyo Branch Office (present-day Tokyo Head Office)

In January 1946, Sumitomo Electric established its Tokyo Branch Office in the Tokyo Sumitomo Building in Marunouchi.

Previously, Sumitomo Electric Wire & Cable Works temporarily opened a Tokyo Office to facilitate supply of products to government departments in Tokyo and for sales activities. Otherwise, Sumitomo Electric's products were handled together with those of other Sumitomo group companies by Sumitomo General Head Office, then by the Tokyo Sales Office at Sumitomo's headquarters, which had a department responsible for the electric wire division (later the Electric Wire & Cable Section). In autumn 1943, the Tokyo Sales Office changed its name to the Tokyo Business Office. At the end of the war, Sumitomo Chemical Co., Ltd. and Sumitomo Mining Co., Ltd. (present-day Sumitomo Metal Mining Co., Ltd) respectively opened independent Tokyo branches, after which Tokyo Business Office comprised three sections: Metal, Machinery, and Electric Wire & Cable. After the war, in response to the dissolution of the Tokyo Office due to the dissolution of the Sumitomo head office resulting from the dismantling of conglomerates, Sumitomo Electric needed to establish its own sales office, opening the Tokyo Branch in January 1946. At the same time, the company also established branch offices in Nagoya and Fukuoka, and focused on building sales channels by handling all product sales and other responsibilities that had previously been entrusted to Sumitomo head office.

The Tokyo Branch Office started with 10 or so staff, including those transferred from the Electric Wire & Cable Section and transferees from the Sumitomo Electric head office. Sumitomo Electric also received a request from the Occupation Forces, for whom telecommunications was paramount, resulting in a rapid rise in demand for telephone cables. Due to the early recovery of the company's production systems, it was able to handle a significant volume of orders compared with other companies.

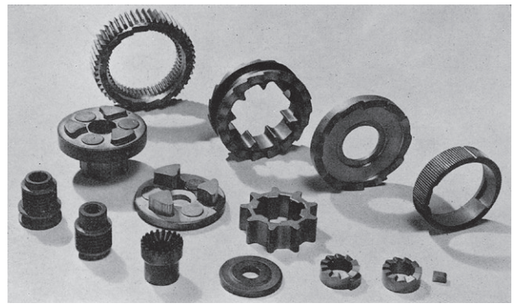
In November 1958, the Tokyo Branch Office was renamed Tokyo Branch Store, then in 1968, it became a division within the Head Office, and then in 1984, it was renamed Head Office (Tokyo).[1]

1 During this period, it was relocated to Ginza Kojunsha (1947), Toranomon Mitsutomo Building (1951), and then the former Akasaka Center Building (1973).

2 Start of sintered product sales

Sintered products are alloy products made by compressing and molding multiple types of metals in fine powder form before baking. The company worked on development of an oil-impregnated bearing (oil-less bearing) using copper powder under the direction of Kyoto University Faculty of Engineering Bearing Research Laboratory. In November 1948, the company launched the first product, Lubrite.

From the mid-1950s the demand for Lubrite bearings increased with the popularization of home appliances. The company planned to expand its applications, develop new mechanical parts using iron powder as a raw material, and expand its market. Consequently, it commercialized parts for sewing machines, knitting machines and other electric tools, and also developed products for automobiles, such as shock absorber pistons. Later, in order to be more price competitive and to improve product features such as durability, the company started technical collaboration with West German company Krebsöge in 1963. The Lubrite business expanded along with the growth of motorization, and, together with stainless steel and soft magnetic materials, it was used for parts for automobiles, household appliances, pumps and tools, and is still a strong brand today.



Lubrite

3 Advancement into the field of overhead transmission line construction

In June 1949, Sumitomo Electric established a construction representative in the business division, and expanded its business into the field of overhead transmission line construction, which had been outsourced to general construction contractors.

Prior to the end of the war, the company only handled construction work for high-voltage, submarine and other specialized cables, for which general construction contractors did not have the technology for connection or installation. However, in order to fulfill the role of a company developing technology suited to the ultra-high voltage transmission voltage, the company needed to accumulate construction and other experience. Furthermore, the company realized the ability to offer construction together with products would increase options for bidding to handle overseas transmission line projects, especially in emerging countries. Even in the case of cable installation work inside buildings, it required the support of subsidiary Taiyo Densetsu Co., Ltd. (present-day Sumitomo Densetsu Co., Ltd.) in order to secure orders and respond to orders from the Occupation Forces. For such reasons, it was decided to establish the Construction Division. In 1949, the company undertook construction of a 77 kV transmission line to an existing steel tower, between Amagasaki and Itami,

using hard copper stranded wire. This was the company's first full-scale construction project. Along the transmission route, there were three railway crossings, Hankyu, JNR (present-day JR-WEST), and Hanshin railways. This required considerable ingenuity on the company's part, including construction of a scaffolding log tunnel at the crossing locations, whereby construction was eventually successfully completed.

4 Start of automotive wiring harness business

In 1949, Sumitomo advanced into the automotive wiring harness business after it received orders for wiring harness to repair Jeeps from the Occupation Forces.

In 1957, the company received an order for bus engine wiring harness from Kawasaki Aircraft Co., Ltd. (present-day Kawasaki Heavy Industries, Ltd.) and began commissioning production to Tokai Electric Wire Co., Ltd. (present-day Sumitomo Wiring Systems, Ltd.), whereby Sumitomo Electric began its business by separating its manufacturing and sales structure. In 1959, the company received orders from Suzuki Motor Co., Ltd. (present-day SUZUKI MOTOR CORPORATION) and Honda Motor Co., Ltd. for motorcycle wiring harness; then orders from Daihatsu Motor Co., Ltd. in 1960 for wiring harness for its three-wheeled Midget trucks and, in 1961, for its four-wheeled Hijet light commercial vehicles. Leveraging entry in the field of disc brakes, Sumitomo Electric succeeded in securing an order for harness for the Clipper (small truck) of Prince Motor Co., Ltd. (present-day NISSAN MOTOR CO., LTD.) in 1965.

In 1966, the company successfully overcame rivals, despite its business history, to obtain orders from Toyota Motor Co., Ltd, (present-day Toyota Motor Corporation), for heavy-duty truck aluminum battery cable, and began trading with them. In cooperation with Tokai Electric Wire Co., Ltd., Sumitomo Electric developed high-tension electric wire (high-tension cables) for automobiles, successfully securing business from automotive manufacturers with this electric wire in 1967. In August 1968, Sumitomo Electric established a Toyota business warehouse and office (present-day Toyota Branch Office) and thereby establishing a successful service system. Then, in April 1969, the company began supplying wiring harness for Publica first.

In 1965, Tokai Electric Wire Co., Ltd. began operations at its Sayama Works, establishing a manufacturing and supply system to Honda Motors, and in 1967, it received orders for harness for the four-wheeled light vehicle N360.

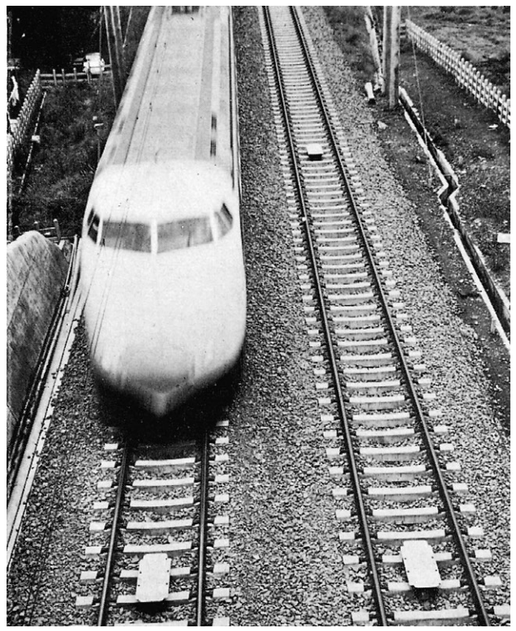
In April 1995, in an effort to further strengthen the company's R&D function, Sumitomo Electric established Harness System Technologies Research, Ltd. (present-day AutoNetworks Technologies, Ltd.) as a joint venture with Sumitomo Wiring Systems, where the former company (SEI) would be responsible for business strategy and sales, Auto Networks would be responsible for development, and Sumitomo Wiring Systems would be responsible for design and manufacturing.

Sayama Works harness assembly line

5 Start of prestressing steel production

In 1932, the Special Steel Wire business, which began with the delivery of Monel metal wire to Sumitomo Fertilizer Manufacturing Co., Ltd. (present-day Sumitomo Chemical Co., Ltd.), leveraged its strengths as Japan's only integrated manufacturer from the steel-making to expand the business to produce high-grade piano wire for aircraft engine valve springs. After the war, it expanded production to steel wire and steel cord for precision springs and prestressing steel.

Prestressing steel is embedded into concrete used for construction to strengthen it. The company invested in Kyokuto Kogen Concrete Shinko Co., Ltd.[2] established in 1952, and signed a contract to deliver prestressing steel to the sublicensed company in May, leading to manufacturing and supply to customers including Tokyo Station. In 1958, the company introduced the DYWIDAG method in collaboration with West German company Dyckerhoff & Widmann AG, which was first used in construction of Arashiyama Bridge (Kanagawa Prefecture), completed in 1959. In 1961, sleepers manufactured using the same method were adopted for the Tokaido Shinkansen, and delivery began from the following year.

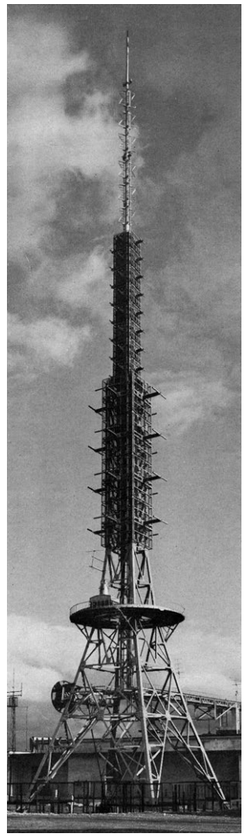


DYWIDAG system sleepers used for the Tokaido Shinkansen

2 Established through technical partnership with the owner of the principle patent for prestressed concrete (PC), French company Freyssinet International (then STUP), for the purpose of introducing the PC construction method into Japan, which it succeeded in industrializing.

6 Delivery of Japan's first domestically produced television broadcasting antenna

In the antenna business, Sumitomo Electric began manufacturing and shipping 30 MHz band transportable antennas to the National Police Agency (whip antennas for patrol car) in 1949. Later, the company also worked on very short wave (VHF) band antennas, including ship antennas for the Maritime Self-Defense Force and portable antennas for the Ground Self-Defense Force.



Japan's first domestically produced television broadcasting antenna

The first television test broadcasting in Japan began in 1952, and from 1953, a succession of television stations opened. Initially, the antennas and power supply wires (coaxial copper cable models) used were all imported. Nippon Hoso Kyokai (Japan Broadcasting Corporation: NHK) requested Sumitomo Electric to assist in domestic production of television transmission antennas. The company quickly embarked upon research and development, manufacturing and installing entire antenna systems including transmission antenna and power supply wires, which were first introduced at NHK Kokura Station in March 1957. Having gained recognition for this achievement, the company was engaged for the construction of transmission antennas at each station thereafter.

The commercialization of the television transmission antenna system was a major advancement for the company's wireless technology, marking the first phase of wireless technology innovation.

7 Start of air springs production for railcars

In 1955, Sumitomo Electric started research and promoted development into air springs, mainly for railway carriages. In 1957, the company developed a new type air spring, Sumipress, which it started manufacturing for private railways in November 1958. In 1960, the company received approval from JNR (the present-day JR companies) for production of three-stage bellows, and began manufacturing air springs for JNR.

A special diaphragm-type air spring developed in 1962 in collaboration with Sumitomo Metal Industries, Ltd. (present-day Nippon Steel & Sumitomo Metal Corporation) was adopted for the first Shinkansen carriages. Later, following the increase in speed of the carriages, the company developed advanced technologies, including horizontal nonlinear air springs, and continued to lead design for air springs for Shinkansen carriages.

By 2017, the company had supplied over 480 thousand pieces in Japan and abroad (equivalent to 120 thousand carriages).

Various air springs

8 Delivery of the first Japanese CV cable

After the war, the oil impregnated paper or natural rubber used for coated wire was substituted with synthetic rubber and resin. The company developed BN (butyl rubber insulated chloroprene sheath) and EV (polyethylene insulated vinyl sheath) for high-voltage power cables, switching over from the older materials.

In addition, following long-term studies with Sumitomo Chemical Co., Ltd., the company developed a high-quality polyethylene able to withstand use in cables, and started full-scale research for practical application from 1957, which led to successful development of the world's first crosslinked polyethylene insulated vinyl (CV) sheath for cable. In June 1960, Sumitomo Electric delivered Japan's first CV cable to Tokai Rubber Industries, Ltd. (present-day Sumitomo Riko Company Limited).

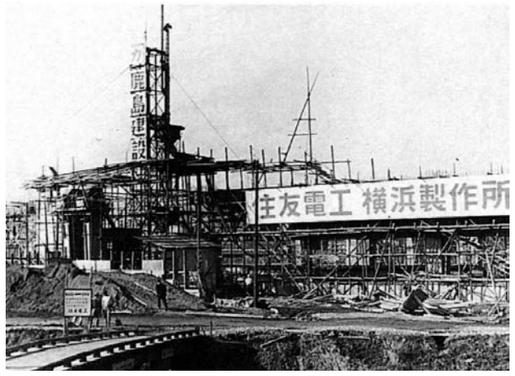
Thereafter, it expanded its production capacity, with the construction of the Yokohama coated wire plant (completed in December 1962). Since then, the company has steadily developed new products, handling increasingly higher voltages

(66 kV → 77 kV → 154 kV → 275 kV), facilitating easier installation, and improving water sealing performance. The company has introduced large-scale state-of-the-art equipment, such as the largest Vertical Continuous Vulcanizer (VCV) in Japan for CV cable, completed in April 1973 at Yokohama Works with a height of 80 m.

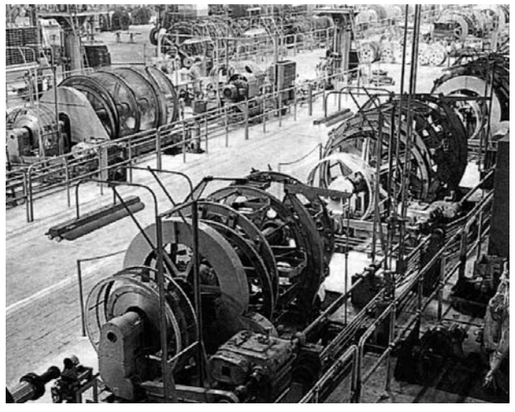
9 Opening of Yokohama Works

In 1961, with cable demand growing sharply due to the Jinmu and Iwato economic booms, the company opened its first manufacturing site in the Kanto area, at Totsuka-ku (present-day Sakae-ku) in Yokohama. The existing Osaka, Itami, and Nagoya Works had become cramped, and a factory was needed in the Kanto area to respond to growing public-sector demand, and to improve customer service.

Yokohama Works was constructed with four concepts in mind. First, it would be a pioneering modern and innovative plant for the company. Second, factory buildings were positioned like a checkered pattern to realize streamlining of transportation. Third, prestressed concrete was used in the buildings for the first time in Japan, acting as a form of PR for the company's special steel wire products. Finally, consideration was made for possible building future extensions.



View of construction of the telecommunication cable plant at Yokohama Works.



View of equipment at the telecommunication cable plant at Yokohama Works.

In May 1961, operations began at the telecommunication cable plant, then in July, the company made its first shipment to Japan Telegraph and Telephone Public Corporation (present-day Nippon Telegraph and Telephone Corporation).[3] The company's electric power cable plant was constructed in December 1962; an IGETALLOY processing plant was completed in October 1965, an electronic wire plant in August 1968, and a bare wire plant in September of the same year.

3 At the time, the two major goals of Japan Telegraph and Telephone Public Corporation were recovery from delays, and the advancement of nationwide automated dialing. The key to achieving these was implementation of a five-year plan for expanding the subscriber wiring network.

10 Start of disc brake production

Around 1959, British company Dunlop, which held the basic patent for automotive disc brakes, approached Sumitomo Electric seeking to approve preferential rights for the company to sell disc brakes, which had started to become widely adopted for passenger vehicles in Europe, to the Japanese automotive industry. Due to the fact that the company already had a close relationship with Dunlop Corporation in the UK at the time, in regards to investing in The Dunlop Rubber Co., (Far East) Ltd. (present-day Sumitomo Rubber Industries, Ltd.), the company decided to introduce the technology in early 1961. In 1963, Sumitomo Electric established Japan's first mass production system for disc brakes for the first time. Then, in 1964, products were adopted by Isuzu Motors Limited for the Bellett GT and Prince Motor Company for the Skyline GT.

Disc brakes were one of the latest technologies at the time and were of great interest to all automobile manufacturers, but Dunlop's standard design was based on 14-inch wheels, and therefore did not fit well on the majority of Japanese models, which had 13-inch wheels. As a result, the company was unable to make an immediate start, and after the launch of the Brake Division in 1963, it remained in the red. The contact for technological assistance with Dunlop was taken over by British automotive brake specialist Girling Ltd. Production of products designed by Girling that were suited to mass production were transferred. A new factory for disc brakes was opened in 1968 in the northern section of Itami Works, firming up the foundations of the business.

Disc brakes

However, the problem of fit on 13-inch wheels and 12-inch wheels, such as on Toyota's Corolla, remained unresolved. Consequently, in 1968, Sumitomo Electric launched a Joint Development Committee together with Toyota Motor Company aimed at developing low cost products with excellent fit that would be uniquely Japanese. As a result, the company successfully developed pin slide (PS) disc brakes, which were widely adopted for the Corolla and other vehicles, becoming an industry standard.

11 Start of electron beam irradiated tube and wire (IRRAX) products manufacturing

In 1959, the company began joint-development of the NS-type electron accelerator together with Nissin Electric Co., Ltd. Then, in 1960, installed the first research electron accelerator in the Research Department. Basic research and product development were undertaken to utilize the "cross-link by electron beam irradiation" for various polymer materials.

In 1964, Sumitomo Electric installed Japan's first industrial electron beam irradiation equipment at its Kumatori Research Laboratory, and began development of applied technology and full-scale mass production of products. Also in 1960, the company developed 6 kV PEX cable (later CV cable) irradiated and cross-linked to a polyethylene (PE) coating, which was supplied to the Kansai Electric Power Co., Inc. Sumitomo Electric commercialized heat resistant tape with irradiated polyethylene film, which was adopted for PEX cable joints.

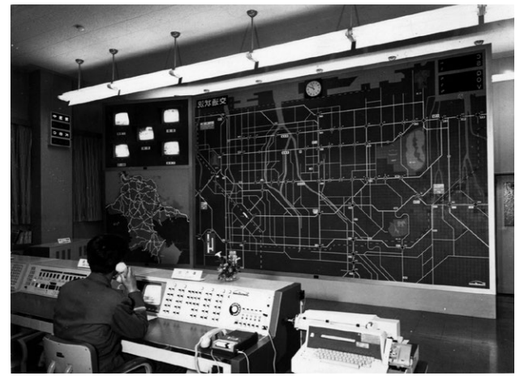
The company registered the trademark "IRRAX" for plastic products crosslinked by electron beam irradiation. It used the research accelerator to commercialize a succession of products including IRRAX tube, IRRAX bags, IRRAX tape, IRRAX wire and heat-shrinkable tube made with electron beam irradiated polyolefin, "SUMITUBE." During this period, the foundations for what would later become the Irradiation Division (present-day Fine Polymer Division) and the Electronic Wire Division.

12 Entry into the traffic control system business

In the traffic control system field, sensor-equipped traffic lights using transistors were introduced in Japan in the mid-1960s as motorization was in full-swing, and Sumitomo Electric entered the field, after a two-year delay. At the time, the wired logic system was in its heyday, and computer-based systems had not been realized. Consequently, the company adopted a strategy to develop a direct control system using computers ahead of other companies.

As the traffics signals on the road are considered to be safety equipment, its adoption chiefly depended upon actual achievements. Consequently, the company conducted studies of the signal control system using computer simulation to build up results. In addition, joint pilot trials were conducted with the National Research Institute of Police Science and the University of Tokyo Institute of Industrial Science. In 1967, a temporary shed was built on the grounds of the Yoyogi Police Station to monitor three intersections of the Koshu Highway, and a DEC Co., Ltd. PDP 8 S minicomputer, known at the time as a "ten thousand dollar computer," was installed. The computer recognized the rise and fall of the vehicle detection pulse and directly controlled the green/amber/red transition of the traffic lights only using software. With this system, the company succeeded in developing world-first techniques including online optimization and multi-criteria systems.

Later, as problems intensified, including traffic overcrowding, accidents and increased fatalities due to mixed traffic, and human and economic loss due to traffic congestion, the National Police Agency made improvements to the law. From 1971, a five-year plan was launched to set up a nationwide traffic control center, with the national and local governments each bearing 50% of costs. In 1970, Sumitomo Electric secured an order from Fukuoka Prefecture Police Headquarters for the first nationwide traffic control center. It proved that the benefits brought by the traffic control center in reducing traffic accidents and improving traffic flow far exceeded the cost of developing the facilities, leading to the launch of the company's traffic control project as a business. Subsequently, Tokyo Police Department traffic control center, which was the largest in Japan, was completed in 1974.



Japan's first wide-area traffic control system (Fukuoka Prefectural Police Headquarters)

13 Establishment of the first overseas production base (for magnet wire; in Thailand) as Sumitomo Electric

In 1969, Sumitomo Electric established SIAM Electric Industries Co., Ltd. (SIAM) in Thailand in cooperation with Mitsui & Co., Ltd. and local investors as the first overseas manufacturing company (magnet wire manufacturing company). The

company's factory began operations in February 1970.

Consequently, the company continued to establish overseas production bases, with Sumiden Singapore Pte., Ltd. in 1973 (magnet wire; began operation in March 1975, renamed Sumitomo Electric (Singapore) Pte., Ltd. in 1986). The second plant was constructed in 1988, and the third in 1989, as the production bases covered from wire rod to fine wire.

Thereafter, the company accelerated its overseas expansion, with electric wire in Nigeria (began operation in 1978, transferred to local company in 1989), and Singapore (1978), wiring harness (Brazil, 1978), PC steel strand and carbide tool (U.S., 1979–) and expansion in China in the 1990s and 2000s.

SIAM

14 Start of flexible printed circuits (FPCs) production

Practical application of flexible printed circuit (FPC)[4] began in the U.S. from the mid-1960s as wiring material for weight reduction and miniaturization in the aerospace industry. In Japan, which had no aerospace industry, it was expected that there would be demand for FPCs in the consumer and measuring equipment sectors. It was used as a wiring material to help reduce equipment size and weight, to cut wiring labor, and also functioned as a rigid printed circuit board for mounting parts. Given this, Sumitomo Electric began research in 1965 into FPCs based on the adoption of rigid printed circuit board (RPC) in Japan for electrical and electronic equipment.

The research was conducted in the absence of literature and technical materials, starting from basic testing, leading to completion of an FPC prototype in 1967, through trial and error. However, various problems became apparent, and it failed to produce the expected miniaturization, weight-reduction or labor-saving. Consequently, it was not adopted immediately, but in the following year, in 1968. In response, the Research Department and Parts Material Development Office were created in 1969, and in 1972, they were positioned as new business divisions.

While a number of Japanese rigid printed circuit board manufacturers were working on FPC development, Sumitomo Electric took the lead, targeting customers with PR and promotional activities. Through these efforts, the company achieved FPC adoption for measurement instruments, computer storage devices, and wire memory applications. In 1973, the company received orders for mass production for use in cameras, and in calculator from 1975, whereby growth in demand became a reality. In that year, the Component Materials Development Office became the Electronic Wire Division Printed Circuit Department, and its status was changed to Division in 1983.

4 Wiring material in which an electric circuit of copper foil is created on an extremely thin insulating film. Due to its thinness, light weight, and flexible nature, it contributed to miniaturization, multi-functionality, weight and cost reduction of electronic equipment. It was also used in fields including camera-integrated VTR and cell phones.

15 Start of compound semiconductors production

Sumitomo Electric's involvement in semiconductors began in 1956 with the Research Department Metals Section, which undertook semiconductors research. In 1961, the company established a Semiconductor Laboratory within the Research Department and began basic research into indium antimonide (InSb) sensors and gallium arsenide (GaAs) oscillators, with the aim of developing key devices for in-house systems. At the time, silicon was undergoing commercialization as a material for semiconductors, but from an early stage, Sumitomo Electric focused on compound semiconductors with different functionality and characteristics from those made from silicon.

However, with no prospect of commercialization, the semiconductor laboratory was disbanded in 1968, and many members were relocated in other divisions. With the remaining members continuing smaller-scale research, 1969 brought the first signs of change from the market. A new functional element was required for the application which was impossible or difficult to achieve with silicon. Promising elements included InSb, which was used as a highly sensitive magneto resistive element in calculator keypads, and gallium phosphide (GaP), and gallium arsenide phosphorus (GaAsP), which were used as display elements in light emitting diodes (LED). In July 1969, the laboratory was relaunched as the Research Department Electronic Materials Group, to investigate new products and business directions for the company in the commercialization of InSb, GaP, and GaAs.

Sumitomo Electric announced its commercialization in June 1970, and the group was promoted to a Development Office in July. At the same time, the company launched a project team to manage the sales structure for GaAs and other elements. Subsequently, inquiries concerning InSb and GaP increased, while the company accelerated research into development of key technologies such as HB-GaAs seeding.[5] In January 1972, the Electronic Materials Development Office became independent from the research department, taking the first major step towards becoming a business. Then, in 1978, the company established its first mass-production factory at Itami Works. Thereafter, a strategic approach was adopted concerning GaP substrate and epitaxial-related matters, including gradual withdrawal to only technical development, due to factors such as excessive competition. In 1982 and 1983, semiconductor-related sales grew sharply, and the company gained the highest share in GaAs and indium phosphide (InP) worldwide.

5 Adjustment of seed crystal temperature for partial melting to blend the seed crystal and the melt.

16 Opening of Kanto Works

In June 1971, the opening ceremony was held for Kanto Works at the Kanuma Industrial Park in Kanuma City, Tochigi Prefecture. At the time of opening, it was the company's fifth manufacturing facility, with 109 employees under the director.

Surveying and investigation into the site for the new factory began in 1968. As a result, in October 1969, a site of 167,596 m^2 was purchased from the Japan Housing Corporation (later, the Housing and Urban Development Corporation; the Urban Development Corporation; the present-day Urban Renaissance Agency), based on the future prospects of the factory and anticipated development in transportation and the transportation network. It was located in Tochigi Prefecture between Utsunomiya City and Kanuma City, and in proximity to the Tohoku Expressway Kanuma Interchange (opened in 1972). In the Phase one business plan, it was decided to introduce the Electronic Wire Department of the Telecommunications Business Division, and by January 1971, some of the factory buildings and residences had been completed. In March 1971, a ceremony was held for new local recruits, and Kanto Electronic Wire Plant was established and began production in April.

After that, a series of great progressions were made, with extension of the electronic wire plant and establishment of the Kanto Telecommunication Cable factory. Meanwhile, the world saw oil crises and the company consolidated some of its plants. Then, in 1982, it undertook full-scale entry into the brake business, increasing the number of employees and making further improvements to the organization.

Kanto Works at the time of opening

Chapter 3

From the Period of Stable Growth to the End of the "Bubble Economy"—New Technologies and Materials Opening the Way for Innovation of the Times

1973–1996

1973 Transitioned to the floating exchange rate system
First Oil Shock
1974 Introduction of optical fiber manufacturing pilot facilities 1
First negative economic growth since the end of the war
1975 Order received for power transmission line project in Iran 2
1976 Order received for communication network construction in Nigeria 3
1977 Japan-U.S. trade friction escalated
1978 Start of the world's first bi-directional optical CATV system "Hi-OVIS" operation 4
1979 Second Oil Shock
1980 Japan became world number one in automotive and crude steel production
1981 The first delivery of optical LAN system 5
1982 Success in synthesizing the world's largest 1.2-carat single-crystal diamond 6
1984 Completion of the longest Fabridam (inflatable rubber gate) in Japan, on the Iwaki River 7
1985 Japan Telegraph and Telephone Public Corporation and Japan Tobacco & Salt Public Corporation privatized
Finance ministers and central bank governors agreed to adjust the strong U.S. dollar (Plaza Accord)
1986 Recession caused by strong yen
1987 JNR privatized and divided; each JR company launched
1988 Full-scale investment in CV cable equipment progressed; and large-sized projects 8
1989 Death of Emperor Showa; current Emperor enthroned
Consumption tax (3%) introduced
Highest historical value of TSE Average Stock Price at 38,915 yen recorded (peak of the "Bubble Economy")
1990 Start of FDDI compliant optical link production 9
Official discount rate increased to 5.25% (end of the low interest rate era)
U.S., Canada, and Mexico agreed upon the North American Free Trade Agreement (NAFTA)
1993 EC market integration
1994 European Economic Area (EEA) launched
U.S. President Bill Clinton decided to reactivate Section 301 of the Trade Act of 1974
1995 Great Hanshin-Awaji Earthquake occurred
Japanese yen recorded its highest level of 79.75 yen against the U.S. dollar
1996 Development of technology for superconducting power cable with Bi-based high-temperature superconducting long length wires 10
Rapid spread of the Internet

In 1973, Japan faced the first oil shock. Then, in 1974, the country experienced actual negative growth for the first time since the end of the war, marking the end of the period of high growth. Against this backdrop, following on from the 1975 power transmission line project in Iran, Sumitomo Electric Industries, Ltd. received an order for a telecommunications network project in Nigeria in 1976. Later, the company opened overseas production bases in a wide range of business fields, actively undertaking power and telecommunications engineering projects worldwide. Meanwhile, in Japan, Sumitomo Electric foresaw the arrival of the advanced information society, and took the lead in development of optical fiber that could transmit large volumes of information rapidly and reliably. It also worked on related products including connectors, and construction equipment, and contributed to the construction of optical communication networks.

From the mid-1980s, with the substantial monetary easing after the economic recession due to the strong yen following the Plaza Accord, Japan advanced towards a "bubble economy." Under these circumstances, the company undertook work in the new fields of the era, releasing a succession of new technologies and materials. It developed an optical link module compliant to the FDDI international standard, responded to the development of ultra-high pressure power CV cable, and developed high capacity power transmission technology by lengthening high-temperature superconducting wire. In fiscal 1989, the company achieved consolidated net sales of one trillion yen.

Consequently, the company continued to develop new technologies and products in response to the needs of the times. Sumitomo Electric also took part in construction of the Honshu-Shikoku Bridge, Kansai International Airport and other large-scale projects, and entered China, which was undergoing remarkable economic development.

1 Introduction of optical fiber manufacturing pilot facilities

In December 1974, Sumitomo Electric completed a pilot plant in the Yokohama site to develop optical fiber[1] manufacturing processes, and began full-scale development of optical fiber ahead of its domestic competitors.

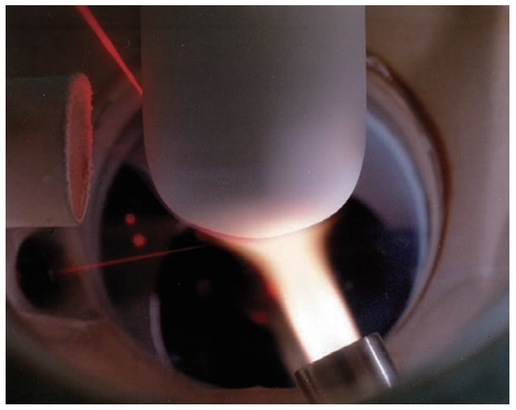
The company began to develop optical fiber in Osaka and Yokohama, based on reports from employees who had attended the Conference on Trunk Telecommunications by Guided Waves, held in London in 1970. At the Yokohama site in particular, research into a fiber structure that reduces the refractive index of cladding (covering material) resulted in the company filing a basic patent for fluorine additive in 1972. The company produced a proprietary optical fiber structure with a pure silica core and cladding containing the fluorine additive with a low refractive index. Later, in 1974, the company registered the basic patent for Vapor Phase Axial Deposition (VAD), which became a key production method in Japan.

The researchers in the Osaka region joined with those from Yokohama and, in May 1975, the company began development, harnessing the combined strength of Japanese companies, centered on Japan Telegraph and Telephone Public Corporation (present-day Nippon Telegraph and Telephone Corporation), together with Furukawa Electric Industry Co., Ltd., and Fujikura Electric Wire Corporation's (present-day Fujikura Ltd.), in the development of silica optical fiber manufacturing technology and cable production, and connection technology. A significant issue of the joint research was the establishment of a production method for optical fiber preform. The finalized VAD method uses fine silica glass particles created in a chemical reaction from the gas materials, depositing them in soot form on the tip of a spinning rod which is pulled upward in the axial direction, after which it is treated to remove moisture, and then fired to produce clear glass. In comparison with MCVD and other methods, it had many benefits, including superior economy, by enabling mass-production of large preform. Furthermore, it resulted in extremely low loss, and made it possible to create wholly synthetic preform which produced high strength fiber.

Later, Japan Telegraph and Telephone Public Corporation conducted on-site testing twice to verify the technology: in December 1980, tests were conducted on a commercial product in 12 sections nationwide, over a total length of 110 km; then in November 1982, it was officially adopted.

In the 1990s, fully-fledged demand for optical fiber emerged. In 1994, the company embarked upon extensions to its Yokohama facilities, then, in November 1996, Kiyohara Sumiden, Ltd. was established in preparation for the opening of a new plant.

1 Optical fiber is glass fiber with the thickness of a human hair. By slightly altering the composition of the glass, it is possible to make the refractive index of the fiber core higher than that of the cladding, whereby optical signals can be enclosed in the core and thereby transmitted. In comparison to transmission by copper wire, it is possible to achieve high frequency and broad bandwidth, as well as significantly extending the transmission distance.



Growth process of optical fiber preform using the VAD method

2 Large-scale overseas projects: (1) Order received for power transmission line project in Iran

After the first oil shock in 1973, industrialized countries including Japan suffered from low growth, while a concentration of large projects took place in the Middle East, thanks to income from oil. Sumitomo Electric also focused efforts on entry into Middle Eastern markets, and secured two successive orders for large-scale power transmission line projects in Iran. In July 1977, in the light of large construction orders overseas, the company integrated its power transmission line and underground construction departments to establish the Power Construction Division, based on overseas large construction orders, and gained orders in Saudi Arabia, the U.S., Thailand, and Hong Kong.

The order received in Iran was for the TS-19 Project to supply electricity from the southern Persian Gulf coast to Sarcheshmeh Copper Mine in central Iran, and the TS-28 Project to supply electricity from the Neka Power Station on the Caspian Sea, in the north, to the capital Tehran, which continued to suffer from power shortages.

The TS-19 Project was the first order received from Iranian company TAVANIR (a power generation and transmission company) in 1975, for 400 kV, 230 kV and 132 kV transmission

Transmission line construction in Iran

line construction connecting Bandar Abbas, Sirjan, Sarcheshmeh, Rafsanjan, and other locations. This transmission line required construction in extreme conditions, with altitudes exceeding 3,000 m in the center, and the majority of construction in the south being in desert regions.

The TS-28 Project, another order from TAVANIR in 1977, was for a transmission line approximately 300 km in length to connect the Neka Power Station on the Caspian Sea coast to the capital Tehran. Construction proved extremely difficult, with the low, soft ground in the coastal area near the Caspian Sea for approximately 40 km, contrasting with another area of about 30 km where the height rising from tens of meters to 2,600 m, where the ground was constantly moist.

The TS-19 Project was completed in March 1978, while, due to the Iranian Revolution (February 1979) and the Iran–Iraq War (September 1980), the TS-28 Project was delayed, finally being completed in February 1982.

3 Large-scale overseas projects: (2) Order received for communication network construction in Nigeria

Sumitomo Electric's overseas telecommunications engineering business gained momentum following the order received for South Africa's national railway coaxial cable construction project in 1967. Thereafter, the company received orders for coaxial cable construction in Iraq (1974–1989), optical cable construction in Argentina (1980–1981), a project for construction of an urban network in Malaysia (1982–1993), and a traffic control system for a second highway in Thailand (1991–1993).

Among them, the project received from the Federal Ministry of Information and Communications of Nigeria in December 1976 was Sumitomo Electric's first large-scale urban communication network construction project. As part of Nigeria's Third National Development Five-Year Plan, the telephone network development plan (for 38 telephone exchange offices) was announced in June for international bidding. It divided the country into six construction areas, and involved construction and installation of telephone exchange office buildings, exchangers, and outdoor telephone line facilities.

Nigeria's urban telephone network

Against major international competitors who tendered bids, such as Germany's Siemens AG and U.S. firm ITT, Sumitomo Electric secured the order for the 2nd Industrial Zone (Ibadan area: about four times the size of Kyushu), which was the largest among the six construction areas. In terms of construction work for a local telephone network, the project was on an unprecedented scale to be contracted to one company.

The company established a Planning Office in January 1977, and in February, a Nigerian Communication Infrastructure Construction Headquarters was established independently from the Telecommunications Division. By March, 23 specialists were assigned from various divisions within the company. Civil engineering work was contracted to local company, Dave Engineering Co., Ltd. (DAVE) and construction began in July 1977.[2] The work involved 300 Japanese staff and 2,000 local staff, and was completed after eleven and a half years, in July 1988. Following the completion of this project, the number of employees experiencing overseas construction projects increased significantly, and success produced greater confidence, which carried over to subsequent projects.

2 From around 1978, the progress of the construction was delayed, and concerns arose as to whether it could be completed within the contract term. In response, the company took measures such as transferring the obviously delayed telephone exchange office construction from the DAVE company to Japanese firm Oshirogumi, which had substantial experience.

4 Start of the world's first bi-directional optical CATV system "Hi-OVIS" operation

In July 1978, operation[3] began of the world's first bi-directional optical CATV system, the Highly Interactive Optical Visual Information System (Hi-OVIS). The system involves transmission of image signal using an optical fiber laid from the center to homes. Specifically, approximately 150 homes in Ikoma City, Nara Prefecture were equipped with a dedicated terminal such as keyboard or television set, then, when a request signal was received from the terminal, it was processed by computer at the center, which launched the video source, such as a VTR, and controlled the image exchanger to manage video services to each home. Sumitomo Electric, as one of manufacturers participating in Hi-OVIS, was responsible for the optical transmission in this system, developing and manufacturing the optical transmitter/receiver (338 pairs), fiber optic cable (equivalent core length of approximately 360 km) and video exchanger (video switch) and was responsible for transmission line construction. Ahead of other company, Sumitomo Electric successfully developed components for the optical transmission system with the required reliability and mass production capability. The company's accumulation of technology contributed significantly to later optical system business development.

After that, evaluation of various video services was conducted for about five years. It was also described in Alvin Toffler's book *The Third Wave*, arousing interest both in Japan and abroad, and in October 1984, even the Emperor Showa visited for an inspection.

3 In the 1970s, boosted by the first new CATV-based media boom, an attempt to realize an advanced information system for general households by fusing optical communication, computer and broadcasting technologies, supported by Ministry of International Trade and Industry, centering on the Visual Information System Development Association.

Ceremony for opening of the Hi-OVIS station

5 The first delivery of optical LAN system

Following the success of "Hi-OVIS," in March 1981, the company developed a 10 Mbps heterogeneous computer connection system using the token ring method, creating what was at that time a state-of-the-art optical LAN system in the world. It was first delivered to the Nippon Kokan Co., Ltd. (present-day JFE Steel Corporation) Fukuyama Plant. At the time, there were no standards for computers and communications, there was no word "LAN," which was instead called the "data highway." It realized a distributed system[4] by connecting multiple computers to a high-speed microcomputer node[5] with optical fibers and absorbing the difference in communication protocol (procedure) using the microcomputer node.

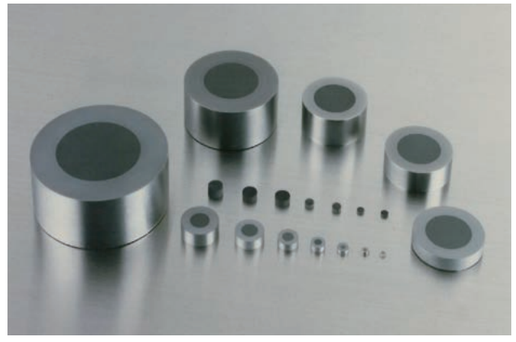
Thanks to its background in microcomputer and optical fiber technology, the company entered the LAN business ahead of other companies, as a natural flow of business expansion. The product was named "SUMINET" by combining the company name with "network." It gradually gained popularity in the market, becoming a national brand, and creating the leading group in Japan's optical LAN market.

4 A system that, rather than using the conventional configuration of a large host computer and terminals, uses a network to connect decentralized, differing small and medium-sized computers.
5 Connection device equipped with a microcomputer.

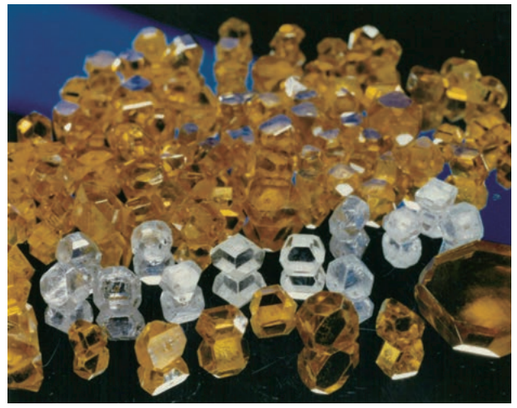
6 Success in synthesizing the world's largest 1.2-carat single-crystal diamond

In 1970, Sumitomo Electric began research on diamond synthesis, starting with the sintered cubic boron nitride (cBN) "SUMIBORON BN 200" (1977), later working on commercialization of a sintered diamond cutting tool "SUMIDIA DA 400" (1978), a sintered diamond compact die material "SUMIDIA WD" (1979), and other ultra-high pressure sintered products. In 1981, the SHM Development Section was established within the Research and Development Headquarters by consolidating the Ultra-high Pressure Research Group, and the SHM Development Division was established within the Technology Development Department of the Powder Alloy Division.

Members of SHM determined that development of ultrahigh pressure technology and business expansion was limited using only sintered material, and therefore set out to synthesize single-crystal diamond. Partly thanks to their experience in ultra-high pressure technology, synthesis of the prototype was relatively easy. Having gained confidence through this, the members applied for a



SUMIDIA WD die material



SUMICRYSTAL

synthetic single-crystal diamond research and development budget in the three-year plan from 1980 and planned for part of it to be covered by a research grant from the Ministry of International Trade and Industry (present-day Ministry of Economy, Trade and Industry), which gained approval.

In 1982, they succeeded in early synthesis of a 1.2-carat single-crystal diamond, which was published as a world record in the 1984 edition of the Guinness Book of Records. Although it took a little more time to confirm its stability for mass production, the company announced the synthetic single-crystal diamond "SUMICRYSTAL" in April 1985 in the newspapers, and in 1986 it was among the Ten Great New Products awarded by the Nikkan Kogyo Shimbun newspaper. In this way, the company established a firm position as a synthetic diamond manufacturer.

7 Completion of the longest Fabridam (inflatable rubber gate) in Japan, on the Iwaki River

Fabridam is constructed by placing a bag made of rubber-made cloth across a riverbed and filling it with air or water to form a weir. Sumitomo Electric utilized its accumulated experience in rubber materials, which are used as a coating material for electric wires and cables, in promoting development. In 1966, the company established a prototype on the Hirata River in Hikone City, Shiga Prefecture, which started the business. In 1968, the company collaborated with U.S. company Firestone, the first company in the world to construct such a dam, and in 1974, with Imbertson, a company established by the inventor of the dam, in an effort to improve the technology. In 1977, Sumitomo Electric received its first overseas order, in Taiwan.

Compared with steel movable weirs, Fabridam required almost no maintenance and the maintenance costs were lower. Consequently, the company gradually built up its construction record, mainly for irrigation intake weirs, as well as for power generation, water supply and sewerage, and to help fish swim up and downstream in rivers. The company also realized application of the technology for large weirs, such as Iwakigawa intake weir completed in 1984, Iiogawa Kakunose weir completed in 1990, and Kurotani Power Plant intake, dispelling uncertainty about strength and reliability by through practical application.

As of the end of March 1997, the company had installed 1,486 Fabridams in Japan and 61 overseas.

Iwakigawa intake weir Fabridam

8 Full-scale investment in CV cable equipment progressed; and large-sized projects

In electric power CV cable, the company undertook major projects for 275 kV ultra-high voltage long distance line, such as Tokyo Electric Power Company Minami Ikegami Line No. 2 (9.5 km, 1988–1989), Chubu Electric Power southern route (26.8 km dual-line, 1989–1993). The company manufactured and constructed large quantities of materials including extruded molded insulated joints, which it had developed independently.

Due to the advancement of ultra-high voltage from 275 kV to 500 kV, in October 1995, VCV was newly established at Osaka Works for mass production of 500 kV CV cable, as well as an UHV (Ultra High Voltage) test hall, in order to establish a mass production and inspection system. Through this system upgrade, the company began delivering 500 kV CV cable for the Tokyo Electric Power Company's Shin-Keiyo-Toyosu Line, in 1996.

Sumitomo Electric received orders from the Kansai Electric Power Co., Inc. and Electric Power Development Co., Ltd. for the Anan-Kihoku 500 kV DC trunk line using PPLP[6] OF cable, and Power Development Co., Ltd. In addition, the company also expanded submarine cable related facilities in 1997 (this project was completed in October 1999).

6 Polypropylene Laminated Paper: Insulating paper developed by Sumitomo Electric laminated with craft paper and polypropylene film.

VCV tower (right)

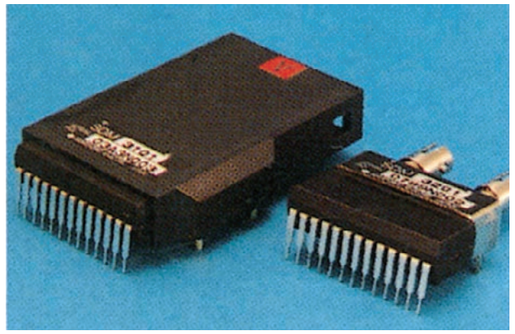
9 Start of FDDI compliant optical link production

The development of high-speed optical link, which the company began in 1982, was advanced through the development of optical devices and its application in circuit technology. In 1985, Sumitomo Electric successfully developed the world's first FDDI[7] compliant 125 Mbps optical link equipped with the company's 1.3 μm light-emitting diodes.

In 1990, the company developed "Super Sumi-Link" (SSL), and in 1991, started mass production of the Super Sumi-Link "SDM 3000 Series" for FDDI. SSL features a proprietary plastic mold integrated structure and was successfully differentiated by making it compact and washable, and by achieving a high degree of reliability. The concept of this plastic mold type optical link was an extension of the mold technology that had only been used for transistors and ICs, which are the constituent elements of electronic circuits, expanding application to the field of optical links. It used a novel technique that achieved integration, including optical connectors used for input and output of light. It enabled cost reduction, and won the award of attention in 1994 from the then Science and Technology Agency. These technologies were also applied to a small duplex optical link featuring optical transmission and reception functionality and 2.5 Gbps optical link for public telecommunication using a semiconductor laser, by applying its GaAs high-speed device. As a result, the company formed the top group in the global optical link market.

After that, Sumitomo Electric also expanded to 10 Gbps and 100 Gbps optical link businesses, and maintained its lead position in the world optical link market.

7 Standard of LAN using optical fiber networks with maximum transmission speed of 100 Mbps.



SDM 3000 series

10 Development of technology for superconducting power cable with Bi-based high-temperature superconducting long length wires

High temperature superconductors discovered in 1986 were capable of high-density conductivity without any electric loss. If the wires could be applied to power cables, it was expected that a compact, large capacity and low loss cable as a large amount of electricity transmission technology could be realized, as electric power demand was growing at that time, and demand for electric power around major cities was particularly remarkable. In 1990, in collaboration with Tokyo Electric Power Company, Sumitomo Electric developed high temperature superconducting cable using bismuth (Bi)-based wires cooled with liquid nitrogen.

In 1993, Sumitomo Electric succeeded in the development of elemental technology, producing a 3-layer 7 m model cable followed by a 50 m flexible thermal insulation pipe in 1995. Then, a long cable conductor with 50 m and AC 2,000A was realized by winding and laminating a large number of Bi-based wires in a spiral formation. In parallel, cable component technologies for electric insulation, thermal insulation, magnetic shielding, and cooling methods were developed. In particular, it was clarified that the electrical insulation wound with PPLP in multiple layers had excellent performance when impregnated with liquid nitrogen. Long length bismuth (Bi)-based Ag sheathed wires over 1,000 m were produced in 1996. Then, based on the results of the cable component technologies development, a prototype 30 m cable cooled by a liquid nitrogen circulation cooling system was developed, and operation at AC 70 kV and AC 1,000A was successfully demonstrated in 1997.

30 m high-temperature superconducting cable prototype

Things That Do Not Change, and Things That Must Not Be Changed—The Company and the Sumitomo Spirit

In the 20 years since Sumitomo Electric celebrated its centenary, the company has been forced into a significant self-transformation.
In addition to the major trends such as information revolution and globalization, unexpected occurrences, including the rise and fall of the IT bubble around 2000 and the Global Financial Crisis of 2008, have made Sumitomo Electric change its organization and business structures.
In other regards, however, Sumitomo Electric has remained steadfast.
One such aspect is the Sumitomo Spirit, and the Corporate Principles and Management Policies which are based upon it.

Monjuin Shiigaki (*The Aphorisms of Monjuin*) (photo supplied by Sumitomo Historical Archives)

Monjuin Shiigaki (*The Aphorisms of Monjuin*), written by Sumitomo Family founder Masatomo Sumitomo in his later years; dates back over 350 years, while the *Rules Governing the Sumitomo Family* and the *Business Principles*, both created as Sumitomo was becoming a modern company, are also more than 100 years old.
They impart the essence and general reasoning of corporate management as a human activity, and the business approach that must be maintained regardless of country or time, as has been conveyed both inside and outside the company by successive Sumitomo leaders.

Wooden image of Masatomo Sumitomo (photo supplied by Sumitomo Historical Archives)

The Sumitomo Spirit

Sumitomo shall achieve prosperity based on solid foundation by placing prime importance on integrity and sound management in the conduct of its business.

Sumitomo's business interest must always be in harmony with public interest; Sumitomo shall adapt to good times and bad times but will not pursue immoral business.

Banji-nissei

The Sumitomo Spirit is renowned for the *shinyo-kakujitsu* ("integrity and soundness," from the first article of the Sumitomo Spirit) and *fusu-furi* ("not pursuing immoral business," from the second article of the Sumitomo Spirit) described above. Sumitomo Electric also puts these teachings into practice; however, over the past 20 years, the company has placed particular emphasis on *banji-nissei*. When the current chairman and CEO Masayoshi Matsumoto was appointed president, he requested a calligraphic work from the Sumitomo Family. The calligraphy he received were the idioms *fusu-furi* and *banji-nissei*. This latter phrase, originating in the prologue to *The Aphorisms of Monjuin*, means: "Do your sincere best, not only in business, but also in every aspect of your life." These words are repeated each year, in the president's greetings to new recruits, and in every aspect of company training.

Banji-nissei is comprised of just four Chinese characters, yet encompasses all business activities at Sumitomo Electric, and holds great significance for the company.

Each person is required to do one's sincere best, in business, including the company's manufacturing technologies and product quality, approach to work and to character development, consideration of various management methodologies and viewing matters from diverse perspectives—and also in every aspect of one's life. Essentially, *banji-nissei* is the spirit that all Sumitomo executives and employees should apply and can put into practice, regardless of their position or circumstances.

Implementing *shinyo-kakujitsu* and *fusu-furi*

Shinyo-kakujitsu and *fusu-furi* are aspects of the Sumitomo Spirit that have been maintained as matters of great importance in the company's history.

Shinyo-kakujitsu is practiced in SEQCDD (Safety, Environment, Quality, Cost, Delivery, Research & Development), which forms the basis of the company's manufacturing. In September 1950, when Typhoon Jane inundated products that were ready for delivery, management instructed their complete re-manufacturing just in case although washing them might have sufficed. Such an approach has been maintained to this day in various forms.

Sumitomo Electric clearly demonstrated *fusu-furi* after the 1923 Great Kanto Earthquake. Electrical wire manufacturers in the Kanto region suffered significant damage and the cost of copper and other raw materials soared. Nevertheless, as part of its efforts to contribute to recovery, Sumitomo Electric provided electrical wires and cables—essential for reconstruction—at pre-earthquake prices and engaged in around-the-clock production for the fastest deliveries. This decision to shun easy money was rooted in the Sumitomo Spirit.

The spirit of "Emphasis on Technology" and "Ambitious Planning" are also unique to manufacturing-focused Sumitomo family. Among Sumitomo Group companies, Sumitomo Electric in particular has inherited and maintains these principles, as a company responsible for main infrastructure such as electrical power and communications. Facing difficulties following the Global Financial Crisis, Sumitomo Electric did not reduce research and development spending. Management decisions made it possible by the Sumitomo Spirit.

Corporate Principles, Charter of Corporate Behavior, and becoming a Glorious Excellent Company

The Sumitomo Spirit has been passed down by successive managers and pioneers; however, since 1990, Sumitomo Electric has also seen rapid spread of globalization. Consequently, the company drew up Corporate Principles and a Charter of Corporate Behavior so that it can ensure the thorough understanding of and adherence to the Sumitomo Spirit also among the Sumitomo Electric Group's overseas employees (see pages 35 and 48).

In VISION 2007, Sumitomo Electric also outlined its goal of becoming a Glorious Excellent Company (see page 48)—and this "Glorious" includes a desire to maintain and continue the Sumitomo Spirit.

By "adapting to good times and bad times," Sumitomo Electric intends to advance its technologies, develop and change its management and organization, and continue to grow exceeding national boundaries. However, so long as companies are run by people, there are also things that must not be changed: to this end, Sumitomo Electric will honestly and resolutely maintain the Sumitomo Spirit.

Maintaining the Sumitomo Spirit and Realizing Change

Masayoshi Matsumoto
Chairman & CEO

Since its foundation in 1897, Sumitomo Electric has overcome a number of tumultuous periods. The past 20 years in particular have seen several events that have completely transformed both the economy and society: the rapid growth and information revolution centered on the Internet, the subsequent collapse of the IT bubble, the advance of globalization, and the Global Financial Crisis triggered by Lehman Brothers' bankruptcy.
Masayoshi Matsumoto, appointed president in 2004, and chairman & CEO in 2017, has stood at the helm of Sumitomo Electric for most of the past two decades.
Here, he summarizes the major trends of the past 20 years, his intentions and recollection of management, and the ideal state he believes Sumitomo Electric should aim to be in.

◆ 120 years in the 400-year history of Sumitomo

Sumitomo Copper Rolling Works—the predecessor to Sumitomo Electric—was founded in 1897, and we celebrated our 120th anniversary in 2017. Our company, which began from the production of copper wires, can trace its history back approximately 400 years to when the Sumitomo Family started a copper smelting business. The history of Sumitomo Electric is, in fact, 120 years within the 400-year history of Sumitomo. Essentially, Sumitomo Electric was incorporated from a division of the Sumitomo business.

Our pioneers worked hard to establish our 120-year history; however, it is also true that this is just a part of the 400-year history of Sumitomo and the two are inseparable. In addition, over the past 120 years we have collaborated with other Sumitomo businesses and companies, and this must also be taken into account when considering the history of Sumitomo Electric.

◆ 20 years in the 120-year history of Sumitomo Electric

The past 20 years of Sumitomo Electric's 120-year history can be considered a period in which we transformed ourselves from a closed business to a company that is able to withstand free and open competition.

Until the 1980s, Sumitomo Electric operated a comparatively closed business, selling electrical wires and cables for use in electric power and telecommunications primarily to Japanese electric power and telecommunications companies. Our customers were mostly based in Japan, and we took industrial co-existence and co-prosperity for granted.

By utilizing our manufacturing technologies and business relationships, over the years, we expanded our business scope to cemented carbide tools and rubber products, traffic control systems, semiconductors, and FPCs (flexible printed circuits). Business environment kept changing, for example, in 1985, telecommunications was transformed with the privatization of Nippon Telegraph and Telephone Public Corporation (NTT); then, in the post-bubble economy recession, the electric power sector also began to change. In the field of telecommunications, privatization combined with rapid technological innovation and globalization resulted in a shift to a free market. Meanwhile, in the electric power field, Japan's electric power infrastructure network neared completion, the recession led electric power companies to reduce investment, and the industry reached a saturation point. Then the advent of a new material called optical fiber changed everything.

◆ The advance of globalization

Another major change in the business environment was the advance of globalization. Japan's economic stagnation after the collapse of the bubble economy, the end of the Cold War, growing competition from the rise of emerging markets in Asia and elsewhere, and the spread of global standards have changed the global economy significantly. The yen repeatedly hit new highs, leading Japanese companies to shift to local production and normalization of international procurement.

Our customers in the electric and automobile fields also globalized rapidly over these 20 years.

◆ Sumitomo Electric's self-transformation

Meanwhile, Sumitomo Electric reformed certain sectors and expanded its business scope while preserving technologies and business models developed by its pioneers. Today, we operate in five key segments, and the automotive business accounts for over 50% of sales and profits. In addition, we have approximately 400 affiliates and subsidiaries worldwide, almost 80% of our workforce is located overseas, and overseas sales now exceed domestic sales.

In summary, in these 20 years, we have successfully transformed our organization and culture from a company focused on the Japanese market—a market with comparatively small competition where we battled with only technological prowess—to a company that competes in free competition on global markets drawing on technological, marketing, and strategic capabilities.

◆ Restructuring with constitutional enhancement

Sumitomo Electric began structural reforms under Norio Okayama, who was president from 1999 to 2004. The company shifted its focus from electric power to infocommunications and automobiles, and implemented mergers with—or acquired—other companies in the same industries.

This brought some success, with the company achieving record sales and profits in fiscal 2000. However, in fiscal 2002, the collapse of the IT bubble saw a reversal in fortunes and the company slipped into the red. Aside from the turbulent era following World War II, this was the first time in its 120-year history that Sumitomo Electric had returned a loss. When I took over as president, the company was still recovering. In the VISION 2007 mid-term management plan, we therefore undertook structural improvement.

I had long been responsible for the Automotive business segment. Japanese automakers have taken part in the world's fiercest battle, and ranked among the world's leading companies. With these automakers as its customers, from the viewpoint of the Automotive business segment, unfortunately it was obvious that many business units were somewhat naïve. I set out to fix this and make it the basis for a v-shaped recovery. Later, during the Global Financial Crisis, I emphasized operating within our means; and, even when exchange rates and market conditions were bad, our constitution ensured that the company at least achieved profit.

◆ Separation of powers through a business unit system

The business unit system introduced in July 2003, before I became president; strongly reflected my beliefs.

The first of these was, of course, raising awareness of profitability. Each business unit would be responsible for its own profits.

The second was an intention for manufacturing, sales, and research and development to relate as equals. In the automotive segment, for example, Sumitomo Electric looked after sales and strategies; and Sumitomo Wiring Systems oversaw manufacturing; while the research divisions of both companies were integrated as AutoNetworks Technologies for research and development. Sumitomo Electric was originally known for its technology, and our manufacturing division held particular sway. We still respect this and have not cut R&D investment even in tough times. However, a corporate culture where the manufacturing front opposes the Sales Group, which directly receives customer demands, becomes less effective as competition grows. I wanted to create an organization in which each of the three functions was able to freely express and deliberate their opinions while maintaining a sense of tension.

Later, we delisted Sumitomo Wiring Systems to create a subsidiary, thereby strengthening the organization's unity. Even some within the company asked whether we had gone too far, and there was of course resistance from Sumitomo Wiring Systems—yet it was amid such fierce conflict that our company evolved. In the automotive sector, we combined our technological and sales abilities, strategically increased our market share via a series of M&As, and effected what may be regarded as a model example of growth.

The expansion of our business in the automotive and other sectors, and the increase in the number of people who understood such businesses, also contributed to changes in our corporate culture.

However, the business unit system also had drawbacks: for one, horizontal relationships tended to become weaker. I therefore met with the heads of each business monthly to ascertain their circumstances. These meetings were also an opportunity to grasp human affairs issues not obvious through reports. Although considered outdated, face-to-face communication is something we must continue to emphasize.

◆ What it means to be a Glorious Excellent Company

Following the launch of VISION 2007 and my appointment as president, I declared the "Glorious Excellent Company" to be the ideal form for our company.

"Excellent" is the quantitative component that involves properly achieving the numerical goals in the Mid-Term Management Plan, and securing target net sales and operating profit. For this reason, "Excellent" changes according to circumstances.

"Glorious," meanwhile, is an unchanging, qualitative ideal. Instead of the fashionable term "Global," we chose "Glorious" based on the Sumitomo Spirit. The word "Glory" was emblazoned on the flags of the Crusaders in Medieval Europe, and the word "Glorious"—which means both "prestigious" and "honorable"—has nuances of "fighting for a greater cause and being loved by God." This is not in a Christian sense, but rather means "being loved by the world." Unless we increase our presence worldwide, devote ourselves to our work, and become a company that is both needed and cherished by society, we cannot say we are fulfilling the Sumitomo Spirit.

◆ Early achievement of VISION 2007 and response to the Global Financial Crisis

Sumitomo Electric achieved the goals of VISION 2007 a year early due both to the hard work of our employees and helped by a weak yen. Then, during VISION 2012, the Global Financial Crisis struck. Our business results marked time; however, we used the opportunity to strengthen our corporate structure. The success of VISION 2007 had seen us unwittingly add excess weight, so I made the decision to once again wield the knife. In manufacturing, we added "safety," "environment," and "research & development" to the standard "quality," "cost," and "delivery" to form a new "SEQCDD" slogan (see page 68), due to the increased importance of these three elements to manufacturers. Boosting the capability of our workforce helped us to effect a v-shaped recovery.

We abolished the stock option system at this time. Although managers and general managers need evaluation for business results, executives hold the fate of the company in their hands and are remunerated accordingly. They devote themselves body and soul to the company as a matter of course—indeed, I believe that this defines the Sumitomo Electric executive.

◆ Embodying the Sumitomo Spirit

As I guided the company, my actions have always been based on the Sumitomo Spirit.

When I joined Sumitomo Electric, the Sumitomo Spirit was not mentioned as much as it is now. The Japanese economy continued to grow until the bubble era, and Japanese companies all prioritized business results and expansion. However, emphasis is increasingly placed on corporate social responsibility, while globalization and M&As resulted in corporations and corporate groups employing increasingly diverse human resources, leading to a greater need for companies to develop a corporate philosophy and ethical code. At Sumitomo Electric, this led to a reemphasis on the Sumitomo Spirit. I am proud that Sumitomo Electric made a significant contribution to the reaffirmation and embodiment of the Sumitomo Spirit.

When I was appointed president, I received a work of calligraphy from the head of the Sumitomo Family. It read *banji-nissei*. This phrase is from *The Aphorisms of Monjuin*, a text authored by Masatomo Sumitomo, the founder of the Sumitomo Family, and it means: "Do your sincere best, not only in business, but also in every aspect of your life." Even now, it is displayed at our training facility. Although it is simple, it is the basis of everything, and I believe that Sumitomo Electric in particular, being manufacturing-based, should value this teaching. While each individual has different talents and capabilities, all have the opportunity to practice *banji-nissei*, although it may not be easy. *Banji-nissei* is meaningful precisely because the Sumitomo Electric Group employs a diverse workforce, and can be considered the powerful Spirit that has sustained the Sumitomo Group for the 400 years since its foundation.

We have also practiced *shinyo-kakujitsu* and *fusu-furi*. Amid the soaring prices following the Nixon Shock and the 1973 Oil Shock, Sumitomo Electric maintained reasonable prices and adopted a corporate attitude emphasizing trust.

◆ The company's preference for Osaka

At present, Sumitomo Electric is the only key Sumitomo Group company headquartered in Osaka, and whose top management is based there.

This is also part of our efforts to maintain and demonstrate the Sumitomo Spirit. If we were solely concerned with making profits, it might be better to base top management in Tokyo. However, Sumitomo has long grown its business in Osaka, and we must show our gratitude. Based in Osaka, we can strike a healthy balance between being a global company and valuing our birthplace; indeed, I believe that this is our duty.

◆ VISION 2017 and the future

VISION 2017 is our third mid-term management plan. While our automotive and materials businesses are growing, there were concerns regarding a decrease in FPC orders and the impact of overhauling aging facilities at J-Power Systems. Consequently, we implemented cost reductions for FPCs, leading to improved sales and profits, and we completed refurbishment of J-Power Systems at the end of 2017, establishing a system whereby the company could handle overseas orders. With Osamu Inoue at the helm, we will continue to strive to be "Excellent" during this and the next mid-term management plan.

Currently, 80% of our products are ranked among the top three in global market share, with the remaining 20% ranking among the top six. I hope to further increase the global share of these products. As with our automotive business, I want to grow the scope of our businesses worldwide and to generate profits via high market shares; and in the same manner as our compound semiconductor devices, I want to achieve high profits despite low sales. I also want to create a business that can balance technological breakthroughs with growth and development.

In terms of the "Glorious" component—rather than viewing our company as a tool for chasing profits that prioritizes short-term earnings and shareholder profits, I want us to be a company that serves the public interest, and gives sufficient consideration to diverse stakeholders. If we can embody the "Long-Range Planning" and "Mutual Prosperity, Respect for the Public Good" of the Sumitomo Spirit—the ideal form of Sumitomo Electric will naturally develop.

Sumitomo Electric will continue to be a company that changes what must be changed, that resolutely maintains what must not be changed, and thereby contributes to society.

Understanding Changes over the past 20 Years

1997–2017

20 Year Story

1998 2003 2008 2013 2018

97 99 2000 01 02 04 05 06 07 09 10 11 12 14 15 16 17

Chapter 1 —Substantial Shakeup—
Rapid Advances in Internationalization and Computerization & the Collapse of the IT Bubble

Chapter 2 —Determination—
Business Restructuring and Early Achievement of the VISION 2007 Mid-Term Management Plan

Chapter 3 —Challenge—
Responding to the Bankruptcy of Lehman Brothers and Deepening the Global Expansion

Chapter 4 —Taking Flight—
Toward Becoming a "Glorious Excellent Company"

President

Noritaka Kurauchi (June 1991–June 1999)

Norio Okayama (June 1999–June 2004)

Masayoshi Matsumoto (June 2004–June 2017)

Osamu Inoue (June 2017–)

VISION 2007

- Sumitomo Electric Fine Polymer, Inc. Commencement of operations (fine polymer products)
- J-Power Systems Corporation Commencement of operations (high-voltage power cables business)
- Sumitomo Electric Networks, Inc. Commencement of operations (ADSL business, etc.)
- Sumitomo (SEI) Steel Wire Corp. Commencement of operations (special steel wire business)
- Sumitomo Electric Wintec, Inc. Commencement of operations (magnet wires business)
- Sumiden Hitachi Cable Ltd. Commencement of operations (wires and cables for buildings and industrial equipment)
- Sumitomo Electric Hardmetal Corp. Commencement of operations (powder alloys and super hard materials)
- A.L.M.T. Corp. reorganized into a wholly-owned subsidiary (powder alloys-related business reorganization)

Fiscal 2005 (year ended March 31, 2006) Net sales **surpass 2 trillion yen**

- Introduction of executive officer system
- Introduction of business unit system
- Wiring harnesses global share reached **20%**

VISION 2012

★VISION 2007 Early achievement of plan

- Sumitomo Wiring Systems, Ltd. reorganized into a wholly-owned subsidiary
- Nissin Electric Co., Ltd. reorganized into a consolidated subsidiary

Fiscal 2007 (year ended March 31, 2008) Net sales **surpass 2.5 trillion yen**

- Opening of The Technical Training Center
- Sumiden Friend, Ltd. (special subsidiary) Start of operations
- Sumitomo Electric Device Innovations, Inc. Commencement of operations (optical and electric device business reorganization)
- Completion of WinD Lab research building
- SEI Optifrontier Co., Ltd. Commencement of operations
- Wiring harnesses global share reached **25%**

VISION 2017

- Revision of VISION 2017
- J-Power Systems Corporation reorganized into a wholly-owned subsidiary

Consolidated net income **119.8** billion yen

Consolidated net income **38.0** billion yen (down 35.5% from previous quarter)

Consolidated net income of **17.2** billion yen, due to the effect of the Lehman Brothers bankruptcy (down 80.4% from previous quarter)

VISION 2022

Fiscal 2017 (year ended March 31, 2018) Net sales **3.082** trillion yen (record high)

Consolidated net income **120.3** billion yen (record high)

Consolidated net sales

Consolidated net income

20.3 billion

The Collapse of the IT Bubble

First time in the red since the end of the war (-19.9 billion yen)

0

The lost 10 years (1993–2002)

Izanami Boom (February 2002–October 2007)

◆Quantitative easing policy and zero-interest policy lifted

◆Lehman Brothers bankruptcy

◆Great East Japan Earthquake

◆Thailand floods

Abenomics

◆Negative interest rates

History of 20

Chapter 1

Substantial Shakeup

Rapid Advances in Internationalization and Computerization & the Collapse of the IT Bubble

1997–2002

Chapter 1

Section 1: Management

Protracted recession and plight of the power cable business

Fiscal 1997 marked the 100th anniversary of Sumitomo Electric. It had grown into a corporate group of 135 consolidated subsidiaries (including 50 overseas subsidiaries), with consolidated net sales of about 1.3 trillion yen. The years 1998 and 1999 were overshadowed by the recession which had continued since the collapse of Japan's bubble economy, together with uncertainty in Japan's financial system, with the failure of major securities firms and commercial banks. Overseas, there was the Asian currency crisis. Amid such circumstances, while Sumitomo Electric did achieve a growth in earnings in fiscal 1999, it was helped somewhat by a weak Japanese yen.[1] The company's situation was far from optimistic.

At the time, the company's business was divided into electric wire and cable (including wiring harnesses), special steel wires (prestressed steel wires, etc.), powder alloys (cemented carbide alloys, sintered products), brakes, hybrid products (fuel tanks, air springs, resin, FRP, etc.), equipment and construction (electrical/communications), system electronics (traffic control, LAN, CATV, etc.), and new business (compound semiconductors, printed circuits, base stations, etc.). A key mainstay of Sumitomo Electric's business had been power cables, but after peaking in fiscal 1990, the downward trend for shipments of power cables continued. Capital expenditure by electric power companies continued to decline, almost halving in fiscal 2002 from about 5 trillion yen in fiscal 1993. The excess supply capacity in the electric wire industry was obvious. Facing a tough environment in its existing businesses, Sumitomo Electric promoted restructuring, including mergers with other companies. At the same time, it hastened to develop new growth areas.

Focus on infocommunications

Under the leadership of President Noritaka Kurauchi, in September 1996, Sumitomo Electric hammered out a policy to concentrate management resources in growth areas.

The company concentrated about one-third of its capital expenditure in the area of infocommunications,[2] which was centered on optical fiber communications. In addition to the establishment of Kiyohara Sumiden, Ltd., one of the world's largest optical fiber plants (1996), the company also planned to expand its optical data link business and its asymmetric digital subscriber line (ADSL) businesses. Sumitomo Electric also promoted development of next-generation technology, increasing its company-wide research and development expenditure, from 40.5 billion yen in fiscal 1995 to about 48.0 billion yen in fiscal 2001 and 2002.

Formulation of the Sumitomo Electric Group Corporate Principles and Code of Conduct

In June 1997, based on the Sumitomo Spirit (see p. 24), the Sumitomo Electric Group newly formulated the Sumitomo Electric Group Corporate Principles and the Sumitomo Electric Employee Code of Conduct.

The mid-1990s was marked by actions for global environmental issues, a rash of corporate scandals, enactment of the Product Liability Act, launch of the shareholder derivative lawsuits system, relaxation of regulations, and globalization. On the back of this, companies began to be seriously questioned about their corporate social responsibility and corporate governance. Further, as business spinoffs, mergers, and acquisitions were advanced as part of structural reform, it was more important than ever for the Sumitomo Electric Group to clarify and share its values. In this context, in celebrating its 100th anniversary, the company established the Corporate Principles as a way of making 'the Sumitomo Spirit' more specific and easier to understand in order to disseminate and permeate it within the Group.

Corporate Principles

Each company of the Sumitomo Electric Group shall,

Offer the very best goods and services to satisfy customer needs.

Build technical expertise, realize changes, and strive for consistent growth.

Contribute to creating a better society and environment, with a firm awareness of our social responsibility.

Maintain high corporate ethics and strive to become a company worthy of society's trust.

Nurture a lively corporate culture that enables employee self-improvement.

Along with its Corporate Principles, Sumitomo Electric also announced its business vision for the new century in the form of a Centennial Declaration. The main points of the business vision were: (1) growth and development of the entire Sumitomo Electric Group by taking advantage of the Group's multiple businesses; (2) reform into a truly global enterprise; (3) harmony with local communities in overseas business; (4) strengthening of business character to survive against international competition; and (5) development of new and original businesses and products.

Appointment of Norio Okayama as president

In June 1999, Kurauchi became chairman of the Board of Directors, and Managing Director Norio Okayama took up his position as the new president. Business circumstances were tough for Sumitomo Electric then. In addition to the ever-growing competition due to globalization, there was considerable excess equipment in the key electric wire and cable industry, and there was even excessive competition in the low- and medium-voltage cables, which led to recurring

1 The excessively strong yen, which had dipped below 80 yen in 1995, depreciated considerably, to an annual average USD-JPY rate of 121 yen in fiscal 1997.
2 With the release of Windows 95 equipped with a browser function, the spread of the Internet was rapid and sudden.

deficits. Coupled with a slowdown of the US economy and appreciation of yen, Sumitomo Electric was driven to a decline in both revenue and profit in the year ended March 31, 2000. In a subsequent magazine interview, president Okayama could only respond, "I am keenly aware that, for Sumitomo Electric to survive in the 21st century, we must change the company framework."

President Okayama, soon after his appointment, set to work rebuilding the business structure, "Even Japan's sizable economic and social frameworks are subject to wild upheaval. (omitted) We have to clarify what we need to do so that our company could be more trusted by society. With all employees pulling together, we will strive to achieve that early on."

Promotion of structural reform

Immediately after becoming president of Sumitomo Electric, President Okayama issued an internal declaration for "change, and a swift change at that." His strong push for structural reform was based on a general framework of defensive restructuring and offensive restructuring. The framework took into account changes in the company's business environment, and comprised:

- For business lines in which it was expected the company would find it difficult to continue independently: promoting greater efficiency such as through alliances with competing companies, and building systems whereby Sumitomo Electric could survive and grow even amid challenging market conditions
  - ⇨High-voltage power cables, wires and cables for buildings and industrial equipment, magnet wires
- For business lines in which the company could continue independently but in which customer needs are changing rapidly or there are prolonged low profits: spinning off the business into a separate company, raising awareness for profit-making, and ensuring an emphasis on speed and self-responsible management
  - ⇨Fine polymer products, brakes, printed circuits, forging die machining, ADSL, special steel wires, powder alloys
- In growth areas: aspiring for a leading share of the global market by also making active use of M&A
  - ⇨Wiring harness
- Also spinning off administrative divisions into separate companies, and working to optimize, and improve the efficiency of, the entire Group, while responding to the era of consolidated management.

Infocommunications was an area of business to which Sumitomo Electric was particularly committed. Technology here was progressing at a remarkable pace that could have best been measured in so-called "dog years," and management speed was beginning to have an effect on business. Spinning off businesses into separate companies was also an effective way of realizing alliances swiftly.

Based on this policy, from 1998 to 2002, the following structural reform measures were implemented in rapid succession. (Business-related measures are described in detail later.)

Sumitomo Electric Information Systems, which was established in October 1998 following a spin-off of operations, was engaged in systems development, maintenance and operation services, as well as the introduction of information equipment and packaged software, plus the installation of that software onto computers and associated education and training. The company was also engaged in external sales of document management and other systems that it produced in the course of developing information systems for the company and the Group.

Key structural reform measures (1998–2002)

October 1998	Sumitomo Electric Information Systems Co., Ltd. and Netmarks Inc. established following spin-off of information systems integration business into separate companies
July 1999	UK joint venture in wiring harnesses reorganized into a wholly-owned subsidiary
	Sumitomo Electric Fine Polymer, Inc. (spin-off of fine polymer products business) and Sumitomo (SEI) Brake Systems, Inc. (spin-off of brakes business) established
March 2000	U.S. joint venture in brakes reorganized into a wholly-owned subsidiary
	Sumitomo Electric Printed Circuits, Inc. established following consolidation of printed circuits businesses
July 2000	Sumiden Magnet Wire, Inc. established following spin-off of magnet wire manufacturing division into a separate company
September 2000	Spin-off of logistics division into a separate company
October 2000	Joint magnet wire sales company, Wintec Wire, Inc., established with equal shares of capital contributed by Sumiden Magnet Wire and Daiichi Denko Corporation
May 2001	Acquired wiring harness business of Italian company, Cabind Automotive, and began operations under a new business structure
July 2001	J-Power Systems Corporation established following merger of high-voltage power cables business with Hitachi Cable, Ltd.
	ADVICS CO., LTD. (brakes business) established jointly with Aisin Seiki Co., Ltd., DENSO CORPORATION, and Toyota Motor Corporation
April 2002	ASDEX Corp. (forging die machining business) established together with Aichi Steel Corporation
	Personnel, payroll and other administrative divisions spun off into separate companies
July 2002	Acquired wiring harness business of Calsonic Kansei Corporation
	Sumiden Hitachi Cable Ltd. established together with TATSUTA Electric Wire and Cable Co., Ltd. and Hitachi Cable, Ltd. through integration of wires and cables business for buildings and industrial equipment
August 2002	Sumitomo Electric Networks, Inc. established following spin-off of ADSL business, etc.
October 2002	Sumitomo Electric Wintec, Inc. established through merger of magnet wire businesses of Sumiden Magnet Wire, Inc., Daiichi Denko Corporation, and Wintec Wire, Inc.
	Sumitomo (SEI) Steel Wire Corp. established following spin-off of special steel wires business into a separate company

Record profits inside the IT bubble, and first-ever loss following the bursting of the bubble

In fiscal 1998, the economic recession caused by instability of financial systems and the impact of the Asian currency crises worsened, and Japan's real economic growth rate turned negative. While China and countries in the West performed comparatively stronger, Korea and ASEAN nations were hit by deep recessions. For this reason, Sumitomo Electric was also driven to reduced revenues and profits. However, the company turned this around the following fiscal year, and in fiscal 2000, posted record-high net sales, operating income and profit.

The turnaround was largely due to the IT bubble experienced in developed countries, particularly in the U.S., between 1999 and 2000 (called the "dot-com bubble" in the U.S.). Burgeoning companies born from the relaxation of regulations in the telecommunications industry began investing heavily up front in long-range optical communication networks in an effort to capture the rapidly growing number of telecommunications customers, and this in turn dramatically spurred demand. Sumitomo Electric achieved an increase in revenues and profits in both its optical fiber and optical data link businesses, which accounted for close to 50% of the company's profits, and helped the company to achieve record-high results.

However, in early 2001, the gap between expected and actual demand went too far, sparking a succession of new businesses to fail. This was the so-called bursting of the IT bubble, and its impact was felt throughout the economy. Burdened by substantial manufacturing facilities, manufacturers of optical communication equipment and materials fell into financial difficulties in the face of shrinking demand and declining market prices. The company's optical data link business slipped into the red in 2001, followed by the optical fiber business in 2002.[3]

As a result, although revenue continued to increase on a consolidated basis, operating income was halved to 46.2 billion yen in fiscal 2001, and fell further to 29.8 billion yen in fiscal 2002. Having maintained structural reforms since 1998, Sumitomo Electric recorded an extraordinary loss of approximately 50 billion yen in fiscal 2002 as costs of business structural reform. As a consequence, a loss of approximately 20 billion yen was recorded that fiscal year, the first ever deficit since the founding of Sumitomo Electric (apart from the chaotic postwar period). Although the decision was taken to deal quickly with the negative business legacy, recovery took time because of the protracted aftermath of the burst IT bubble and effects of the terror attacks of September 2001 in the U.S.

Acceleration of reforms through establishment of a committee for urgent structural reform

The harsh reality was that product prices were falling due to sluggish demand and intensifying competition between companies. In order to further accelerate its offensive and defensive restructuring, in October 2001, Sumitomo Electric set up a committee for urgent structural reform, headed by one of the executive vice presidents.

The company set a goal of achieving a return on assets (ROA) of 8% in fiscal 2003. During the first phase, divisions were to promote structural reforms by March 2002. Specifically, each division promoted fundamental reforms, such as: (1) persistent cost reductions, (2) reduction of total invested assets, including reduction of inventory and swift collection of sales proceeds, (3) withdrawal from unprofitable products, (4) optimal arrangement of production bases, including overseas bases, (5) consolidation of duplicate internal divisions and businesses, and (6) spin-off of businesses into separate companies and business alliances with outside companies. The previously mentioned tri-company merger in wires and cables for buildings and industrial equipment was one of the outcomes of these reforms.

As a measure for strengthening profitability on a consolidated basis, the head office staff divisions also put effort into reducing the costs of materials and logistics by 20%, as well as the costs of operations by 10% through improving efficiency, across the entire company. As part of the cost reduction measures, the company also made temporary lay-offs in February 2002.

During the second phase starting in fiscal 2002, the company proceeded to reform internal systems, and prepared for the introduction of the business unit system and new personnel system (both of which are discussed in Chapter 2).

Strong promotion of CSR

Corporate social responsibility (CSR) came into the limelight in the 1990s. Factors that led to this included issues relating to protection of the global environment, a series of corporate scandals, and greater emphasis being placed on shareholders because of globalization. Although the Sumitomo Spirit meant that Sumitomo Electric was already practicing a type of CSR-based management, efforts were taken for further improvement and for stronger management systems, including investor relations for shareholders, governance that incorporates Group companies, prevention of various types of harassment, and compliance.

In terms of environmental action, besides direct contributions through business in the form of developing new products with a low burden on the environment, Sumitomo Electric acquired ISO 14001 certification (environmental management systems) at all its key production bases—Kumatori (February 1998), Kanto (November 1998), Yokohama (February 1999), Osaka (March 2000), and Itami (September 2000). Other efforts included enhancing the content of its *SEI Environmental Report*, and introducing environmental accounting (October 2000). The Environment Department was launched in July 2001.

QR-1 Campaign, in pursuit of the world's top quality

Manufacturing products related to critical social infrastructure, Sumitomo Electric has continuously and constantly worked on improving quality with particular awareness and pride. This is evidenced by the fact that the company acquired ISO 9001 certification at all its key production bases by 1997.

For two years from April 2000, under the slogan of "enhancing the SEI brand through basics (*kihon*) and speed," the company undertook its QUICK campaign (Quality Innovation Complete *Kihon*), based on concepts of quality-oriented and customers-first. Its goals for the first year were: (1) to set and achieve priority targets in each division; and (2) to at least halve the number of complaints from fiscal 1999. In the second year, the company set goals consistent with its achievements from the previous year. As a consequence, the company effectively halved the number of complaints, and it succeeded in establishing and observing basic rules.

The numbers improved, on the other hand, there were many unresolved issues related to the character of Sumitomo Electric, including improvements to the company's work processes and its customer-first activities. In addition, in order for the urgent structural reform which was being promoted company-wide at the time to succeed, it was imperative that Sumitomo Electric solidify the basics of its work processes. Therefore, in April 2002, the company

3 In 2001, while global markets were experiencing the collapse of the IT bubble (sharp decline in demand), in Japan, NTT continued to invest in large-scale construction, and so Sumitomo Electric's optical fiber business still performed well that year.

launched its QR-1 Campaign, focused on instilling the customer perspective and establishing quality and reliability to outperform the competition. The campaign slogan was "To become an enterprise rated No. 1 by our customers," and the goals of the campaign were for zero material complaints and to develop business systems to prevent complaints from arising. Activities included division heads making rounds of the workplace, integrated promotion of business activities, and renewal and improvement of quality control education.

Prioritization of research and development

Since its founding, Sumitomo Electric has produced numerous Japan-first and industry-first original technologies and products. However, as Japan's economic growth, which had continued steadily since the end of the war, came to an end following the collapse of the bubble economy, and at the same time, as global competition intensified and there was rapid innovation in the field of infocommunications, limitations in speed and strength meant that Sumitomo Electric could not single-handedly carry out fundamental research and development pivotal for the next generation in response to demands in all of its business areas. Therefore, as with its business expansion, the decision was made to establish infocommunications, automotive, electronics and new materials as priority areas, and to focus on commercializing products in these areas. In addition, the company resolved to cooperate actively with external parties. Nevertheless, as described earlier, research and development expenditure was increasing, and without narrowing down its businesses too far, the virtue of the Group's multiple businesses was maintained.

In terms of organizational change, in April 1997, the Development Planning Department was integrated into the Corporate Planning Department, strengthening the collaboration between group strategy and business development. Then in January 2001, the System Electronics R&D Center was renamed the Information Technology Laboratory, and the Electric Power System Technology Research Laboratories were renamed the Energy and Environmental Technologies Laboratory in an effort to align them with the content and direction of research and development. In February that year, the Automotive Research Institute was established as an organization capable of responding comprehensively to the automotive field. Meanwhile, as seen in the launch of the Analysis Technology Research Center[4] in January 2002, Sumitomo Electric established a system to support product manufacturing and development of new products using cutting-edge high luminance analytical technologies and large-scale simulation.

Moreover, in August 1997, Sumitomo Electric Intellectual Property & Technology Center, Ltd. was established to strengthen the management and support for intellectual property use and application.

Establishment of the Compliance Committee

In February 2003, the Japan Fair Trade Commission rendered a recommendation to Sumitomo Electric that it should cease activities in violation of the Antimonopoly Act with respect to a tender process by the Metropolitan Police Department for works to construct traffic signals. Taking the recommendation to heart, in order to establish comprehensive corporate ethics and instill compliance with laws and regulations, in March 2003, the company strengthened its measures for compliance by reorganizing its previous Corporate Ethics Committee and establishing the Compliance Committee.

Section 2: Business

1 Infocommunications business leading the way on the tailwind of broadband

Rapid progress in optical fiber on the back of large-scale investment and development of overseas markets

Infocommunications had been designated a priority area in the company's mid-term management plan, and at the core of infocommunications were fiber-optic cables, optical links, and ADSL for subscriber equipment.

The history of optical fiber started in 1974 with development of the vapor-phase axial deposition (VAD) method—Sumitomo Electric's proprietary technology for manufacturing the base material. Just prior to the company's 100th anniversary, the company had become the leading Japanese manufacturer of fiber-optic cable, a product that was to shoulder the fiber-to-the-home (FTTH) vision being promoted by Nippon Telegraph and Telephone Corporation (NTT) at the time. Overseas too, Sumitomo Electric had become the leading manufacturer of optical fiber supplying manufacturers of fiber-optic cables in various countries where demand was beginning to rise. In fiscal 1997, net sales of its infocommunications divisions exceeded 100 billion yen, putting it in the group of companies second only to U.S. firm Corning in terms of its share of the global optical fiber market.

Sumitomo Electric also actively invested in plant and equipment in the priority area of optical fiber. In step with the spread of broadband services, domestic demand for fiber-optic cable remained high, and overseas markets also rapidly expanded. For this reason, the company continued to extend its optical fiber plant at the Yokohama Works (progressively coming online from 1994 to 1997), and in November 1996, Kiyohara Sumiden was established in the Kiyohara Industrial Complex in Utsunomiya City, Tochigi Prefecture, with construction of a new plant starting in April 1997. In constructing the plants, mass-production facilities with far greater performance than existing facilities were developed and installed. Kiyohara Sumiden subsequently expanded its program keeping pace with market growth, and five years later, its optical fiber plant, complete with state-of-the-art mass-production facilities, had become one of the largest in

4 With activities based in Osaka, Itami and Yokohama, the Analysis Technology Research Center supports the Sumitomo Electric Group by using computer-aided engineering (CAE) analysis along with advanced analysis technologies, such as 3D structure visualization, elemental mapping with sub-micron resolution, and nano-level structural analysis.

Kiyohara Sumiden, Ltd.

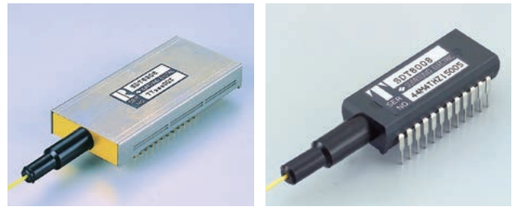
the world, capable of manufacturing 15 million km of fiber each year.

That the global market for optical fiber at the peak of the IT bubble in 2001 was 110 million km in size indicates the relative size of Kiyohara Sumiden, and also Sumitomo Electric's strong determination to concentrate management resources into optical-related fields. Its first phase of capital investment became operational in December 1998 (annual production capacity: 1 million km), and the cumulative capital expenditure up to the final seventh phase of investment in 2001 was approximately 37 billion yen, equivalent to the company's average annual net income at the time. Furthermore, in order to capture a share of the Chinese market where growth was expected, in July 2001, Sumitomo Electric Optical Fiber and Cable (Shenzhen) Co., Ltd. was established in Shenzhen to engage in the manufacture and sale of fiber-optic cables.[5] In conjunction with expanding sales of general-purpose fibers overseas, progress was also made in expanding sales of the company's original high-performance fibers, such as pure-silica core fibers for use in submarine cables and PureGuide fibers for WDM.

Combined with the optical fiber plant in Yokohama, Sumitomo Electric's production of optical fiber peaked in fiscal 2001 at 11 million km. However, with the collapse of the IT bubble in 2001, domestic and overseas demand for fiber-optic cable plummeted to about half, and Kiyohara Sumiden was forced to operate at part capacity. In addition, the oversupply of optical fiber meant that prices continued to fall from their peak in 2000. Large losses were recorded, and Sumitomo Electric was driven to rebuild the business. In October 2002, the company streamlined its organization to match the reduced business size. In order to promote integrated management of the optical fiber business and cable business, the communications division was merged into the optical fiber division, and reorganized into the Optical Fiber & Cable Division.

Establishment of global business by new optical link products during the IT bubble

At the same time, Sumitomo Electric also became one of the top manufacturers of optical link products, which are needed at the connection between an optical cable and transmission equipment to convert electrical signals and optical signals. With its FDDI[6]-compliant LAN product called "Super Sumi Link" (SSL, 125 Mbps), which it first shipped in November 1990, the company attracted more orders and became one of leading manufacturers it successfully differentiated the product from competitor products by downsizing it with an integrated mold



2.5 Gbps optical link

structure the company had invented, and allowing it to be washed in water.

From 1996, Sumitomo Electric then proceeded to prioritize development aimed at making inroads into the market for optical links for public communication, and in July 1998 it secured the top market share with the launch of its 2.5 Gbps products, the fastest optical links at the time.

Optical links for public communication require high performance. Part of the reason why the company succeeded in developing the optical links was because it used devices produced in-house, which were cutting-edge at the time—such as high-performance DFB[7] lasers that the company had developed since the 1980s, which operate in non-temperature-controlled environments, and GaAs (gallium arsenide) IC, which feature high-speed operation and low power consumption.

Sumitomo Electric's 2.5 Gbps product was overwhelmingly more compact than competing products, and was superior in terms of its low power consumption. So, while the company was a late entrant to the market, it succeeded in capturing about half the global high-speed link market, which had been dominated by major Western manufacturers of telecommunications equipment.

Sumitomo Electric also began external sales of high-performance optical devices used in optical links. Along with ultra-low-distortion lasers for analog applications and pumping lasers for optical amplifiers, the company also began to launch optical devices as an actual business.

Next, electronic devices date back to the company's Semiconductor Division embarking on the development of prototype devices for the purpose of appraising GaAs substrates, in which the company held a top market share, and for pioneering new high-value-added products. Side by side with its process development of the 1980s, Sumitomo Electric also extensively promoted the development of high-performance field effect transistors (FETs), digital IC, and analog IC. In the 1990s, the company moved beyond using the devices in its own optical links, and in 1996, it began selling high-power GaAs amplifiers for use in base stations for Japan's personal handy-phone system (PHS). At the height of its growth, Sumitomo Electric shared control of the market with Fujitsu Limited, but by 2001, the business had begun contracting as consumers replaced PHS with cellular phones.

Riding the wave of the IT bubble, Sumitomo Electric's optical link business expanded rapidly alongside its optical fiber business, and in fiscal 2000, the two businesses accounted for close to half of the company's profit. But with the bursting of

5 In China, Chengdu SEI Optical Fiber Co., Ltd. had been established through merger in January 1998.
6 Abbreviation of fiber distributed data interface—a local area network (LAN) standard capable of communicating data up to a maximum of 100 Mbps, using optical fiber as its transmission medium. Established by the U.S. standards association for optical fiber.
7 Abbreviation of distributed feedback—refers to a laser that emits only one wavelength. Suited to long-distance, large-capacity communications.

the IT bubble, the wave was brought to a crashing halt, and the company was forced to reorganize its business.

Great advances through the ADSL business as a manufacturer of telecommunications equipment

Advancement of the Internet requires an infrastructure that enables high-speed communications. But in the 1990s, optical fibers were still expensive, and so moves were made in Europe and the U.S. to develop ADSL as a high-speed digital communications technology using existing telephone lines. Anticipating that ADSL would be used in practice ahead of the eventual penetration of an optical subscriber network, Sumitomo Electric promptly initiated product development in Japan from 1995. Since the structure of metal cables in Japan is different from those in Europe and the U.S., the company developed a proprietary ADSL that suppresses interference with existing service signals in the same cable, and proposed this technology to NTT. Sumitomo Electric also played a leading role in activities to make Japanese specifications international standard.

In 1997, Sumitomo Electric released a local ADSL modem for use on local area networks (LANs). The company was subsequently selected as a supplier to NTT in February 1999, and in August that year, began delivery of Japan's first ADSL modems for use on the public switched telephone network (PSTN). It supplied NTT, as well as DSL providers besides NTT, with digital subscriber line access multiplexers (DSLAMs) for installation inside telephone exchanges, and home ADSL modems for installation in subscribers' homes, plus splitters for use in exchanges and homes. As of April 30, 2002, Sumitomo Electric had shipped a cumulative total of DSLAMs for 2.1 million subscriber lines and home ADSL modems for 1.4 million subscriber lines. Shipments of DSLAM for that fiscal year alone were for 1.9 million subscriber lines. ADSL business became a core of the company's infocommunications business, on par with optical cables, and this heralded a shift in the perception of Sumitomo Electric from being primarily a manufacturer of cables to also being recognized as an equipment manufacturer.

In August 2002, the ADSL business was included in the spin-off into a separate company, resulting in the establishment of Sumitomo Electric Networks, Inc., and enabling the Group to keep pace with sudden changes in technology and the market.

TE4000 series of ADSL modems

CU4000 series of ADSL devices used in exchanges (DSLAM)

Digitization of CATV and establishment of Broad Net Mux Corporation

In the area of CATV, on top of high-definition, multichannel broadcasting, there was increasing demand for Internet services. Sumitomo Electric expanded its business through the opticalization of CATV. By combining optical fiber with existing coaxial cable, the company developed hybrid fiber coaxial (HFC) products with superior high-definition and multichannel qualities, delivering products for the first time in Japan in 1996. Then, in 1999, in the lead-up to the digitization of BS (satellite) broadcasting in 2000, the company merged its CATV business with Toshiba Corporation, whose strengths lay in digital imaging technologies. The joint venture company, Broad Net Mux Corporation (capital stock: 480 million yen; Sumitomo Electric: 55%, Toshiba: 45%[8]) was established with an aim of strengthening the business structure and expanding the scale of business. Broad Net Mux also played a leading role in the field of CATV Internet, for instance, releasing the first cable modems in Japan that were compliant with the North American DOCSIS specification.

Increase in sales of traffic control systems

Sumitomo Electric raised the functionality of traffic control systems since launching its business in this area in 1968. Based on lessons learned from the Great Hanshin-Awaji Earthquake, building on the existing system supplied by Sumitomo Electric in 1995, the disaster prevention and traffic control system supplied to the Tokyo Metropolitan Police Department in September 1998 incorporated additional functions to reduce traffic congestion following an earthquake, including a database of inward traffic regulations, damage to roads and traffic-related disaster information. In March 1999, the company received an order from the Ministry of Construction for an information HUB system for the Nagano National Highway, designed to collect and distribute disaster-prevention and surveillance images from cameras installed along the national highway.

In April 2001, Sumitomo Electric also completed a public transportation priority system and bus location system for the Osaka Prefectural Police Department and Nankai Bus Co., Ltd., and in September 2002, an order was received from the City of Nagoya's Transportation Bureau for a complete bus service information system. The company's traffic control systems continued to spread, including to the Kagawa Prefectural Police (1997) and Fukuoka City (1999), and even overseas, including a highway system in Thailand (1998).

Traffic Control Center at the Tokyo Metropolitan Police Department

8 In October 2011, Sumitomo Electric increased its share in the company to 80% by purchasing stock from Toshiba, and in January 2013, the company was reorganized into a wholly-owned subsidiary.

2 The expanding automotive business

Global expansion grows the wiring harness business

The automotive business was regarded as a priority area alongside infocommunications. From the 1950s, Sumitomo Electric had expanded its automotive business, including wiring harnesses and disc brakes, and the business grew in tandem with Japan's auto industry. Following the oil crisis of the 1970s, a superior fuel efficiency and lower price helped Japanese cars increase their share of the global market, and in the 1980s, economic friction with the U.S. led Japanese automakers to step up their overseas production. During this time, to comply with new exhaust restrictions and to achieve improvements in safety, comfort and fuel efficiency, the proportion of electronically controlled parts in vehicles increased, as did the importance of wiring harnesses as an automotive component. Amid these developments, Sumitomo Electric and Sumitomo Wiring Systems, Ltd. were expanding this area of business with an emphasis on covering the global market and developing technologies, setting up bases in the Americas, Europe and Asia in the 1990s, and establishing Harness System Technologies Research, Ltd. in 1995 (renamed AutoNetworks Technologies, Ltd. in 2000). With Sumitomo Electric in charge of business planning and sales, Sumitomo Wiring Systems in charge of design and manufacturing, and Harness System Technologies Research in charge of research and development, the Group took an integrated approach to expanding its wiring harness business.

Continuing to proceed in this direction, in 1997, Sumitomo Electric established two technical centers: SATG in Mainz-Kastel, Germany, in July (currently, SEI ANTech-Europe GmbH), and SEAI in the U.S. in December (currently a division of Sumitomo Electric Wiring Systems, Inc. (SEWS), the Group's base for automotive business in North America). Then, in July 1999, the Group established a presence in Europe, by cancelling the agreement for a local joint venture company it had set up with UK company Lucas to produce wiring harnesses, and establishing Sumitomo Electric Wiring Systems (Europe) Ltd. In May 2001, Sumitomo Electric also acquired the automotive wiring harness business of Italian company, Cabind, creating a new company, SEWS-CABIND S.p.A. Through these efforts, not only did Sumitomo Electric strengthen its support for Japanese automakers, but it also began dealing with Fiat (Italy) and other companies, establishing a business base in Europe. In Japan, too, the Group expanded its business with Nissan Motor Co., Ltd., taking over the wiring harness business division belonging to Calsonic Kansei Corporation in July 2002. Thus, Sumitomo Electric accelerated its building of a trilateral business structure across the Americas, Europe, and Asia.

Sumitomo Electric Wiring Systems, Inc.

Sumitomo Electric Wiring Systems (Europe), Ltd.

SEWS-CABIND S.p.A.

Efforts for optimal global production

Having expanded its operational bases in Asia, a new approach was taken to supply wiring harnesses from Asia to the North American market in an effort to improve cost competitiveness in North America. Under the Global Production Plan (GPP) of supplying wiring harnesses across different regions, the business gradually grew in size as the system was developed, and the company's Asian bases became an important source of supplying wiring harnesses to North America. On the other hand, as it was no longer cost competitive, production of wiring harnesses in North America was wound up in 2002, and production for this market was concentrated into Mexico and Asia.

Spin-off of the brakes business into a separate company

Sumitomo Electric was a prominent manufacturer of brakes, having started production of Japan's first automotive disc brakes in 1963, and having mass-produced antilock braking systems from 1987. In July 1999, the company's brakes business was transferred and integrated into affiliated company, Mie Sumitomo Denko, Co., Ltd., and was spun off into a separate company and renamed Sumitomo (SEI) Brake Systems, Inc.

Responding to a situation where brake development and orders were transitioning from a standalone arrangement to an integrated system, Sumitomo Electric subsequently established ADVICS CO., LTD. in July 2001 in collaboration with Aisin Seiki Co., Ltd., DENSO CORPORATION, and Toyota Motor Corporation, integrating development and sales. In October 2007, Sumitomo Electric transferred the business to Aisin Seiki—the consolidated parent company of ADVICS, and together with Aisin Seiki, established AS Brake Systems, Inc. Production of automotive brakes was also transferred to this company, and with this, Sumitomo Electric withdrew from the automotive brakes business.

3 Electronics business catering to higher speeds, higher functionality, smaller sizes

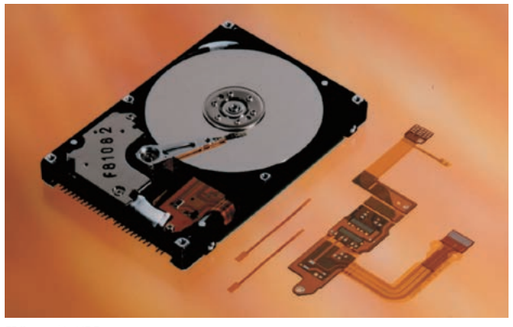
Overseas expansion of the FPC business

It was 1969 when Sumitomo Electric began researching and manufacturing flexible printed circuits (FPCs), and 1975 when its FPC business got into full swing with establishment of the Printed Circuits Section in the Electronic Wire Division. As the business grew, the section was reorganized into the Flexible Printed Circuit Department in 1992 and into the Flexible Printed Circuits Division in 1996. It also turned a profit in 1996, after which it continued to expand despite business results fluctuating up and down.

Domestic production of FPCs began at the company's Osaka Works. It expanded to the Nagoya Works (1980), Kanto Works (1984), and to the subsidiary, Sumiden Circuits, Inc. (established in Shiga Prefecture in 1990, and renamed Sumitomo Electric Printed Circuits, Inc. in 2000), before being concentrated entirely at Sumitomo Electric Printed Circuits in 2000. Overseas production of FPCs began in Singapore in 1988. As the business expanded, Song Gang Electronics Wire Factory (renamed Sumitomo Electric Interconnect Products (Shenzhen), Ltd. in 2010) was established in Shenzhen, China in 1994, and First Sumiden Circuits, Inc. was established in the Philippines in 1996. Thus, Sumitomo Electric proceeded to provide customer service and reduce costs.

The product that was the driving force behind the FPC business turning a profit was Sumitomo Electric's FPCs for high-capacity hard disc drives (HDDs) used in computers, which were released in 1996. They were a high-value-added product, utilizing a method that the company had developed for heat laminating bumps (minute protrusions for connection). In March 1998, a production line began operating at Sumiden Circuits, incorporating this method to mass-produce FPCs with a finer pitch as small as 50 μm.

Following HDDs, the next driver for the FPC business was FPCs for mobile phones. The FPCs for Sharp's J-SH04 mobile phone (released in November 2000)—the world's first mobile phone with an inbuilt camera, and recognized as industrial heritage—also contributed to Sumitomo Electric's earnings. Sumitomo Electric's track record with Japanese products resulted in it being approached by Nokia, which had begun selling slider-type and flip-type mobile phones as it expanded business worldwide, and work for Nokia products increased. One of these was multi-layer FPCs for mobile phones, which Sumitomo Electric began shipping in January 2002. Rather than simply supplying FPCs, mounting work incorporating other electronic components began at around this time, and the FPC business expanded. However, with mobile phones (and later with smartphones), since new models were released every year or every few months, the difference between busy and slack periods at production sites was striking, which was a problem for securing and coordinating personnel.



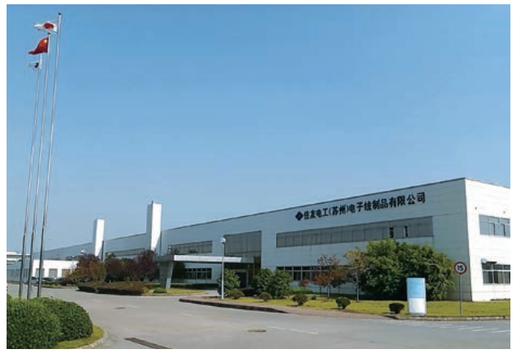
FPCs used in HDD

Full-scale expansion of the electric wires business into China

Another core business in electronics was electric wires. Beginning in May 1969 with the integration of businesses involving electric wire used in equipment and machinery wiring (such as IRRAX wire (electron beam irradiated cross-linked heat-resistant wire), coaxial cable, flat cable, cable assembly (for computers, TVs, videotape recorders)), which had been spread across the power, equipment wiring, communications and other business divisions at the time, electric wires were ultimately integrated into a single business division in May 1973.

Sumitomo Electric had introduced products differentiated by technology—such as the SUMI-CARD flexible flat cable, a multicore coaxial harness for medical use, and flexible high-voltage wires—and in 1998, it released the Eco Wire series of environmentally-friendly electric wires used in electronic appliances and automobiles. Using zero lead compounds, halogen, phosphorus and other such substances in the insulation materials, Eco Wire has been used in a wide range of products, including flat-screen TVs and game consoles. 1998 also saw the start of production for lead wires used in lithium-ion batteries (Tab-Lead) as well as harnesses used in laptop computers.

Meanwhile, as Japanese electronics manufacturers expanded their operations overseas, Sumitomo Electric also actively expanded its electric wires business, establishing Sumitomo Electric Interconnect Products (Singapore) Pte. Ltd. in 1978, Sumitomo Electric Interconnect Products (M) Sdn. Bhd. in Malaysia in 1988, acquiring Judd Wire Inc. in North America in 1988, and establishing Sumitomo Electric Interconnect Products (Hong Kong), Ltd. and Song Gang Electronics Wire Factory in Hong Kong in 1994. From the late 1990s, as Japanese, European and US electronics manufacturers expanded their operations into China, Sumitomo Electric also expanded its electric wires business into China in pace with customers' movements, establishing Sumitomo Electric Interconnect Products (Shanghai), Ltd. in August 2000 to manufacture and market flexible flat cables, and later establishing Sumitomo Electric Interconnect Products (Shenzhen), Ltd. in 2001 to manufacture and market IRRAX wire.



Sumitomo Electric Interconnect Products (Shenzhen), Ltd.

Development of the compound semiconductors business

A compound semiconductor is a semiconductor composed of two or more elements. Since electrons move faster than in an ordinary silicon semiconductor, compound semiconductors can operate at a lower voltage, and can also be used to emit and receive light. For this reason, demand for compound semiconductors increased as communications became faster and as multimedia evolved. Sumitomo Electric's research and development into the III-V family of compound semiconductors began in earnest in 1980, and it continued to devise techniques for growing gallium arsenide (GaAs) and indium phosphide (InP) crystals. For instance, with GaAs, the company began with the horizontal Bridgeman (HB) method, followed by the liquid encapsulated Czochralski (LEC) method, before advancing to the vertical Bridgeman (VB) method.[9]

Using its proprietary VB method, in April 1998, Sumitomo Electric succeeded in developing a 6-inch high-quality GaAs single crystal used in wireless communication systems, thereby helping to lower the cost of devices. In April 2000, the company developed and commercialized the world's first gallium nitride (GaN) substrate—a material used in blue-violet lasers—contributing to the practical application of Blu-ray. Furthermore, in April 2002, through the technological development of the VB method, the company succeeded in developing 4-inch InP crystals used in optical communication devices.

In order to strengthen its global production system for GaAs, in 2001, Sumitomo Electric established SEI Electronics Materials, Ltd. in Taiwan in January, Sumiden Semiconductor Materials Co., Ltd.[10] in Kobe, Japan in May, and Sumitomo Electric Semiconductor Materials, Inc. (SESMI) in the U.S. in November.

Sumiden Semiconductor Materials Co., Ltd.

4 Environment and energy-related fields contributing to better efficiency and safety

Completion of large-scale power cable projects

Utilizing copper wire—the business on which Sumitomo Electric was first founded—the high-voltage electric wires business was long the company's core business. Including oil-filled (OF) cables, high-voltage CV cables, and aluminum conductor steel-reinforced (ACSR) cables, a series of large-scale projects were completed in the late 1990s. These include the manufacture and installation of the Tokyo Electric Power Company, Inc.'s (TEPCO)[11] Shin-Keiyo–Toyosu line, which was the world's first long-distance main line using 500-kV CV cable (1996–2000), and the manufacture and installation of the Kansai Electric Power Co., Inc. (KEPCO) and Electric Power Development Co., Ltd. (J-POWER) Anan-Kihoku DC trunk line, which was similarly the world's first submarine power transmission line using direct-current 500-kV OF cable (1998–1999).

The TEPCO Shin-Keiyo–Toyosu line is an underground power transmission line of about 40 km in length connecting the Shin-Toyosu substation in Tokyo with the Shin-Keiyo substation in Chiba Prefecture. The long-distance transmission line based on the mass-production of 500-kV CV cable to stringent quality standards was a world first. To achieve this project, a total of 10 billion yen was invested into the Osaka Works in 1995 for the construction of new production and inspection facilities for ultrahigh-voltage cables. Supply and construction began in June 1996, with the transmission line becoming operational in November 2000.

The Anan-Kihoku submarine trunk line is a transmission line connecting the Anan converter station across the Kii Channel to the Yura switching station in Wakayama Prefecture. It supplies the Kansai region with electricity from the Tachibana-wan Thermal Power Station in Anan City, Tokushima Prefecture. A joint development project with KEPCO, J-POWER and other participants had succeeded in taking PPLP (polypropylene laminated insulating paper), which had been developed for use with an alternating

Construction of the TEPCO Shin-Keiyo–Toyosu line

9 The VB method has better dislocation density and electrical properties compared to the commonly used liquid encapsulated Czochralski (LEC) method.
10 In 2004, a plant at Itami Works was also placed under the control of Sumiden Semiconductor Materials, and began manufacturing indium phosphide (InP), etc.
11 In April 2016, TEPCO transitioned to a holding company system comprised of Tokyo Electric Power Company Holdings, Inc. positioned above three operating companies: TEPCO Fuel & Power, Inc. (power generation), TEPCO Power Grid, Inc. (power transmission and distribution), and TEPCO Energy Partner, Inc. (electricity retail).

current, and adapting it for a direct current, and this was the first time for it to be used as a substitute for conventional insulating kraft paper. Weighing about 5,000 tons, a continuous length of cable about 48 km in length was supplied, and using a newly developed high-speed water jet plow capable of simultaneously laying and embedding cables, the cable was laid along the entire length of the sea floor at a depth of 2–3 m.

Sales also increased for overseas projects, such as in Singapore, Hong Kong, and Mexico, and in 1998, the cable business recorded its highest profit ever.

Furthermore, in April 1998, Sumitomo Electric also began activities for a project aimed at developing environmentally friendly general-purpose electric wires for use in buildings and industrial equipment. By exercising ingenuity in the materials used in the wires, the company successfully reduced environmental pollution and improved its products' recyclability.

Establishment of J-Power Systems Corporation and Sumiden Hitachi Cable Ltd.

With the large-scale projects now complete and progress having been made in improving Japan's domestic power networks, electric power companies reined in their capital expenditure, which led to a considerable surplus capacity in the high-voltage electric wires business. It was also expected that demand for electricity would decrease further because of increased energy efficiencies, and that Japan's electric power companies would step up their efforts for international procurement. Consequently, there was dramatically increased competition with Europe and other Asian manufacturers in the export market. Sumitomo Electric determined, therefore, that growth and development in this business by itself would be difficult, and so proceeded with structural reform in partnership with other companies.

In July 2001, Sumitomo Electric merged its high-voltage power cables manufacturing division and international sales division with Hitachi Cable, Ltd. (now Hitachi Metals, Ltd.), and set up a new company, J-Power Systems Corporation (JPS, capital stock: 4.0 billion yen) by contributing equal shares of capital. JPS commenced trading that October. Discussions for the merger began in April 2000. With both companies reducing their facilities and personnel by half, Sumitomo Electric ceased production of power cables at the Yokohama Works, and Sumitomo Electric Toyama Co., Ltd. ceased production of ACSR and other cables. The new company took over the manufacturing facilities of Sumitomo Electric's Osaka Works and Hitachi Cable's Hidaka Works and Toyoura Works (both located in Hitachi City).[12]

Then, in July 2002, Sumiden Hitachi Cable Ltd. was established following the merger of divisions selling wires and cables for buildings and industrial equipment at Sumitomo Electric, Hitachi Cable, and TATSUTA Electric Wire and Cable (beginning operations in January 2003). With a capital stock of 400 million yen (equity share: Sumitomo Electric (40%), Hitachi Cable (40%), TATSUTA Electric Wire and Cable Co., Ltd. (10%), and Tonichi Kyosan Cable, Ltd.[13] (10%); currently: Sumitomo Electric (56%), Hitachi Metals (34%), and TATSUTA Electric Wire and Cable (10%)), the company sold products from eight companies in three different corporate groups (Sumitomo Electric, Kawamura Electric Wire Industries, Ltd. (now Sumitomo Electric Industrial Wire & Cable, Inc.), JPS, Dyden Corporation, Kitanihon Electric Cable Co., Ltd., Hitachi Cable, Tonichi Kyosan Cable, and TATSUTA Electric Wire and Cable).

Reorganization and reinforcement of the copper wire rods and aluminum business

In the copper wire rods business, Sumitomo Electric was manufacturing high-quality wire rods efficiently by using continuous casting and rolling machines to carry out all manufacturing processes, from melting and casting the copper metal through to rolling it into wire rods. These wire rods were then being used all over the world, having been processed into a wide range of wires, such as magnet wires and electric wires, which were then used in power cables, indoor wiring and motor coils, not only by Sumitomo Electric but by other wire manufacturers in Japan and overseas.

At the time, wire rods were being manufactured at two locations—the Osaka Works and the Yokohama Works—but with the decline in demand in Japan and the increase in demand overseas, Sumitomo Electric established PT. Karya Sumiden Indonesia in January 1998 in Indonesia. In September 2001, one of Southeast Asia's largest plants manufacturing copper wire rods became operational, producing roughly 40% of the Sumitomo Electric Group's copper wire and copper wire rods (about 12,000 tons/month). Meanwhile, the factory at the Yokohama Works producing electronic conductors was shut down in 2002 in conjunction with closure of the power cable plant on the same site.

Moreover, moves were made to consolidate the company's aluminum business, with aluminum products, which until then had been manufactured at the Osaka Works and at Sumitomo Electric Toyama Co., Ltd., being amalgamated into Toyama in 1997, and Nihon Senzai Co. being acquired and merged in 2001.

Reorganization of the magnet wire business

Manufacturing of magnet wires was based at the Nagoya Works, and the company's leading product was the UTZ scrape-resistant, heat-resistant wire with superior lubricity and film strength, which was commercialized in 1995. Through its magnet wire business, Sumitomo Electric offered various products, such as for car electrical equipment, industrial motors, home appliances, electric power equipment, and infocommunications devices. However, as manufacturers of home appliances shifted production offshore,[14] demand for magnet wires in Japan continued to decline, falling to about two-thirds of peak demand by 1998. The Magnet Wire Division had responded to this trend by establishing overseas bases in Thailand (1969), Singapore (1973, shut down in 2011), Malaysia (1989), the U.S. (1989), China (1994), and Batam Indonesia (1994), but profits were squeezed by excess supply and falling unit prices.

Given this, Sumitomo Electric moved to spin-off its manufacturing division and establish a separate company, and then to establish a sales company financed by this manufacturing spin-off and Daiichi Denko Corporation, but

12 Subsequently, Furukawa Electric Co., Ltd. and Fujikura Ltd. established VISCAS Corporation in September 2001, and Showa Electric Wire and Cable Co., Ltd. (now SWCC Showa Holdings Co., Ltd.) and Mitsubishi Cable Industries, Ltd. established EXSYM Corporation in April 2002, at which point, the high-voltage power cables businesses of Japan's six major electric wire manufacturers had been consolidated into three companies.
13 A consolidated subsidiary of Hitachi Cable; became a wholly-owned subsidiary of Hitachi Cable in March 2004.
14 The switch from CRT to LCD TVs and computer monitors also had a considerable impact.

Sumitomo Electric Wintec, Inc.

in the end, a decision was made to completely integrate the manufacturing and sales businesses with Daiichi Denko. Although Daiichi Denko was the top-ranked business in the magnet wire industry, due to the tough business conditions alluded to above, it elected to integrate operations with the second-ranked company, Sumitomo Electric. The integration was carried out over two phases. First, in July 2000, Sumitomo Electric spun off its magnet wire manufacturing business into a separate company, Sumiden Magnet Wire, Inc., and then, in October 2000, the sales divisions of Daiichi Denko and Sumiden Magnet Wire were integrated into a new company, Wintec Wire, Inc. During the second phase in October 2002, Sumiden Magnet Wire, Daiichi Denko and Wintec Wire merged and launched a new company, Sumitomo Electric Wintec, Inc. (capital stock: 3.0 billion yen[15]). With its head office located in Shigaraki-cho, Shiga Prefecture (the location of Daiichi Denko's key manufacturing site), Sumitomo Electric Wintec commenced operations with three domestic sites in Nagoya, Shigaraki and Taguchi (Niigata Prefecture), as well as six overseas sites in Thailand, Malaysia, Singapore, the U.S., and China, plus in Indonesia where Daiichi Denko operated. For the sake of improving production efficiency, the magnet wire manufacturing facilities in the Nagoya Works were subsequently transferred and consolidated into the Shigaraki site (2004)[16]. Since domestic production had been consolidated into two locations, differences in manufacturing technologies and so on between Daiichi Denko and Sumitomo Electric Wintec meant that there was great confusion on site at first. But as the confusion gradually dissipated, the merits of integrating the top two businesses in the industry became evident.

In addition, in response to globalization of relay coil processing around this time, Daikoku Electric Wire Co., Ltd., a manufacturer of ultrafine magnet wires (Sumitomo Electric held an 83.9% share of equity in 1997), established a new manufacturing site in the Philippines in 1998 (Daikoku Electronics (Phils.) Inc.). At the same time, efforts were being put into developing a high-value-added self-bonding magnet wire, an innovation that would blossom during the smartphone era.

R&D advancements in high-temperature superconductors and redox flow batteries

Sumitomo Electric also promoted research and development into high-temperature superconductors with an aim of reducing power transmission loss. In September 1997, it developed a magnet in cryostat capable of generating 7 Tesla, the world's highest performance at the time, which it supplied to the

Superconducting cable

Research Development Corporation of Japan (now Japan Science & Technology Agency (JST)). In April 1999, SEIQUID was released, a supersensitive magnetic sensor that exploits high-temperature superconductor SQUID. Further, in October 1999, the company embarked on joint development with Tokyo Electric Power Company (TEPCO) of a cable system incorporating high-temperature superconductors. In June 2001, 100 m of the world's first 100,000-kW-class three-core high-temperature superconducting cable was constructed, and demonstration testing was conducted over the course of a year to accumulate meaningful data.

Redox flow batteries, on the other hand, are a product that accentuates Sumitomo Electric's uniqueness. Following demonstration testing of a redox flow battery system for buildings at a facility of the Kansai Electric Power Company (KEPCO) in August 1999, the company received an order for its first commercial battery in April 2000. Since then, the business has expanded domestically and overseas, including systems attached to wind power and solar power generation facilities.

5 Industrial materials business, aiming for high added value in new fields

Streamlining of the powder alloys and powder metal products divisions

Business divisions in the powder alloys, diamond products and sintered products business worked with affiliated companies to offer such products as IGETALLOY cemented carbide, synthetic diamond tools, sintered products, functional parts, as well as tungsten and molybdenum powders and plates. Amid the protracted economic recession and other tough conditions in this field, Sumitomo Electric worked to effect a breakthrough by developing new products while promoting structural reforms.

The company started research and development on cemented carbide in 1927, and in the following year, succeeded in developing a carbide die for drawing wires and launched the carbide tool business. Since then, in addition to disposable tools (indexable inserts) and other cutting tools of innovative design and functions, the company has developed a steady stream of various coating grades and new materials, such as cubic boron nitride (cBN), helping to increase productivity and reduce machining costs in the machining field.

In the powder alloys business, Sumitomo Electric worked

15 Since Daiichi Denko was affiliated with the Mitsubishi Group, when Sumitomo Electric Wintec was founded, the Mitsubishi Group had an equity share of 20% (held by Mitsubishi Materials Corporation, The Bank of Tokyo-Mitsubishi UFJ, Ltd. and Mitsubishi UFJ Trust and Banking Corporation); however, in March 2007, Sumitomo Electric bought out that share, making Sumitomo Electric Wintec a wholly-owned subsidiary.
16 Daiichi Denko had closed its main Amagasaki Plant, along with its overseas production bases, apart from in Indonesia.

Axismateria Ltd.

to streamline its business, such as by taking IGETALLOY products, which had been manufactured at the Yokohama Works and Nagoya Works (shut down in 2004), and consolidating production into the Itami Works in 2000, as well as by pulling out of unprofitable products. Meanwhile, in August 2000, the company established Axismateria Ltd. in Ono City, Hyogo Prefecture, to manufacture cemented carbide materials, and it expanded sales of materials to other companies in the same industry. The company's powder alloys and diamond products divisions were subsequently integrated in June 2002, to form the Powder Alloys/Diamond Division.

In the sintered products business, Sumitomo Electric began selling powder metallurgical products soon after World War II. Evolving from home appliances to automotive parts, the business expanded as the auto industry grew. In April 2003, the company's divisions involved in manufacturing and developing sintered products were integrated into the subsidiary, Sumitomo Electric Sintered Alloy, Ltd.

Furthermore, in October 2000, A.L.M.T. Corp. was established following a merger between Tokyo Tungsten Co., Ltd. and Osaka Diamond Industries Co., Ltd. In October 2003, the functional parts business of Sumitomo Electric was transferred and integrated into A.L.M.T. Corp.

Structural reform of the special steel wire business

The special steel wire business is centered around spring steel wires used in vehicles and electronic products, steel wires for prestressed concrete (PC) used in expressways, bridges, buildings and railway ties, and steel cords used in radial tires. Sumitomo Electric conducted this business at its Itami Works, Sumitomo Electric Tochigi, and in the U.S. and Indonesia. However, with declines in demand for PC steel wires, which had been the main driver of earnings, and as the auto industry shifted production offshore, the domestic market began to contract, and so Sumitomo Electric was forced to implement structural reform. Amid a difficult business environment, in October 2002, Sumitomo Electric established Sumitomo (SEI) Steel Wire Corp. (SSW) as a company specializing in wire products. The aims of this move were to strengthen profitability through drastic streamlining and to ensure mobility, as well as to revitalize and expand its core business through domestic and international alliances. Sumitomo Electric's special steel wire business had been unique among industries worldwide, as it was completely integrated at the Itami Works, from the production of steel billets in an electric furnace, through to rolling and secondary processing. Nevertheless, it was to shift to a new business structure whereby the steelworks would be shut down at the end of December 2002, and instead, steel billets would be procured from Nippon Steel Corporation (now Nippon Steel & Sumitomo Metal Corporation) and other suppliers, which would be rolled at Sumitomo Electric, and supplied as wire rods to SSW.

Meanwhile, in an attacking move, Sumitomo Electric set about developing and commercializing corrosion-resistant PC steel materials as well as anchorage system and prefabricated products, and in 1997, established a mass-production system for these developed products by constructing dedicated plants at the Itami Works. Through supplying steel wire products to many national projects, including the Shin-Tomei and Meishin Expressways (total length: 490 km, including 120 km of bridges), Sumitomo Electric contributed greatly to infrastructure development in Japan. Increasing the added value of products linked to these projects later helped to improve the profitability of the PC business.

Furthermore, the company actively expanded business operations in the overseas growth markets. In the U.S., to keep up with increasing demand for PC steel wires accompanying the growth in the construction sector, in addition to the Stockton plant in California, the company also began manufacturing the same products at its Dickson plant in Tennessee in 1997. In 1999, the company began manufacturing and selling epoxy-coated and filled PC steel wires at the Stockton plant, promoting the spread of corrosion-resistant PC steel wires for bridges, dams, slope reinforcement, mines and pavements in the U.S. In Indonesia, coinciding with affiliate company, Sumitomo Rubber Industries, Ltd., setting up operations at a tire factory, Sumitomo Electric began producing bead wire and steel cords for tire reinforcement. This marked the start of Sumitomo Electric's global supply system.

Reinforcement of the steel tire cord business

Steel tire cords are one of Sumitomo Electric's more recent core products. Up until 1999, monthly production had been not more than about 1,000 tons, but in order to respond to the increased production of tires, Sumitomo Electric initiated a project for integrated production and increased production at Sumitomo Electric Tochigi Co., Ltd. Production capacity was increased to 2,000 tons per month by 2001, and to 5,000 tons per month from 2003. At the same time, Sumitomo also established collaborative systems with customers and suppliers of raw materials, achieving production and sales records of 4,800 tons per month, and successfully developing steel tire cords into a core business for the division.

Steel cord plant

History of 20

Chapter 2

Determination

Business Restructuring and Early Achievement of the VISION 2007 Mid-Term Management Plan

2003–2007

Chapter 2

Section 1: Management

Start of the VISION 2007 mid-term management plan

Sumitomo Electric launched its VISION 2007 mid-term management plan in fiscal 2003, just as its business results were beginning to improve somewhat having accelerated structural reforms in response to the deteriorated business climate following the collapse of the IT bubble. VISION 2007 was a five-year plan covering fiscal 2003–2007, and its aim was to gear up for growth while maintaining its offensive and defensive structural reforms.

Under the plan, numerical goals for fiscal 2007 were, on a consolidated basis, net sales of more than 2 trillion yen (1,488.9 billion yen in fiscal 2002), operating income of 120 billion yen (29.8 billion yen in fiscal 2002), and ROA (operating income / invested assets) of more than 8% (2.4% in fiscal 2002). The corporate vision for the Group was to become a "Glorious Excellent Company." The word "glorious" symbolized what the Group should be in a qualitative sense. It signified becoming a company that enjoys the confidence and trust of society, and which is worthy of respect, by practicing the Sumitomo Spirit and Corporate Principles. The word "excellent" signified what the Group should be in a quantitative sense. This could be realized by achieving the numerical goals set out in the mid-term management plan. Another aim in presenting this corporate vision was to raise a stronger awareness for achieving the goals and to reinforce the sense of cohesion within the Group, which had weakened somewhat during the process of structural reform.

To realize these goals, while maintaining structural reforms, Sumitomo Electric promoted growth strategies centered on "Expanding Our Global Presence" and "Strengthening Our Leading Technology," while also giving each research and development, production and manufacturing, sales and planning, and the corporate division the sense of a separate profit center. "Global Presence" was more than just about relocating manufacturing bases overseas. It was about establishing a truly global presence complete with associated R&D, logistics, and sales networks. And "Leading Technology" meant ensuring the best in all aspects of quality (Q), cost (C), delivery (D) and research and development (D). Furthermore, besides continuing to promote business structural reforms, Sumitomo Electric also worked on developing new systems, with an emphasis on developing human resources to actually carry on these reforms.

Formulation of the Sumitomo Electric Group Charter of Corporate Behavior

The rash of corporate scandals[1] from 2001 to 2002 and the enactment of the Act on the Protection of Personal Information in May 2003 further called into question the ethics and compliance of companies. In February 2003, Sumitomo Electric, too, received notice from the Japan Fair Trade Commission advising it to cease activities in violation of the Antimonopoly Act with respect to a tender process by the Tokyo Metropolitan Police Department for works to construct traffic signals. Therefore, in order to widen the Sumitomo Electric Employee Code of Conduct into a Group-wide code of conduct, the company established the Sumitomo Electric Group Charter of Corporate Behavior in September 2005, and resolved to realize the Sumitomo Spirit and Corporate Principles.

Sumitomo Electric Group Charter of Corporate Behavior

1. Provision of Useful and Safe Products and Services
2. Development of New and Original Businesses and Products
3. Growth and Development of the Sumitomo Electric Group through Global Business Activities
4. Contribution to Preservation of the Global Environment
5. Observance of Laws and Regulations
6. Fair and Proper Business Activities
7. Conduct as a Member of Society
8. Harmony with the International Community
9. Safe, Sound Workplace and Employees' Growth and Development
10. Disclosure of Relevant Information and Promotion of Communication with Society

Introduction of a business unit system and an executive officer system

As part of promoting VISION 2007 and rebuilding the management of the business which was operating in the red, the company introduced an executive officer system in June 2003 followed by a business unit system in July.

Along with strengthening the system of consolidated management in light of the global expansion of operations and the spin-off divisions into separate companies following Sumitomo Electric's structural reform, the aims of the business unit system were to speed up business operations, and to clarify the authority and responsibility of each business organization. Under the previous management structure, which had been based on business divisions and management units that were fractionalized and decentralized according to products or technologies, there were limits to how well Sumitomo Electric could address the rapidly changing needs of customers who now required products and solutions that spanned multiple business divisions. The system also had limitations in terms of the management of subsidiaries both in Japan and overseas. Therefore, Sumitomo Electric reorganized itself into a customer-oriented (market-oriented) structure comprised of seven Business Units, two Sales Units, a R&D Group, and Corporate Staff Group. The Business Units, Sales Units, and R&D Unit were given equal, independent status, and enhanced function and efficiency by checking with each other based on the philosophy of customers first.

1 In addition to the successive failures of major corporations in the U.S. from window-dressing their accounts, namely Enron Corporation (2001) and WorldCom (2002), in Japan too, there was a series of incidents, including a cover-up of vehicle defects and the fraud involving the mislabeling of food.

The General Manager of each Business Unit was delegated considerable authority in terms of personnel and investment, and with responsibility for profitability and strategy, oversaw the business divisions and affiliated companies under the umbrella of the respective Business Unit. Such an arrangement gave clarity to the positioning of businesses and subsidiaries within the Group, and it also simplified and streamlined the chain of command, leading to more efficient business operations. The Sales Group was divided into two Sales Units in order to strengthen the promotion and marketing functions and to clarify responsibility for sales. Separate from the Sales Units were district sales units. Later, the Business Units were reorganized to better suit the business environment and other factors at the time, into the Advanced Materials Business Unit (April 2004), the Electric Wire & Cable, Energy Business Unit (June 2005), and the Broadband Solutions Business Unit and Industrial Materials Group (June 2005), and finally into the current structure it is today (see p. 120 of the Reference Section).

Along with separating management and execution, reducing the number of directors and, together with the business unit system, speeding up the decision-making process in the Board of Directors, one of the aims of the executive officer system was to enhance the oversight of business execution. Specifically, managing directors and higher were made directors, and executive officers were selected and appointed by the Board of Directors. Executive officers were not only selected from within Sumitomo Electric, but also from the top management of Group companies. This was designed to strengthen the Group management.

In addition, a new Crisis Management Committee was formed in August 2003.

Introduction of new personnel system

As part of structural reforms, a new wage and compensation scheme was introduced in August 2003. The wage system was changed to better reflect the annual performance and results of each individual employee, and the performance evaluation system was also revised from a similar perspective given its direct relationship to the wage system. The new scheme sought to improve the ability of individual employees to respond flexibly and swiftly to change, and to improve their ability to independently achieve goals consistent with their business unit policies.

Appointment of Masayoshi Matsumoto as president

In June 2004, President Okayama became chairman of the Board of Directors, and Senior Managing Director Masayoshi Matsumoto was appointed as the new president. President Matsumoto had previously served as general manager of the Automotive Group and general manager of the Chubu District Office, and had been instrumental in expanding Sumitomo Electric's business in the automotive sector. At the time of his appointment, President Matsumoto stated, "Through sustained structural reform, I am determined to rebuild our business base no matter what it takes, by implementing measures designed to expand and streamline our existing businesses and to branch out into new business areas. To this end, cooperation among the R&D Group, the Production and Manufacturing Group, the Sales and Planning Group, and the Corporate Staff Group will be strengthened while maintaining a moderate amount of tension between them by treating them like separate profit centers. By doing so, we will build a sturdy management structure, and strategically expand our business activities globally." In doing so, he highlighted his aspiration to become a "Glorious Excellent Company"—a corporate group based on the Sumitomo Spirit and trusted by the international community, including a commitment to human resources development and to research and development.

In November that year, Sumitomo Electric put forward VISION 2007 for the first time as the Group's management plan. The announcement included market-specific strategies and a business portfolio comprised of growth businesses (infocommunications and electronics), maturing businesses (industrial materials), and profit-earning businesses (automotive). The plan also clarified that the Group would strengthen CSR initiatives in six areas: compliance; investor relations and public relations; quality and customer satisfaction improvement; health, safety and the environment; procurement and logistics; and employees, human rights and social contribution.

In July 2007, President Matsumoto launched the President's Blog. At the time, it was rare for the top-level executive of a major company to disseminate information in this way. Over the next ten years, by continuing to broadcast information on a wide range of topics—not just business—he worked to improve the level of affinity and understanding for the Sumitomo Electric Group.

Introduction of a tag line and establishment of SEI University

From the time of his appointment, President Matsumoto emphasized strengthening the sense of cohesion within the Group. One measure for realizing this was the Group's new tag line, "Ingenious Dynamics," introduced in March 2005. Tag lines are a phrase that expresses the philosophy or proclamation of a company or the value it provides. The phrase "Ingenious Dynamics" carries the message that the Sumitomo Electric Group has unsurpassed knowledge and unique creativity (= ingenious), and leveraging that dynamism to create maximum effect (= dynamics), will meet the expectations of society." Since then, the new tag line has been used in advertisements, exhibitions, product catalogs, and so on.

In January 2005, Sumitomo Electric also established the new Human Resources Development Department, and in April, it developed and expanded its existing education and training system, reorganizing it into SEI University. The fundamental principles of the new system were to disseminate the corporate philosophy of the Sumitomo Electric Group and to share its management strategies and vision, and to develop employees' abilities, skills, and knowledge so that they may play active roles in the global community. Group-wide training programs were organized so that employees could combine compulsory position-based training with optional training according to their operational needs. These programs were on top of five basic subjects essential for all Sumitomo Electric Group personnel, namely: (1) The Sumitomo Spirit, Corporate Principles and CSR, (2) Management policies and visions, (3) Compliance, (4) Safety, environment and quality, and (5) Diversity. A new Executive Training Program for executive officers and general

managers was also launched and established as a course for developing the next generation of executives.

Furthermore, in October that year, the Sumitomo Electric Group opened Minami-Hakone Seminar House in Kannami Town (Tagata District, Shizuoka Prefecture), to serve as an accommodation and training facility for the Group's SEI University alongside the existing Ikoma Seminar House (opened in 1990).

Building on the basic concept that "manufacturing products relies on human resource development," in April 2006, the Group also initiated training for new technician and engineer recruits (technical trainees), and it also enriched its training curriculum on the basics of manufacturing, such as SEQCDD.[2] In addition, in February 2007, the Group also instigated a program in which global managers are invited to Japan for training, and since then, has continued to enrich its programs for the development of global personnel.

Company-wide promotion of CSR

In addition to achieving VISION 2007, an essential component of realizing the future vision of a "Glorious Excellent Company" was the promotion of CSR. After initiating the CSR Committee in July 2004, Sumitomo Electric worked to enrich and expand specific measures and activities, while continuing to disseminate the Sumitomo Spirit, Corporate Principles, and the Charter of Corporate Behavior.

In terms of environmental measures, Group-wide environmental conservation activities were commenced under the "Action ECO-21" campaign in April 2003. Sumitomo Electric had already initiated efforts in earnest having established its Voluntary Plan[3] in fiscal 1993, and had elevated these into the Mid-Term Plan for Environmental Conservation Activities in fiscal 2001, but the aim of this new campaign was to pick up the pace. "ECO" stood for engineering (E), communication (C) and originality (O). The main activities of Action ECO-21 included energy conservation, zero emissions, reduction of packaging materials, complete elimination of hazardous pollutants, development of eco products, and green procurement. The campaign shifted to second phase in April 2005, as the Group proceeded to achieve the goals under each theme.[4] In 2003, Sumitomo Electric established the Green Procurement Guidelines, and rolled them out to its suppliers. Then in fiscal 2008, the Group launched the Eco-Life Activities "Household Eco-Account Book" in an effort to encourage employees to also reduce CO_2 emissions at home.[5] At the same time, Sumitomo Electric continued to acquire ISO 14001 certifications for its Group companies. Moreover, in fiscal 2005, the Group enriched its *SEI Environment Report*, which had published since fiscal 1998, and expanded it into the *SEI CSR Report*.

As for social contribution, in May 2007, marking the 110th anniversary since its establishment, the company formulated the Sumitomo Electric Group Basic Policies on Social Contributions bolstering its stance on promoting voluntary activities.

The policies were fleshed out from that year and in April 2007, ahead of the policies being formulated, Sumitomo Electric introduced the volunteer holiday system, under which employees can use accumulated leave (up to 10 days per year) to participate in volunteer activities. Then in September that year, the company also adopted a matching gift system, under which the company contributes an amount equal to any donations made by employees to external funds and foundations. The company also established the SEI Group CSR Foundation as well as a special subsidiary specifically for employment of persons with disabilities (see p. 70 in Chapter 3).

The Sumitomo Electric Group Basic Policies on Social Contributions

The Sumitomo Electric Group will proactively address voluntary social action programs, as a member of society, focusing on "respect for human resources," "attaching importance to technology" and "creating a better society and environment" in accordance with the Sumitomo Spirit and the Sumitomo Electric Group Corporate Principles, as well as widely contributing to society through its business activities, including the provision of products, technologies and services that benefit society.

The Sumitomo Electric Group shall:

1. globally promote efforts toward the development of human resources, the promotion of research and learning and environmental conservation,
2. promote community-oriented social contribution activities in the Group's business locations all over the world, and
3. provide continuous support to employees' voluntary social contributions.

Ongoing promotion of structural reform

Structural reforms were continuously promoted based on VISION 2007.

In April 2003, Sumitomo Electric established the Structural Reform Promotion Committee to promote the following kinds of measures.

January 2003	Fabridam business transferred to Marsima Aqua System Corporation (Sumitomo Electric to specialize in manufacture of the rubber body)
April 2003	Division of Sumitomo Electric Systems Co., Ltd. involved in the development of road traffic and infocommunications systems transferred to Sumiden Field Engineering Co., Ltd., which is engaged in the construction and maintenance of systems in the same area
	Sumitomo (SEI) Electronic Wire, Inc. and Sumitomo Electric Flat Components, Inc. established following the integration and reorganization of Sumitomo Electric's domestic development and manufacturing divisions with two affiliated companies, in an effort to reorganize the electric wire business
	Sumitomo Electric Technical Solutions, Inc. (a comprehensive engineering company) established primarily around the engineering department of Sumitomo Electric
April 2004	Eudyna Devices Inc. established following integration of the electronic devices (gallium arsenide IC) business with Fujitsu Limited
	Broad Wireless Corporation established following integration of the antenna-related business with Furukawa Electric Co., Ltd. (company liquidated in March 2009)
June 2004	Nagoya Works of Sumitomo Electric Wintec, Inc. closed (business consolidated into the Shigaraki Works)
July 2004	Electric power cables business of Sumitomo Wiring Systems, Ltd. consolidated into Sumitomo Electric Industrial Wire & Cable Inc., and Hannan Electric Wire & Cable Co., Ltd. reorganized into a wholly-owned subsidiary (integrated into Sumitomo Electric Industrial Wire & Cable Inc. in October)
September 2004	Began consolidating the equipment of the Yokohama optical fiber plant into Kiyohara Sumiden, Ltd.
October 2004	Sales function of high-voltage power cables to Japan's electric power companies transferred to J-Power Systems Corporation
April 2005	Sumiden Tomita Shoji Co., Ltd. established following merger of Tomita Shoji Co., Ltd. with Sumiden Shoji Co., Ltd.
	SEI Hybrid Products, Inc. established following spin-off of hybrid products division (rubber, synthetic resin, crystalline materials, special porcelain) into a separate company
October 2006	Sumitomo Electric System Solutions Co., Ltd. established following merger between Sumitomo Electric Hightechs Co., Ltd. (primarily engaged in the development of traffic control systems, etc.) and Sumitomo Electric Field Systems Co. Ltd. (engaged in equipment design and construction management in the same field)
April 2007	J-Witex Corporation established following merger of Kanto Wire Products Corporation and Metax Corporation (Sumitomo Electric Group companies) with Kokoku Steel Wire Ltd. (a subsidiary of Nichia Steel Works, Ltd.), based on an agreement with Nichia Steel Works for business integration in the steel wire business
July 2007	Suzuki-Sumiden Stainless Steel Wire Co., Ltd. established following integration of the stainless steel business with Suzuki Metal Industry Co., Ltd.
August 2007	Sumitomo Wiring Systems, Ltd. reorganized into a wholly-owned subsidiary
October 2007	Automotive brakes business transferred to Aisin Seiki Co., Ltd.
December 2007	Nissin Electric Co., Ltd. made into a consolidated subsidiary, and Toyokuni Electric Cable Co., Ltd. reorganized into a wholly-owned subsidiary[6]
January 2008	Sumitomo Wiring Computer Systems, Ltd. integrated into Sumitomo Electric Information Systems Co., Ltd. (an information systems subsidiary)

Initiatives for balancing work and life

As part of CSR, in addition to creating a workplace environment where employees can work with enthusiasm, Sumitomo Electric also promoted efforts to meet societal demands. In light of Japan's aging society with a low birthrate and an increase in non-regular employees, movements to review working styles gained momentum. For instance, in July 2005, the Council for Gender Equality issued the "Basic Direction for the Promotion of the 'Work life Balance.'" In this context, Sumitomo Electric began formulating action plans every two years, and promoted improvements such as support for employees caring for their children or nursing family members, and encouraging employees to take paid holidays.

As for general welfare initiatives, in April 2003, Sumitomo Electric revised the existing blanket company-wide system into a "cafeteria plan" (a voluntary, selective welfare system), enabling employees to individually choose the social services they require.

Regarding the active engagement of older employees, in October 2005, Sumitomo Electric introduced a program to re-employ workers after they reach retirement age (the so-called Masters Program), and in April 2006, it introduced the Senior Partner Program. In addition, in September 2007, in an effort to increase the motivation of older workers, the company abolished the expert system, and improved the wages of employees aged 57 and over. Furthermore, acknowledging the importance of veteran employees with high levels of technical know-how, knowledge or skills in developing human resources and in "Strengthening Our Leading Technology" as highlighted in VISION 2007, the company began recognizing persons who possess advanced or rare skills, knowledge or know-how, and who can be of service in executing the Group's business, as "Fellow" and "Senior Specialist" in January 2004, and persons demonstrating important manufacturing skills as "Meister" and "Expert" in April 2005.

In initiatives related to caring for children, the company has instituted assistance far in excess of the statutory requirements (granting childcare leave until the child turns 3 years of age; allowing employees a shorter work time and exempting them from overtime work while their children are enrolled at elementary school), and has been making efforts to support employees achieve a balance between their work and home life. For instance, the company opened childcare centers at its Yokohama Works (March 2008), Osaka Works (April 2008) and Itami Works (March 2009), and has introduced a leave program for employees whose spouses are giving birth.

Measures for accelerating research and development

Research and development into "Strengthening Our Leading Technology" was promoted by the R&D Unit, which had been established following adoption of the business unit system, in collaboration with each of the business units. The R&D Unit, which had been established in conjunction with adoption of the business unit system, was comprised of the Research Planning Department (in charge of operational management), the Intellectual Property Department, and the Analysis Technology Research Center (dealing with common technologies), plus seven function-specific laboratories (energy and environment, infocommunications, optical communications, transmission devices, electronics and materials, advanced materials, and automotive). Its key areas of research and development were environment and energy, infocommunications, electronics and materials, and automotive. Expenditure in research and development continued to consistently rise, from 55.3 billion yen in fiscal 2003, to 72.3 billion yen in fiscal 2007. Furthermore, to improve the situation where meetings of the Executive Management Committee (Management Conference) were not attended by researchers and developers, steps were taken to have management regularly kept abreast of key topics and to raise the awareness and motivation of researchers and developers through direct dialog.

Institutionally, Sumitomo Electric established development teams for semiconductors, power line communication (PLC), intelligent transport systems (ITS), broadband equipment, and so on. The aim of this was to shorten the time taken to develop bismuth-based superconducting cables and nanotechnology materials and parts into products, by

2 SEQCDD is the Sumitomo Electric Group's policy of carrying out business activities while being cognizant of safety (S), environment (E), quality (Q), cost (C), delivery (D) and research and development (D).
3 Refers to the plan for environmental conservation which, in October 1992, the Ministry of International Trade and Industry (MITI) (now the Ministry of Economy, Trade and Industry (METI)) had requested major industry groups prepare. Leading companies in each industry complied with this request.
4 Zero emissions were achieved domestically in fiscal 2010, and globally in fiscal 2016. Hazardous pollutants (trichloroethylene and two others) were completely eliminated by Sumitomo Electric in November 2001, and by the Group, including affiliated companies, in fiscal 2011.
5 More than 4,000 families had begun participating within just over a year of the program starting.
6 Nissin Electric is a medium-sized manufacturer of heavy electric machinery, engaged in substation facilities, etc. and became part of the Sumitomo Group in 1937. Toyokuni Electric Cable was formed in 1973, following the merger between the Toyokuni Electric Cable Factory, Co., Ltd. and Sasaki Electric Wire, Co., Ltd. It is primarily engaged in the manufacture and sale of optical communication cables, optical equipment products, and wiring system products for houses and buildings, etc.

positioning them as projects for commercialization while strengthening collaboration with production and sales.

Sumitomo Electric also promoted open innovation. In May 2005, the company signed a cooperative agreement with the National Institute of Advanced Industrial Science and Technology (AIST) (which has since been reorganized from an incorporated administrative agency into a national research and development agency), and has since collaborated in supporting basic research and developing human resources in the areas of infocommunications, electronics, environment and energy, and life sciences. The company also promoted the following collaborative research and development.

February 2004	Glucose chips (Tokyo University of Technology, AIST Research Center of Advanced Bionics)
April 2004	Hospital information systems (Toshiba Sumiden Medical Information Systems Corporation established together with Toshiba Corporation; all shares held by Sumitomo Electric transferred to Toshiba in October 2011)
December 2006	Development of products using high-temperature superconducting wire (General Electric Research Laboratory, U.S.)
April 2007	Rare material recycling system (Nagoya University EcoTopia Science Institute)

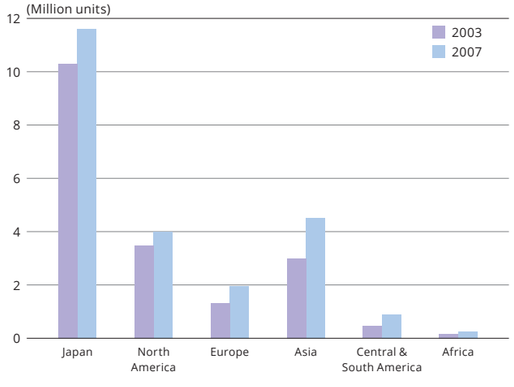
Section 2: Business

1 Global expansion and strengthening of product-specific systems in the automotive business

Aiming for 20% share of the global wiring harness market

Under VISION 2007, Sumitomo Electric's automotive business was focused on strategies to grow the company's share of the global wiring harness market to 20% (from about 15% at the end of fiscal 2003). To realize this, it decided to expand sales to non-Japanese manufacturers and utilize M&A, while maintaining its market share among Japanese manufacturers. The company also needed to increase its portfolio of new products by combining its core harness products with technologies from its infocommunications and electronics areas.

Number of vehicles produced by Japanese manufacturers (based on JAMA statistics)



At the time of formulating VISION 2007, Sumitomo Electric had projected that the Japanese, U.S., and European markets would remain stagnant, while the Asian (Chinese) market would expand, but as shown in the graph on the left, in reality, there was growth in every market, which provided a tailwind for the company's business.

Sumitomo Electric proceeded to steadily promote strategies, including M&A, growing its automotive business from consolidated net sales of 664.1 billion yen, and operating income of 43.6 billion yen in fiscal 2003, to 1,199.3 billion yen and 74.5 billion yen, respectively, in fiscal 2007. As a result, almost half of the company's consolidated operating income of 149 billion yen was earned from its automotive business. Furthermore, as a result of buying out a wiring harness company belonging to the Volkswagen Group (Germany) in March 2006 (see p. 53 in Chapter 2), Sumitomo Electric was also to achieve its target share of the global market.

Building production bases in China and other emerging countries

Under VISION 2007, China was a key market for Sumitomo Electric's automotive business. Starting with Tianjin Jin-Zhu Wiring Systems Co., Ltd.—a company producing wiring harnesses, established in November 1994 through a joint venture[8] with Tianjin Automobile Industry (Group) Co., Ltd.—Sumitomo Electric went on to establish Huizhou Zhucheng Wiring Systems, Co., Ltd. as a joint venture with the Dongfeng Motor Group, and Chongqing Jin-Zhu Wiring Systems Co., Ltd. as a subsidiary of Tianjin Jin-Zhu Wiring Systems Co., Ltd. in 2004. Then in 2005, it established Huizhou Sumiden Wiring Systems Co., Ltd. and Wuhan Sumiden Wiring Systems Co., Ltd. in collaboration with Sumitomo Wiring Systems, thereby setting up a system for supplying local joint venture companies of Japanese automakers, such as Toyota Motor Corporation and Honda Motor Co., Ltd. Also in China, manufacturing bases were set up by Sumitomo Wiring Systems—either independently or in collaboration with Sumitomo Electric—in Fuzhou, Suzhou and Huizhou, to produce wiring harnesses, electric wires, connectors and electronic components, bringing the overall number of automotive bases in China, including wiring harness components, to 15 as of 2005, employing some 13,000 workers.

In the ASEAN region, as Japanese automakers increased their local production in Thailand, Sumitomo Electric Wiring Systems (Thailand), Ltd. set up a second plant, and established SEWS-Components (Thailand) Ltd. to manufacture connectors and electronic components (June 2002). And in Vietnam, Sumitomo Electric and Sumitomo Wiring Systems jointly contributed to the establishment of Sumiden Vietnam Automotive Wire Co., Ltd. (February 2006) as a company to manufacture electric wires for SUMI-HANEL Wiring Systems Co., Ltd., which had been established in 1996 to manufacture wiring harnesses.

Also around this time, in Hungary, Sumitomo Electric established SEWS-Automotive Wire Hungary Ltd. in June 2003 as a subsidiary to manufacture electric wires for automobiles.[9] In South Africa, SEWS South Africa (Pty) Ltd. was established in June 2004.

Buyout of Volkswagen harness subsidiary

In 2003, more than 90% of Sumitomo Electric's wiring harnesses for cars were sold to Japanese manufacturers, and so in order to increase its global market share, it was important that the company also break ground in the market for overseas manufacturers. However, the only opportunity the company had to enter new markets or expand its market share for wiring harnesses was when manufacturers released new models or completely redesigned existing models. For this reason, Sumitomo Electric also moved to get customers through alliances and M&A.

In November 2004, the Group acquired a 50% share of Kyungshin Industrial Co., Ltd. (present-day Kyungshin Corporation), a leading wiring harness manufacturer in Korea, (Sumitomo Electric: 30%, Sumitomo Wiring Systems, Ltd. 20%), thereby adding the Hyundai Kia Automotive Group to its list of clients.


Sumitomo Electric Bordnetze SE

Then in March 2006, again in collaboration with Sumitomo Wiring Systems, the Group bought out Volkswagen Bordnetze GmbH (headquarters: Wolfsburg), a wiring harness manufacturer belonging to the German Volkswagen Group. At the time, the company had net sales of 446 million euro (approximately 62.4 billion yen), a workforce of approximately 8,600, and had production subsidiaries in Poland, Slovakia, Bulgaria, Morocco and China. It was Sumitomo Electric's first big step into breaking new ground into the German automaker market. Once the company had become part of the Sumitomo Electric Group, it was renamed Sumitomo Electric Bordnetze SE.

By its own efforts, Sumitomo Electric also secured its first ever order from U.S. company General Motors for its Hummer H2 Junction Box in 2002. Orders were subsequently also received for GM's core models: Buick and Cadillac, and this experience later led to orders being received from Ford and from Fiat Chrysler Automobiles as business grew.

Reorganization of Sumitomo Wiring Systems, Ltd. into a wholly-owned subsidiary, and transfer of the brakes business

As the automotive industry expanded globally, including in emerging countries, and as advances were made in automotive electronics and IT, there were calls in the components industry too for a stronger global response, technological development capability, and cost competitiveness. Consequently, in May 2007, Sumitomo Electric announced it would reorganize its automotive business so that it could better focus management resources into its action for the environment and into systems for transmitting energy and information centered on wiring harnesses.

As part of this, the reorganization of Sumitomo Wiring Systems, Ltd. into a wholly-owned subsidiary was completed in August 2007 through share exchange. Until that point, Sumitomo Electric had held 51.59% of shares in the company, and business had been conducted with Sumitomo Electric responsible for business planning and sales, and Sumitomo Wiring Systems responsible for the design and manufacture of wiring harnesses. However, in responding to the aforementioned demands of the automotive industry, it was determined that management resources needed to be integrated, by eliminating the duplication of decision-making and business operations, and so the decision was made to further bolster integrated management. In another move, the automotive brakes business was transferred to Aisin Seiki Co., Ltd. in October 2007 (see p. 42 in Chapter 1).

7 Despite being a boom, the annual growth rate was relatively low at around 2%, and the increase in non-regular employees meant that overall wage growth was sluggish and spending was stagnant. The period was also described as the "illusory economic recovery" and the "lost two decades."

8 Sumitomo Wiring Systems, Sumitomo Corporation, and Singapore Science and Technology Industries also participated in the joint venture.

9 In the 1990s, Sumitomo Electric had advanced its wiring harness business into Europe in earnest, setting up bases in the UK, Germany, and the Netherlands, as well as in Poland, Slovakia, Hungary, Romania, and Morocco. Electric wires for automobiles had been procured locally, but the EU strengthened its demands for halogen-free wires and cables to be adopted.

Development of automotive technologies

Overseeing research and development of automotive technologies, AutoNetworks Technologies, Ltd. (established in 1995) proceeded to develop a variety of new products and new technologies. From its establishment in 1995 to 2005, it produced a lightweight harness for mounting in car ceilings (2004), as well as technology for waterproofing harness ground terminals; a high-voltage, under-floor wiring harness for hybrid vehicles, using the world's first technology for bending electrical wiring once it has been inserted in an aluminum conduit used for electromagnetic shielding; and lever-type harness connectors (each produced in 2005).

Products developed for market since 2006 include a shielded wiring harness for power steering and a high-voltage wiring harness for hybrid vehicles (2006), as well as joint connectors for instrument panel harnesses using flexible flat cables (2007). The company also succeeded in further reducing the weight of wiring harnesses by developing the world's thinnest and lightest automotive electric wire (0.13 mm^2; conventionally 0.35 mm^2 had been the thinnest), which began to be mounted in cars from February 2007.

Other developments delivered by the company include body control units that control the operation of headlamps, wipers and door locks, etc., as well as wide-angle, front-mounted cameras, and connectors used with in-vehicle flat cables, plus small, lightweight relay boxes, and junction boxes used in luxury cars.

2 Integrated expansion of optical communications products in the infocommunications business in the rollout of FTTH

Rebuilding the infocommunications business from the collapse of the IT bubble

Infocommunications-related businesses were the headline act of Sumitomo Electric's growth in the late 1990s, but inevitably struggled following the collapse of the IT bubble. Under VISION 2007, the company worked hard on structural reform with a goal of returning the infocommunications business to surplus in fiscal 2005 and for substantial reinstatement of the business by the final year of the management plan, fiscal 2007 (increase net sales by 80% from the level in fiscal 2003). During this time, the market environment was affected by a mixture of headwinds (stagnant demand for trunk line networks, stricter budget efficiency for public projects, increased competition in the broadband market, etc.) and tailwinds (expansion of FTTx, increased demand for corporate systems, rise of emerging markets overseas, etc.).

The company's basic approach to structural reform in its optical fiber business was to consolidate domestic production of general-purpose items to affiliated companies, and increase competitiveness by reducing production costs through volume efficiencies, while at the same time, responding to market recovery by specializing in high-functionality products. With the spread of FTTH in full swing, Sumitomo Electric developed and brought to market a diverse range of products, including wiring materials used together with cables, optical splitter modules, optical connectors used in onsite construction, and compact optical fiber fusion splicers. In optical links, Sumitomo Electric expanded sales by developing 10 Gbps high-speed products, not only for the telecom market, but for the datacom market too. As for broadband network equipment for subscribers, following on from ADSL, VDSL for apartment houses and buildings, GE-PON (Gigabit Ethernet Passive Optical Network)[10] for optical subscribers and so on became new mainstays, contributing to the earnings of the infocommunications business.

As a result, the earnings of the infocommunications business improved dramatically in fiscal 2004 and 2005. In fiscal 2005, the business successfully turned a profit, recording consolidated net sales of 250 billion yen and operating income of 8.9 billion yen, and continued to perform solidly through to fiscal 2007.

Global business expansion on the back of structural reform and stronger competitiveness in the optical fiber business

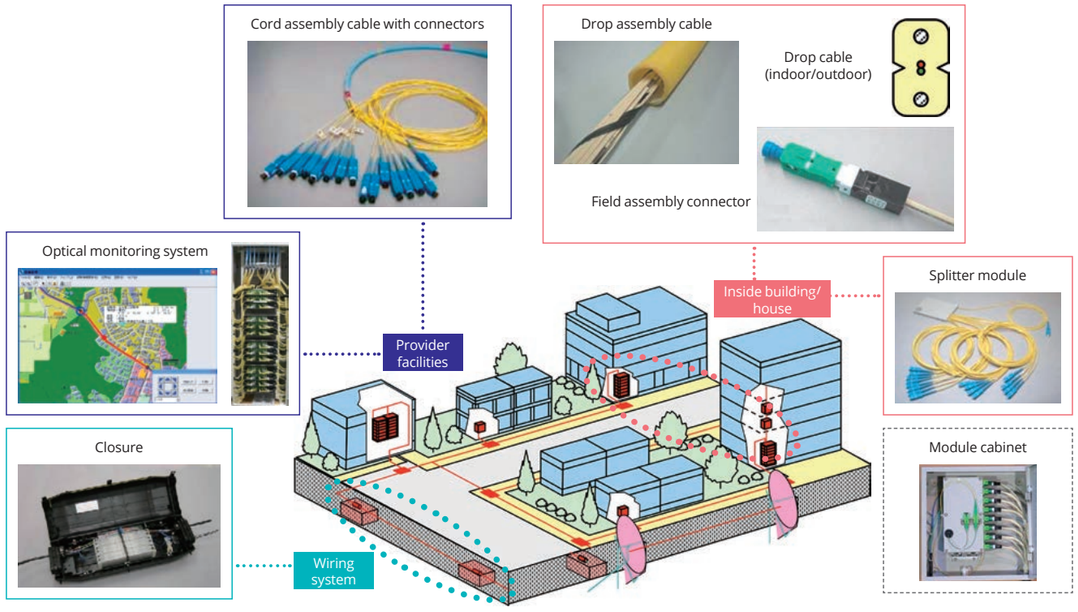
A challenge for Sumitomo Electric was to make its optical fiber business profitable again by restoring its production scale, which had plunged from 11 million km in fiscal 2001 to 6.7 million km in fiscal 2003.

In order to achieve this goal, the company promoted structural reforms from September 2004 to limit optical fiber production at the optical fiber plant at the Yokohama Works to small lots of special, high-performance optical fibers, and to concentrate production of standard single-mode fiber, which accounts for the majority of production, at Kiyohara Sumiden, Ltd. Kiyohara Sumiden had invested in state-of-the-art equipment during the IT bubble period, and so coupled with volume efficiencies through intensive production, the company managed to nearly halve production costs. On the back of price competitiveness, it expanded the amount of orders being received in the European and US market, which had begun to recover, and in the new emerging Chinese market. After a while, in order to meet growing demand, the optical fiber plant resumed partial operations, and in fiscal 2007, total production increased significantly to 18 million km, outstripping production during the IT bubble period. As growth of the global market gained certainty, to cope with its global expansion of business activities, Sumitomo Electric began to consider construction of a second plant for mass-production and selection of business partners in the key markets of China and Europe.

Development of new products and strengthening of the FTTH wiring and equipment business

Although the introduction of FTTH in Japan began in 2000, the spread of the Internet meant that extensive investments had been made, not just by NTT, but also by communications service providers affiliated with power companies. Sumitomo Electric, therefore, pursued development of optical cables and wiring parts and materials suitable for optical networks. Examples include SZ optical cable for aerial installation, EZbranch fiber ribbon which makes branching work more efficient, and PureAccess fibers that can tolerate a small bending radius. In submarine cables, Sumitomo Electric also developed Z-PLUS Fiber with a large core area.

Since PON (Passive Optical Network: technology for distributing and sharing a service provider's single fiber to multiple subscribers) had been adopted for FTTH, optical splitter modules were important. The company also developed an extensive portfolio of peripheral products for undertaking work connecting optical fibers in the field, such as field installable optical connectors, compact optical fiber fusion splicers and small-sized closures installed on utility poles, as well as products used in telephone exchanges, such as optical fiber line monitoring systems designed to improve maintenance and operation efficiency for subscriber fibers. By expanding its lineup of products in the market beyond existing optical connectors, Sumitomo Electric was able to increase sales.



Optigate series of FTTH products

Structural reform of the transmission device business—establishment of Eudyna Devices Inc. and production base in China

Sumitomo Electric worked hard on structural reform in its transmission device business amid ongoing difficult circumstances, including the market for optical links becoming even more price competitive based on the customer-driven common specifications that had been introduced. At the same time as streamlining its overall organization, the company enhanced its product competitiveness, such as by withdrawing from conventional optical links for LAN and concentrating resources in optical links for public communication, accelerating development of 10 Gbps high-speed optical links and other new products, and even advancing the functions of existing products by adding a digital control function. In optical devices, the company strived to expand its scope of business in order to improve business results. At the same time as advancing overseas sales of LD-CAN[11] for optical links, TOSA (transmitter optical sub-assembly) and coaxial LD modules for analog transmission, since NTT had begun its full-scale launch of FTTH, the company also devised and commercialized bi-directional (Bi-D) modules useful in optical transmitter OLT (optical line terminal) configurations inside exchanges.

In rebuilding the electronic devices business, Eudyna Devices Inc. was established in April 2004, following integration of Sumitomo Electric's compound semiconductor devices division (part of the Photo-Electron Division) with Fujitsu Quantum Devices, Ltd. (a subsidiary of Fujitsu Limited), with Sumitomo Electric and Fujitsu contributing equal shares of the 19.5 billion yen of capital. With headquarters located within Sumitomo Electric's Yokohama Works, and production based at the Yokohama Works and at a plant of Fujitsu Quantum Devices in Yamanashi, the new company aimed to expand business in devices and modules used in mobile phone base station equipment, mobile terminals and radar products. Nevertheless, Sumitomo Electric continued to develop, manufacture, and sell optical links and optical devices for links, and Fujitsu continued its optical link business. However, since Fujitsu products had limited application, they were segregated.

Next, in order to reduce the processing costs for optical devices and optical links, it was decided to perform the submodularization process of light-emitting devices, light-receiving devices, high-speed electronic circuits and so on, which were manufactured in Japan, as well as the final assembly process for optical links, in China. Sumitomo Electric had been using Chinese EMS since 2002, but in May 2007, it switched to production at a manufacturing subsidiary with establishment of Sumitomo Electric Photo-Electronics Components (Suzhou), Ltd. in Suzhou, China. Three

10 A public network of optical fiber cables capable of realizing transmission speeds of 1 Gbps, and the associated technologies.

11 LD stands for laser diode (semiconductor laser). CAN is the module in which the LD is incorporated, so called because it resembles a metal can.

Sumitomo Electric Photo-Electronics Components (Suzhou), Ltd.

years later, products assembled at the Suzhou subsidiary accounted for more than 80% of Sumitomo Electric products, going a long way toward strengthening the company's cost competitiveness.

The effects of a weaker yen on top of the above reforms helped Sumitomo Electric's optical transmission device business perform steadily alongside Eudyna Devices up until fiscal 2007. Adding to its relationship with companies from Europe and the U.S., Sumitomo Electric's business targeting Huawei Technologies Co., Ltd. also started around this time as it made inroads into the Chinese telecommunications equipment market.

Betting on the growth of broadband—expanding business from ADSL to a variety of access devices

Sumitomo Electric entered the broadband subscriber network market with ADSL in 1999. Since ADSL was a kind of bridging product to the more favored FTTH, though, a new post-ADSL market needed to be developed. Sumitomo Electric took two approaches.

The first approach was to commercialize VDSL (very high speed DSL)—the successor to ADSL enabling high-speed data communications in apartment houses using telephone lines. Development began in 2000, with the first products shipped in 2002. From 2003 onwards, the company improved the MegaBit Gear series, capable of transmission rates of 70–100 Mbps. Since about half of Japanese households live in apartment houses, sales remained at a high level after peaking in fiscal 2005. VDSL became one of the key products supporting business, with cumulative shipments to the end of fiscal 2007 exceeding 3.5 million subscriber lines. The second product is GE-PON—the favored product for FTTH.


A GE-PON optical line terminal for network carriers

Development began in 2000, and following integration of the module technologies of its optical device departments, Sumitomo Electric entered the NTT market, with full-scale shipment of products beginning in fiscal 2005. Through these new product groups, Sumitomo Electric Networks, Inc. was able to sustain a high level of sales even after 2005, strengthening its business foundations.

Focus was also put on broadband services. Sumitomo Electric developed indoor terminals for IP telephone services (which later evolved into Home Gate-Way (HGW) products) as well as set-top boxes for IPTV (IP-STB), with shipment of products starting in 2003 and 2004, respectively. These products would blossom from 2008 as NTT expanded its next-generation network (NGN) services and its IP retransmission of terrestrial TV broadcasting on the NGN.

Meanwhile, in the area of CATV, Broad Net Mux Corporation achieved stable revenue by expanding its market share as a comprehensive integrator, covering from the manufacture of broadcasting equipment and terminal units on subscriber premises, to system integration.

Reorganization of the solution business

Sumitomo Electric also promoted structural reform in its systems business, including traffic control systems. In April 2003, the division responsible for development of road traffic and infocommunications systems and software at Sumitomo Electric Systems Co., Ltd. was transferred to Sumiden Field Engineering Co., Ltd., which was responsible for construction and maintenance in the same field. By doing so, Sumitomo Electric Field Systems (as it had been renamed at the time of the transfer) sought to undertake all processes related to road traffic and infocommunications systems, from development to construction and management, enabling it to increase its orders received for full turnkey systems.

These reforms led to increased sales in traffic control systems, including delivery of a traffic signal control system to Phuket City, Thailand (August 2003), and a large display system for the Nara National Highway Office of the Kinki Regional Development Bureau (December 2004). Furthermore, ahead of the next generation of systems, in fiscal 2006, Sumitomo Electric accepted an order for a model project for next-generation signal control, led by the National Policy Agency (Kanagawa Prefectural Police and Ehime Prefectural Police), and set about a profile signal control that can quickly adapt to changing situations using predictive information.

At the same time, Sumitomo Electric Systems moved to specialize in the development, construction, and sale of medical information systems, and transitioned from a function-based division of roles to a market-based division of business. Furthermore, in April 2004, following integration of the departments responsible for hospital information systems at Sumitomo Electric Systems Co., Ltd. and Toshiba Medical Systems Corporation, a new company commenced operations, Toshiba Sumiden Medical Information Systems Corporation. By combining the strengths of Sumitomo Electric Systems, which held a dominant market share in university hospitals, etc., with Toshiba Medical Systems, which was the country's leading firm in diagnostic imaging equipment, the integration sought to strengthen competitiveness. Operations at the new company were going smoothly, when in 2011, an offer for the shares held by Sumitomo Electric was received from Toshiba Medical Systems, and Sumitomo Electric sold all its shares in October that year.

Reorganization of Toyokuni Electric Cable Co., Ltd. into a wholly-owned subsidiary

In November 2007, Sumitomo Electric made a friendly takeover bid for consolidated subsidiary, Toyokuni Electric Cable Co., Ltd., making the company a wholly-owned subsidiary in December that year. Since the restructuring of the cables business for use in buildings and industrial equipment in 2002, Toyokuni Electric Cable had specialized in optical cables and related products for use in telephone exchanges as well as prefabricated copper cable for use in buildings and houses. Sumitomo Electric owned a 55.86% stake in the company at the time, and its optical communications products were facing a number of challenges, including declining product prices due to intensifying competition, increased sophistication of product specifications, and shortened product lifecycles.

Reorganizing Toyokuni Electric Cable into a wholly-owned subsidiary quickened the decision-making process. In addition, cost reductions went beyond the standard joint procurement of raw materials, and development of optical cables for FTTH was accelerated because of the integration with Sumitomo Electric.

3 Electronics business looking ahead to the adoption of higher functionality in the next generation

Asia—the key to growth for the electronics business

The collapse of the IT bubble and the effects of weaker yen led to the electronics-related business—with core products including flexible printed circuits (FPCs), electric wires, compound semiconductor and irradiated tubes—operating at a loss in fiscal 2002. Nevertheless, the popularization and sophistication of mobile phones and other personal digital assistants and demand for digital home appliances were relatively solid. The emergence of Chinese and Korean manufacturers in these sectors, though, led to more intense cost competition.

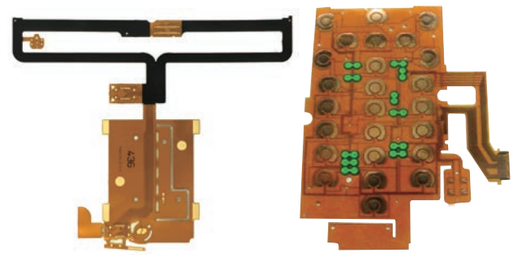
In such an environment, the basic approach taken for the electronics business under VISION 2007 was to improve sales and profit by leveraging synergies of diverse product groups and sales networks, and by exercising the Group's collective strength. Sumitomo Electric's growth strategy for FPCs was to strengthen its relationships with top-ranking international companies and to expand the business for surface-mounted products; for compound semiconductors, it was to maintain its advantage in gallium nitride (GaN) substrates and to expand into new high added-value businesses; and for electric wires, it was to build a cost-competitive global production system and to expand the global market for its dominant products.

Expansion of the FPC business

Partly because mobile phones with inbuilt cameras were such a hit, the FPC business of Sumitomo Electric Printed Circuits, Inc. was hardly affected by the collapse of the IT bubble. The strategy in VISION 2007 of strengthening its relationships with global companies had firms like Finnish multinational Nokia in mind. Nokia commanded the greatest share of the global mobile phone market in 1998. In the mid-2000s, its global market share exceeded 30%, and in 2007, it was selling 435 million units (37.8% share).

Business with Nokia began in earnest in April 2005 with the assembly of micro coaxial wires. Orders for FPCs also increased sharply, and so centered on Nokia which was releasing four models a year, Sumitomo Electric expanded its mobile phone-related business, including the mounting of electronic components. In view of this trend, Sumitomo Electric Printed Circuits completed construction of its second plant at the Minakuchi Works in October 2004.

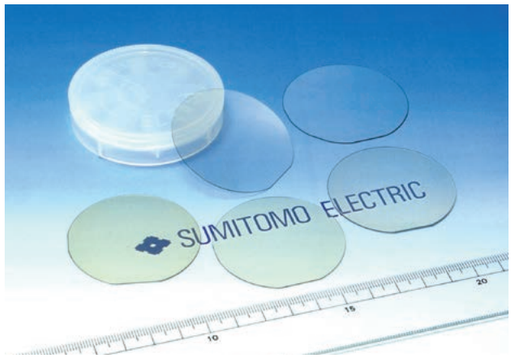
In response to technological advances being made in multilayering and the miniaturization of wiring, Sumitomo Electric beefed up its FPC team within the R&D Group. In addition to high-density mounting, flip-chip mounting, higher flexibility and halogen free wires, the company also promoted development of built-up multilayer substrates. It also succeeded in developing SEINTRONICS INK, a silver nanoparticle ink used in forming inkjet circuits.


FPCs for mobile phones

Expansion of the compound semiconductors business

In the compound semiconductors business, which is centered on the semiconductor plant at Itami Works and Sumiden Semiconductor Materials, Sumitomo Electric aimed at growth focused on GaAs and InP substrates, epitaxial wafers, as well as a GaN substrate developed by Sumitomo Electric.

In April 2003, the company began mass production of the world's first 2-inch GaN substrate, contributing to better performance of the blue-violet lasers which are necessary as a light source for reading and writing on next-generation high-capacity optical disks (HD-DVDs, Blu-ray). Furthermore, in December 2004, using the VB method, Sumitomo Electric succeeded in developing the world's first 6-inch high-quality InP crystal used in optical communications.



GaN substrate

Expansion of the electric wires business

Domestic demand in the electric wires business was declining, affected by the recession that followed the collapse of the IT bubble, as well as by the company's key customers—manufacturers of components for home appliances, electronic equipment, information equipment and cars—shifting their production activities away from Japan, and especially to China. In addition, there were also growing demands for shortening the product cycle. Consequently, Sumitomo Electric reorganized its domestic business structure in an effort to strengthen its business organization and speed up its business operations.

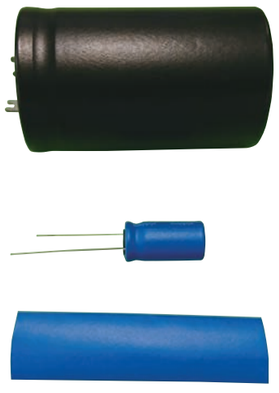
In April 2003, two manufacturing subsidiaries were established in Japan: Sumitomo (SEI) Electronic Wire, Inc. and Sumitomo Electric Flat Components, Inc., and the development and manufacturing departments, which until then had been structured within the Electronic Wire Division, were transferred to these new companies. Both had their headquarters located in Kanuma City, Tochigi Prefecture, and they worked on improving the development and production technologies associated with their respective specialized products, with Sumitomo (SEI) Electronic Wire handling electric wire and harness products used in electronic appliances and information equipment, and Sumitomo Electric Flat Components handling flat cables and Tab-Lead products.

At the same time, Touhoku SEI Co., Ltd., a subsidiary that had produced micro coaxial cables, and Kanto Sumiden Electronic Wire, Ltd., which had produced harnesses, were absorbed into Sumitomo (SEI) Electronic Wire in an effort to streamline the organization and improve operational efficiency.

Meanwhile, in the overseas expansion of business, in April 2003, the company established a sales company, Sumitomo Electric (Korea) Electronics, Ltd., to expand business in the Korean market. And in the development of new products, there was a steady release of goods, including: Eco Wire, which conformed to environmental regulations; micro coaxial harnesses, which addressed the torsion properties required in mobile phones; Au-plating SUMI-CARDs and high-frequency SUMI-CARDs following the transition to flat-screen displays; and Tab-Lead for lithium-ion batteries used in mobile terminals and vehicles. These new products were used widely by customers in Japan and overseas, and became an earnings base for the electric wires business.

Expansion of the fine polymer business

To address growing demand in the electronics market for environmentally friendly products, the heat-shrinkable tubing (SUMITUBE) business of Sumitomo Electric Fine Polymer, Inc. focused on the sale of its Ecotube series. Due to the widespread environmental concerns about polyvinyl chloride (PVC), Ecotube composed of polyolefin-based products was used widely for covering and protecting electronic components (batteries, capacitors) and harnesses, and was well received by customers advocating green procurement. Furthermore, with the establishment of Sumitomo Electric Fine Polymer (Suzhou) Ltd. in China in 2005, Sumitomo Electric now had five global bases producing heat-shrinkable tubing, and proceeded to separate production according to customers and sectors.


SUMITUBE used in capacitors


Micro coaxial cable assembly used in mobile phones

Sumitomo Electric Fine Polymer (Suzhou) Ltd.

4 Attention drawn again to the environment and energy-related business

Reorganization of wire and cable-related businesses

In addition to the establishment of J-Power Systems Corporation (JPS: high-voltage electric wires and cables) through business integration with Hitachi Cable, Ltd. (present-day Hitachi Metals, Ltd.), Sumitomo Electric promoted structural reform in its electric-power related businesses, including the commencement of sales by Sumiden Hitachi Cable Ltd. (low-voltage wires and cables for buildings and industrial equipment) in January 2003. In October 2004, sales to Japan's electric power companies were transferred and integrated into JPS, raising the presence of JPS in the electric power business. Growth strategies under VISION 2007 included securing Sumitomo Electric's advantage in terms of materials and production technologies in addition to making JPS a global brand.

As for industrial electric wires, in order to strengthen Sumitomo Electric's ability to develop products and technologies in this area, as well as to achieve efficient and flexible management of business operations from 2003 onwards, consolidated subsidiary, Kawamura Electric Wire Industries, Ltd., was reorganized into a wholly-owned subsidiary (September 2003), after which it was renamed Sumitomo Electric Industrial Wire & Cable Inc. (January 2004), and the decision was made to position it as the core company in industrial electric wires, concentrating the design, manufacturing and development technologies of Sumitomo Electric and each of the Group companies into the one entity. In July 2004, the electric power cables business of Sumitomo Wiring Systems, Ltd. was transferred to the core company. At the same time, Hannan Electric Wire & Cable Co., Ltd. was reorganized into a wholly-owned subsidiary, and merged into the core company in October, thereby strengthening the overall business structure.[12]

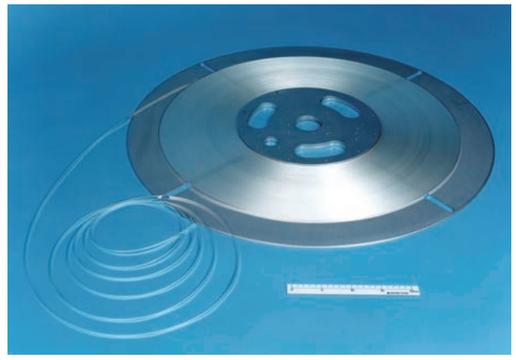
Furthermore, in December 2007, Sumitomo Electric made a takeover bid for equity-method affiliate, Nissin Electric Co., Ltd.—whose strengths were in substation facilities and charged particle beam-orientation equipment, and which had expanded business operations into Asia, with a particular focus in China—making it into a consolidated subsidiary and strengthening the relationship.

During this time, Sumitomo Electric Wintec, Inc. closed its Nagoya Works in June 2004, and consolidated equipment into its Shigaraki Works (see p. 45 in Chapter 1), bringing the wire-related structural reforms to an end for the time being.

In terms of overseas expansion, in March 2006, in collaboration with Yantai Jinhui Copper Co., Ltd.—a local subsidiary of Itochu Corporation—Yantai Jinhui Sumii Electric Industries Co., Ltd. was established in Yantai in China's Shandong province to manufacture trolley wires supplying power to railway carriages (equity share: Sumitomo Electric (18%)).

Progress in superconductivity and standstill of the redox flow batteries business

Two key focuses of new technologies were high temperature superconductivity (HTS) and redox flow batteries.


DI-BSCCO, bismuth-based superconducting wire

In the area of superconductivity, Sumitomo Electric entered cross-licensing agreements for bismuth-based[13] HTS with two U.S. firms (in 2002 and 2003), and in September 2004, received the world's first commercial contract from Korea Electric Power Research Institute (KEPRI) for 100 m of a cable system incorporating high-temperature superconductors. In 2005, 350 m of 3-core superconducting cable, termination and joints were shipped to the HTS cable project in Albany, U.S. These were connected to a practically operating underground power transmission line for the first time in the world in the U.S., where there was a national strategy to improve transmission networks using HTS.

Sumitomo Electric also released a 1,500 m long bismuth-based superconducting wire in 2004, drastically reducing connection time. The product was selected for the grand prix Masuda Prize during the Nikkan Kogyo Shimbun's Ten Best New Products Awards for 2004 (with the award ceremony held in January 2005). In 2005, an innovative bismuth-based superconducting wire, DI-BSCCO, was released. The critical current of this product was initially 150 A, but measurements of 192 A and 210 A were recorded in 2006 and 2007, respectively. The aims for DI-BSCCO are to pioneer magnet applications and to reduce the total system costs.

In 2005, a collaborative industry-academia group comprised of the University of Fukui and seven companies, including Sumitomo Electric, succeeded in developing the world's first liquid nitrogen-cooled full superconducting motor exclusively using superconductive coils and, in 2007, it also achieved the world's greatest output (365 kW). A high-field magnet using superconducting cables was also developed (2007).

Meanwhile, in the area of redox flow batteries, despite steady development being shown, including delivery of trial batteries to the Kyushu Electric Power Company in April 2003, an issue was uncovered related to product quality at the time, which caused repeated troubles at the customer sites, and eventually sales activities were suspended. Sumitomo Electric was pushed to the brink of withdrawing from the business, but the team members decided to push ahead with research on resolving the quality-related issues, while steadily dealing with complaints and handling the

12 Sumitomo Electric Industrial Wire & Cable was now comprised of five manufacturing bases: plastic coated wire (Hiroshima and Utsunomiya), rubber coated wire (Wakayama, Akitakata (Hiroshima) and Suzuka (Mie)).
13 Manufactured by combining bismuth, strontium, calcium, and copper.

servicing and maintenance at places where the batteries had already been supplied.

Expansion of the hybrid products business

The Hybrid Products Division, in charge of developing products using rubber, plastics, ceramics and other materials, offered a diverse range of products while undergoing business structural reforms, such as transferring sales of its Fabridam (inflatable rubber gate) to Marsima Aqua System Corporation, and establishing SEI Hybrid Products, Inc. through spinning off the division into a separate company in April 2005.

In April 2003, Sumitomo Electric succeeded in mass-producing an inexpensive, general-purpose multi-beam antenna capable of receiving radio waves from multiple satellites, which it had developed jointly with J-SAT. The antenna uses a hemispherical lens (Luneburg lens), and was developed as the LuneQ-40. Online sales commenced in December 2004, followed by sales at mass merchandisers in December 2005. The antenna also received a prize during the Nikkan Kogyo Shimbun's Ten Best New Products Awards for 2005. The technology was also extended to navigation radars and wind profiler radars.

Other demonstrations of Sumitomo Electric's technological capabilities accumulated over many years include custom-made products, such as air springs for Japan's first permanent linear motorcar on the Aichi Rapid Transit Tobu Kyuryo Line (2005), as well as air springs for the N700 series of Shinkansen trains (2007).

An air spring used on railway carriages

5 Overseas growth in the industrial materials business

Structural reform of the powder alloys and sintered products businesses

Although positioned as a mature business, Sumitomo Electric sought to grow its powder alloys and sintered products businesses through technology development and overseas expansion.

As part of the business reorganization of April 2003, Sumitomo Electric established a structure of three operating companies in the industrial materials business: Sumitomo Electric Hardmetal Corp., which was established following the spin-off of the powder allows and diamond business (IGETALLOY, cutting tools, etc.) into a separate company; Sumitomo Electric Sintered Alloy, Ltd., which was established following transfer and integration of the sintered products business of the Itami Works; and A.L.M.T. Corp., which handled tungsten and molybdenum powders and products (heat spreader substrates, electronic components, functional parts) as well as diamond and CBN precision tools. Furthermore, with the launch of Sumitomo Electric Hardmetal, Sumitomo Electric expanded the comprehensive alliance it had concluded with Nachi-Fujikoshi Corp. in December 1999, promoting joint tool engineering services as well as cooperative sales and after-sales services (regrinding) in Japan and overseas.

In October 2003, Sumitomo Electric transferred and integrated its functional parts business (high-performance ceramic air bearings, heavy metals, electrical contacts, heat spreader substrates for semiconductor devices, etc.) into A.L.M.T. Corp. in a move to make development, manufacturing and sales more efficient and quicker, and to enrich its product lineup. In July 2004, A.L.M.T. Corp. was reorganized into a wholly-owned subsidiary through an exchange of shares, thereby establishing a system allowing strategies to be rolled out quickly under the direction of the Business Unit.

Product developments in this business included the following.

2004	XF1 ultra-fine-grain tungsten cemented carbide with a grain size of 90 nm
2006	WEX SEC-Wave Mill, milling tool with indexable inserts
2007	SUMIDIA DA1000 sintered diamond cutting tool

In terms of overseas expansion, in June 2004, together with Fine Sinter Co., Ltd., a manufacturer of sintered parts headquartered in Aichi, Sumitomo Electric Sintered Alloy co-financed the establishment of Precision Sintered Products (Wuxi) Co., Ltd. in Wuxi in China's Jiangsu province, and production of variable valve timing (VVT) systems for vehicles began. Then in 2007, Sumitomo Electric and Sumitomo Electric Sintered Alloy jointly acquired Cloyes Europe GmbH—a German manufacturer of sintered parts located in Saxony, close to the border with Poland and the Czech Republic—establishing Sumitomo Electric Sintered Components (Germany) GmbH as a production base for the Eastern European market.

In the powder alloys business too, Sumitomo Electric strengthened the capacity of Sumiden Carbide Manufacturing (Tianjin) Ltd. (manufacturer of indexable inserts; commenced operations in 1997) and Sumiden Precision Tools (Shanghai) Ltd. (manufacturer of micro drills for use on printed circuits; commenced operations in 2003), adding the SUMIBORON CBN tool to items produced in Tianjin, and adding drills used in steel/cast iron hole making to items produced in Shanghai. In addition, a design function and regrinding service were also started.[14]

Sumitomo Electric Sintered Components (Germany) GmbH

Furthermore, in 2004, Sumitomo Electric Hardmetal Corp. established Sumitomo Electric Hardmetal Trading (Shanghai) Co., Ltd. (a wholly-owned subsidiary engaged in sales and service), thereby strengthening its sales and service network. In December 2005, Sumitomo Electric Hardmetal Manufacturing (Thailand), Ltd. (a production base in Thailand) began operations at a new factory building, significantly increasing its production capacity. In 2006, Sumitomo Electric acquired a stake in Motherson Techno Tools Ltd. (a major manufacturer of cutting tools in India) through a third-party allocation of new shares.

In 2007, new sales bases were also established in North America (Alabama) and Europe (Czech) in an effort to expand business primarily targeting the automotive industry. In 2007, Sumitomo Electric bought out Master Tool LLC (a U.S. manufacturer of cutting tools), enabling the majority of tools needed for automotive parts processing to be produced locally, and establishing a structure for growth in the U.S., Europe and Asia.

Expansion of the special steel wire business

The special steel wire business consists of PC strands used in construction and steel wire for springs used in vehicles and electronic products, which are handled by Sumitomo (SEI) Steel Wire Corp. (SSW), as well as steel tire cords, which are handled by Sumitomo Electric Tochigi Co., Ltd. Beginning in 2004, major improvements were made to facilities at Sumitomo Electric Tochigi, almost doubling its capacity to produce steel tire cords. Furthermore, in October 2005, in order to increase production of oil-tempered wires used for valve springs in car engines, with equity also contributed by Nippon Steel Corporation (supplier of wire rods; now Nippon Steel & Sumitomo Metal Corporation), Sumitomo Electric established Hokkaido Sumiden Steel Wire Co., Ltd. on the premises of Nippon Steel's Muroran Works.

Amid a decline in domestic demand and increasing intensity in offensive moves by overseas manufacturers, the establishment of Suzuki-Sumiden Stainless Steel Wire Co., Ltd. in July 2007 (equity share: SSW (40%), Suzuki Metal Industry Co., Ltd. (now Nippon Steel & Sumikin SG Wire Co., Ltd, 60%)) was designed to strengthen business character and advance business operations in Asia, by integrating and consolidating the stainless steel wire businesses of Suzuki Metal Industry and SSW.

Furthermore, in April 2007, J-Witex Corporation was established following a three-way merger between Kanto Wire Products Corporation, Metax Corporation (Sumitomo Electric Group companies) and Kokoku Steel Wire Ltd. (a subsidiary of Nichia Steel Works, Ltd.). With users increasingly shifting offshore for production and an influx of imports from emerging countries, the situation for galvanized wire and wire rope handled by the three companies was severe, and so the aim of the integration was for survival and growth.

While implementing these structural reforms, Sumitomo Electric demonstrated the following achievements in each area of business.

In the PC business, Sumitomo Electric focused on developing high-value-added products. In 2005, it developed high-strength PC strands (20% stronger than conventional products), which were used for the first time in girders as part of development of a pedestrian bridge in Akihabara. In 2006, a new material was developed designed to improve the fatigue strength of automotive valve springs by 10%, paving the way for Sumitomo Electric to gain the top share of the domestic market for spring wire. The company also succeeded in developing and mass-producing a high-strength stainless steel wire for use in lightweight electrical wiring, which played an important part in one of the Group's strategic products, automotive wiring harness.

Super-high-tension prestressed concrete strand

14 In Japan too, the capacity of Hokkaido Sumiden Precision Co., Ltd. to produce indexable inserts was increased in 2005 to about 50 million units per year (30% increase).

History of 20

Chapter 3

Challenge

Responding to the Bankruptcy of Lehman Brothers and Deepening the Global Expansion

2008–2012

Chapter 3

Section 1: Management

VISION 2012, aspiring for sustainable growth

In light of having achieved its targets under VISION 2007 ahead of schedule, in May 2007, Sumitomo Electric announced VISION 2012, its second five-year management plan through to fiscal 2012.

While maintaining the focuses of "expanding our global presence" and "strengthening our leading technology," whereas the main purpose of VISION 2007 had been business restructuring, a focal point of the new plan was "strengthening of strategies"—to formulate and promote measures aimed at achieving sustainable growth.

Numerical targets for the final fiscal year of the plan included net sales of 3 trillion yen, a ratio of operating income to net sales of 7%, and a return on equity (ROE) of 10%. Targets were set for the middle year of fiscal 2009, and the company resolved to steadily achieve them. The broad plan was to achieve substantial expansion in the infocommunications and electronics business segments, which had recovered from the blow following the collapse of the IT bubble, while steadily extending the automotive; electric wire, cables and energy; and industrial materials business segments.

To realize this, the following three points were adopted as central pillars of the plan.

(1) Developing a profit-oriented growth portfolio
(2) Bolstering our business structure based on full implementation of capital and financial strategies
(3) Optimizing Group management worldwide

The first of these central pillars was aimed at shifting from a situation where about half of operating income was accounted for by the automotive business segment, to a well-balanced business portfolio with each of the five business segments contributing 10–30%. The second pillar was crucial for strengthening global expansion and for becoming a "Glorious Excellent Company," and was aimed at promoting improvements, not only in ROE, but also in shareholders' equity ratio through a reduction in interest-bearing debt. The third pillar was about transitioning from management where most decision-making and business operations were carried out on the basis of independence-focused business units, to operations where the primary focus is on optimization of the entire Group. In the short and medium term, the aim was to restructure subsidiaries and operational bases and to share technologies globally across the entire company, and in the long term, objectives included developing global human resources and establishing corporate identity.

In addition, emphasis was placed on the development of new products in the growth strategy of the five business segments, and energy was also put into expanding new businesses based on the use of core technologies. In fiscal 2012, the company set a target new product sales ratio of 30%. In new businesses, Sumitomo Electric set "Environment & Resources," "Life Sciences" and "Safety & Security, Ubiquitous Networking" as core themes for development.

Furthermore, the company doubled efforts for CSR, aiming for growth with support from a wide range of stakeholders.

Responding to the bankruptcy of Lehman Brothers

From 2007, a shadow began to fall across the economic environment, both in Japan and overseas, which had previously been in good shape. In the wake of the collapse of the major U.S. investment bank, Lehman Brothers, in September 2008, advanced economies in Japan, the U.S. and Europe recorded negative growth across the board, and the world economy fell into a serious recession.[1] The Sumitomo Electric Group also plunged into a very harsh business environment, with the once-in-a-century global recession leading to unprecedented sharp declines in demand across its automotive, electronics and industrial materials business segments. In the interim results for fiscal 2009, operating income went into the red for the first time since consolidated results began being disclosed in 1996. In 2010, signs of an upturn were seen in part due to responses taken in G20 member countries, which included the emerging economies of China and India, but automakers and manufacturers of electronic appliances were subsequently delivered a devastating blow, first by the Great East Japan Earthquake in March 2011, and later by the Thailand floods in autumn that year. Also during this period, the Japanese yen proceeded to appreciate sharply against the U.S. dollar, strengthening from an annual average rate of 117 yen in 2007, to 103 yen in 2008 and 93 yen in 2009, and then further to 87 yen in 2010 and 79 yen in 2011.

Under these circumstances, Sumitomo Electric's business results declined markedly. Net sales decreased for two consecutive periods in fiscal 2008 and 2009, slipping from above 2.5 trillion yen in fiscal 2007 to 1.8364 trillion yen in fiscal 2009. Operating income also fell dramatically, from about 149 billion yen in fiscal 2007 to 23.5 billion yen in fiscal 2008.

For this reason, the structural reinforcement promotion committee was established in December 2008 to deal with this emergency situation (remaining until April 2010).

Based on the slogans "Keeping our organizations appropriate to declining demand, and reconstructing our cost structure," "Improving quality and efficiency of operations," and "Reinforced human resource training," the Committee promoted a raft of measures focused on two key courses of action: (1) emergency measures to survive the immediate crisis; and (2) measures for strengthening competence in SEQCDD, aimed at sustainable growth in the future. Regarding the first, Sumitomo Electric promoted extensive cost reductions and personnel measures, with a target of achieving net sales about on par with fiscal 2003 (1.5424 trillion yen). And regarding the second, President Masayoshi Matsumoto had determined that simple cost-reduction measures and downsizing measures alone would only cause the company to shed capacity and limp along during the recovery phase. In line with this judgement, the

1 Many U.S. investment banks, including Lehman Brothers, had been rapidly expanding subprime loans—mortgages designed to disperse risk by securitizing home loans provided to consumers ordinarily unable to get loans, and selling them to other financial institutions. The collapse of the housing bubble, though, led to a flood of borrowers unable to make repayments.

company sought to rebuild its manufacturing (*monozukuri*) capabilities from the ground up, investing much of its depleted profits such as into developing human resources.

Having promoted a series of measures, performance began to improve in fiscal 2010, and by fiscal 2013, net sales had recovered to 2,568.8 billion yen, on par with the level of sales prior to the bankruptcy of Lehman Brothers. In addition, outcomes from structural reinforcement measures had already helped to increase yearly operating income in fiscal 2009, when sales had been at their lowest, and despite the effects of a stronger yen, operating income remained in a range between 70 and 120 billion yen. On the back of these efforts, in order to keep VISION 2012 on course, expenditure in research and development was increased every fiscal year, apart from a 1% decrease in fiscal 2009. In fiscal 2012, expenditure was 94.3 billion yen, representing a 30% increase from fiscal 2007.

Amid a series of difficulties, including bankruptcy of Lehman Brothers, strong yen and large-scale natural disasters, VISION 2012 had pretty much come to a standstill in numerical terms. The operational improvements implemented during this period would begin to take effect in fiscal 2013.

Crisis as a springboard for reinforcing *monozukuri*

The move to strengthen competence in SEQCDD in response to the bankruptcy of Lehman Brothers stemmed both from a management decision focused on the recovery phase and from the company's Corporate Principles as a core company of the Sumitomo Group built upon *monozukuri* (manufacturing). For this reason, despite the tough situation, Sumitomo Electric invested funds in the development of human resources and environmental improvements, signaling the intention of the management team to look beyond the immediate circumstances.

In July 2008, the company created the Factory Expert System, establishing an environment to recognize and compensate proficient technicians and outstanding achievements in the workplace. In the wake of the bankruptcy of Lehman Brothers, in October 2008, the company opened a technical training center (TTC, three stories high, with a total floor area of 4,245 m^2), to be the core facility for manufacturing education and training within Itami Works. This was the first step toward consolidating the Group's manufacturing training and enhancing both the structural and non-structural aspects of manufacturing with a view to global development of the Group. The center adopted the concept of acquiring the basics of *monozukuri* through to the latest technology, skills, and manufacturing principles via the five senses while working with the actual equipment and products. It introduced much fundamental production equipment and units, and started with around 100 courses, including automated equipment training, improvement training using simulated lines, and training in maintenance techniques and skills.

Technical Training Center (TTC)

In January 2009, the TTC was the location used to launch a number of training programs designed to promote structural reinforcement, namely, the MKP program (developing engineers to drive innovation in manufacturing), the GKP program (developing personnel to promote on-site improvements) and KKP training (reinforcement of manufacturing fundamentals). The MKP program (in which participants tackle an important issue over the course of 6 or 12 months), the GKP program (designed to develop potential leaders for manufacturing sites), and the KKP training program (which targets all personnel involved in manufacturing) each involved practical activities, and produced results not possible by classroom study alone.

Sumitomo Electric also mounted an effort in logistics to strengthen its delivery system. In April 2008, SEI Loginet Co., Ltd. was established following the integration and reorganization of Sumitomo Electric's subsidiary, S.E.I. LogiTex Co., Ltd., with Sumitomo Wiring Systems, Ltd.'s subsidiary, Sumidenso Loginet Co., Ltd. The aim of this was to build a logistics system that is competitive in the global supply chain, by consolidating and streamlining duplicate functions, reducing costs through leveraging the Group's economies of scale, and centralizing the training for logistics personnel.

Completion of the WinD Lab research building

Sumitomo Electric also continued to strengthen research and development amid severe conditions such as the collapse of Lehman Brothers and the appreciation of the yen.

The largest structural investment was WinD Lab, a research building within the Osaka Works that was announced in March 2007 as part of projects commemorating Sumitomo Electric's 110th anniversary. The complex is comprised of a R&D building (7 stories above ground, total floor space: 15,500 m^2) and an adjacent auditorium building (2 stories). The name "WinD Lab" expresses the concept of sensitively gauging the "winds" that are the changing times and societal demands, while contributing to society with new "winds" that are unique technologies. The aim of the new building was to create synergy and accelerate the creation of new products and the expansion of new business areas, by concentrating the research divisions dispersed within the Osaka Works and sharing ownership and use of equipment, and by treating each floor as a large room so as to facilitate collaboration between laboratories and interaction among the 500 or so researchers.

WinD Lab

Energy-saving designs were also incorporated into various parts of WinD Lab, achieving about a 10% energy reduction compared to conventional labs. The lab has also been used as a place for public relations and for promoting open innovation with external partners. For instance, in addition to actively adopting Sumitomo Electric's own products and technologies, such as power line communications (PLC) and optical links for backbone LAN, booths were set up on the first floor of the lab to showcase the company's research activities. As for programs to increase greenery, Sumitomo Electric set up rooftop gardens (80 m^2 on top of the R&D building and about 620 m^2 on top of the auditorium building), as well as a rose garden (about 2,200 m^2 to the north of the R&D building), the latter of which also hosted invitational tours for neighborhood associations and other community stakeholders.

Construction began in the summer of 2007. The R&D building was completed in May 2009, and the auditorium in April 2010. The total investment was about 8 billion yen.

In January 2010, the new Power System R&D Laboratories were established at WinD Lab, together with the NEXT Center (described on the following page). This marked the start of the company's business development accommodating increased use of renewable energies (which were expected to take off at a rapid pace) as well as technological innovations in the area of power infrastructure, including the shift to electric vehicles.

In January 2012, Sumitomo Electric received the Thomson Reuters 2011 Top 100 Global Innovator Award[2] for a selection of its R&D outcomes. It subsequently received the same award in 2013, 2014, 2015, and 2016.

Foundation of the NEXT Center

In terms of organizational changes in research and development, Sumitomo Electric launched the NEXT Center in January 2010. With R&D activities tending to prioritize connections with existing business, the NEXT Center was an organization that conducts planning in new business domains, based on the next-generation conception under VISION 2012. Extending over both the Materials and Process Technology R&D Unit and the Information and Communications Technology R&D Unit, it was established to formulate R&D strategies without being too concerned about short-term outcomes. Its predecessor, the New Frontier Planning Group within the R&D General Planning Division, had laid out the direction for new areas to be tackled in anticipation of a future 30 years from then. This is described below.

(1) Adopt a perspective based on five keywords describing future societal trends: energy, mobility, communication, human welfare, and community

(2) Considering this perspective and Sumitomo Electric's DNA, set "Power System Integration" and five other areas as the direction for promising new business domains

NEXT Center conducted extensive analyses and investigations of these promising business domains through such activities as collaboration with, and utilization of, internal and external partners, as well as probing research into advanced technologies.

In October 2011—a while after opening the NEXT Center—Sumitomo Electric established the new R&D General Managing Unit, merging the Information and Communications Technology R&D Unit with the Materials and Process Technology R&D Unit in an attempt to enhance the research and planning function and to speed up development in new business areas. Then in November, the New Business Development Division was established to take charge of business modeling and marketing. Doing so completed the medium- and long-term division of roles and processes regarding the creation of new business areas: long-term research strategy (NEXT Center); research and development (the R&D General Managing Unit and its research labs); and commercialization (New Business Development Division).

Development of human resources and promotion of talents to take on global management

A focus of VISION 2007 had been for Sumitomo Electric to expand its global presence. As a result of having established production and sales bases overseas in various business areas at a feverish pace, as well as having expanded mergers and acquisitions, the Group then employed more than 180,000 people in more than 30 countries around the world. Moreover, from

Global Manager Development Program in Japan (GMJ)

2 Thomson Reuters is one of the world's leading corporate and scientific information service companies. Using rigorous and objective analysis of proprietary intellectual property data, it selects 100 companies judged to be truly innovative and to have generated globally influential inventions. The four criteria for selection are: Success (ratio of published applications to granted patents), Global (patent portfolio in major world markets), Influence (impact of inventions determined by the frequency of citations by other companies), and Volume (the number of patents).

Management Program based on the Sumitomo Spirit (MPSS)

2011, Japan transitioned to a society with a decreasing population, and so for its further growth, it was imperative for Sumitomo Electric to secure, promote, and nurture global human resources.

As mentioned earlier, systems were put in place for the systematic development of overseas human resources and to publicly honor those bases, divisions or teams that had contributed to management. In February 2007, the Global Manager Development Program in Japan (GMJ) was launched with an aim of developing talented personnel with leadership potential who were employed locally by overseas Group companies, and in July 2008, the 1st Sumitomo Electric Group Global Award Ceremony[3] was held. Based on a perspective of strengthening the capabilities of executives to deal with globalization, training provided under GMJ from February 2011 also targeted Japanese candidates for executive positions, and was also focused on developing leadership. Given this, the name of the program was changed to the Global Leadership Development Program (GLP). As part of the training, internal and external candidates would discuss in English the management issues affecting the Group, and would learn together about the Sumitomo Spirit and Corporate Principles. Time was also set aside for direct dialogue with the president and other head office executives, serving as an opportunity for participants to network beyond their local area and to further enhance loyalty for the Group and motivation for their respective work.

In 2010, the Executive Training Program, which had previously targeted executives employed at Sumitomo Electric and the Group companies in Japan since 2005, was expanded to also include executives employed at local subsidiaries overseas.

In 2012, the Management Program based on the Sumitomo Spirit (MPSS) was developed, and has since been held regularly in Germany and other countries.

In parallel with these measures for developing human resources overseas, in Japan, faced with the challenge of improving English proficiency as a basic skill for all managers and staff working and managing the business globally, in June 2009, achievement of a certain score in TOEIC was added as a criterion for being considered for staff promotion.

Establishment of a common global HR policy

Along with human resources development, given Sumitomo Electric's resolve to also make genuine improvements to employment, evaluation, conditions and other HR aspects across the Group, the company set up the Global HR Group within the HR & Administration Division (as it was called at the time). Furthermore, in April 2009, the Group opened the Singapore HR Center, responsible for resolving HR issues and for the effective utilization of human resources within the ASEAN region.

In addition to these system improvements, in September 2011, the Group established the Global Human Resource Management Policy as a common basic policy on managing human resources to be adopted globally by the Group. (The underlined text was revised in January 2017.)

Later that fiscal year, the Group managed to compile the skills, career directions and so on of executives at bases in each country into a database to be centrally managed, facilitating the flexible placement of personnel. In addition, by holding regular HR meetings in each business unit and area, the Group created a mechanism for discussion about human resources and organization, raised the capacity and motivation of foreign employees, and improved the global competitiveness of the Sumitomo Electric Group.

On the other hand, Sumitomo Electric was ahead of the field when it came to the global development of human resources in manufacturing, starting with the North America Plant Manager Development Program in May 2006, and the Thailand Monozukuri Key Person Development Program in April 2007. As for China, where more and more production and sales bases were being established in each business segment, in March 2012, the Group established a new Chinese Human Resource Development Committee as well as a new Chinese Quality Control Work Group and Chinese Safety Work Group to consider and formulate effective measures for human resources development and quality control, while taking into account the social and cultural circumstances in China.

Sumitomo Electric Group Global Human Resource Management Policy

We provide workplaces where all the employees can work actively, grow both personally and professionally through work, achieve self-actualization, and contribute to the society.

We offer various career opportunities and globally pursue "the right person in the right position" regardless of race, ethnicity, national origin, religion, age, gender, gender identity, sexual orientation, or disability.

We value and promote diversity in the workplace in order to enhance the creativity of the organization and to sustain the growth of the business.

We develop global leaders who lead and give energy to our global business. Global leaders are those who understand and share the Sumitomo Spirit and the Corporate Principles and can lead highly diversified teams.

3 Awards have been conferred on approximately 200 people from countries around the world.

Strengthening new market development

In the world economy, Japan, developed countries in Europe and the U.S. still had a considerable presence. Markets in emerging and developing countries, such as in Asia, BRICs, the Middle East and Africa, though, were growing in importance in the largest segments of the automotive and infrastructure fields. This importance was demonstrated by the fact that post-Lehman measures were discussed at the G20 and that the growth in China and India was propping up the worldwide recession. Sumitomo Electric, too, was accelerating its expansion into China in the infocommunications and industrial materials markets. In addition, the Automotive Group began shifting production bases for Europe from Eastern Europe toward Africa. While the main reason for this was the cost of labor, the company was also aware of the future development for both regions.

Amid such circumstances, the Dubai Office was established in July 2008. Although each business segment had already expanded operations into Middle Eastern countries on an individual basis, oil-producing countries in this region were accelerating the creation of new industries and the development of infrastructure with an eye on power and automotive trends in a post-fossil-fuel society, and Sumitomo Electric anticipated that there was considerable scope for business expansion. The Dubai Office was established in the Dubai Airport Free Zone adjacent to Dubai Airport, and as the Group's only sales support base in the Middle Eastern market, the office undertook market research, information collection and sales support for optical communications, optical equipment, industrial wires and cables, and products related to new business (concentrator photovoltaic systems, redox flow batteries, and water treatment membranes).

Strengthening governance and work-life balance

Under VISION 2012, the company steadily realized various CSR measures that it had laid out with establishment of the Sumitomo Electric Group Basic Policies on Social Contributions (see p. 50 in Chapter 2).

Looking first at corporate governance and compliance, Sumitomo Electric launched the J-SOX[4] Project in April 2008. However, following an on-site inspection by the Japan Fair Trade Commission (JFTC) in June 2009 regarding optical fiber cables and related products, Sumitomo Electric promptly recruited outside experts in order to identify and eliminate any conduct that violates the Antimonopoly Act, and in addition, strengthened training on competition law compliance and established regulations. The Sumitomo Electric Group CSR Procurement Guidelines (established August 2010) also incorporated provisions on compliance with laws and elimination of antisocial forces, working to bolster activities, including those of its suppliers.

In terms of environmental consideration, the Group continued to conduct the Action ECO-21 campaign at each of its business locations, and through the "Household Eco-Account Book," expanded its efforts to the families of its employees. Furthermore, in collaboration with Furukawa Electric Co., Ltd. in October 2008 and with Panasonic Corporation in December 2008, Sumitomo Electric commenced joint shuttle transportation of copper wire using JR's bulk containers on the segment between Osaka and Utsunomiya. This complete modal shift for supplies on this route led to a reduction in CO_2 emissions.

In order to develop and improve the working environment of employees, various measures, such as the expansion of childcare-related programs, were evaluated, and since 2007, Sumitomo Electric has been Kurumin-certified[5] (certification given to a general employer that conforms to standards based on the Act on Advancement of Measures to Support Raising Next-Generation Children). Sumitomo Electric also started its SWITCH[6] campaign in April 2008. In a move toward realizing VISION 2012, SWITCH is a company-wide campaign aimed at each and every employee, upon whom business is founded, doing an effective job while also enriching both their work and home life in a balanced manner. In April 2011, Sumitomo Electric commenced a second phase of initiatives under the SWITCH Plus Campaign. In addition to the previous themes of adjusting working hours and improving labor productivity, the new wave of measures included support for caring for children and nursing family members, mental health measures, more active communication among employees, and introduction of the campaign into Group companies in Japan and overseas.

Furthermore, Sumitomo Electric held its First Stakeholder Dialogue in July 2010, as a forum for the exchange of views on the Group's CSR activities.

Modal shift

4 This is the name by which the Companies Act of 2004 is commonly known. It is the Japanese version of the U.S. Sarbanes–Oxley (SOX) Act, which was enacted in response to the bankruptcies of major companies including Enron and WorldCom, and which requires companies to develop internal control systems. It became applicable in fiscal years commencing in 2008.

5 Kurumin is a certification granted by the Minister of Health, Labour and Welfare to applicant companies that have successfully formulated and achieved action plans for a certain level of support for parenting.

6 The aims of achieving a proper balance between work and life—working at 100% when on the job, turning off completely when away from the job (like a clear-cut ON-OFF switch between work and home)—are to improve work efficiency, eliminate long overtime hours, promote the systematic taking of paid leave, achieve self-actualization through work, and realize a fulfilling life.

Continuing to Strengthen the Company's Manufacturing Base: the Adoption of SEQCDD

SEQCDD

Since the end of World War II, as a manufacturer, the entire company has implemented modern quality control initiatives and continued to strive to improve its Quality, Cost, and Delivery (QCD).

In the last 20 years, Sumitomo Electric has added "Safety," "Environment," and "Research & Development" to create "SEQCDD" as a slogan that is shared throughout the Sumitomo Electric Group. It is the core of the company's business activities and the source of sustainable corporate growth; therefore, the company ensures that each employee understands it, while the Group implements a variety of SEQCDD measures in all of its fields.

In addition to structural and technical initiatives in equipment, technologies, systems, and skills, Sumitomo Electric endeavors to share and communicate the "soul" of manufacturing—which includes the Sumitomo Spirit.

Group-wide quality assurance and safety convention

Own process quality assurance banner

Safety banner

S Safety

Safety is the first letter of SEQCDD, reflecting the Group's approach of "Safety first!" and "Prioritizing the safe return of employees." The Group has always implemented safety initiatives at each plant; however, following a work accident in fiscal 2004, Sumitomo Electric Group launched an Emergency Safety and Disaster Prevention Measures Conference and, in a special issue of the in-house magazine, President Norio Okayama announced his decision to create "Safety-first and Zero-Accident Workplaces." Thereafter, the company rolled out Emergency Group-wide Safety Strengthening Measures, the Group-wide Safety Convention (which still takes place every year), and Global Safety Activities. The Safety Vision 2022 seeks to promote and enhance equipment-related safety measures, a workforce that prioritizes safety, and a safety-first corporate culture.

C Cost

With changes in the Sumitomo Electric Group's business portfolio and the advance of globalization, enhancing cost competitiveness has become increasingly important. Following the Global Financial Crisis of 2008, in addition to strategic measures such as overseas production, President Masayoshi Matsumoto established the structural reinforcement promotion committee installing himself as chairman, implemented fundamental reform of organizational and cost structures, reinforced measures aimed at resolving SEQCDD issues via inventory visualization, and strengthened manufacturing via "Reinforced Human Resources Training." Accordingly, Sumitomo Electric continues to strive for greater work efficiency, cost reductions, and other constitutional improvements.

E Environment

Since the Meiji period, the Sumitomo Group has paid careful attention to the environment—for example, it invested large sums into the relocation of plants to eliminate smoke pollution from its Besshi Copper Mine. However, since the 1990s, environmental problems have become global in scale. The Sumitomo Electric Group drew up its Environmental Policy in 1997, and launched the Group-wide Action ECO-21 campaign in fiscal 2003. At the heart of this campaign were initiatives aimed at preventing global warming, preserving resources, promoting recycling, and expanding the line-up of environmentally conscious products. Gradually, these initiatives have evolved and grown in importance, and fiscal 2018 marks the start of Action ECO-22 V.

D Delivery

Logistical rationalization and shorter delivery times not only increase customer satisfaction, but also contribute to inventory and cost reductions. Consequently, they are indispensable to constitutional strengthening. The Sumitomo Electric Group launched the Strategic Global Logistics (SGL) campaign as part of its VISION 2007; then, in the SGL Phases III and IV of VISION 2012, the company sought to reduce costs and improve efficiency in its transportation; in SGL Phase V, implemented as part of VISION 2017, it strengthened the logistics functions of overseas workplaces and reorganized its Japanese logistics bases. The company has been also actively engaged in green logistics, and has been implementing a modal shift in its long-distance transportation; in particular, the company has been promoting the use of rail for distances over 500 kilometers. Accordingly, in 2013 Sumitomo Electric acquired certification to use the Eco Rail Mark.

Q Quality

Sumitomo Electric's quality assurance activities started with the plant management initiatives launched after the war. The company began promoting Group-wide implementation in fiscal 1975, as part of its Reliability Improvement Campaign. Since fiscal 2002, Sumitomo Electric advanced the QR-1 Campaign, whereby it aims to become the number one company in quality and reliability from customers' perspectives. The QR-1 Campaign adopted "Own Process Quality Assurance: Eliminating Defects in the Manufacturing Process" as its slogan since fiscal 2010, and implemented own process quality assurance activities globally with the goal of "neither creating nor passing defective products on downstream." In order to support these activities, the Group has been working to strengthen the constitutional foundations of its manufacturing quality via thorough quality control training and global quality inspections.

D Research & Development

Historically, the Sumitomo Electric Group has possessed a multi-faceted and diverse corporate DNA. The Sumitomo Electric Group Corporate Principles, drawn up in 1997, declare the Group's aim "to build technical expertise, realize changes, and strive for consistent growth." As well as focusing on R&D, the company established systems that value market needs, created spaces to promote knowledge sharing, and strengthened collaborative strategies and joint development initiatives. In VISION 2022, Sumitomo Electric also stated its desire to advance innovation in three focus fields of Mobility, Energy, and Communications. The company intends to do this by allying its core technologies of semiconductors, powder alloys, wires, insulation, and transmission and control with new technologies such as IoT, AI and security.

Sumiden Friend, Ltd.

Presentation ceremony for the CSR Foundation

Establishment of a special subsidiary, and creation of a Group fund for social contribution

In terms of CSR, in addition to contributions made through its principal business, such as the development of energy-efficient and environmentally friendly products and systems, Sumitomo Electric also strengthened its social contribution activities.

In July 2008, special subsidiary Sumiden Friend, Ltd. was established for the purpose of employing people with intellectual disabilities. It commenced operations in October at a sales office within the Itami Works, and its principal businesses were the lending and maintenance of foliage plants, the production of cushioning materials for packaging, the conversion of documents into digital format and other commissioned services. Sumiden Friend subsequently established other offices within the Yokohama Works (May 2013), Tokyo Head Office (April 2014) and Osaka Works (April 2015), and the number of employees with disabilities employed at the company has increased from an initial workforce of five, to 54 as of April 1, 2018.

Also, in April 2009, with donations from Sumitomo Electric and Sumitomo Wiring Systems, Ltd., the SEI Group CSR Foundation was established for the purpose of developing human resources and promoting academic activities in a wide variety of fields both in Japan and overseas. (It was officially recognized as a public interest incorporated foundation in February 2010.) With an aim of putting "Mutual Prosperity, Respect for the Public Good" (one of the principles of the Sumitomo Spirit) into practice, the Foundation implements three key programs of activities: (1) monetary contributions to university courses; (2) support for academic and research activities; and (3) provision of scholarships (to local students studying at overseas universities, international students studying in Japan, and domestic students in Japan). Examples of (1) include the establishment of courses for the development of human resources and the resolution of various modern problems, such as biofuel crops, Alzheimer's, and the nurturing of entrepreneurs. Examples of (2) include grants for pioneering and creative research projects in natural and social sciences. As for (3), overseas scholarships have been provided to students at seven universities in China, Thailand, and Vietnam, and domestic scholarships have been provided for about 20 universities, including the University of Tokyo and Waseda University. (Fiscal 2017 actual.)

Response to the Great East Japan Earthquake and to the Thailand floods

In 2011, Japan and Japanese manufacturers suffered a devastating blow as they were hit by a succession of unprecedented large-scale natural disasters.

In the Great East Japan Earthquake, which struck on March 11, 2011, the earthquake off the Pacific coast of Tohoku was measured at magnitude 9.0, the largest ever on record. The ensuing tsunami and the accident at the inundated Fukushima Daiichi Nuclear Power Plant (operated by the Tokyo Electric Power Company) combined with the earthquake to cause unprecedented damage, including more than 19,000 fatalities and people missing, more than 370,000 completely or partially destroyed buildings, and more than 400,000 people living in evacuation shelters. Sumitomo Electric Group also suffered damage exceeding 8.8 billion yen, including Kiyohara Sumiden being forced to shut down operations for half a year, but there were no major casualties among Group employees.

Immediately after the earthquake, Sumitomo Electric established an emergency headquarters, and proceeded to confirm the safety of its employees and their families, to ascertain the situation at each of its bases, and to undertake recovery efforts. President Matsumoto issued an emergency message, "As a company that provides products and services that support social infrastructure, it is our duty to support the recovery of affected areas and affected business partners. With complete devotion to executing our business, a spirit of cooperation, good communication, and strong teamwork, we will endeavor to overcome any difficulties in the process of providing support." Concrete efforts included sending relief goods and prioritizing the provision of materials made by Sumitomo Electric for the recovery and restoration of affected areas. Sumitomo Electric contributed

Products from Tohoku region (Tokyo Head Office)

200 million yen, and more than 30 million yen was donated by employees, executives and matching contributions. Donations were also made by Group companies in Japan including Sumitomo Wiring Systems, Tokai Rubber (now, Sumitomo Riko), Nissin Electric, Sumitomo Densetsu and TECHNO ASSOCIE, as well as by overseas Group companies and employees in South Africa and other countries. In total, over 500 million yen was donated.

Furthermore, the entire Group provided ongoing support for reconstruction over a long period of time. For instance, the company held annual markets at its Head Offices and Works to sell specialty products from the affected Tohoku region, and it continued to collect and match donations. In addition, the SEI Group CSR Foundation provided funds for research into the reconstruction of disaster-stricken areas.

On the other hand, in the Thailand floods that occurred between July and December 2011, in addition to the loss of more than 800 lives, seven industrial parks were flooded, causing many Japanese manufacturers of automobiles, precision equipment and so on to cease operations at their local production bases. Sumitomo Electric was commended by several companies for providing donations collected by the Group and for responding to clients' requests, such as for postponement of deliveries and delivery to alternative production sites.

In May 2011, Sumitomo Electric launched Smile Relay, a blog to introduce readers to the corporate citizen activities of its Group companies around the world.

Section 2: Business

1 Development of the automotive business focused around wiring harnesses

Promotion of a global strategy, and responding to the collapse of Lehman Brothers

The automotive business achieved its VISION 2007 target of 20% global market share for wiring harness, its key product, four years ahead of schedule in 2003. Through M&A, it also made a full-scale entry into European automotive manufacturing, eventually producing half of the Sumitomo Electric Group's total operating income.

Under VISION 2012, in addition to capturing 25% of the global wiring harness market (GLOBAL 25), the basic strategies for the automotive business were to respond to environmental change and to increase profits by leveraging the collective strengths of the Group. To realize its GLOBAL 25 target, on top of acquiring a stable stream of orders from Japanese manufacturers, who were maintaining strong performance globally, the company sought to increase its global share of non-Japanese manufacturers to 15%. Measures for environmental change included accommodating the shift by Japanese automakers toward a global platform,[7] developing environmental, safety and weight-reduction technologies, and networking and developing software; and measures for increased profits comprised strengthening its procurement capabilities and reducing logistics expenses.

However, following the collapse of Lehman Brothers in 2008, the global demand for vehicles plummeted, and the production volume of Japanese manufacturers decreased sharply from 11.6 million units in 2007 to less than 8 million units in 2009. The decrease among U.S. manufacturers was even greater, and along with European manufacturers, their production volumes never surpassed the level of 2007, despite being on track for recovery in 2010.[8] Furthermore, as of 2008, emerging markets were regarded as a driving force for the future. Sales in these markets numbered 31 million units, closing in on the 37 million units that was the total of the Japanese, North American and European markets. On the other hand, from the perspective of protecting the environment, hybrid vehicles and electric vehicles had been wielding a stronger presence, and in Japan, the tax break for eco-friendly cars was implemented as part of the economic recovery policy following the collapse of Lehman Brothers.

Under such circumstances, Sumitomo Electric also accelerated its global optimization of production, such as relocating production bases to regions with lower costs. While attempting to keep costs down, such as by reducing the workforce at overseas bases where labor mobility is high, the company sought to capture the demand for wiring harnesses, both in the markets of developed countries and in the markets of emerging countries, promoting increased sales to local carmakers and to Japanese, European and U.S. automakers for their strategic models targeted at emerging nations. The company also promoted the development and broader sale of products for eco vehicles, such as high-voltage

7 The idea of taking a single chassis (frame, suspension, steering, etc.) and using it in a wide range of models sold in various countries around the world, in order to reduce design variations and production costs.

8 Only Chinese manufacturers were able to extend their production volumes at the time of the collapse of Lehman Brothers. They maintained their high growth into 2009, surpassing the production volume of the U.S. and Japan.

wiring harnesses for hybrid vehicles and electric vehicles as well as aluminum wiring harnesses that contribute to better fuel efficiency through a reduction in weight.

Response to the increasingly important emerging markets

Sumitomo Electric proceeded to capture demand in emerging markets by utilizing the production and sales bases it had already established in China, South America and Southeast Asia, as well as the overseas bases of companies it acquired (for instance, the local Chinese subsidiary of Bordnetze).

As for cars made by Japanese automakers for emerging markets, Sumitomo Electric began supplying wiring harnesses for Camry models in December 2007 which were manufactured by Toyota Motor Corporation at its plant in Russia. Sumitomo Electric's wiring harnesses were also used in the Nissan Motor Co., Ltd.'s new model March, mass production of which began in March 2010. The car had been produced in Japan and the UK, but was shifted to plants in Thailand (including for cars for the Japanese market), India (for the Indian and European markets), China, and Mexico (for the North and South American markets), positioning it as a global car to capture entry users in emerging countries.

With the measures for increased sales taking effect, Sumitomo Electric ended up achieving its GLOBAL 25 target in fiscal 2010, two years ahead of schedule.

Wiring harness production base global optimization

Meanwhile, Sumitomo Electric shifted some of its wiring harnesses production for the European market from Eastern Europe to North Africa, as a measure aimed at global optimization of production.

As of 2008, the company had been producing wiring harnesses for the European market at 14 plants situated in six Eastern European countries, including Poland, but labor costs rose 10–15% in 2007, and were projected to continue climbing.

In North Africa, Sumitomo Electric had acquired the Moroccan plant of Italian company, Cabind, following acquisition of that company's wiring harness business in 2001. In addition, in collaboration with Sumitomo Wiring Systems, Ltd., SE Wiring Systems Egypt S.A.E. was established in Egypt in July 2008 (Egypt's first ever manufacturer of wiring harnesses), SE Bordnetze Tunisia S.A.R.L. was established in Tunisia in September, and back in Morocco, a new plant began operations in 2009. Each of these grew to become an important production base in North Africa for wiring harnesses for the European market, overcoming tough times on account of the impact of the Arab Spring from the end of 2010.

Production for the Japanese and North American markets began shifting from China and Thailand to the other ASEAN countries, such as the Philippines and ones neighboring Thailand, in part due to an increase in the volume of vehicles being produced in China and Thailand, as well as to the effects of rising labor costs.

In China, Sumitomo Electric collaborated with Sumitomo Wiring Systems and the Dongfeng Group to establish Kaifeng Zhucheng Wiring Systems, Co., Ltd. in August 2011 as a manufacturer of wiring harnesses for Dongfeng Nissan. Furthermore, with supply to the parts market increasing, Sumitomo Wiring Systems established parts manufacturer, SEWS-Components Changshu Ltd., in March 2011.

In the ASEAN region, Sumitomo Wiring Systems set up Sumi Vietnam Wiring Systems Co., Ltd. (manufacturer of wiring harnesses) in February 2008, followed by SEWS-Components Vietnam Co., Ltd. (manufacturer of parts) in October 2010. Production of wiring harnesses in Vietnam had begun with establishment of SUMI-HANEL Wiring Systems Co., Ltd. in 1996. Since then, Sumitomo Electric had continued to establish bases primarily in the vicinity of Hanoi, and as of 2011, it had become a major production base, employing some 13,000 people.

Sumitomo Wiring Systems also established Sumi Philippines Wiring Systems Corporation (manufacturer of wiring harnesses) in the Philippines in May 2011, followed by Sumi (Cambodia) Wiring Systems Co., Ltd. in Cambodia in June 2011.

By 2012, including companies involved in sales, development and jig manufacturing, the China and ASEAN region had become a major stronghold, with 27 companies in China, two companies in Hong Kong and Taiwan, and 28 companies in the ASEAN region.

With recovery of the global economy in full swing, in fiscal 2012, Sumitomo Electric decided to increase production capacity for its automotive wiring harnesses. It invested in plants located in Mexico, Tunisia, Ukraine, Morocco, and other countries, building new constructions and introducing new production lines. In addition to the growing volume of vehicles being produced, the decision to increase capacity was also based on the spread of hybrid vehicles and the greater usage of wiring harnesses per vehicle because of more onboard devices such as car navigation systems, rear-view cameras and sensors.

Development of new products in response to eco vehicles (aluminum wiring harnesses)

Worthy of special mention among the development of new products for eco vehicles were aluminum wiring harnesses for automotive low-voltage systems, which were successfully developed in September 2008, using the world's first thin stranded thin aluminum wires. The material used in the wire was changed from copper to an aluminum alloy with one-third the weight of copper. When all copper wires were replaced with this aluminum alloy, the harness was about 25% lighter, and was expected to help improve fuel efficiency. The rising price of copper metal also favored this new product. Aluminum resources are also more plentiful than copper, and so its price was also relatively more stable.[9]

From 2006, with an aim of achieving both strength and conductivity, the company's Electronics Materials Laboratory teamed up with subsidiaries AutoNetworks Technologies, Ltd. and Sumitomo Electric Toyama Co., Ltd., and set about developing a new aluminum alloy for use in automotive wiring. After making good use of mass-production technologies to overcome problems with wires breaking and so on, the team achieved the function and the productivity that measure up favorably to copper wire. To address the issues of vibration, the team also established aluminum wire terminals and anticorrosion technologies, as it strived to bring the harness to practical application. In 2010, it was adopted in the door panels of Toyota Motor Corporation's third-generation Vitz and its second-generation Ractis (a mini MPV based on the Vitz) strategic models, allowing Sumitomo Electric to lead the way in aluminum wiring harnesses.

9 In 2000, the price of aluminum was only about $300 cheaper per ton than copper, but by 2008, the price difference had widened to $4,400, and at the peak of copper prices in 2011, the difference had swollen to $6,400.

Expansion of products for eco vehicles

In order to address problems of global warming caused by the increase in CO_2 emissions, around this time, the automotive industry began to become more active in the development of hybrids, other eco vehicles, and electric vehicles. Hybrid vehicles are equipped with both an internal combustion engine and an electric drive system consisting mostly of batteries, inverters, and motors. They are designed to greatly improve fuel efficiency by selecting the drive system that best suits the driving situation at the time. Again, Sumitomo Electric was ahead of the field in developing products for these hybrid vehicles. Its product lineup included under-floor pipe-shielded wiring harnesses, high-voltage connectors and reactors (magnetic components).

The under-floor pipe-shielded wiring harness comprises cables for carrying a large current between the battery and the inverter. An electric wire is passed through an aluminum pipe, which provides protection against bounced stones and other hazards and also shields the wire from electromagnetic noise, and the terminal is fitted with a connector for securing the cable to the inverter. As for the electric wire, an aluminum wire is used in order to reduce the weight increase attributable to the thicker wire needed to accommodate the large current. The connectors also have specifications suitable for electrical connections between the inverter, motor, and battery, and are compatible with waterproof and electromagnetic shields adapted to high-voltage wiring. Having first been installed in the 2005 Honda Civic, the harnesses were adopted for the Toyota Prius in 2015, growing to become one of Sumitomo Electric's leading products. The company also developed a reactor for boost converters used in hybrid vehicles, which paved the way for miniaturization, and steadily promoted sales of products for eco vehicles.

Reactor

Under-floor pipe-shielded wiring harness

2 Aiming to be an integrated manufacturer in the infocommunications business, in anticipation of the expansion of broadband communication

Aiming for growth through global expansion and technological capabilities

The growth strategy of Sumitomo Electric's infocommunications business, which was centered on optical fiber, transmission devices, and network equipment, was based on becoming the world's leading integrated manufacturer of optical products, spanning the fields of transmission lines, network equipment, and devices in the global market, while keeping an eye on the universal expansion of telecommunication infrastructure. Examples of infrastructure included access networks such as FTTH and mobile phone networks, Ethernet metropolitan-area networks[10] that connect these access networks, long-distance trunk networks as typified by submarine cables, and data center networks as typified by cloud services.

In the optical fiber business, Sumitomo Electric had restored its competitiveness through structural reform and concentrating production at Kiyohara Sumiden, Ltd. In order to expand its business to the global market—which had been a challenge from the time of the structural reform—while steadfastly maintaining its top share in the domestic market and continuing to secure stable earnings, the company set about building an optical fiber supply chain that included alliances.

As for the transmission device business, in the area of optical communications, Sumitomo Electric aimed to become a global leader, with the highest market share, by getting ahead of the field in expanding its 10G product lineup and developing next-generation 40G/100G high-speed optical links and optical devices for trunk lines. In the area of wireless communications, again Sumitomo Electric aimed to expand the market, primarily around its new GaN devices. Furthermore, the company's key strategies for network equipment now that the introduction of devices for GE-PON had passed its peak, were to expand terminal products (set-top boxes, home gateways, etc.) set up in homes to handle complex services, such as telephone lines, the Internet and video broadcasting, and to expand the GE-PON business in countries with advanced infocommunications, such as the U.S. and Europe, where broadband services were getting into full swing.

However, in the Great East Japan Earthquake of March 2011, damage was sustained at Kiyohara Sumiden's plant producing the base material for optical fiber, and at the plants producing devices in Yamanashi and in the Yokohama Works. As the subsequent very strong yen greatly exacerbated the company's export profitability, it faced a difficult situation again.

10 A metropolitan-area network (MAN) is a network that covers an area at the urban level. It is broader than a LAN, but narrower than a WAN.

Realization of alliances in optical fiber business in China and Europe

With an aim of expanding from a mature domestic market to a global market with good growth prospects, as a second phase of structural reforms from 2005, Sumitomo Electric proceeded with negotiations for the global expansion of its optical fiber business, based on a theme of alliances with leading manufacturers in China and Europe.

As a result of these negotiations, in October 2008, agreement was reached to start a broad joint venture in fiber and cables with the Futong Group (Zhejiang), which had the fourth largest market share in the optical cable business in China. Then in December that year, with its sights set on breaking new ground in the European market in a joint venture, agreement was reached with major French cable manufacturer, Nexans S.A., to contribute a 40% stake in Nexans's optical cable subsidiary in Belgium, Opticable S.A. In the U.S., Sumitomo Electric Lightwave Corp., which had been reorganized in February 1994, was already manufacturing and selling optical cables, ABF, optical fiber fusion splicers and other products. Sumitomo Electric was structured to expand its fiber and cable business in the three major markets of the U.S., Europe, and China.

Expansion of the optical fiber business in China

The joint venture agreement with Futong Group (China) involved establishing the following three companies in China and Hong Kong and conducting integrated production, from the base material for optical fiber to cables. Although Sumitomo Electric had a 51% majority in Hangzhou SEI-Futong Optical Fiber Co., Ltd. (manufacturer of the base material), it was a major decision to take the lead among major global manufacturers to conduct the cutting-edge production of the base material in China.

SEI Sumitomo Electric Optical Fiber and Cable (Shenzhen) Co., Ltd. (established July 2001), which was engaged in fiber drawing and cable manufacturing, and Futong subsidiary, Transtech Optical Communications Co., Ltd. (Hong Kong), which was engaged only in fiber drawing, came under the umbrella of a holding company. Established in November 2008, Hangzhou SEI-Futong Optical Fiber Co., Ltd., which was central to the joint venture structure, commenced construction of a plant in April 2009, which began operations in September 2010, and which became a state-of-the-art factory in China. Furthermore, in December 2009, Tianjin SEI-Futong Optical Fiber Co., Ltd. was established in Tianjin to manufacture fiber-optic cable, thereby strengthening Sumitomo Electric's capacity to supply the entire Chinese market.

Hangzhou SEI-Futong Optical Fiber Co., Ltd.

Hangzhou SEI-Futong Optical Fiber Co., Ltd.	Manufacture of optical fiber and base material, Fuyang (Zhejiang Province)
Chengdu SEI-Futong Optical Cable Co., Ltd.	Manufacture of optical cable, Chengdu (Sichuan Province)
Hong Kong SEI-Futong Optical Fiber Co., Ltd.	Holding company, Hong Kong

Following the 2008 Lehman Brothers collapse, the Chinese government implemented an economic stimulus package worth 4 trillion yuan. The package also included investment in infrastructure, and in view of this, Sumitomo Electric and the Futong Group decided to make investments in increasing production on a massive scale. Sumitomo Electric's capacity to supply the preform to China was enhanced by expanding production facilities at Kiyohara Sumiden, Ltd. (became operational in October 2010), and additional fiber-drawing machines were installed at the above companies in China. This series of investments enabled the joint venture with the Futong Group to command the second largest share of the Chinese market, which itself had expanded rapidly and now accounted for close to half of global demand.

Meanwhile, in Japan, Kiyohara Sumiden, Ltd. had sustained extensive damage at its production facilities from the Great East Japan Earthquake of March 2011, and the subsequent strengthening of the yen only compounded its suffering. Reductions in manufacturing costs and solid, record-high earnings recorded by the Chinese businesses helped the company to survive, but the tough situation continued.

Establishment of SEI Optifrontier Co., Ltd., and strengthening of FTTH products business

In Japan, construction of regional information systems was promoted, not only by conventional communications service providers, but also by local governments. This consequently stimulated demand for optical cable and for wiring components, such as connectors and terminal boxes, but an excess of supply capacity invited intensified market competition. Therefore, in order to strengthen the cost competitiveness of its FTTH products and to accelerate the development of new products, in July 2010, Toyokuni Electric Cable Co., Ltd., which had been made a wholly-owned subsidiary in 2007, was merged with Sumiden High Precision Co., Ltd., and after adding part of one of Sumitomo Electric's business segments, was reorganized into SEI Optifrontier Co., Ltd. The new structure eliminated overlapping areas of development and manufacturing, and refocused on strengthening the Group's ability to develop new FTTH products, blending the technologies of both companies. In this way, high-density cords/cables with multifiber connectors that are effective for wiring in exchanges, which are becoming increasingly cramped for space, and the new core monitoring fusion splicer connectors for optical fiber connections, T-71C, which is compact and lightweight and enables high-speed, high-precision connections, were developed (2011), and sales grew.

Furthermore, as part of the merger into a new company, Toyokuni Electric Cable's business in prefabricated copper cable for use in buildings and houses was integrated into Sumitomo Electric Industrial Wire & Cable, Inc., with the union of these two dominant players cementing its top market share.


SEI Optifrontier Co., Ltd. (Shonan Works)

SEI Brasil Soluções Ópticas Ltda.

As for expanding its FTTH products business overseas, in an equal joint venture with Nanjing Putian Telecommunications Co., Ltd. (a manufacturer of communication wiring equipment in China), in June 2010, Sumitomo Electric established SEI-Nanjing Putian Optical Network Co., Ltd. in Nanjing to manufacture optical networking equipment. The aim of this move was to secure the largest market share in the optical networking equipment for FTTx.

Furthermore, in June 2012, Sumitomo Electric established SEI Brasil Soluções Ópticas Ltda. in Sorocaba on the outskirts of Sao Paulo, to serve as a bridgehead for making inroads into the South American market, centered on Brazil.

Development of a varied lineup of fiber and cable products

Progress was also made in the development of new optical fiber and cable products for use in FTTH cabling. Examples include: small-diameter, 1000-fiber optical cables, which the company began delivering to NTT in 2008; small-diameter, low-friction indoor optical fiber cables that can be added through metal conduit already installed in existing apartment houses; and PureAccess-R5 fibers which have an allowable bending radius of 5 mm for home cabling. In March 2011, Sumitomo Electric set a new world record for transmission capacity of 109 Tbps using its new structure of multicore optical fiber.

On the other hand, despite the demand from development of regional information systems promoted by the Ministry of Internal Affairs and Communications (MIC) in the domestic market for optical cables, prices remained low and overall demand was still sluggish.

Restructuring of the transmission device business, through making Eudyna Devices Inc. a wholly-owned subsidiary

Meanwhile, in the optical transmission device business, total shipments of optical link products reached 10 million units in 2008, energizing Sumitomo Electric toward business expansion.

In April 2009, Sumitomo Electric bought out Fujitsu Limited's 50% stake in Eudyna Devices Inc. (see p. 55 in Chapter 2), turning it into a wholly-owned subsidiary. The motives of each company were complementary: Sumitomo Electric aspired for global expansion through higher functionality and higher added value in the transmission device business, and Fujitsu sought to shift its main business focus from hardware to systems and software. After acquiring Eudyna Devices, Sumitomo Electric integrated its optical transmission device business into the company, and in August 2009, renamed it Sumitomo Electric Device Innovations, Inc. (SEDI). This allowed SEDI to evolve into a manufacturer capable of providing a range from devices to link products. And, at the same time as centrally managing the development, manufacturing, and quality control of optical and electronic devices, by reorganizing and consolidating the overseas sales offices that both companies operated in the U.S., UK, Italy, China, and Hong Kong, SEDI was poised for global business expansion. Technologically, there was a large synergy effect from merging human resources and Fujitsu's widespread device technologies, and coupled with the support provided by Sumitomo Electric's production engineering department to the device plant at Yamanashi, progress was made in the development of new competitive products. In optical products, SEDI leveraged the technological synergies from the integration to accelerate development of next-generation, ultrafast products, such as 40 Gbps and 100 Gbps devices. And in electronic devices, with sights set on next-generation mobile phone base stations, SEDI accelerated development based on a policy revolving around GaN devices capable of higher output at higher frequencies than conventional GaAs devices. The technology base underlying SEDI's GaN devices was overwhelming, and would continue to develop into the company's leading products.

However, SEDI's semiconductor plants in Yamanashi and the Yokohama Works were affected by the Great East Japan Earthquake of March 2011, and the subsequent excessive appreciation of the yen caused the performance of the transmission device business, which mainly consisted of exports, to rapidly deteriorate.


Sumitomo Electric Device Innovations, Inc.

Despite these circumstances, in March 2012, the Group acquired the vertical-cavity surface emitting laser (VCSEL) business of EMCORE Corporation (technology, products and related assets). VCSEL is the required light source for short-distance optical links. The strategic acquisition put Sumitomo Electric in position for making advances into the data center market, which was predicted to expand rapidly in near future.

Integrated services terminals and network equipment for creating new markets through overseas expansion

In 2008, NTT launched Next Generation Network (NGN) services to facilitate the introduction of FTTH. This resulted in a boost to sales in all four product fields being advanced by Sumitomo Electric Networks, Inc., namely: VDSL, GE-PON, home gateways (terminal devices for using the Hikari Phone service), and IP-STB (terminal devices for using Hikari TV). However, since development of the subscriber broadband infrastructure in Japan had reached maturity, the domestic market gradually diminished after posting record-high sales in 2008.

To address this situation, the company worked on expanding into overseas FTTH markets and on pioneering integrated services terminals. In terms of expanding into overseas markets, the company began supplying GE-PON products to Chunghwa Telecom in Taiwan in 2007, and to PCCW Ltd. in Hong Kong in 2008. And in 2009, it strengthened efforts aimed at the North American market of CATV operators where investigations had begun into the introduction of FTTH services. As for integrated services terminals, the company supplied terminals for NTT's energy monitoring service in the wake of the Great East Japan Earthquake in 2011, and it supplied terminals for Deutsche Telekom's home automation service in 2012. Progress was also made in development of the next-generation FTTH transmission device, 10 G-EPON, but its introduction into the market was delayed, and so could not make up for the contraction of the existing market in Japan.

In the domestic cable television market, local governments began to introduce FTTH, prompted by measures of the Ministry of Internal Affairs and Communications (MIC) for regional information systems. Broad Net Mux maintained solid business expansion, teaming up with Sumitomo Electric Networks to expand sales of CATV systems providing Internet and telephone services utilizing GE-PON and CATV IP telephone terminals.

Development of the traffic information systems business

One of Sumitomo Electric's strongest areas of expertise is traffic control systems, and in fiscal 2008, a program for the renewal of traffic control systems based on new standards by the National Policy Agency was launched nationwide. The first system conforming to these new standards was delivered to the Tottori Prefectural Police in March 2010.

Sumitomo Electric played a key role in putting together various traffic information systems. For instance, in fiscal 2008, as part of a large-scale verification test of Driving Safety Support Systems (DSSS), which aimed to reduce traffic accidents such as through road-to-vehicle communication, an order was received for a model DSSS for use ordinary roads. The system used road-to-vehicle communication to provide drivers with warnings about signals at intersections and so on, and at the same time, aimed to make signal control more sophisticated for the authorities by collecting information on vehicle positions and direction indicators.

Sumitomo Electric had also contributed to facilitating road transportation, by developing and delivering systems that provide information on traffic congestion (Nagoya Expressway, 2009), equipment that used image processing to measure traffic volume (Joban Expressway, Kita-Kanto Expressway, Higashi-Mito Road, and Thailand (Bangkok), 2010), as well as Traffic Vision SERVICE—a distribution service of traffic information and maps to companies. The company also supplied train radio devices and other equipment for the Nippori-Toneri Liner—a new transit system that opened in March 2008.

Traffic control system used by the Tottori Prefectural Police

3 Electronics business concentrating on growth areas

Global expansion in growth areas and development of new business

The electronics business was based on sourcing profit by enhancing and expanding sales of products targeting three growth areas, namely: smartphones, which were still in a phase of rapid popularization; liquid crystal, the demand for which increased because of tablet devices; and storage (external storage devices), which was expanding because of security and the need for large capacity for video and so on. Another challenge in these areas was building production systems in places like China and Vietnam to accommodate the pressure on product manufacturers to lower prices and the demand for prompt delivery.

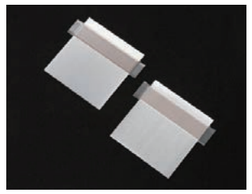
On the other hand, in terms of new businesses, in addition to promoting commercialization of a filtration module for wastewater treatment in line with the fields of Environment & Resources and Life Sciences, Sumitomo Electric also promoted the global expansion of other existing businesses.

Expansion of electric wires, FPC and compound semiconductors businesses

In the field of electronics, various existing businesses and new businesses were overlapping around electric wires, FPCs, compound semiconductors and irradiated tubes, and overseas production bases were being also being expanded in North America, Europe, and Asia. In China, the Song Gang Electric Wire Factory in Shenzhen, which had been operating as a contract processing plant since 1994, was the largest of the production bases, and in April 2010, new capital was injected into the business to make it a wholly-owned subsidiary. It was reorganized into Sumitomo Electric Interconnect Products (Shenzhen), Ltd., and began operating at full capacity that November. As a manufacturing base for harnesses used in electronic equipment, flexible flat cables, and FPCs, it became a large works employing more than 10,000 workers.

In the electric wires business, there had been two manufacturing subsidiaries in Japan, but in April 2012, Sumitomo Electric Flat Components, Inc. was integrated into Sumitomo (SEI) Electronic Wire, Inc. Also in 2012, the company began manufacturing and selling Thunderbolt cables. A standard data transmission cable jointly developed by Apple Inc. and Intel Corporation, Thunderbolt achieved an ultrafast bi-directional transfer speed of 10 Gbps. Furthermore, in 2010, the company also began producing and supplying new large tab leads for lithium-ion batteries used in electric vehicles.

Meanwhile, in the FPC business, the popularity of smartphones had grown exponentially, and so FPCs for smartphones accounted for a greater proportion of the business. In addition to being used as a phone, since a smartphone also performed the functions of a point-and-shoot camera, game console, portable music player, and computer, demand for these products eroded as smartphones grew in popularity. Therefore, the company's FPC business also focused on this. In terms of products, despite advances in higher functionality and multilayering, cost demands conditional on bulk orders were tight, meaning unit prices were, if anything, trending downward. For this reason, Sumitomo Electric Printed Circuits, Inc. worked to increase sales by incorporating the process of mounting other components on FPCs.


Automotive tab leads

In its compound semiconductors business, in addition to developing product lines using GaN, in July 2009, Sumitomo Electric succeeded in oscillating the world's first true green semiconductor laser. Then in June 2012, in collaboration with Sony Corporation, it developed a true green semiconductor laser with the world's highest output and efficiency (with an output power of 100 mW at a wavelength in the 530 nm range). In 2008, Sumitomo Electric also contributed to business expansion by successfully mass producing a 6-inch high-quality GaAs single crystal used in wireless communication systems and a 4-inch GaAs single crystal used in red high-brightness LEDs.

Accelerated expansion of filtration modules for wastewater treatment business

Among the new business fields, filtration modules for wastewater treatment demonstrated steady progress. Using POREFLON (a polytetrafluoroethylene porous material developed by Sumitomo Electric Fine Polymer, Inc.) as the base material, the module was developed for use in treating waste water, applying the company's unique processing technology. The microfilter bundles together a large number of hollow membrane materials, each of which has many fine holes of about 0.1 μm in diameter on the surface. Compared to competing products, the modules are stronger and offer excellent resistance to chemicals, and so can be used to filter and purify highly polluted wastewater. Since its release onto the market in 2003, the module has been adopted extensively at water purification plants, sewage treatment plants and at factories for industrial wastewater.

In June 2008, Sumitomo Electric expanded into overseas markets, when the module was adopted at the sewage treatment facility in the city of Dangjin in Korea. And in March 2010, the first deliveries of the MBR POREFLON Membrane Module were made to a major chemical plant and steel mill in China for the reuse of industrial wastewater. In Japan, the first delivery of the module was to a food company in September 2011, demonstrating that it was also applicable to industrial sectors where there are stringent water quality and safety requirements for treated water.


Pressurized module for wastewater treatment

4 Environment and energy business development

Development of new revenue streams

In environment and energy businesses, Sumitomo Electric aimed for growth on a basic strategy of maintaining stable revenue in existing businesses and developing new revenue streams.

In its existing domestic businesses in Japan, amid ongoing declines in investment in Japan's power industry, in order to put the company back on track for growth away from its mature businesses, Sumitomo Electric sought to stabilize and improve profits, such as through further reforms of the business structure and through various cost reductions.

On the other hand, promoting new business development was also a key strategy. In terms of markets, growth

prospects for high-voltage power cables were particularly good in emerging countries and in the U.S., and so the company's plan was to be more aggressive in such overseas businesses, while also keeping alliances in mind, such as M&A and joint ventures. In terms of technology, the company decided to nurture the area of superconductivity, such as cables and apparatuses, as well as thermal control devices, such as heaters for semiconductor fabrication equipment, and magnet wires for automotive drive motors.

Promotion of the overseas high-voltage cable business

Responsible for the high-voltage electric wires business, J-Power Systems Corporation (JPS) actively promoted overseas expansion.

In January 2008, Finolex J-Power Systems Pvt. Ltd. was established—a joint venture in high-voltage power cables with leading Indian cable manufacturer, Finolex Cables Ltd. (equity share: JPS (51%), Pune, Maharashtra). The bold decision to establish a local manufacturing base in India was made because, being one of the BRICs countries, there was an urgent need to improve the power infrastructure upon which economic growth was contingent, and so demand for high-voltage power cables was expected to increase. The new company introduced state-of-the-art equipment such as a vertical continuous vulcanizer (VCV), and commenced production of high-voltage CV cable in September 2011.

In November 2009, JPS and Marubeni Metals Co., Ltd. established J-Power Systems Saudi Co., Ltd. in Al-Khobar, Saudi Arabia, as a joint venture to manufacture and sell submarine electrical cable. The decision to establish the first submarine electrical cable company in the Middle East and Africa was made after receiving a request from the Saudi Arabian Oil Company (a state-run oil company in Saudi Arabia) for the establishment of a local factory for the purpose of securing a stable supply of submarine electrical cables and enhancing the maintenance of those cables. The plant was completed in June 2012, and it began producing mid-voltage 5 kV–35 kV submarine electrical cables. Prior to this, in the Middle East, an agreement for technical assistance had been concluded in September 2006 with Ducab High Voltage Cable Systems Pvt. Joint Stock Co., a high-voltage power cable manufacturer in the Emirate of Dubai, UAE.

Meanwhile, in October 2008, JPS also established J-Power Systems Cable Accessories (Shanghai) Corp. in Shanghai, China, as a wholly-owned subsidiary to procure and assemble electric power equipment.

Construction of the Hokkaido–Honshu (Kitahon) HVDC Link

As JPS established bases overseas, it steadily built up a portfolio of projects, as described below.

2005–2008	Construction of an overhead transmission line connecting Thailand and Laos
2011–2012	Delivery of gap-type conductor[11] to increase the capacity of existing overhead transmission lines in India
	Submarine cable project connecting Vladivostok and Russky Island in Russia
2011–2014	Project for the installation of submarine power cable between the Indonesian islands of Java and Bali
2011–2018 (planned)	Project to install submarine power cables between Taiwan and the Penghu Islands[12]
2012–2014	Project for underground power cables in Sydney, Australia

In Japan, JPS developed a technology for recycling the material coating outdoor cross-linked polyethylene insulated (OC) wire used in high-voltage overhead distribution lines, and in May 2008, made its first delivery of recycled OC wire using this material to the Tokyo Electric Power Company.[13]

In March 2009, JPS was contracted by Electric Power Development Co., Ltd. (J-POWER) for the submarine cable project (45 km connecting Hokkaido and Honshu) using 250 kV DC XLPE (cross-linked polyethylene) cable, which was the highest voltage used in the world at the time. JPS completed installation of the submarine cable in June 2012. Using a new XLPE insulator that was jointly developed for DC by JPS and J-POWER, it was also the world's first XLPE cable that allows polarity reversal to change the direction of power transmission (exchanging the positive and negative poles as required in operation).

Progress in the superconducting cable project

In superconductivity, which is considered to be central to new business, Sumitomo Electric delivered superconductive cable core used in DI-BSCCO (bismuth-based superconducting wire) to Chubu University for use of long-distance superconducting cable, and in September 2009, using this cable core, Chubu University succeeded in transmitting electricity 200 m for the first time in the world. By combining silver and bismuth-based high-temperature superconducting materials in a groundbreaking process, DI-BSCCO significantly improved critical current and strength, and achieved lengths of wire exceeding 1,000 m and a 4-fold production yield.

In July 2010, Sumitomo Electric successfully conducted the demonstration test of the 30 m superconducting prototype cable, and started commercial production of the cable for the Tokyo Electric Power Company's (TEPCO) Asahi Substation (in Yokohama). In September, 40 km of DI-BSCCO wire was delivered to China, and another order for the wire was also received for a large project in the order of 100 km. Therefore,

11 The electric wire was comprised of a steel core center for maintaining strength, surrounded by aluminum alloy with a gap around the core, increasing current carrying capacity while controlling elongation under high temperature conditions.
12 With a total installation distance of 350 km at a depth of up to 150 m, this project is one of the largest of its kind in the world.
13 Among the main coating materials of the insulated wire, polyethylene and vinyl chloride were recyclable, but the enhanced molecular bonds in the cross-linked polyethylene made melting it difficult.

Superconducting cable project

in 2011, the capacity of the Osaka Works to produce superconducting wire was doubled to 1,000 km per year. Superconducting wire was also supplied to superconducting cable projects in Germany and Russia, and in terms of the scale of production, Sumitomo Electric became the global industry leader, overtaking U.S. manufacturer, American Superconductor. In 2012, in collaboration with TEPCO and Mayekawa Mfg. Co., Ltd., which was in charge of the cooling system, Japan's first demonstration test was started at the Asahi Substation to connect a superconducting cable to an actual power grid and to transmit power to ordinary houses. Over the course of a year, the stability of the transmitted power and operating temperature were evaluated, taking the technology one step closer to practical application.

At the same time, Sumitomo Electric also appealed to the breadth of its efforts and its technological prowess in this field, exhibiting a superconductor electric vehicle at the Integrated Exhibition of the Environment commemorating the G8 Hokkaido Toyako Summit in June 2008, and delivering a superconducting magnetic system to Nihon Denji Sokki Co., Ltd. in August 2010 for use in its BH curve tracer.

Toward systems integrating the new technologies

Beset with problems, the business of redox flow batteries came to a standstill for a while, but steady improvements were made while providing support for facilities already in operation.

The micro smart grid demonstration system, which Sumitomo Electric began testing in June 2011 on the premises of the Osaka Works, integrated the efforts that Sumitomo Electric was making in various fields. The system achieved stable and efficient operations, by interconnecting three types of photovoltaic systems, a small-scale wind-power generator and redox flow batteries using direct current (DC), utilizing storage batteries to make up for any fluctuations in power generation, which is a weakness of renewable energy, and by making use of an energy management system for the advanced management of energy, including fluctuations in power demand. All the equipment used in generating power was made by Sumitomo Electric, including the concentrator photovoltaic (CPV) system, which the company had developed in-house using special compound semiconductors to double the power generation efficiency compared to silicon panels, as well as the DC cables, the energy management system (EMS) and control unit mounted on the smart distributor, the converters and inverters, intelligent taps (outlets), and even the recharging station for electric vehicles. Following a year of testing, the results were taken into account, and in July 2012, Sumitomo Electric commenced the demonstration operation of its megawatt-class large-scale power generation/storage system at the Yokohama Works. This system combined one of Japan's largest concentrator photovoltaic (CPV) systems (28 CPV units, maximum power

Demonstration project of a large-scale power generation/storage system (Yokohama Works)

output capacity: 200 kW) with one of the largest redox flow batteries in the world (capacity: 1 MW x 5 h). Large enough to supply an apartment house or small town, this system attracted attention both within Japan and abroad, and since many people visited the site, it became an opportunity to showcase Sumitomo Electric's technological prowess.

Furthermore, in the magnet wire business, Sumitomo Electric proceeded with structural reorganization. In April 2009, it revived the Magnet Wire Division, and transferred the sales, planning and overseas subsidiary operations from Sumitomo Electric Wintec, Inc., so that the latter could concentrate on manufacturing and development. Overseas, Sumitomo Electric discontinued production at its base in the U.S., and transferred and consolidated production from Singapore to its base in Malaysia.

Growth of Sumitomo Electric Toyama Co., Ltd.

At the start of the 2000s, tougher environmental regulations led to a requirement for improved fuel efficiency, and demand for hybrid vehicles grew rapidly. Celmet—a porous metal produced by Sumitomo Electric Toyama Co., Ltd.—was used as the cathode in nickel metal hydride batteries installed in hybrid vehicles, and as demand for hybrid vehicles increased, the company expanded its capacity to supply Celmet as its core product, for instance, by setting up additional dedicated plants between 2007 and 2010.

Sumitomo Electric was also working on research and development into corrosion-resistant and heat-resistant materials, and was proceeding to uncover new demand, such as the application of these materials in fuel cell vehicles. Effort was also being put into cultivating markets, such as applications of all-solid-state batteries in vehicles, and fuel cells and hydrogen generators, demand for which was likely in the impending hydrogen-based society.

The aluminum division not only serves as a base supplying the whole Sumitomo Electric Group with materials for aluminum wire, it is also engaged in research and development into materials for conventional forging applications, as well as high-strength, high-tensile materials amid a trend toward more aluminum as vehicles become increasingly lightweight. It has also proceeded to develop new applications, beginning to supply materials for harness applications and for parts applications, such as AT spools (transmission component) and bolts.

Establishment of base in China for the production of air springs for railway cars

Production of air springs also began expanding into China.

In August 2009, in collaboration with subsidiary Tokai Rubber Industries, Ltd., (present-day Sumitomo Riko Co., Ltd.) Sumitomo Electric agreed to establish a joint venture with Chinese firm, KTK Group Co., Ltd., for the manufacture and sale of air springs for railway cars and anti-vibration rubber. In China, the construction of medium-speed and high-speed railways connecting major cities was proceeding at a feverish pace, and there were plans to develop approximately 16,000 km of rail lines by 2020. Development of subway networks in major cities was also progressing, and so demand for subway carriages was also expected to expand rapidly. For this reason, a decision was made to establish a joint venture partnered with the KTK Group, which commanded a considerable share of the market for railway car interior components and displays, and which had a strong influence over railway car manufacturers.

The following month in September, KTS HIGH-TECH Rubber Co., Ltd. (Changzhou: equity share: Sumitomo Electric (25%), Tokai Rubber (25%), KTK Group (50%)) was established. The strategic alliance quickly produced results with Sumitomo Electric air springs being used for the Beijing–Shanghai high-speed railway in May 2010.

5 Successive overseas production bases established for industrial materials

Strengthening organizational structure in the powder alloys business

In the powder alloys business, Sumitomo Electric decided to concentrate management resources in the priority areas of strengthening the competitiveness of its relevant core technologies—such as new material development and machining technologies, and raw material recycling technologies—and developing products to position Sumitomo Electric in the top three global companies. To this end, in addition to forming alliances aimed at increasing global market share and shoring up weaknesses, the company aimed to create new businesses in optical products and in diamond products for electronics.

In April 2009, Sumitomo Electric's Hardmetal Division took over the functions of Sumitomo Electric Hardmetal Corp. relating to business planning, raw material procurement, domestic and international sales, and logistics management, and clarified the division of roles. Furthermore, for the purpose of helping to enhance technical capabilities and to strengthen ties with customers, Sumitomo Electric established its first Tool Engineering Center in 2006 on the premises of the Itami Works as a center providing various services, such as test machining, special tool design and training. From there, the company proceeded to set up TEC both domestically and internationally: Thailand in 2006, Yokohama in 2008, Hokkaido in 2009, Mie and Shanghai in 2011, Saga and Germany in 2012, and the U.S. and Indonesia in 2013. Meanwhile, in a move to strengthen its organizational structure, the company took the cemented carbide materials that had been produced at the Itami Works, integrated and consolidated them into Axismateria Ltd., and shut down Itami alloy plant.

Global expansion of the powder alloys business

In August 2008, as it promoted further global expansion of its powder alloys business, Sumitomo Electric reformed its global logistics structure, launching a new logistics center in Maishima, Osaka. At the center, the company's systems were linked with those of logistics and delivery firms. This allowed deliveries to be completed within 24 hours of orders being received depending on the country or region of delivery, and enabled the transportation status of all domestic and international deliveries to be managed and traced right up until the goods are received.

In parallel with the improvements in logistics, overseas production and sales companies were vigorously established. In December 2007, sales company Sumitomo Electric Hardmetal de Mexico. S.A. de C.V., a wholly-owned subsidiary of Sumitomo Electric Carbide, Inc. (sales and marketing headquarters in the U.S.), was established in Aguascalientes, Mexico, as the company's first local subsidiary in Latin America. Since Mexico had free trade agreements with the U.S. and Canada, there had been a succession of parts processing companies expanding operations into Mexico, especially in the automotive industry. This had resulted in an increasing demand for cutting tools, and so the plan was to meet this demand through direct sales and technical services, leading to an increase in sales.

In 2011 and 2012, Sumitomo Electric established the following local sales bases in order to expand sales of its cutting tools in emerging markets.[14]

December 2011	Sumitomo Electric Hardmetal do Brasil Comércio e Importação Ferramentas Ltda. (Sumitomo Electric Group (100%), Campinas)
April 2012	SumiSertmetal Limited Sirketi (Sumitomo Electric Group (51%), Milmak (49%), Istanbul)
	PT. Sumitomo Electric Hardmetal Indonesia (Sumitomo Electric Hardmetal Corp. (100%), Jakarta)

In manufacturing too, along with bases in Tianjin and Shanghai, Sumitomo Electric established Sumitomo Electric Hardmetal Manufacturing (Changzhou) Co., Ltd. in Changzhou in China's Jiangsu province to manufacture cemented carbide drills and diamond crystal inserts. Together, these bases supplied China, Asia, Europe, and Japan.

In Japan too, in May 2012, Hokkaido Sumiden Precision Co., Ltd. commenced full operation of its new plant producing cemented carbide indexable inserts. Through comprehensive labor savings and efficient equipment placement, the company achieved substantial improvements in productivity.

Establishment of the tungsten refining business and recycling system

The raw materials used in Sumitomo Electric's cutting tools are rare metals such as tungsten and cobalt. Since 80% of estimated tungsten reserves were held by China, this made it an ore with strikingly uneven distribution, and made procuring tungsten difficult if export restrictions or other such measures were implemented. For this reason, in April 2010, Niagara Refining LLC was established in Buffalo, U.S., for the purpose of refining the raw materials for tungsten from ore. This made it possible to procure ore from mines outside of China and to refine the ore in-house. Furthermore, with an aim of securing a stable supply of raw materials and of utilizing the rare resources effectively, in addition to the zinc treatment process that was initiated in the 1980s, in April 2011, A.L.M.T. Corp. commenced operation of a wet-chemical treatment plant at its Toyama Works.

The main points in bringing the recycling system to fruition were to create a system that makes it easy for Sumitomo Electric customers to cooperate, and to establish a system capable of recycling all products sold domestically. Dedicated personnel assigned to each district in Japan, travel around to customers who have bought cutting tools, collecting used indexable inserts and drills. These are transformed into a recycled powder through either the zinc treatment process or the wet-chemical treatment process, which produces a higher recycled quality, and are used again as a raw material.

Niagara Refining LLC

Expansion of the sintered products business

Sintered products business was targeted at the automotive sector, and included variable valve timing (VVT) parts and common rail valves (for fuel injection systems in diesel engines). Consequently, with an aim of expanding sales in anticipation of development of the automotive industry in Indonesia, in April 2012, PT. Sumiden Sintered Components Indonesia was established in Bekasi, West Java, to manufacture and sell engine parts and transmission parts for four-wheeled and two-wheeled vehicles (equity share: Sumitomo Electric Group (66%), aggregate of two local corporate groups (34%)).

Expansion of the special steel wire business

In the special steel wire business, Sumitomo Electric was focused on automotive businesses, and targeted global suppliers of high-performance steel wires.

In the spring wire business, the company succeeded in expanding sales of oil-tempered wires used for valve springs, not only for Japanese automobile manufacturers, but also for the Big Three in the U.S.

In the PC strands business, steel wires, such as high-corrosion-resistant prestressing steel strand and high-strength PC stands, had been used in successive key infrastructure projects in Japan, including the new runway at the Tokyo International Airport (Haneda Airport) as well as the Shin-Tomei and Shin-Meishin expressways. Sumitomo Electric also developed a remarkable product that incorporates a hollow metal sheath with high-strength PC strands in the center, for use as an anchor to prevent cave-ins in underground mines. Given that it helps to reduce construction costs, it was adopted in mines in Australia—a country rich in natural resources—and ended up playing a part in the global sales expansion of the PC business.

14 Brazil is one of the BRICs nations. Indonesia has a population of more than 200 million, and car ownership is getting higher. Among the VISTA countries (Vietnam, Indonesia, South Africa, Turkey, and Argentina) on the heels of the BRICs, Turkey had the largest GDP, and was the sixth largest producer of vehicles in all of Europe, producing more than 1 million units.

In the steel tire cords business, following a customer's expansion of operations overseas, in November 2012, Sumiden Steel Wire (Thailand) Co., Ltd. began operations as a manufacturing and sales base in the Thai province of Rayong, opening the way for Sumitomo Electric to expand its steel cord business overseas.

Sumiden Steel Wire (Thailand) Co., Ltd.

History of 20

Chapter 4

Taking Flight

Toward Becoming a "Glorious Excellent Company"

2013–2017

Chapter 4

Section 1 Management

Beginning of "VISION 2017" toward becoming a "Glorious Excellent Company"

"VISION 2012" faced ongoing management challenges, shaken by the unprecedented global financial crisis triggered by the collapse of Lehman Brothers, shortly after launch, closely followed by the Great East Japan Earthquake, and the extremely high yen which broke through 80 yen to the U.S. dollar. Faced with these difficult circumstances, Sumitomo Electric turned its focus on strengthening internal operations, whereby it was able to ensure firm profits despite a fall in net sales. The second cabinet of Shinzo Abe, which took power in December 2012, promoted so-called "Abenomics," based on bold monetary easing and fiscal stimulus, the fields of health and medical care, and greater utilization of women. Consequently, stock prices rose and the yen depreciated, which improved the company's business environment. However, circumstances remained unpredictable both in Japan and abroad, with individual consumption wavering, in 2017, the new US president Donald Trump took office, proclaiming a policy of "America First," the UK declared its intention to leave the EU, and North Korea continued to present challenges.

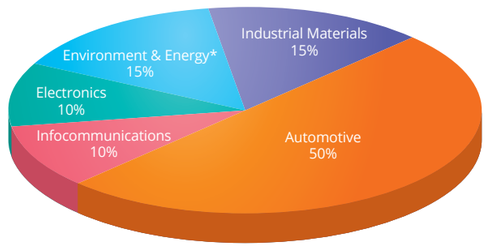
"VISION 2017," which began in fiscal 2013, aimed to create a "glorious excellent company," driven by a basic philosophy of "innovation" (business innovation), based on the business environment which began to improve in fiscal 2013. Leveraging the company's material and information technologies, Sumitomo Electric aimed to divide the business field into three categories, "new growth in current business fields," "expansion into integrated business fields" and "challenging new business fields." With the global and market circumstances marked frequent intermittent change, President Masayoshi Matsumoto and other executives probed the needs of customers and of the market, and the company's strengths, and to respond with a spirit of creative destruction.

In addition, the company set as its three priority efforts the "strengthening strategic marketing (new market creation)," "increasing global presence (promotion of diversity of personnel)" and "enhancing the leading technology (acceleration of commercialization)." These were interconnected, for example in the current business field, "strengthening strategic marketing" means strengthening relations with non-Japanese customers and emerging markets, naturally leading to "increase our global presence."

The foundation supporting these initiatives is comprised of three components which Sumitomo Electric works to strengthen: human resources (management based on global HRM policy, and promotion of diversity), manufacturing (competitiveness, QCD, safety and security, eco-friendly, etc.) and finances (stockholders' equity ratio 50%, dividend ratio 30%).

In the light of the tough business situation, the fiscal 2017 numerical targets were set at on a par with those in VISION 2012: net sales of 3 trillion yen, operating income of 180 billion yen (operating income ratio 6.0%), and ROA of 9%, which the company was able to soundly achieve. Targets for overseas sales and productivity ratio were both over 60%, and the target for the ratio of new product sales was 30%. Capital investment (annual average 150 billion yen) and research and development costs (annual average 90 billion yen) were both forecast to exceed the levels in VISION 2012. In addition, the company determined that the ideal future state was to transform the portfolio, which relies on the automotive segment for 60–70% of operating income, to one split between 50% automotive, 10% infocommunications, 10% electronics, 15% environment and energy, and 15% industrial materials.

Operating income portfolio in fiscal 2017
(by segment)



* Starting in fiscal 2013, we changed the name of the Electric Wire & Cable, Energy Segment to the Environment & Energy Segment

Ahead of the announcement of this vision, in January 2013, Sumitomo Electric relocated its Tokyo headquarters, which had been in Tamachi since 2009 during reconstruction, back to the completed Akasaka Center Building. Furthermore, in June 2016, the company consolidated its Chubu District Office and the Nagoya Branch Office to Nagoya Lucent Tower, adjacent to Nagoya Station. In April 2017, one of the projects for the 120th anniversary, the Toyota Branch, was completed.

Division into three fields and targets

Under the focus of VISION 2017, growth through innovation, the business was divided as follows.

Current business fields: Sumitomo Electric selected Mobility, Energy, and Communications as three current business fields in which to leverage the company's strengths.

Integrated business fields: A field which combines technology and product lines from current business fields to respond to new needs of society in business relating to the environment and city infrastructure.

New business fields: Fields where the Sumitomo Electric Group will take on new challenges, including life sciences and resources.

In the current business fields, Sumitomo Electric established the ideal future state for the five segments of Automotive, Infocommunications, Electronics, Environment and Energy, and Industrial Materials as follows.

(1) Automotive: All-round supplier of automotive parts
- In the market environment, advance the expansion of emerging markets, increased fuel efficiency in environmentally friendly vehicles (hybrid, plug-in hybrid and electric vehicles), and idling stop systems.
- Strategically, advance expansion of non-Japanese share, acceleration of new product development and of cost reduction.

(2) Infocommunications: Become a globally competitive vendor in the optical-related market (fiber, connect, transmission devices and systems)
- In the market environment, expand high-speed/large-capacity infrastructure development with increased transmission volumes, expand global FTTH, and grow the ITS business.
- Strategically, accelerate overseas expansion, cost reduction, strengthening of high profit products and expand products for smart functionality.

(3) Electronics: Be the top supplier of high-functionality wiring materials and highly functional parts and materials
- In the market environment, consumer appliances such as mobile phones and automobiles are both performing strongly and expected to see growth; development is underway in product modularization and commodification, and customer needs diversification.
- The strategies are to strengthen the global systems for manufacture and sales; boost development of new products; and expand customer bases and business fields.

(4) Environment & Energy: Offer high functional, high quality environmental and energy products and systems globally, and contribute to sophistication of social infrastructure.
- The market environment is seeing expansion both domestically and abroad of new energy systems, including sophistication of electricity infrastructure and energy saving. Demand in infrastructure is growing particularly in emerging countries.
- The strategy is to strengthen development of next-generation energy system-related products, enhance the solution proposal capabilities, and bolster the global supply structure.

(5) Industrial Materials: Leverage the company's world-class materials technologies, particularly in steel and rare metals, to globally provide high-performance and high-functionality products that support the basic functions of industry.

- In the market environment, automobiles are performing strongly, infrastructure demand expands particularly in emerging countries, rare metals prices are rising sharply, and supply shortage is severe.
- The strategies are to improve and innovate core technologies; strengthen raw material procurement; and accelerate overseas expansion.

Meanwhile, in the integrated business fields, in addition to business areas, technologies and product groups, Sumitomo Electric is undertaking cooperation between business segments and the research and development divisions in its initiatives, exercising the Group's comprehensive power, and seeking strategic collaboration with companies with which the company could have complementary relationships, as demand increases for greater integration.

In new business fields, Sumitomo Electric will build a business model that not only appropriately captures market and customer needs and provides products, but also uses open innovation and M&A, based on its proprietary technologies including ICT (transmission and control), materials (wiring, powder metallurgy, insulation and conducting), and harness (conducting). Specifically, the company will target areas such as medical and factory inspection equipment, bio, water-related, and sand cultivation (agriculture).

In the final year, fiscal 2017, Sumitomo Electric targeted net sales of 150 billion yen in the integrated and new business fields.

Organizational restructuring for achievement of the new vision

In June 2013, the company implemented organizational restructuring in order to promote innovation, which is at the core of VISION 2017.

An example is the establishment of the New Business Development Unit and the New Business Marketing & Promotion Division. The New Business Development Unit was created by transferring the SiC Power Device, Magnesium Alloy, and Water Processing businesses, positioned in the integrated and new business fields under VISION 2017, from the R&D Group and existing Business Group, with the aim of attempting to accelerate the commercialization of new themes. Thereafter, in regard to other themes, the company successively transferred from other units, while scrutinizing the state of progress in research and development and their status in preparation for commercialization.

Also, the New Business Marketing & Promotion Division captures various needs of society in a timely manner and is responsible for promoting new business from the marketing side in cooperation with the New Business Development Unit and the R&D Group. The priority efforts of VISION 2017 include responding to new markets that emerge, development that is closely aligned with markets and customers, and strengthening the market and customer perspective in research theme planning, which are the first steps toward achieving its goals.

At the same time, with the aim of developing the three key themes in the current business fields, and in integrated and new business fields, the R&D Group has also been restructured into an R&D Center, which pursues new possibilities by joining various technical resources within the Group, and the Core Research Laboratory, which aims to enhance core technologies and to encourage technological innovation to existing technologies and businesses. Through reorganization, as of January 2018, the R&D Center handles three areas--the new automotive field, power systems, and information network; and the Core Research Laboratory handles five areas—the new technology field, advanced materials, energy and electronic materials, optical communication, and transmission devices. In addition, Sumitomo Electric is attempting to accelerate innovation, with the Analysis Technology Research Center, IoT R&D Center and Cyber Security R&D Office in shared technologies, the CAS-EV Development Promotion Office which leverages synergy of Group technologies to lead innovation in the automotive industry, and the Power Device Development Division, which advances SiC-related crystal, substrate, transistor, and module development and commercialization.

Furthermore, the Life Science Business Development Division, established in April 2014, promotes development including food analysis with a composite imaging system using near infrared light, application to medical treatment in collaboration with Wakayama Medical University, and a human walking monitoring system.

In June 2014, Sumitomo Electric launched the Social Infrastructure Sales & Marketing Unit and to establish a dual sales unit structure with the Electronics Sales Unit. The unit is comprised of the Sales Planning & Marketing Division, responsible for overall planning management, together with nine sales divisions: Power Cable & System Sales, Telecom Carrier Sales, Industrial System Sales, Power Projects Business, Global Network System, Global Industrial System Sales, Central Japan Social Infrastructure Sales, Hybrid Products Sales and Optoelectronic Products Sales. Together Sumitomo Electric has strengthened collaboration between domestic and overseas, and between fields; and enhanced its ability to propose products as systems and solutions.

J-Power Systems Corporation becomes a wholly-owned subsidiary

Recent restructuring of Group companies included the incorporation of J-Power Systems Corporation (JPS) as a wholly-owned subsidiary in April 2014. While domestic growth in electronic wire demand was wavering, Hitachi Metals, Ltd.[1] announced its strategy to focus on high added-value cables, such as for medical use. In order to address the growing new energy system market in Japan and overseas, Sumitomo Electric hoped to expand and strengthen its business combining electric power storage batteries, and superconductivity with cables integrated. The company therefore reached an agreement with Hitachi Metals for acquiring all shares they held in the company. Thereafter, in August 2014, the sales and engineering (construction) divisions were transferred from JPS to Sumitomo Electric.

1 Hitachi Metals absorbed Hitachi Cable in 2013 and JPS was a joint venture between Hitachi Metals and Sumitomo Electric.

In January 2016, the design, development and quality assurance of JPS wires, cables, and power transmission equipment were transferred to Sumitomo Electric, and JPS specialized in manufacturing of electric wire and cable. Also, the design, development and production of overhead and distribution equipment was transferred to Sumiden Asahi Industries, Ltd. and the company name was changed to Sumiden Transmission and Distribution System Products, Ltd. In November 2014, Sumitomo Electric acquired shares of Sumiden Hitachi Cable Ltd. (HST) held by Hitachi Metals and Tonichi Kyosan Cable, Ltd., and gained 56% ownership in HST (remaining 34% and 10% held by Hitachi Metals and TATSUTA Electric Wire and Cable Co., Ltd. respectively).

In July 2014, Sumitomo Electric acquired the broadband business related to access broadband communications equipment from Sumitomo Electric, Ltd Networks, Inc. In October 2014, the company acquired the broadband business for the domestic CATV market from Broad Net Mux Corporation (BNMUX), and undertook internal integration and strengthening to better respond to new demand and the market (BNMUX remained responsible for maintenance services).

Transfer of shares in Sumitomo 3M Limited and ADVICS CO., LTD.

In September 2014, Sumitomo Electric sold all of its shares in Sumitomo 3M Limited in response to their request. The company came into existence following discussions in 1958 between the heads of the 14 Sumitomo Group companies and U.S. company 3M.[2] In 1961, the company was established with 50% financing from 3M, and 25% each from Sumitomo and Nippon Electric Company, Limited (NEC). (3M acquired NEC's shares in 2003.) Through the sale, Sumitomo Electric recorded extraordinary gain of 44 billion yen in its 2014 financial results.

In November 2014, Sumitomo Electric and three other companies, Aisin Seiki Co., Ltd., DENSO CORPORATION, and Toyota Motor Corporation, reached an agreement with ADVICS CO., LTD., which was established to consolidate the brake business, to proceed with further business consolidation. In September 2016, at the time of third party allotment of shares of ADVICS, the company transferred its ADVICS shares to DENSO and reduced its investment to 18% from 6%.

Strengthening the foundation for global expansion

The priority in VISION 2017 of "increasing global presence" refers not only to quantitative business growth but also signifies becoming a global company in terms of qualities including information sharing, human resource utilization, and compliance. Already in the fiscal 2012, 48.6% of Group sales were overseas. The company implemented further measures to establish a structure suited to such conditions and to realize the new vision.

Then, in February 2014, the company unified the Group newsletter, which was previously published separately, to release *ALL SEI* for all Group employees, in Japanese, English, Chinese, German, and Thai. The newsletter is a communication tool to share the Sumitomo Spirit, the Sumitomo Electric Group Corporate Principles, messages from management, business conditions, and information from each region about their business and social contribution activities along with interviews with global managers, to enable sharing of information between Group employees, nurture a sense of unity, and boost motivation.

Group Global Championships

ALL SEI

In April 2014, in preparation for realization of its global HRM policy, the company introduced a global grade system as a human resources system whereby personnel with ability and talent can be responsible for management of Group companies in Japan and abroad, and can achieve more than required by duty, aiming for broad career growth beyond their individual company. Executives at subsidiaries abroad (excluding listed subsidiaries) and equivalent persons were graded as "GL," and leadership personnel equivalent to this grade were recognized as "Group Global Executive." The evaluation and remuneration of Group Global Executives is determined at headquarters and by the business unit. In addition, they are offered career opportunities and given support to play a more active role.

From January 2015, Sumitomo Electric introduced visual identity (VI), which began with the renewal of its website. The company expressed its Group brand values of Visionary, Committed, Diverse and Innovative, in a visual way, and began initiatives to share this with employees and business partners worldwide and enhance its appeal.

2 At the time, 3M was an acronym for Minnesota Mining & Manufacturing Co., however, in 2002, the official company name was changed to 3M Co.

In terms of global bases, in June 2015, the company established a branch office of Sumitomo Electric (Thailand) Ltd. in Yangon, Myanmar in order to boost research and sales support for the Sumitomo Electric Group. Since the inauguration of the new government in Myanmar in 2011, democratization has been making progress. Given the country's human resources of over 60 million population and its strategic location between India and China, it is viewed as the "last frontier" in Southeast Asia, investment from abroad is growing and economic development is accelerating. Against this background, establishment of this new branch office has played a role in conducting broad market research, focused on social infrastructure including infocommunications, electricity and transportation; in sales promotion; and in providing sales support for local dealers.

These measures were incorporated into the activities of each business segment and sales unit, and thereafter, the ratio of overseas sales has continued to rise, approaching 60%, reaching 59.7% in fiscal 2017.

Interim revision of VISION 2017

In May 2015, Sumitomo Electric announced its interim revision of the company's VISION 2017. Based on the experience of facing changes to the business environment, such as the global financial crisis (after the bankruptcy of Lehman Brothers) and the Great East Japan Earthquake, which one company could not deal with on its own, VISION 2012 was designed with an interim revision planned from the beginning.

In the interim revision, Sumitomo Electric noted that factors such as the economic slump in emerging countries resulted in a bearish market compared with expectations at the time of planning. It was also explained that the sharp decline in the value of the yen from 2013 meant that the company achieved its fiscal 2015 targets for net sales and operating income (2.6 trillion yen and 130 billion yen) in fiscal 2014, ahead of schedule.

In addition, Sumitomo Electric redefined its final numerical targets to net sales and operating income of 3.3 trillion yen and 200 billion yen respectively, ROA of 9% or above, and ROE of 8% or above, and increased capital investment and research and development expenses. The portfolio goal was left unchanged, while the company undertook new strategies. In environment and energy, it strengthened its power cable business by making JPS a wholly owned subsidiary; in infocommunications, it entered the North American CATV market; in electronics, it expanded its automotive market; and in industrial materials, it developed the aviation sector and ore refining.

Launch of the *Monozukuri* Technology Improvement Committee

In regard to enhancing the company's *monozukuri* (manufacturing) capabilities, in order to further strengthen competence in SEQCDD, in April 2015, Sumitomo Electric established the *Monozukuri* Technology Improvement Committee as a company-wide organization. The committee laterally promoted line activities for *monozukuri* innovation by business segments and subcommittee activities concerning companywide shared technology, based on the two pillars of quality assurance of own processes quality assurance activities, and the SEI just-in-time approach.

Own Process quality assurance activities involves incorporating quality into processes, aiming for processes that do not producing defective products or transmit them to later process stages. The concept does not rely on final inspection, but rather hopes to achieve perfection in each manufacturing process. The SEI just-in-time approach seeks the manufacture of what is needed in the right quantity at right timing. Sumitomo Electric positioned these two concepts as a goal for all products and all production methods throughout the Sumitomo Electric Group.

Promotion of open innovation

In VISION 2017, Sumitomo Electric also emphasized acceleration of the development of new technologies and products using open innovation by collaborating with other companies and research facilities.

In July 2013, the company signed a comprehensive cooperation agreement with Wakayama Medical University to develop new medical equipment including application of "Compovision," the company's unique composition imaging system which uses near infrared light, in the medical field.

In July 2014, the company began joint development and verification testing by combining the cultivation equipment Sandponics,[3] which the company has been developing since the 1970s, with the advanced cultivation environment control technology of Chiba University. Testing aimed to greatly increasing the yield of high sugar content tomatoes. Testing was conducted using Chiba University's solar lighting plant factory, with the aim of contributing to agriculture which, regardless of natural conditions, does not use fossil fuels.

Promotion of diversity

Sumitomo Electric also focused on promoting diversity, as proclaimed in VISION 2017, a management strategy to defeat competition. The company promoted the development of a corporate culture where diverse human resources can exercise their abilities. Overseas, the company introduced the above-mentioned global grading system. Furthermore, the company expanded its support system for returning to work after childcare and nursing, as mentioned above, and provided a company childcare center, in an effort to help women play a more active role. In July 2016, the company introduced a full-scale teleworking system. The company has also bolstered career development training for female employees and diversity management training for managers.

Multifaceted enhancement of CSR

Sumitomo Electric also strengthened implementation and promotion of CSR.

In terms of compliance, since 2009, in relation to the competition laws, Sumitomo Electric Group has been investigated for misconduct by the authorities, and has been required to pay fines or received violation action exclusion measure orders from a number of countries in several business fields including high-voltage power cables and automotive wiring harness, both in Japan, and also in related countries/regions such as the U.S., the EU and China. The company also received claims for damages from the respective customers of the violating transactions and was targeted by class actions seeking damages in the U.S. and Canada. This brought the total surcharge and settlement to 64.5 billion yen by fiscal 2017, which the company posted as extraordinary loss. In regard to the various competition laws, there have been cases such as transaction suspension by customers, and the filing of a shareholder representative lawsuit against company officers. Consequently, revision of competition law compliance was the company's most important management task at the time. In regard to this, Sumitomo Electric believed that one reason that these problems arise and continue is the corporate culture. Since these incidents, top management repeatedly conveyed the message "Compliance is a major prerequisite of the business and must be prioritized over profit." The company strives to establish the Sumitomo Spirit, centered on integrity and working proactively. Since 2010, Sumitomo Electric has worked to firmly establish compliance and to prevent its deterioration. It established and implemented regulations for compliance with the competition laws; organized compliance promotion systems in each sales and business division; and promoted compliance training activities globally. Furthermore, since 2013, the company has promoted anti-bribery compliance.

In addition, after the Kumamoto Earthquakes in April 2016, Sumitomo Electric donated 10 million yen to relief efforts via the Japanese Red Cross Society.

Meanwhile, since 2012, the company has also made efforts toward the promotion of sports, with the aim of contributing to Japan's sport's world, corporate image enhancement, and morale boosting for employees and the Group. In particular, the company's circle activities focused on track and field events, partly because some of the company's employees were participating as leading athletes. In July 2012, Sumitomo Electric undertook repair work and made other contributions for all-weather proofing the athletic track of Sumitomo Sogo Ground.[4] In addition, since March 2013, the company has been an official sponsor of Lake Biwa Mainichi Marathon. It has also strengthened its athletics club and made its first appearance at the All-Japan Men's Corporate Team Ekiden Championships ("New Year Ekiden" relay race) in 2014. Since then, the company has sent athletes to the World Athletic Championships and the Rio Olympic Games.

In regard to CSR, the company received the Minister of Economy, Trade and Industry Prize from the Reduce, Reuse, Recycle Promotion Association in October 2014. It also received the division award of the Environmental Communication Awards in relation to reporting.

Strengthening information security management

Sumitomo Electric formulated its Information Security Policy in 2003. Since then, the company has promoted information security measures centering on the Information Systems Division, but security risks to enterprises have risen with the increase in the number and sophistication of cyber-attacks. Against this backdrop, Sumitomo Electric believes that it has a social obligation to maintain high quality security as the company's products and production facilities are connected to the network. In October 2016, the company established the SEI-CSIRT Office to oversee group information security in order to further strengthen its information security management systems.

120th Anniversary and commemorative projects

In April 2017, Sumitomo Electric celebrated its 120th anniversary.

Projects for the company's 120th anniversary included expansion and relocation of Toyota Branch Office; renovation of cafeteria and entrance of Osaka Works; updating of uniform; creation of new logo; and convivial parties to celebrate the 120th anniversary (held in Osaka, Nagoya, and Tokyo).

A new building (4 stories, floor space of 5,176 m^2) was constructed for the Toyota Branch Office in Toyota City. The wiring harness sales division, and the sales division for coil, used for in-vehicle motors were also located there. The company thereby achieved collaboration between sales and technology, unification of customer contacts, and improved proposal capabilities toward automobile manufacturers.

Appointment of Osamu Inoue as president

In June 2017, Masayoshi Matsumoto was appointed chairman & CEO, and Managing Executive Officer Osamu Inoue was appointed president & COO. Chairman Matsumoto was appointed Chairman of the Kansai Economic Federation, whereby he is responsible for promotion of the entire Kansai economy.

After joining the company, the new president, Inoue, worked mainly in the accounting and automobile segments. He demonstrated his skills in restructuring overseas subsidiaries. After serving as president of Bordnetze, acquired from Volkswagen AG, he became president of Sumitomo Wiring Systems Co., Ltd., which became a wholly-owned subsidiary, from 2012 until March 2017. He also acted on his will to strengthen communication both inside and outside the Group,[5] with a management foundation of contributing to society and providing stable earnings by providing high quality products, with the motto of "Detailed checks and bold decisions."

In his first fiscal year as president and the final year of VISION 2017, although the company did not achieve the higher target set for fiscal 2017 following the interim review, net sales reached 3.822 trillion yen, operating income was 173.1 billion yen, and net profit was 120.3 billion yen, which were all record highs. Together with the boost to stand-alone profitability, this added momentum to VISION 2022.

Under the new structure, Sumitomo Electric will promote the development of its birthplace, Kansai, and global business expansion, while adhering to the Sumitomo Spirit, and creating further history.

3 Equipment that combined sand cultivation technology with automatic irrigation and fertilization functions.

4 Constructed in February 1965 on a reclaimed section of Koya Pond, in Itami City, Hyogo Prefecture, and operated by 36 companies of the Sumitomo Group.

5 Sumitomo Electric created an e-magazine "id" based on the concept of a magazine to create the future of the Sumitomo Electric Group. It is a medium for sharing the state of the Group from various perspectives.

Supporting Sports

Support for Sports and Health Management

Sumitomo Electric takes the Sumitomo Spirit as its spiritual foundation, which has been passed down from generation to generation for 400 years. Among the principles outlined there, Sumitomo Electric places particular value on *banji-nissei*. The company believes that completing one's tasks to the best of one's abilities, and steadily accumulating experience leads to individuals flowering in the future. There is something similar to this in the attitudes of athletes and sports instructors and, for this reason, Sumitomo Electric provides support for various sports and athletes. Through its sports support activities, the company also aims to contribute to the growth of local communities.

Tomoya Tamura at the Rio 2016 Olympic Games

Sports activities from before the war

At present, Sumitomo Electric is focused on providing support for sports that have featured prominently in its 120-year history.

Records show that Sumitomo Electric established its athletics club in 1928 to participate in the Sumitomo Club Competition, a Sumitomo Group sports event. Sumitomo Electric made its presence felt by winning the Kansai Industrial Track & Field Association Competition for seven consecutive years from 1996.

Around the time the athletics club was created, volleyball fans in the company established a nine-member volleyball team. In 1981, it was featured in the Nikkan Kogyo Shimbun's "Our Company's Clubs" feature, and in November of that year it first participated in the All-Japan Industrial Volleyball Championships, coming second, and came to demonstrate a high level of ability continuously.

Kensuke Takezawa

Competing on the national stage and contributing to society

In athletics, Ai Wakabayashi won the women's 400 m hurdles at the 2009 Japan National Industrial Teams Championships; in 2012, Airi Ito and Yusuke Kotani, who had both competed at the Asian Games while at university, joined Sumitomo Electric. With their participation, the athletics club reached a level where it could compete nationally, and its name was changed to the *Rikujo Kyogibu* (track and field club). The club also transformed from an association of amateur enthusiasts to a competitive team under the company's control, while the company strengthened support to nurture talent capable of competing in national competitions and the Olympics. In October 2012, as part of its regional contribution activities, Sumitomo Electric hosted the Sumitomo Track and Field Festival. Members of the Japanese national team were invited to meet local residents, and participate in events aimed at breaking national track and field records.

Olympian Kensuke Takezawa joined Sumitomo Electric in 2013, and competed at the All Japan Industrial Teams Men's Ekiden (New Year relay race) between 2014 and 2016. He gave the relay team a truly national presence.

In 2015, Yasuyuki Watanabe, who had led Waseda University to the triple crown of University *ekiden* relay races in 2010, was appointed manager, further strengthening the company's track and field team.

The same year, Yuta Konishi won the men's 400 m hurdles at the Asian Games; both he and Tomoya Tamura—in the men's 4 × 400 m relay—went on to represent Japan at the IAAF World Championships Beijing 2015. Sumitomo Electric also won the overall standings at the Japan National Industrial Teams Championships for the first time.

Tamura also took part in the 2016 Rio Olympics. Group employees cheered for him both at the venue and at public viewings—a demonstration of the power of sport to unite the Group.

In 2017, Kosuke Horii was selected on the Japanese national team for the IAAF

Yuta Konishi at the IAAF World Championships Beijing 2015

World Championships London 2017, whereby Sumitomo Electric has been represented at three successive world-level events. The same year, Hyuga Endo broke the under-20 Japanese record in the men's 3000 m, and set the fifth fastest under-20 time in Japanese history in the 5000 m. Inspired by his stage win, Sumitomo Electric finished in 11th position at the 2018 New Year Ekiden relay race; demonstrating the team's top-class abilities on a national level.

Manager Yasuyuki Watanabe

Kosuke Horii at the IAAF World Championships London 2017

The 62nd New Year Ekiden relay race, 2018

Promoting sports in local communities

The volleyball club won their first All-Japan Championships at the 1988 Sakurada Memorial Corporate Team Tournament; in fiscal 1997 and 1998, they won four of the five leading national competitions. More recently, in fiscal 2016 the team won the 69th All-Japan 9-man Volleyball Industrial Men's Championships and the 87th All-Japan 9-man Volleyball Men's Championships the following year. Up to and including fiscal 2017, the team has recorded more than 30 victories at All-Japan events. The team also hosts regional volleyball classes for mothers and engages in other regional sports promotion activities. Using its traditional volleyball style of "keeping the ball in play" and "winning with powerful spikes," the team is aiming to secure further All-Japan titles and achieve its ultimate goal of winning the single-year grand slam—that is, winning every All-Japan event in a single year.

Diverse support initiatives

In addition to strengthening its corporate teams, Sumitomo Electric is also focused on activities aimed at energizing sports as a whole.

The company has sponsored and supported the Lake Biwa Mainichi Marathon since 2013, the Osaka Marathon, the Japan U20 Indoor Track and Field Championships, and the Kansai University Men's Ekiden Relay Race. Sumitomo Electric will also sponsor the 10th World Masters Games,[1] scheduled to be held in the Kansai region in 2021. Since it is headquartered in Osaka, the birthplace of Sumitomo, the company plays a particularly significant role in promoting sports in the Kansai region.

In 2017, Sumitomo Electric made a sponsorship deal with Yui Hamamoto, who won silver at the 2016 World Team Table Tennis Championships, and won gold in the women's doubles at the ITTF World Tour Grand Final.

1 The World Masters Games is held every four years under the auspices of the International Masters Games Association. It is an international multi-sport event at which, in principle, any sports fan aged 30 or over is eligible to compete; its motto is "sport for life." The Sumitomo Electric Group is aiming to be represented by some 500 employees at the 2021 event in Kansai.

Sumitomo Electric secures its first-ever overall victory at the 63rd Japan National Industrial Teams Championships in 2015

The 87th All-Japan 9-man Volleyball Men's Championships (2017)

Volleyball classes for mothers

68th Lake Biwa Mainichi Marathon (2013)

71st Lake Biwa Mainichi Marathon (2016), photo supplied by the Mainichi Shimbun

Launching "Kenkatsu!" for health management

Sumitomo Electric's sports support activities are also linked to promoting health lifestyles among its employees. In December 2015, the company drew up the Sumitomo Electric Group Health Management Declaration, which defined its intention to actively support health maintenance among its employees, and to promote health promotion measures as an organization. To this end, the company established an Occupational Health and Safety Management Committee, and formulated Group-wide Health Management Regulations; Sumitomo Electric has also implemented mental health measures, increased the scope of eligibility for its sports incentives, and held Health Festivals with the aim of promoting health among its employees, their families, and local communities.

In July 2017, the company launched its "Kenkatsu!" health maintenance and improvement activities, including passive smoking countermeasures, increased support for individual and team sports, and created an incentive system for employees to review their lifestyle and habits.

Trial yoga class at the Family Health Festival

ケン カツ
健活!
Kenkatsu!

1 Striving to respond to the next generation vehicles and to strengthen sales for the automotive business

Development of the aluminum wiring harness business

In the automotive field, Sumitomo Electric will further strengthen the wiring harness business, a key business pillar, while accelerating its response to next-generation vehicles.

From a technical perspective, the company has undertaken full-scale sales expansion of aluminum wiring harness, which were first adopted in 2010. Because of issues such as their strength, only about 30% of these harnesses were used for automobiles. However, the company promoted development aimed at adoption of aluminum harnesses for all automotive wiring harnesses as early as possible. In April 2015, it managed to develop and achieve adoption of high-strength harness for use with engines, overcoming earlier problems of vibration and high temperature. Sumitomo Electric used a special high-grade aluminum alloy, to produce harnesses half the weight of copper harness, making it possible to replace up to about 70% of automotive wiring harness with aluminum harness.

In April 2012, the company established SEI Thai Electric Conductor Co., Ltd. for production. The company began manufacturing aluminum wire for automobiles from September 2014. A production process for aluminum wire rods was added in October 2016 to create an integrated production system from casting, rolling to automotive aluminum wire. The supply structure then consisted of two bases, together with Sumitomo Electric Suzuka Works. Mass production of high-strength materials began at both sites in April 2015, creating a system to prepare for the shift toward aluminum wiring harness for all automotive wiring harness.

Groundwork for next-generation vehicles

The automotive industry is undergoing a "once in a century" revolution with changes represented by the keywords Connected, Autonomous, Sharing and Electric (CASE). New players including major IT and emerging EV manufacturers are also entering this era of drastic innovation.

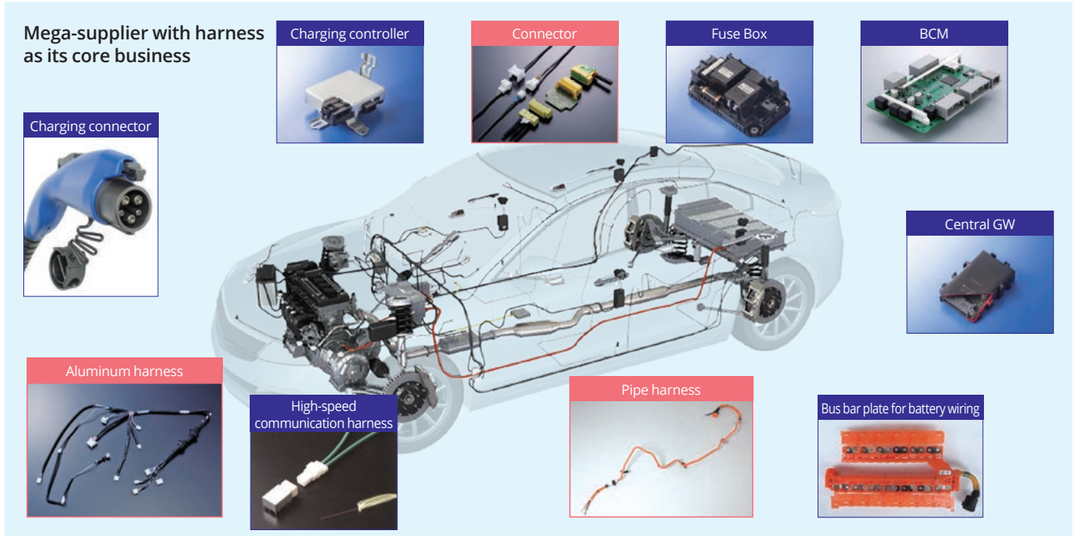
In response, in October 2016, Sumitomo Electric Group established a chassis dynamo experiment equipment with a radio wave darkroom able to reproduce a radio wave environment during driving of the car at Sumitomo Electric Wiring Systems Suzuka Plant to strengthen the company's development capabilities.

In addition, the company established the NEV[6] Development Office at AutoNetworks Technologies, Ltd., the NEV Business Planning Office at Sumitomo Wiring Systems, and the CAS-EV[7] Promotion Office at Sumitomo Electric, creating a system to respond to new developments. These actions were aimed at creating a more lateral company-wide structure, unifying business, research, planning, and sales divisions, in order to strengthen cooperation between automobile, electric power, and infocommunication divisions.

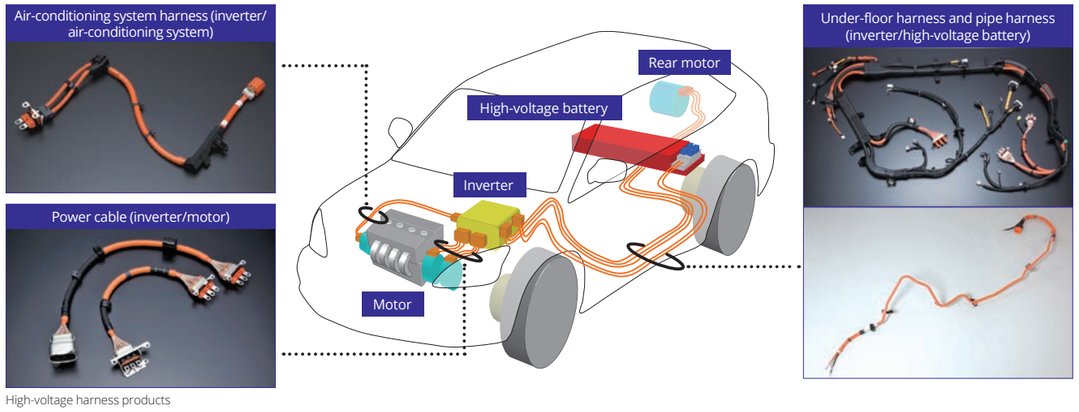
The NEV Business Development Office began proposals for distinct components from the perspective of vehicle concepts, and functional requirements in an effort to evolve from the conventional "component perspective" to "car-centered perspective." The NEV Business Planning Division examines modules for electric vehicles and battery-related products that can not be handled by individual business divisions. The CAS-EV Promotion Office started collaborating with customers and partners outside of the automotive industry. It aims to build new information networks and services based on the concept of coordination between electric energy and infrastructure leveraging EV, and cars and communication infrastructure using AI and IoT.

Consequently, the company has been able to examine a wide range of products, and is promoting their development in earnest. Products include Gateway-Electronic Control Units (GW-ECU) with Firmware On-The-Air (FOTA) function, capable of rewriting software from the communication network; high-speed communication harness able to transmit camera images without delay; integrated antennas for next-generation 5G; inductive power supply units and high-speed charging cable able to significantly improve charging convenience; and Virtual Power Plant (VPP) servers that optimize management for charging multiple EVs.

As a result of these initiatives, in fiscal 2017, net sales in the automobile segment exceeded 1.6 trillion yen, segment profit at 96.8 billion yen approached the 100 billion yen mark, and the company's global market share for wiring harness grew to almost 30%. Consequently, following on from VISION 2007 and VISION 2012, the wiring harness business achieved the mid-term management plan target for the third consecutive time.

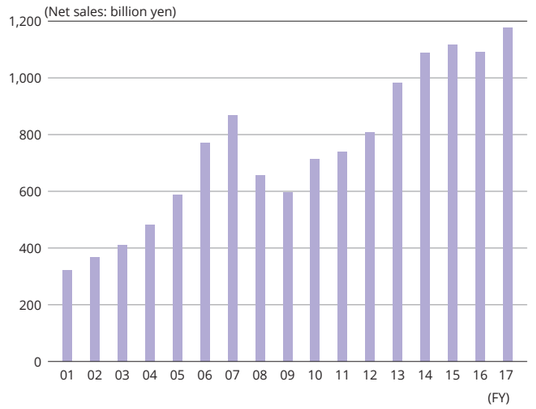


6 New Energy Vehicle (general term for PHEV, EV and fuel-cell vehicles)
7 An electric vehicle corresponding to the "CAS" in "CASE" described in the main text.

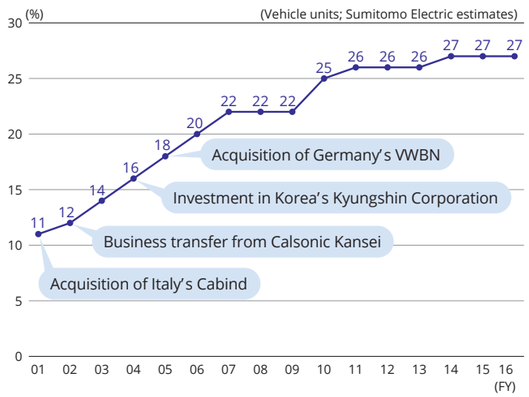


High-voltage harness products

Results of harness business



Share of global harness market



2 Infocommunications business aiming to differentiate with high-end products

Expansion of the optical fiber business and development of cable for data centers

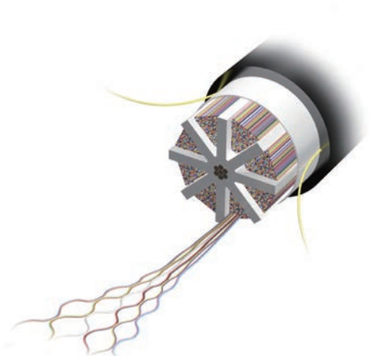
In the infocommunications segment, Vision 2017 outlines the company's aims for growth, including global expansion and enhancement of high-end products. Sales generally grew steadily, and in fiscal 2017 the company achieved net sales of 220.3 billion yen, up 42% compared to fiscal 2012.

In the optical fiber industry, global demand grew from 290 million kmc (kilometers of fiber cores) in 2013 to 500 million kmc in 2017. Sumitomo Electric boosted its efforts in growth regions around the world and increased its sales. In addition to the results from cost reductions, earnings also grew rapidly due to the weakening of the yen since 2013. Aside from the standard single-mode fiber segment, since the large capacity digital coherent method in the submarine cable field is commercialized, the company has gained attention for its ultra-low loss Z fiber. The company launched Z-PLUS Fiber 130

ULL (Z+130), which is effective for high input signal power by enlarging the effective core area to about 1.6 times compared with the conventional Z fiber, by using the same method. As a result, in 2014, the company successfully delivered Z+130 for a cross-Pacific system, the world's first transoceanic system using the digital coherent technologies. Due to its low-loss properties, it successfully reduced the number of optical amplifying repeaters in the optical submarine cable system, thereby contributing to total cost reduction. In 2013, the company achieved a new world record for the lowest optical transmission loss of 0.149 dB/km (wavelength 1,550 nm), and 0.1419 dB/km (wavelength 1,560 nm) in 2017. Sumitomo Electric also promoted development of multi-core optical fiber in collaboration with NTT and KDDI, anticipating application in next-generation data centers and for submarine cable. In 2017, the company set a new record for large capacity transmission of 10.16 Pbps.[8]

The Japanese optical cable market has matured and growth in demand is not expected. Consequently, in 2014, the company closed the Optical Cable Plant of Osaka Works and consolidated optical cable production at the Optical Cable Plant of Yokohama Works. Meanwhile, as new demand for optical cable is rapidly rising for use by data centers abroad, Sumitomo Electric has continued to lead this market, and quickly began development and delivery of ultra-high-count cable, containing over 3,000 fibers, aimed at major data center operators. These sales grew significantly from 2016, to the point where it accounted for one-third of optical cable sales, as the cable business has continued to globalize.

In 2015, which marks 35 years since the commercialization of optical fiber telecommunications, the VAD Method, a mass production method promoted by Sumitomo Electric for high quality optical fiber, received an IEEE Milestone[9] together with NTT, Furukawa Electric Co., Ltd and Fujikura Ltd.

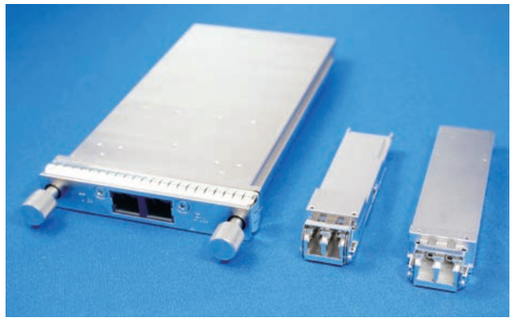


Ultra high fiber count cable (3,456 fibers)

Development of transmission and related device business

Meanwhile, the transmission device business of Sumitomo Electric Device Innovations, Inc. (SEDI) saw a rapid recovery in results following the weakening of the yen in 2013 combined with an expansion in sales from the introduction of new products. In June 2013, SEDI shut its Osaka Plant and consolidated its mass production function for downstream processing to Sumitomo Electric Photo-Electronics Components (Suzhou), Ltd. (Suzhou City, China). Next, the upstream processes for device element manufacture previously handled at SEDI's Yokohama Plant were consolidated at the Yamanashi Plant (Showa-cho, Nakakoma-gun, Yamanashi Prefecture), which was also assigned the mother plant function for optical elements TOSA and ROSA (receiver optical sub assembly). At the same time as this restructuring of business operations, the company actively implemented expansion of manufacturing facilities for 10 Gbps EML[10] TOSA, for which demand was growing rapidly, and commercialized GaN devices, positioned as a strategic product. The company also undertook development to improve the performance of 10 Gbps DFB-LD and to boost the power of GaN devices in an effort to expand the business. In particular, GaN devices saw a rapid rise in sales for LTE (Long-Term Evolution) fourth-generation mobile communication system compatible products for 2–3.5 GHz base stations.

SEDI actively promoted internal technical integration for development of new products, contributing to business expansion through commercialization of products including



Optical data link

8 Pbps (petabit/second). Peta = 10^{15} = 1,000 trillion, or one million times a mega.
9 IEEE Milestones are awards presented by the world's largest society of electrical and electronic engineering, the Institute of Electrical and Electronics Engineers (IEEE), to recognize key historical achievements in electrical and electronic engineering and related fields. In Japan, technological achievements including the Tokaido Shinkansen and hi-vision have received awards.
10 Abbreviation for External Modulation Laser Diode, an external modulated LD for high-speed and long-distance transmission.

FSU7100 series, GE-PON center equipment for North American CATV operators

subscriber 10 Gbps Bi-D modules, and 100 Gbps Ethernet optical links. Also, the company undertook the development of next generation products including coherent optical devices for trunk lines, Ethernet over-400 Gbps high-speed optical links, VCSEL products for data centers, fifth-generation mobile communication system 5G compatible 3.5–4.5 GHz high output GaN devices and inter-base communication 28 GHz high-frequency GaN devices.

Also, in May 2013, the company's GE-PON[11] products, which support optical broadband access, were among the first to be certified under version 1.0 of the DOCSIS Provisioning of EPON (DPoE) specifications of Cable Television Laboratories, Inc. (CableLabs). Sumitomo Electric was the only Japanese company among those certified. DPoE is a technology comprising gigabit scale high capacity optical network utilizing existing CATV infrastructure and management systems, through integration of DOCSIS conventional CATV operation management with EPON optical access telecommunications technology, which CableLabs is promoting the standardization of. Acquisition of certification marked the beginning of development of the North American market.

In December 2014, Sumitomo Electric began delivery of IP set-top boxes for the world's first commercial 4K 60 frame/second compatible IP image distribution service which NTT Plala Inc. launched on their Hikari TV. It is able to provide high definition 4K images with definition roughly four times greater than high vision for television via an IP broadband network. Its successor, designed for popularization, launched in 2016, secured the 4K market share lead. From July 2017, Sumitomo Electric began to offer hybrid 4K compatible "Cable Plus STB," operable by voice recognition, suited for both CATV and IPTV, through KDDI for

ST-4100 4K-compatible IP set-top box

CATV. These 4K set-top boxes contributed to the launch of a 4K service in Japan and the recovery of the profit for the broadband network equipment business from 2016 to 2017. The company is continuing to invest in advanced development investment in preparation for advanced BS broadcast scheduled to start in December 2018.

Meanwhile, while the full-scale introduction of 10G-EPON by NTT was behind schedule, by 2015 the company gained a place among the top two MSO (multiple system operators) in North America. However, with the gradual progression in increased speed for existing optical coaxial infrastructure, the rise of full-scale demand was delayed, and it became apparent that recovery in positive balance would require a long-term strategy. Consequently, in March 2018, Sumitomo Electric formed a partnership with North American company ADTRAN, Inc., the third largest provider of telecommunications equipment for North American carriers. Sumitomo Electric decided to transfer the EPON business for North American MSO to ADTRAN, to provide technical licensing and OEM supply, and to promote cooperation on a global scale. During this period, in Japan, the company was laterally deploying 10G-EPON, with global specifications virtually identical to that used for North America, in the CATV and PNJ (Power Nets Japan: electric utility telecommunications carrier) markets. In 2017, the company recovered to gain the leading share in both markets.

Development of traffic-related information systems

In regard to traffic-related information systems, in 2016, Sumitomo Electric secured an order for the Hiroshima Prefectural Police traffic management host system, which grew into deliveries to 12 prefectures.

Overseas, the company received an order in Cambodia for a traffic control system for Phnom Penh's core area (115 intersections in 2015).

Hiroshima Prefectural Police traffic management host system

11 Abbreviation for Gigabit-Ethernet Passive Optical Network, a gigabit network comprising station-side equipment and subscriber-side terminals.

In terms of road-to-vehicle communication, Sumitomo Electric developed ITS wireless equipment ahead of other companies using the 700 MHz bandwidth previously used for analog TV broadcasts. From fiscal 2017, the Driving Safety Support System (DSSS), which coordinates vehicles with infrastructure, has been deployed nationwide, and it is expected that this will also contribute to further developments in autonomous driving.

Also, in 2014, the company took orders from four divisions of West Nippon Expressway Company Limited (Kansai, Chugoku, Shikoku, Kyushu) for centralized traffic volume measurement equipment. In the private sector, Sumitomo Electric contributed to smoother traffic flow with the adoption of its telematics products, Traffic Vision and AgentNavi by Yahoo! CarNavi.

3 Electronics business expands from FPC into multiple fields

Growth of FPC business

In fiscal 2008, although sales for the electronics business fluctuated each quarter, electrical wires, FPCs, and other remained at roughly one-third of the total. However, from about fiscal 2010, growth in FPCs became conspicuous, and from the latter half of fiscal 2012 through to fiscal 2015, it grew to comprise 50–60% of sales. The driving force behind this rapid growth was its adoption by major smartphone manufacturers for their latest models. In May 2013, Sumitomo Electric gained greater recognition for its technological capabilities and responsiveness to miniaturization and multilayering, such as in FPCs with conductive paste connection, for which it had begun mass production.

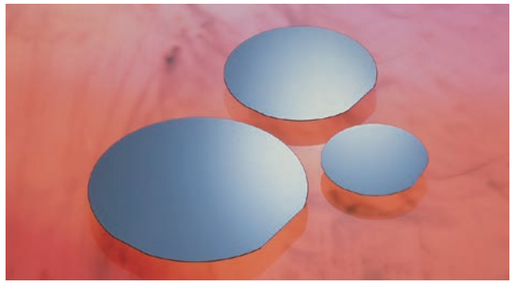
By developing highly conductive paste using its proprietary nano-sized conductive particles, it opens vias (holes to connect layers with a multilayer printed circuit board) after circuit formation and fills them with paste for connection. Realizing this process has significantly changed the conventional process of creating circuits after plating. Because it is possible to create a circuit without plating, it makes it easier to form finer circuits and increases the reliability of connections. In addition, Sumitomo Electric's FPC business has developed more responsive technological capability for multilayering and miniaturization, including the launch of high heat-resistant FPCs in October 2013 This established the FCP vendor among the top five in the world.

Meanwhile, because smartphone companies undertake procurement from multiple vendors as they seek to secure a large volume and stable supply, price negotiations are also intense. Despite multilayering and miniaturization, there is little increase in the FPC unit price. Also, because demand concentrates around the time of the once a year release of new models, the business environment is increasingly tough, with fluctuations in business even more extreme than before. Under such conditions, production was transferred to SEI Electronic Components (Vietnam), Ltd. which was established in 2012 in Hanoi, Vietnam. Increasing the proportion of integrated production overseas and automating production processes was promoted to reduce cost and to maintain and improve competitiveness. The company pushed forward with the development and marketing of high added-value products in Japan and realized even greater business expansion.

SEI Electronic Components (Vietnam), Ltd.

Development of the compound semiconductor business

The compound semiconductor business established its production and sales structure at the four bases of Japan (Itami, Kobe), the U.S. and Taiwan, around the four product axes of wireless communication GaAs substrate and optical communication InP substrate, red to infrared-light emitting GaAs substrate, and green to blue-light emitting GaN substrate. In 2016, there was a growing need for development of 3D sensor light source VCSEL (vertical-cavity surface-emitting laser) for smartphones. Sumitomo Electric developed and supplied 6-inch diameter low defect GaAs monocrystal, thereby accelerating development for customers. Mass production began in May 2017, which contributed to growth of the business.



6-inch GaAs substrate

Development of the electric wire business and strengthening of the electronic product sales structure in China

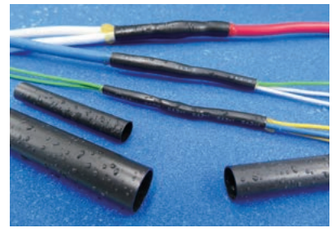
In the electric wire business, the following four products were the main axes for the company; the Irrax series wire coated by heat resistant plastic which was electron beam cross-linked, micro coaxial cable/harness, SUMI-CARD flexible flat cable, and Tab Lead lithium ion battery electrode lead. The company established its production and global supply structure, around eight bases in Japan, the U.S., Europe, China, and Southeast Asia.

In VISION 2017, as one of the company's strategies to bolster the global sales structure, including FPCs, a specific measure taken in October 2013 was to establish an electronic product sales management company, Sumitomo Electric (Shanghai) Electronics, Ltd., in China (Shanghai) Pilot Free Trade Zone which started operating in December.

Previously, in the Chinese market, the sales teams at four companies had operated independently (two in Suzhou: FPC/electric wire and heat-shrinkable tubing; one in Shanghai: electric wire; and one in Shenzhen: electric wire and FPC). By consolidating these, Sumitomo Electric strengthened marketing activities by adopting a bird's eye view of activity efficiency and the overall Chinese market (fields and customers). At the same time, the existing four companies began to specialize in manufacturing. The new company handles the products of the four companies, and also deals with products of Group companies outside of China, aiming to further expand sales to customers, including establishment of branch offices in North China and inland areas.

Growth of fine polymer business

With Sumitube, a heat-shrinkable tubing that is the main product of Sumitomo Electric Fine Polymer, Inc., the company focused on the development of shrinkable tubes with hot melt adhesive that performs the function of environmental sealing at the connecting part of the wiring harness, targeting the growing automotive field, the company expanded the product lineup to meet the specific requirements of Japanese and overseas automobile manufacturers. The product also demonstrated high waterproof performance and reliability in various harness shapes and under different operating temperatures, and was therefore approved and adopted by many automobile manufacturers worldwide.



Shrinkable tubes with hot melt adhesive

Another major product, Poreflon, a fluroplastic product, are thin sheets of polytetrafluoroethylene (PTFE), porous products with a controlled fine pore size, used in a wide variety of industrial materials including microfiltration membrane, electrical insulation, sealing material and breathable material. For microfiltration filter application in particular, its chemical resistance makes it ideal for the cleaning process for semiconductor wafers. With the high integration of semiconductors typified by smartphones, it has become essential to make the pores of filtration membranes finer to prevent circuit defects. Sumitomo Electric has developed and successfully mass produced membrane with micropore size suited to advanced exposure technology that is developing rapidly. The company undertook facility expansion twice, in 2014 and 2017, and achieved an eight-fold increase in sales of Poreflon for semiconductor applications.

Poreflon

Expansion of water-related business

Water-related business, a new business field for the company, has attracted attention due to water shortages caused by the economic development of emerging countries and the various water recycling businesses. Group company Sumitomo Electric Fine Polymer has endeavored to expand in this field by utilizing its unique porous material film material Poreflon, developed from polytetrafluoroethylene (PTFE).

The company strives to boost and expand sales with bigger modules and with membrane separation wastewater treatment equipment incorporating membrane modules.

In October 2017, a decision was made to invest in expansion of facilities at Zhongshan Sumiden Hybrid Products Co., Ltd., in Guangdong, China, to increase production capacity for Poreflon membrane modules by more than 50% to 500,000 m^2 per year. Operations began in March 2018.

Water treatment equipment of the East Cafeteria at Osaka Works

4 Environment and energy business led by advanced products

Growth in orders for submarine cable

In the environment and energy business, as described above, Sumitomo Electric undertook restructuring, including making JPS a wholly-owned subsidiary and HST a consolidated subsidiary, focused on the power cable business, and implemented full-scale expansion in overseas markets.

In January 2014, the company received an order from U.S. power operator Pacific Gas & Electric Company for a 230 kV submarine CV cable (total length: 15 km) project under San Francisco Bay, which was completed in 2016.

In January 2014, the company received an order from Italian cable manufacturer Prysmian Group for the production of 115 km of 500 kV DC MI[12] submarine cable to link Montenegro with Italy, which was delivered in November 2016. With this, Sumitomo Electric entered the market for 500 kV long-distance, large-capacity, international interconnection.

In June 2015, the company received an order for high-voltage DC power transmission cable to link Britain and Belgium from Nemo Link Limited, a joint venture between British firm National Grid plc and Belgian firm Elia System Operator NV. This is a construction project for a 141.5 km power transmission line connecting Britain and Belgium, with just the submarine cable portion measuring about 130 km and transmitting one million kW at the high-voltage of 400 kV. JPS is responsible for designing and manufacturing the world's highest voltage DC CV cable, which is scheduled for delivery, construction, testing and hand-over in 2019. JPS's products have gained recognition for their features. By enabling operation at the temperature of 90°C, higher than competitors' at 70°C, cable can be made more compact. It offers a large margin for operating temperature fluctuation caused at times of heavy loads or due to aging caused by soil heat conditions, and enables operation of bidirectional systems to handle polarity inversion[13]. It has also attracted attention as the first Asian cable manufacturer involved in the construction of important European international power transmission lines.

In November 2016, J-Power Systems Saudi Co., Ltd. (JPS Saudi, a subsidiary of JPS) entered into a long-term contract for delivery of medium-voltage submarine power cable for oil drilling ocean platform power supply for the Saudi Arabian Oil Company (Saudi Aramco), a national petroleum firm. Sumitomo Electric has supplied Saudi Aramco with submarine power cable since 1974, and JPS took over the business in 2001. In 2009, it established JPS Saudi, deepening the relationship with Saudi Aramco by establishing submarine power cable manufacturing plant (see p. 78 in Chapter 3).

High-voltage DC transmission cable for NEMO Link Limited.

In addition, Sumitomo Electric saw further benefits from its restructuring in accelerating its overseas business, including an order received for overhead transmission line for Sri Lanka in November 2016. In the field of medium to low voltage power cable, the company made steady progress in the global expansion of its electric cable business, entering into a sales cooperation agreement with Wa Minn of Myanmar in June 2016. In March 2017, the company received an order for joint construction with German firm Siemens of India's first transmission system including 320 kV DC cable in the country's south. At the same time, the company signed a cooperation agreement for high-voltage DC transmission with Siemens.

Responding to global demand for electric wires—establishment of second overseas production base for copper wire rods in Thailand

In 1998, Sumitomo Electric established its first overseas base for production of copper wire rods, PT Karya Sumiden Indonesia (KSI), from which the company procured approximately 40% of copper wire rods used by the Group (see p. 44 in Chapter 1). However, due to growth of the wiring harness business and expansion of magnet wire and electric wire businesses overseas, the production capacity of copper wire rods for overseas reached its limit. Consequently, in January 2012, the company announced the opening of a manufacturing and sales base for copper wire rod and drawn wire, and aluminum bar material for cutting, in Amata City Industrial Estate in Rayong Province, Thailand and in April 2012, it established SEI Thai Electric Conductor Co., Ltd. (STEC; capitalization 1.11 billion baht). The main aim was to meet expanding demand in China and Southeast Asia, and for risk diversification following the Great East Japan Earthquake and Thai floods. In May 2015, the company began production of copper wire rod. Initially, it experienced trouble in production, however in 2017 it achieved mass production basically as planned, whereby Sumitomo Electric established its three base system of Japan (Osaka), Indonesia, and Thailand to produce the copper wire rod it used and supplied.

During this period, in October 2014, Sumitomo Electric, STEC conducted the integrated manufacture of the aluminum wire rods used in aluminum electric wire, from the casting and rolling process. Furthermore, increased its capital to 20.1 billion baht, and worked to bolster facilities. The company already used aluminum wire rods procured from Japan to produce aluminum bars for automobile parts and aluminum electric wires for automobiles. With integrated production of high-grade aluminum wire rods, it aimed to expand its adoption for the engine room of automobile aluminum wiring harness and grow sales of aluminum bars for automotive parts in Southeast Asia and Europe. Production began in October 2016 in preparedness for future growth in demand and to play the role of an aluminum supply base for the Group.

Group company Daikoku Electric Wire Co., Ltd. (a wholly-owned subsidiary since 2010) also experienced strong growth when magnet wires for voice coil developed by the company was adopted for smartphone earphones, speakers and other products. In the relay coil business, partially due to declining demand in Japan, the company continued to consolidate its production bases and promoted the steady increase of manufacturing in the Philippines (DEPI).

Development related to the concentrator photovoltaic power generation

Photovoltaic power generation entered the application stage with concentrator photovoltaics, development of which began in 2010. CPV uses an extremely high power generation element with a conversion efficiency as high as 40–50%. Direct solar energy is concentrated many hundred-fold by a lens which tracks sun, thereby generating power. The module conversion efficiency is about double that of a conventional silicon-based solar cell. From April 2013, a Group company began verification testing of its CPV in the suburbs of Casablanca, Morocco. In September 2015, tests began at the research facilities of Moroccan Agency for Solar Energy (MASEN). Thereafter, in May 2016, the company entered into a contract with MASEN for construction and verification operation of a 1 MW power generation plant, which was completed in November 2016, with verification testing currently underway. Also, in January 2017, Sumitomo Electric began verification experiments with Queensland University of Technology in Australia, gaining a foothold for commercial expansion while demonstrating its technology at an actual plant.

Morocco CPV project

In July 2014, the company began operation of a module at the University of Miyazaki campus, in Japan. It uses characteristics that can display pictures and writing without a decrease in output, whereby one base displays the university's logo.

During this period, the company steadily implemented its practical application in facilities and products. It successfully developed the industry's smallest photovoltaic power conditioner, which it commercialized in January 2013 and began delivery of 1,500 kV DC cable for photovoltaic power generation equipment in February. The company's achievements were not limited to generation and transmission equipment. It also developed a real-time mega-solar monitoring device using power line communication (PLC) without the need for a dedicated communication line (December 2014), and is boosting its sales as a system.

Expansion into the superconductivity field

In the area of high-temperature superconductivity, from January 2013, the company began long-term test operations of cable distribution system at its Osaka Works. The testing investigated operation settings with construction methods and drops, uneven settings using cables and branch boxes that can even be installed in limited spaces, with the view to application in low-voltage, high-current distribution systems including DC, such as indoor distribution lines in data centers. After successful grid interconnection test at TEPCO's Asahi Substation in December 2013 (see p. 79 in Chapter 3) the company began delivering stable supply of electricity to approximately 70,000 households over one year and two months. Testing at Osaka Works was also successfully completed in February 2014, allowing the company to

Superconducting magnet (6T-70 Magnet)

12 Mass impregnated. The insulation paper is heavily impregnated with high viscosity insulating oil. Unlike OF cable, lubrication equipment is unnecessary, thereby enabling long distance power transmission.
13 DC interconnection operation involves switching the positive and negative polarities of the voltage applied to the cable.

accumulate further significant findings. In September 2015, the company was also successful in transmission to a data center using a DC superconducting cable in the high-temperature superconducting DC system verification research project (forming the Ishikari Superconducting and DC Transmission System Technology Research Organization, comprising Sakura Internet Inc., Chiyoda Corporation, and Chubu University, under the assignment for the Ministry of Economy, Trade and Industry).

Meanwhile, in July 2014, Sumitomo Electric released a refrigerated superconducting magnet system weighing 100 kg, with a main body one-quarter of the weight and one-fifth the size of conventional systems. In April 2015, the company began sales of ultra-high-strength superconducting wire with significantly greater tensile strength, eyeing the prospects of peripheral area business.

Acceleration of redox flow battery commercialization

In July 2013, the redox flow battery, which was undergoing demonstration testing at Yokohama Works, was adopted in a fiscal 2012 emergency demonstration project for large-scale power storage system in a joint project with Hokkaido Electric Power Co., Inc., in the operation of a large-scale storage battery system at Minami-hayakita Substation, and the movement toward practical use accelerated. Construction on the system began in July 2014 and operation started in December 2015. It is the world's largest-scale redox flow battery system, with rated output of 15 MW, and storage capacity of 60 MWh. By March 2019, Sumitomo Electric plans to develop a control method for suppression of frequency variation with the storage battery as a power source for frequency adjustment, develop an operation method to handle surplus electric power (lower margin) with a storage battery, and evaluate the performance of the redox flow battery, with the aim to move toward commercialization.

In April 2014, Sumitomo Electric began international standardization activities for the battery. In March 2017, the company was commissioned by the New Energy and Industrial Technology Development Organization[14] (a national research and development agency), and cooperated with the California state government and leading U.S. electric power company San Diego Gas & Electric Company ("SDG&E"), and began demonstration operations of the largest-scale redox flow battery system in San Diego, California.

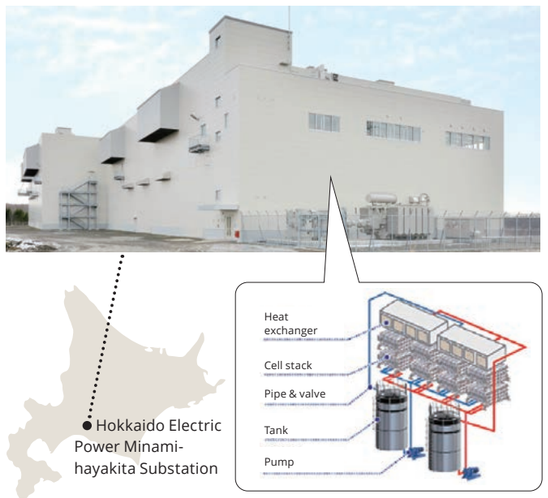
In March 2017, the company also delivered a 125 kW rated output redox flow battery for the Taiwan Power Company's research institute.

Energy management systems commercialization

With the recent advancement of infocommunications technologies, attention is focused on a system called demand response (DR) that changes the consumer's electricity consumption pattern itself according to the state of electricity supply and demand in order to achieve a balance between them. Sumitomo Electric participated in a test project for the Ministry of Economy, Trade and Industry's DR automation system and a test project supported by the Ministry, the "Next-Generation Energy and Social Systems Demonstration" project, and has been striving to upgrade DR technology. In 2015, Sumitomo Electric used its "Sumitomo Energy Management System Architecture" (sEMSA) to collectively manage 3 redox flow batteries (total 5 MWh) installed, 6 gas generators (total 4 MW) and 15 concentrator photovoltaic (CPV) batteries (total 100 kW) at its Yokohama Works, whereby it is obtaining precise, positive results in the aforementioned test project.

In the U.S., the company is working on DR testing for EV and PHV charging, which is expected to be a major source for distributed power in the future, including participation in Toyota Motor Corporation and Duke Energy's optimum PHV charge testing (PROJECT PLUG-IN). In Europe and the U.S., where reforms to power systems are being implemented, business is advancing in "virtual power plants" (VPP), which use infocommunications technology to integrate control of multiple energy equipment such as storage batteries and photovoltaic power generation, to act as a single power plant. In 2016, Sumitomo Electric participated in the Ministry of Economy, Trade and Industry's VPP Construction Verification Project.

Through such verification projects, the company has gained know-how in power system management technology and power trading, and is using this in an effort to increase the commercial value of its products.




2F Battery base


1F Tank PCS

14 New Energy Industrial Development Organization (NEDO)

Contribution to development of environmentally friendly vehicles

In response to growing demand for better fuel economy for automobiles, the number of hybrid vehicles has rapidly increased in the 2000s. Sumitomo Electric has also promoted the development of magnet wires for hybrid vehicle motors.

Sumitomo Electric was slower than other companies in the introduction of flat magnet wires suited to motor size reduction and increased output of motors, however, through company-wide efforts, including the sales, production technology, and research and development divisions, the company succeeded in developing high function flat magnet wires with a high degree of measurement accuracy and uniform film thickness, which enabled a significant improvement in insulation performance and coverage, and which was adopted by automobile manufacturers in 2015.

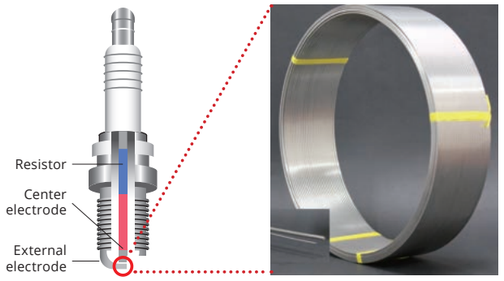
Sumitomo Electric OF cable registered as future engineering heritage

In September 2014, Sumitomo Electric's 66 kV neoprene anticorrosion OF cable (size: 675 mm²) was registered by Japan's National Museum of Nature and Science as "Essential Historical Materials for Science and Technologies" (popularly called "Future Engineering Heritage").

This cable was the first 66 kV oil filled (OF) cable used in Japan. It was installed in 1930 to transmit electric power from the Tokyo Keihoku Substation to the Ogu Substation of the then Nihon Denryoku electric power company. It is also the oldest extant OF cable. In 1985, investigation was conducted into electrical properties, and properties of insulating paper. It was confirmed that, although deterioration had taken place, it retained its good properties. Even now, it is used for electricity transmission, and its reliability and superior performance were recognized, leading to its registration.

Development of the electronic materials business

The creation in 1977 of the Electronic Materials Division was the full-scale launch of the electronic materials business, which focuses on lead materials for semiconductors and lighting electronics components. Since the IT bubble period which began in 2000, the company has undertaken integration and consolidation of related businesses and bases, to create the new Electronics Components Department in 2004. Based on integration of the three technologies of nickel alloy, metal composite, and surface treatment (plating, etc.), Sumitomo Electric has expanded to the business fields of automotive components, medical equipment, robotics, and sensors, in addition to the conventional electronics field. The company's main products include automotive components, nickel-based alloy wire, Dumet wire[15] for electronic parts, plating wire, and discharge processing cut wire. Sumitomo Electric secured the world's leading shares, particularly in the automotive field, for spark plugs electrode materials and lead materials for lighting, combining the company's proprietary technologies. In the field of robotics and sensors, the company is focusing on mass production of new conductors with unique new properties.



Spark plug electrode material

Since 2014, with Sumiden Fine Conductors Co., Ltd. positioned as a mother base, the company has promoted optimization of development, mass production, and upstream–downstream processes, strengthening collaboration with Sumi-Pac Corporation (SUMI-PAC, established in 1987) in Taiwan and Sumiden Electronic Materials (M) Sdn. Bhd. (SEMS, established in 1996) in Malaysia, with the aim of securing superiority in QCDD.

5 The industrial materials business advances its global supply structure

Greater expansion overseas through establishment of bases and M&A

In the field of industrial materials, the company is implementing continuous measures to further expand the business globally.


Keystone Powdered Metal Co.

15 A functional material with an iron alloy and nickel core coated with copper. The company saw a temporary reduction in demand for cathode-ray tubes and automotive lamp materials due to expanded adoption of flat display and LED, but demand has increased in the sensor field due to IoT.

Lach Huyen Bridge

In August 2014, Sumitomo Electric Sintered Alloy, Ltd. established Sumitomo Electric Sintered Components Mexico, S.A. de C.V. in Mexico. Japanese automobile manufacturers and parts manufacturers are accelerating their expansion into Mexico, therefore the company is aiming to expand sales of sintered products for which demand is expected to increase. The company invested approximately three billion yen to build a new plant in the industrial estate of Aguascalientes Province, which started operation in July 2016, with an annual production capacity of 2,000 tons.

In September 2016, the company acquired Keystone Powdered Metal Co., a major U.S. sintered products manufacturer to boost its presence in the North American market. Established in 1927, it has two plants in Pennsylvania and one in North Carolina. Its strength is in large automotive parts, in particular, transmission components for large SUV and pick-up trucks for Ford and General Motors.

With the acquisition of the company, Sumitomo Electric further strengthened its place as second globally by market share in the sintered products business.

Meanwhile, corrosion-resistant PE and epoxy coated and filled steel strands, which the Special Steel Wire Business has been selling to manufacturing bases in Japan, the U.S. and China, was delivered for the Lach Huyen Bridge, the longest offshore bridge in Vietnam. The company has promoted global sales expansion with the development of new markets by broadening applications, including concrete barriers and wind power generation. In July 2017, Sumiden Wire Products Corporation, responsible for the PC strands and stainless steel wire business in the U.S., began operation of its third plant, in Dayton, Texas (annual production capacity 24,000 tons), in addition to its existing plants in California and Tennessee. The company caters to housing-related demand in the south, and achieved its record high sales volume in 2017. In addition, in April 2014, PT. Sumiden Serasi Wire Products in Indonesia started manufacturing and marketing high-quality oil-tempered wire, and is continuing to grow its share, currently third globally, to second place. In addition to this capital investment, the company also undertook investment in PC strands to boost production. Its sales volume has grown each year since 2015, and it also achieved record highs in 2017.

Meanwhile, at the end of June 2017, the company closed its wire rod hot rolling plant, which had lost its cost competitiveness with the decline in domestic demand. The company implemented restructuring to procure wire rod entirely from steel making manufacturers.

In terms of production, Sumitomo Electric succeeded in the mass production of ultra-fine saw wire (60 μm) and electric discharge electrode wire (30 μm). It is striving to enter the solar cell and high grade semiconductor markets, which are expected to grow in the future.

Opening of a base in Tohoku and receipt of the Okochi Prize—the powder alloys business

In December 2015, Sumitomo Powder Metal, Co. Ltd. announced the establishment of a production base in Fukushima Prefecture for cutting tools, known as Multidrill, due to the growth in sales in the east Japan region, which had until then been low. In April 2016, Tohoku Sumiden Precision Co., Ltd. (capital 100 million yen, roughly 50 employees) was established in Miharu, Tamura-gun, Fukushima Prefecture. The company also opened a new line of steel tools, contributing to immediate delivery to customers in the Tohoku region, and began producing Multidrill from June 2017, as a global product supply base. A tool engineering center, the sixth base in the country, was also established on the same site, which played a part in industrial restoration for the region. In an effort to respond to growth in global demand, in December 2017, Sumitomo Electric announced that investment of approximately eight billion yen in Hokkaido Sumiden Precision Co., Ltd., the main production base for cutting tools, increasing production capacity by about 20%. The facilities are scheduled to begin operation in December 2019.

From the technical perspective, mention should be made of the company being awarded the Okochi Memorial Technology Prize in March 2014 at the 60th (fiscal 2013) Okochi Prize for nano-polycrystalline diamond synthesis technology and applied product development.

Material for diamond tools conventionally consist of single crystal diamond or sintered diamond, however the former has issues of cost and tool life, while the latter has issues of tool damage due to degeneration caused by heat. Nano-polycrystalline diamond is a material that instantly resolves these issues. Its hardness, toughness, and high heat resistance are superior to single crystal diamond. The company commercialized it as the cutting tool “Sumidia Binderless.” The company received recognition for its special material production technology to convert graphite directly in a short time, under 15 GPa ultra-high pressure, three or more times higher than conventional technology, by heating at 2,000°C or more; and for commercialization of a tool capable of precision cutting of cemented carbide and other hard brittle materials at high speed.

Tohoku Sumiden Precision Co., Ltd.

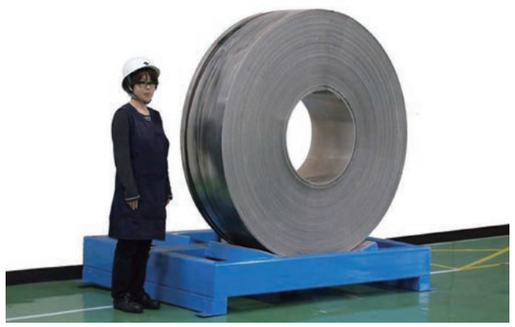
Sumidia® Binderless

6 Initiatives of new business divisions

Magnesium alloy business

In December 2013, the company established Sumiden Light Alloy (Changzhou) Co., Ltd. as a manufacturing and sales company in Changzhou City, Jiangsu Province, China, to promote AZ91 magnesium alloy sheet for electronic enclosures, which began production in June 2014. In 2010, the company first succeeded in mass production of AZ91 magnesium alloy sheet, designed for greater strength and corrosion resistance. Following its adoption for notebook PC enclosures in 2012, the company established bases in China, where most of the world’s notebook PCs are produced, especially in eastern China, which has a concentration of manufacturing bases, aiming to expand to business for tablets and smartphones.

Apart from PC enclosures, the company is also expanding its business activities for transportation equipment fields including automobiles, railways and aircraft, which are also expected to be lightweight. In addition to AZ91 sheet, the company is working on improving the characteristics of other new alloys. In collaboration with the University of Toyama, the company succeeded in developing magnesium alloy with excellent heat resistance for die casting in November 2017.



Mg coil material

History of 20

Epilogue

To Become a "Glorious Excellent Company"

Announcement of VISION 2022

In May 2018, Sumitomo Electric Group announced its new mid-term management plan "VISION 2022." Economic growth is expected in Japan and abroad in 2018, and, according to end of fiscal year results, Japanese companies saw record high net sales and net profit for the second consecutive year.

The new plan, announced against this backdrop, sets a basic concept of "Contributing to a better society by leveraging the Group's expertise in connectivity and transmission technologies through concerted efforts of the entire Group" in striving to become a Glorious Excellent Company. The company aims to provide value that serves a role in creating a society that is: green, safe and secure, comfortable and viable; leveraging the Group's connectivity and transmission technologies, nurtured over 120 years.

It set out the following two growth strategies.

(1) Enhancement and Expansion of Five Business Segments

(2) Further Growth through Innovation

Holding and developing growth strategies implemented to date, striving for firm growth in the existing business, focused on the Mobility, Energy, and Communications fields.

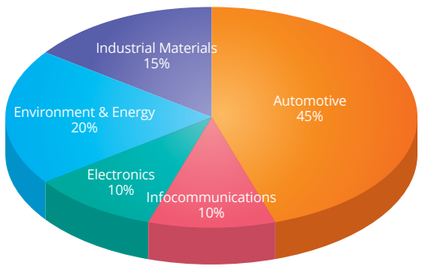
In addition, with the new opportunities born through dramatic changes in automobiles, energy and communications, Sumitomo Electric Group will aim for further growth by producing innovation leveraging the Group's strengths cultivated over many years, through concerted efforts that transcend divisions.

Fiscal 2022 target values include net sales of 3,600 billion yen, operating income of 230 billion yen (operating margin ratio 6.4%), return on invested capital (ROIC),[1] instead of return on assets (ROA), at 9% or more, and return on equity (ROE) at 8% or more. The new-product sales ratio was kept at 30%. Five-year cumulative capital investment was set at 950 billion yen (an average of 190 billion yen annually), representing a 15.7% increase over the VISION 2017 achievement of 821.1 billion yen, while R&D expenditure was set at 600 billion yen, which is a 9.3% increase. The company aims for a business portfolio comprising 45% automotive, 10% infocommunications, 10% electronics, 20% energy and environment, and 15% industrial materials.

The plan set out three priorities of "Enhancement of manufacturing capabilities," "Creation and enhancement of leading technology," and "Increasing global presence." The first refers to further enhancement of ongoing SEQCDD activities by sharing production technologies laterally among Group companies led by the Manufacturing Management & Engineering Unit. The second aims to strengthen the competitiveness of business segments and accelerate new business creation. The third refers to efforts to increase market share, and enhance the efficacy of the company's marketing function to anticipate major global changes in order to quickly seize new business opportunities. The plan also set out the following "Three Bases" to support these priorities.

- Manufacturing (consolidating manufacturing base and business quality, developing personnel)
- Human resources and organization (promoting diversity management, building a common global structure for human resources and organization)
- Financial (reinforcing corporate structure, striving to build a robust financial footing)

Ideal future state: Operating income portfolio (by segment)



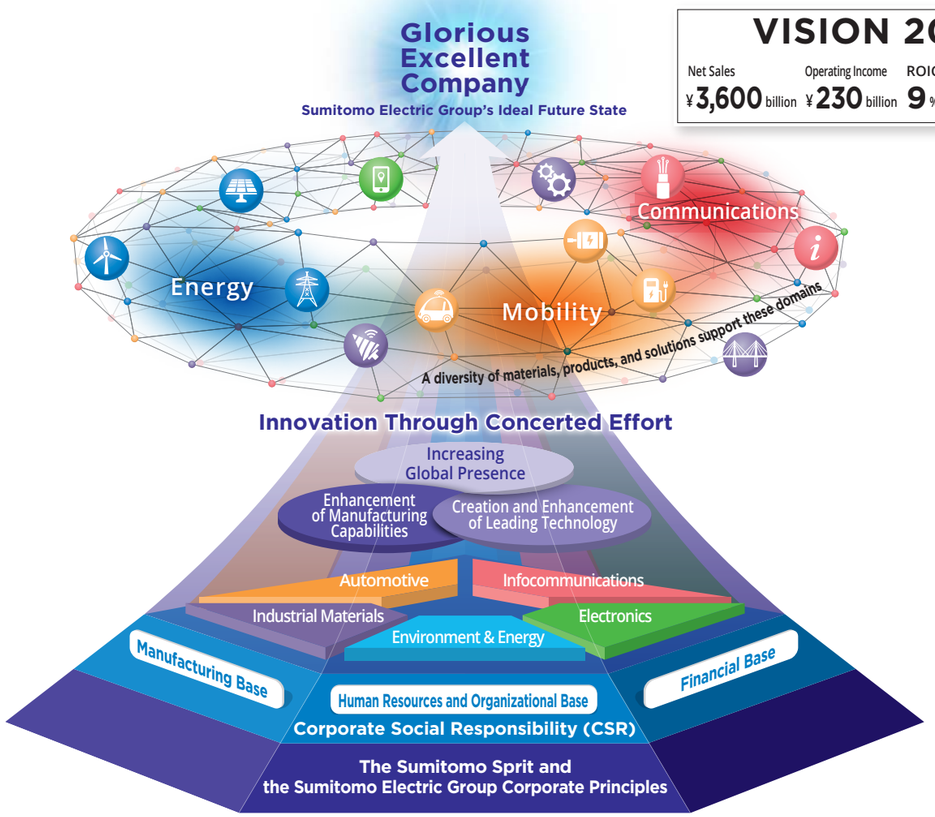
Aiming to achieve a balanced portfolio, while growing overall

[1] ROIC = operating income / net assets – no interest liabilities

Establishment of new tag line

Along with the launch of VISION 2022, the company established a new tag line "Connect with Innovation," coupled with the message that "The Sumitomo Electric Group moves forward hand-in-hand in its contribution to the development of society by connecting with continuous innovation." "Connect" represents the Group's determination to contribute to the development of society by connecting society, stakeholders, and the value generated through our business activities. "Innovation" represents the Group's endeavor to further refine core technologies that cover every stage of production from material engineering to manufacturing processes and entrepreneurship to promptly respond to changes in society.

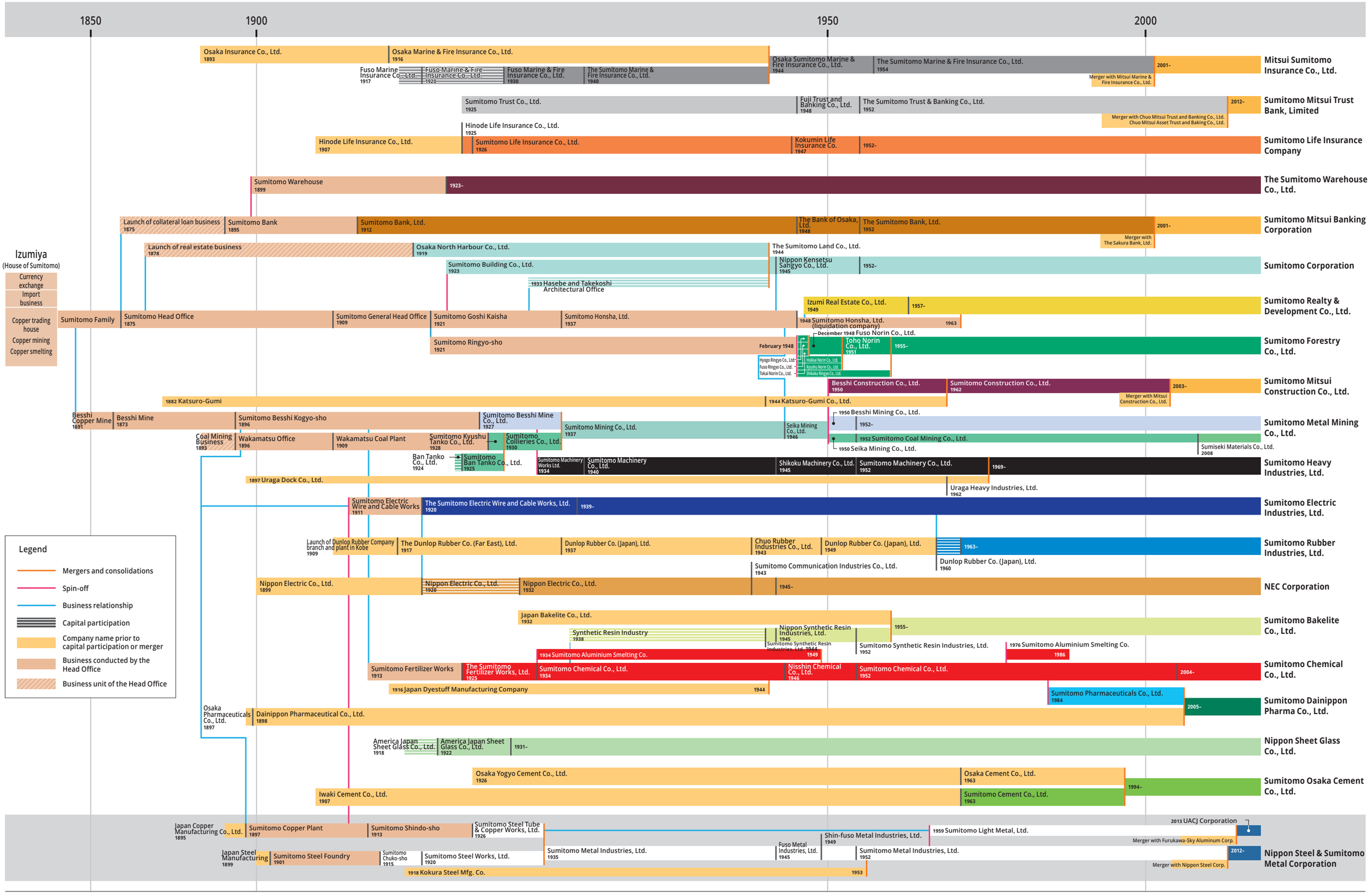
The new mid-term management plan "VISION 2022" also reiterates the Sumitomo Electric Group Corporate Principles and the Sumitomo Spirit upon which it is based. Sumitomo Electric boldly proclaims its intention to continue to strive for innovation and creation, while constantly reaffirming its unchanging, universal values.



Appendix

1897–2017

Sumitomo Group development chart



List of presidents

Sadatoshi Bekku

February 26, 1943–June 28, 1947

Kaname Kishi

June 28, 1947–November 27, 1956

Tetsuro Kawakami

June 25, 1982–June 27, 1991

Noritaka Kurauchi

June 27, 1991–June 29, 1999

Kazue Kitagawa

November 27, 1956–November 25, 1966

Tsunatoshi Nabeshima

November 25, 1966–September 26, 1969

Norio Okayama

June 29, 1999–June 29, 2004

Masayoshi Matsumoto

June 29, 2004– June 28, 2017

Isamu Sakamoto

October 1, 1969–November 27, 1973

Masao Kamei

November 27, 1973–June 25, 1982

Osamu Inoue

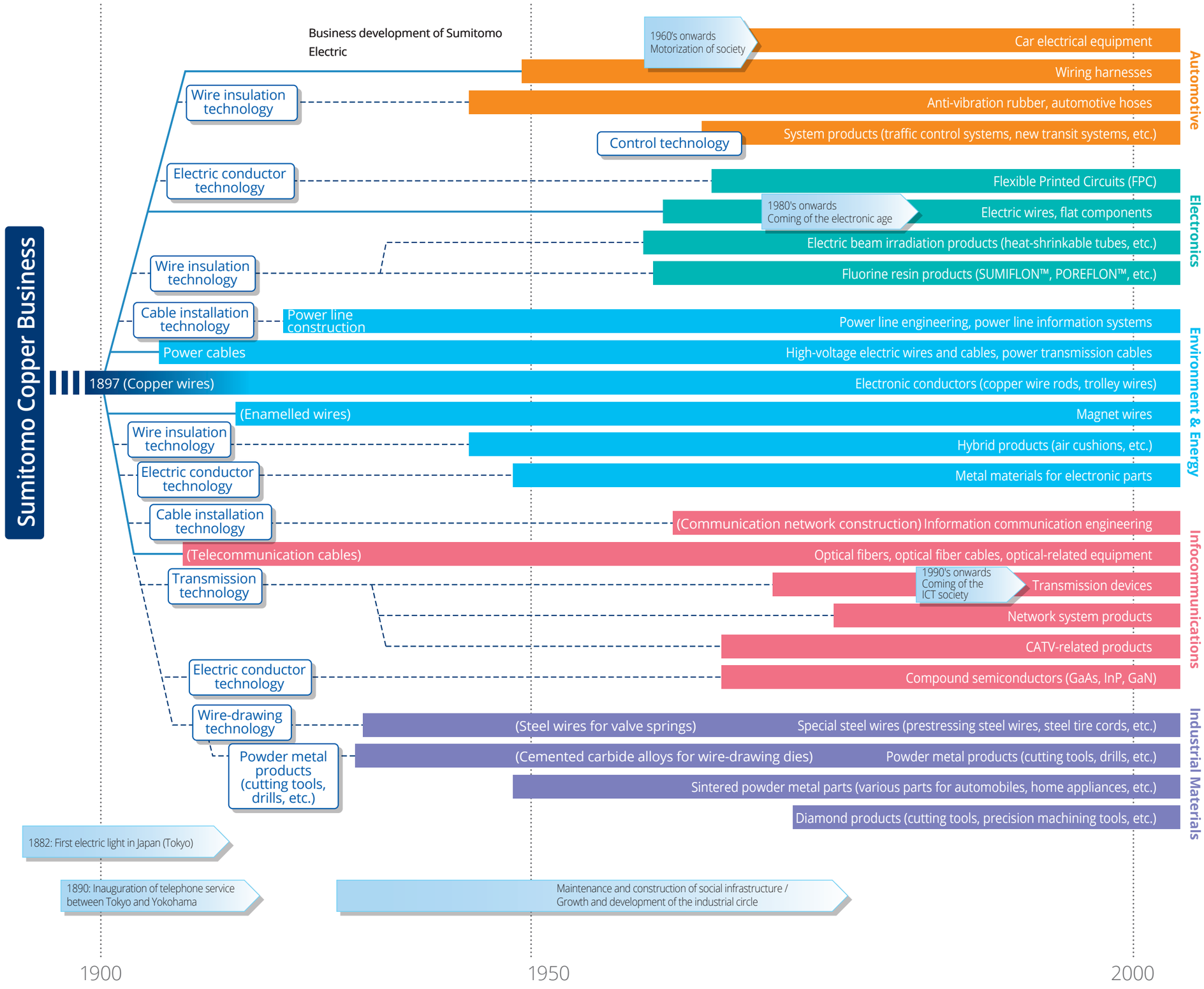
June 28, 2017–present

Business development of Sumitomo Electric

Sumitomo Electric's electric wire and cable business, originating from copper wire production, has evolved to power and communication cables, electronic wires and to magnet wire, automotive wiring harness and electric wire for information equipment. In doing so, the company expanded each of its businesses to cater to social developments. Meanwhile, Sumitomo Electric also diversified its business at an early stage based on its electric wire and cable production technologies. The company took a bold step into non-electric wire business by starting the production of cemented carbide tools in 1931 and entering the field of special steel wire the following year.

Since 1960's, the company accelerated business diversification with the aim of achieving a non-electric wire sales ratio of 50% by developing and commercializing epoch-making products and technologies such as compound semiconductors, optical fibers, artificial diamond and high-temperature superconductors, which support changing social trends.

The Sumitomo Electric Group, which has endeavored to develop unique technology and create new business, is now developing its business globally in the five segments of automotive, electronics, environment & energy, infocommunications and industrial materials.



Organizational structure as of January 1998

Management Staff Group
- Administrative & Public Relations Dept.
- Tokyo Administrative Dept.
- Legal Dept.
- Overseas Contracts & Legal Affairs Dept.
- Personnel Dept.
- Accounting Dept.
- Finance Dept.
- Tokyo Finance & Accounting Dept.
- Information Systems Dept.
- Intellectual Property Dept.
- Corporate Planning Dept.
- Purchasing Dept.
- Logistics Management Dept.
- Internal Auditing Dept.
- Plant & Production Systems Engineering Div.
- Osaka Works
- Itami Works
- Nagoya Works
- Yokohama Works
- Kanto Works
- Kumatori Works

General Planning Group for Electric Wire & Cable
- Planning & Administrative Dept.

Sales Group for Electric Wire & Cable
- Electric Power Companies Sales Dept.
- Electric Wire & FPC Sales Dept.
- Magnet Wire & Irradiated Products Sales Dept.
- Communications Sales Dept.
- Visual & Information Network Sales Dept.
- National Projects, Public Works & Electro-Optic Products Sales Dept.
- Industrial Systems & Railway Companies Sales Dept.
- Electronics Materials Sales Dept.
- Osaka Sales Dept.
- Osaka Electric & Electronic Materials Sales Dept.
- Infrastructure Development Dept.

Sales Group, Regional Markets
- Chubu District Office
- Toyota Branch Office
- Kyushu Branch Office
- Chugoku Branch Office
- Tohoku Branch Office
- Hokkaido Branch Office

Production Group related to Electric Conductor, Power Cable and Insulated Wire & Cable
- Tokyo Engineering Service Dept.
- Electric Conductor Div.
- Power Cable Div.
- Industrial Wire & Cable Div.
- Power Line Construction & Engineering Div.

Information & Communication Systems Group
- Communications Div.
- Communications Engineering Div.
- Fiber Optics Div.
- Development Initiative & Manufacturing Div.
- Electro-Optic Products Div.
- Information & Network Systems Div.
- Radio & Optical Wave Systems Div.
- Systems & Electronics Div.
- Public Information Infrastructure Development Div.

Production Group of Electric & Electronic Component
- Electronics Wire Div.
- Flexible Printed Circuits Div.
- Magnet Wire Div.
- Irradiated Products Div.
- Electronic Materials Div.
- Semiconductor Div.

Defense Group
- Defense Project Dept.

New Material Business Group
- Special Steel Wire Div.
- Hardmetal Div.
- Powder Metal Products Div.
- Super Hard Materials Div.
- Hybrid Products Div.

Automotive Parts & Systems Group
- Automotive Business Planning, Administrative & Sales Dept.
- Tokyo Automotive Parts Sales Dept.
- Hiroshima Automotive Parts Sales Dept.
- Automotive Electrical & Electronics Div.
- Brake Div.
- ABS Div.

International Business Group
- International Business Div.
- Foreign Trade Administration Office

R&D Group
- Systems & Electronics R&D Center
- Intelligent Transport Systems Labs.
- Basic High Technology Labs.
- Electric Power System Technology Research Labs.
- Osaka R&D Labs.
- Itami Research Labs.
- Yokohama Research Labs.
- Optoelectronics R&D Labs.
- Harima Research Labs.

Organizational structure as of July 2003

Corporate Staff Group
- Administrative & Public Relations Dept.
- Legal Dept.
- Personnel Dept.
- Safety & Environment Dept.
- Accounting Dept.
- Finance Dept.
- Information Systems Dept.
- Corporate Planning Dept.
- Purchasing Dept.
- Logistics Management Dept.
- Internal Auditing Dept.
- Plant & Production Systems Engineering Div.
- International Planning Dept.
- Foreign Trade Administration Office
- Osaka Works
- Itami Works
- Yokohama Works

Sales Group

Telecommunications & Solutions Sales Unit
- Sales Planning & Marketing Dept.
- Sales Planning & Marketing Dept. For Electric Power Companies
- Communications Sales Dept.
- Industrial Systems & Railway Companies Sales Dept.
- Solution Systems Sales & Marketing Bureau
- Optoelectronic Products Sales Dept.
- International Sales & Marketing Dept.

Electronics Sales Unit
- Sales Planning & Marketing Dept.
- Electronics Wire Sales Dept.
- Flexible Printed Circuits & Components Sales Dept.
- Fine Polymer Sales Dept.
- Semiconductor-Electronics Sales & Marketing Dept.

Sales Group, Regional Markets
- Electric Power Companies Sales Dept.
- Osaka Electric Power Companies Sales Dept.
- Osaka Industrial & Network Systems Sales Dept.
- Osaka Electronic Materials Sales Dept.
- Chubu District Office
- Kyushu Branch Office
- Chugoku Branch Office
- Tohoku Branch Office
- Hokkaido Branch Office
- Okinawa Branch Office

R&D Group

R&D Unit
- R&D Planning Dept.
- Intellectual Property Dept.
- Analysis Technology Research Center
- Information & Communications Labs.
- Automotive Technology R&D Labs.
- Energy and Environment Technology R&D Labs.
- Electronics & Materials R&D Labs.
- Advanced Materials Labs.
- Optical Communications R&D Labs.
- Transmission Devices R&D Labs.

Production Group

Electric Wire & Cable, Energy Business Unit
- Administrative Dept.
- Electric Conductor Div.
- Power Cable Div.
- Industrial Wire & Cable Div.
- Energy Storage Systems Div.

Telecommunications Business Unit
- Planning & Administrative Dept.
- Fiber & Communication Cable Div.
- Lightwave Network Products Div.
- Photo-Electron Products Div.

Solution Business Unit
- Administrative Dept.
- Systems & Electronics Div.
- Systems Integration & Engineering Div.

Electronics Business Unit
- Administrative Dept.
- Electronic Wire Div.
- Flexible Printed Circuits Div.

Electronics Materials Business Unit
- Strategic Business Development Dept.
- Electronics Components Dept.
- Compound Semiconductor Materials Div.
- Epi Solution Div.

Automotive Business Unit
- Planning Administrative & Sales Dept.
- Toyota Branch Office
- Sales Dept. (West-Japan Customers)
- Sales Dept. (East-Japan Customers)
- Brake Systems Div.

Industrial Materials Business Unit
- Administrative Dept.
- Special Steel Wire Div.
- Powder Metal Products Div.
- Hybrid Products Div.

Organizational structure as of January 2008

Corporate Staff Group
- Legal Dept.
- Overseas Contracts & Legal Affairs Dept.
- Public Relations Dept.
- HR & Administration Dept.
- Human Resources Development Dept.
- Accounting Dept.
- Finance Dept.
- Information Systems Dept.
- Corporate Planning Dept.
- Purchasing Dept.
- Logistics Management Dept.
- Intellectual Property Dept.
- Internal Auditing Dept.
- Business Process Quality & Internal Control Promotion Dept.
- Foreign Trade Administration Office
- Osaka Works
- Itami Works
- Yokohama Works

Manufacturing Management & Engineering Unit
- Safety & Environment Dept.
- Quality Management Div.
- Plant & Production Systems Engineering Div.

Office of Corporate Auditors

Sales Group

Network Products Sales & Marketing Unit
- Sales Planning & Marketing Div.
- Sales Planning & Marketing Dept. For Electric Power Companies
- Communications Sales Dept.
- Global Business Dept.
- Public & Industrial Fields Sales Dept.
- Optoelectronic Products Sales Dept.

Electronics Sales Unit
- Sales Planning & Marketing Div.
- Electronics Wire Sales Dept.
- Flexible Printed Circuits & Components Sales Dept.
- Fine Polymer Sales Div.
- Semiconductor-Electronics Sales & Marketing Dept.
- Electronic Materials & Functional Products Sales Dept.

Sales Group, Regional Markets
- Osaka Sales Dept.
- Osaka Electronic Materials Sales Dept.
- Chubu District Office
- Kyushu Branch Office
- Chugoku Branch Office
- Tohoku Branch Office
- Hokkaido Branch Office
- Okinawa Branch Office

R&D Group

Materials and Process Technology R&D Unit
- R&D Planning Dept.
- Analysis Technology Research Center
- Automotive Technology R&D Labs.
- Electric Power & Energy Research Labs.
- Electronics & Materials R&D Labs.
- Semiconductor Technologies R&D Labs.

Information and Communications Technology R&D Unit
- R&D Planning Dept.
- Information & Communications Labs.
- Optical Communications R&D Labs.
- Transmission Devices R&D Labs.

Production Group

Electric Wire & Cable, Energy Business Unit
- Administrative Dept.
- Electric Conductor Div.
- Power Cable Div.
- Industrial Wire & Cable Div.
- Hybrid Products Div.

Telecommunications Business Unit
- Planning & Administrative Dept.
- Optical Fiber & Cable Div.
- Lightwave Network Products Div.

Broadband & Solution Business Unit
- Administrative Dept.
- Systems & Electronics Div.
- Optical Transmission Components Div.
- ITS Development Dept.
- Broadband Equipment Development Div.

Electronics Business Unit
- Administrative Dept.
- Electronic Wire Div.
- Flexible Printed Circuits Div.
- Electronics Components Dept.
- Compound Semiconductor Materials Div.
- Fine Polymer Div.

Automotive Business Unit
- Strategic Planning Div.
- Group Management Div.
- Quality Management Dept.
- Sales Div. (Eastern Japan)
- Sales Div. (Western Japan)
- Automotive EDS Business Global Sales & Marketing Div.

Industrial Materials Business Unit
- Administrative & Planning Dept.
- Powder Metal Products Div.
- Special Steel Wire Div.
- Energy Storage Systems Dept.
- Superconductivity & Energy Technology Dept.

Organizational structure as of January 2013

Corporate Staff Group
- Competition Law Compliance Office
- Legal Dept.
- Overseas Contracts & Legal Affairs Dept.
- Public Relations Dept.
- HR & Administration Div.
- Human Resources Development Dept.
- Accounting Dept.
- Finance Dept.
- Information Systems Div.

Corporate Staff Group for Strategy Planning
- Corporate Planning Dept.
- NEXT Center

- Infrastructure Business Promotion Div.
- Procurement Div.
- Logistics Management Dept.
- Intellectual Property Dept.
- Internal Auditing Dept.
- Security Trade Control Office
- Osaka Works
- Itami Works
- Yokohama Works

Manufacturing Management & Engineering Unit
- Safety & Environment Dept.
- Quality Management Div.
- Plant & Production Systems Engineering Div.

Office of Audit & Supervisory Board Members

Sales Group
- Sales Compliance Office
- Sales Planning & Marketing Div.
- Business Development Div.

Network Products Sales & Marketing Unit
- Telecom Carrier Sales Div.
- Global Business Dept.
- East Japan Network Products Sales Div.
- Central Japan Network Products Sales Div.
- West Japan Network Products Sales Div.
- Device Sales Dept.
- International Device Sales and Marketing Div.

Electronics Sales Unit
- Electronics Wire Sales Dept.
- Flexible Printed Circuits & Components Sales Dept.
- Fine Polymer Sales Div.
- Semiconductor-Electronics Sales & Marketing Dept.
- Electronic Materials & Functional Products Sales Dept.
- West Japan Electronic Materials Sales Div.
- Central Japan Electronic Materials Sales Div.

- Chubu District Office

R&D Group

R&D General Managing Unit
- R&D General Planning Div.
- New Business Frontier R&D Labs.
- Power System R&D Labs.

Materials and Process Technology R&D Unit
- Analysis Technology Research Center
- Automotive Technology R&D Labs.
- Advanced Materials R&D Labs.
- Electronics & Materials R&D Labs.
- Semiconductor Technologies R&D Labs.
- Power Device Development Div.

Information and Communications Technology R&D Unit
- Information & Communications Labs.
- Optical Communications R&D Labs.
- Transmission Devices R&D Labs.

Production Group

Environment and Energy Group

Electric Wire & Cable, Energy Business Unit
- Administrative Dept.
- Electric Conductor Div.
- Power Cable Div.
- Industrial Wire & Cable Div.
- Magnet Wire Div.
- Hybrid Products Div.

- Superconductivity Technology Div.

Infocommunications Group

Infocommunications Business Unit
- Planning & Administrative Dept.
- Optical Fiber & Cable Div.
- Lightwave Network Products Div.
- Transmission Devices Div.

Optical Network & Systems Business Unit
- Planning & Administrative Dept.
- Systems & Electronics Div.
- Network Systems Div.

Electronics Group

Electronics Business Unit
- Administrative Dept.
- Electronic Wire Div.
- Flexible Printed Circuits Div.
- Electronics Components Dept.
- Compound Semiconductor Materials Div.
- Fine Polymer Div.

Automotive Group

Automotive Business Unit
- Automotive Compliance Office
- Strategic Planning Div.
- Automotive New Business Planning & Development Div.
- Quality Assurance Div.
- Sales Planning & Marketing Div.
- Sales Div. (Eastern Japan)
- Sales Div. (Central Japan)
- Sales Div. (Western Japan)

Industrial Materials Group

Advanced Materials Business Unit
- Administrative & Planning Dept.
- Hardmetal Div.
- Powder Metal Products Div.

Special Steel Wire Business Unit
- Administrative and Planning Dept.
- Special Steel Wire Div.

Organizational structure as of January 2018

Corporate Staff Group
- Compliance & Risk Management Office
- Legal Dept.
- Public Relations Dept.
- Administration Div.
- Tokyo Administration Div.
- Human Resources Div.
- Human Resources Development Dept.
- Accounting Div.
- Finance Dept.
- Information Systems Div.
- Corporate Planning Dept.
- Procurement Div.
- Logistics Management Dept.
- Intellectual Property Dept.
- Internal Auditing Dept.
- Security Trade Control Office
- Osaka Works
- Itami Works
- Yokohama Works

Manufacturing Management & Engineering Unit
- Safety & Environment Dept.
- Quality Management Div.
- Plant & Production Systems Engineering Div.

Office of Audit & Supervisory Board Members

Sales Group
- Sales Compliance Office
- New Business Marketing and Promotion Div.

Social Infrastructure Sales & Marketing Unit
- Sales Planning & Marketing Div.
- Power Cable & System Sales Div.
- Industrial System Sales Div.
- Power Projects Business Div.
- Energy Solution Sales Div.
- Communication Carrier Sales Div.
- Global Network System Div.
- Central Japan Social Infrastructure Sales Div.
- Optoelectronic Products Sales Dept.

Electronics Sales Unit
- Sales Planning & Marketing Div.
- Mobility Electronics Sales Div.
- Electric and Information System Materials Sales Div.
- Flexible Printed Circuits & Components Sales Div.
- Semiconductor-Electronics Sales & Marketing Div.
- Electronic Materials & Functional Products Sales Div.
- West Japan Electronic Materials Sales Div.

Chubu District Office

R&D Group

R&D Unit
- R&D Planning & Administration Div.
- Advanced Automotive Systems R&D Center
- Power Systems R&D Center
- Information Network R&D Center
- IoT R&D Center
- Analysis Technology Research Center
- Frontier Technologies Labs.
- Advanced Materials Labs.
- Energy and Electronics Materials Labs.
- Optical Communications Labs.
- Transmission Devices Labs.
- Power Device Development Div.

Production Group

Environment & Energy Group

Electric Wire & Cable, Energy Business Unit
- Planning & Administrative Div.
- Global Power Cable Project Engineering Div.
- Power Cable Div.
- Power Cable Accessories Div.
- Power Cables Engineering & Construction Div.
- Overhead Transmission Line Div.
- Industrial Wire & Cable Div.

Electric Conductor & Functional Products Business Unit
- Planning & Administrative Div.
- Electric Conductor Div.
- Magnet Wire Div.
- Hybrid Products Div.
- Electronics Components Dept.

Energy System Div.

Infocommunications Group

Infocommunications Business Unit
- Planning & Administrative Dept.
- Optical Fiber & Cable Div.
- Lightwave Network Products Div.
- Broad Networks Div.

Semiconductor Innovation Business Unit
- Administrative & Planning Dept.
- Transmission Devices Div.
- Compound Semiconductor Materials Div.
- Infocommunication Device Sales Div.

Systems & Electronics Div.

Electronics Group
- Flexible Printed Circuits Div.
- Electronic Wire Div.
- Fine Polymer Div.
- Water Processing Div.

Automotive Group

Automotive Business Unit
- Automotive Compliance Office
- Strategic Planning Div.
- Automotive New Business Planning & Development Div.
- Quality Assurance Div.
- Sales Planning & Marketing Div.
- Sales Div. (Eastern Japan)
- Sales Div. (Central Japan)
- Sales Div. (Western Japan)

Industrial Materials Group

Advanced Materials Business Unit
- Administrative & Planning Dept.
- Business Development Dept.
- Hardmetal Div.
- Powder Metal Products Div.

Special Steel Wire Business Unit
- Administrative and Planning Dept.
- Special Steel Wire Div.

New Business Development Group

New Business Development Unit
- Planning & Administrative Dept.
- Superconductivity Technology Div.
- Magnesium Alloy Development Div.
- Life Science Business Development Div.

Business locations

● Head Office (Osaka)
Sumitomo Building, 4-5-33, Kitahama, Chuo-ku, Osaka 541-0041
Telephone: +81-(0)6-6220-4141

● Head Office (Tokyo)
Akasaka Center Building, 1-3-13, Motoakasaka, Minato-ku, Tokyo 107-8468
Telephone: +81-(0)3-6406-2600

● Osaka Works
1-1-3, Shimaya, Konohana-ku, Osaka 554-0024
Telephone: +81-(0)6-6466-5651

● Itami Works
1-1-1, Koyakita, Itami, Hyogo 664-0016
Telephone: +81-(0)72-772-3300

● Yokohama Works
1, Taya-cho, Sakae-ku, Yokohama 244-8588
Telephone: +81-(0)45-853-7182

● Chubu District Office
Nagoya Lucent Tower, 6-1, Ushijima-cho, Nishi-ku, Nagoya, Aichi 451-6035
Telephone: +81-(0)52-589-3850

Changes in number of employees

(people)

FY	Consolidated	Non-consolidated
1911		233
1912		310
1913		359
1914		373
1915		410
1916		891
1917		1,152
1918		1,539
1919		1,608
1920		1,650
1921		1,647
1922		1,558
1923		1,857
1924		1,496
1925		1,447
1926		1,611
1927		1,681
1928		1,668
1929		1,663
1930		1,597
1931		1,524
1932		1,506
1933		1,572
1934		1,692
1935		2,241
1936		2,288
1937		3,546
1938		3,968
1939		4,841
1940		4,739
1941		5,983
1942		6,859
1943		10,360
1944		15,384
1945		6,909
1946		5,234
1947		5,189
1948		5,365
1949		4,446
1950		4,304
1951		4,387
1952		4,324
1953		4,322
1954		4,464
1955		4,353
1956		4,321
1957		4,529
1958		4,621
1959		4,705
1960		5,179
1961		5,893
1962		6,880
1963		7,278
1964		7,478
1965		7,941
1966		8,113
1967		8,181
1968		8,784
1969		9,869
1970		10,633
1971		11,222
1972		11,026
1973		11,233
1974		11,539
1975		11,721
1976		11,362
1977		11,474
1978		11,582
1979		11,607
1980		11,674
1981		11,878
1982		12,197
1983		12,329
1984		12,597
1985		12,850
1986		12,967
1987		13,172
1988		13,371
1989		13,648
1990		14,491
1991		15,156
1992		15,705
1993		15,715
1994		15,657
1995		15,381
1996		15,062
1997		14,715
1998		14,239
1999	66,992	13,868
2000	70,936	13,580
2001	69,959	13,352
2002	79,197	12,976
2003	87,415	12,385
2004	104,398	11,796
2005	124,650	11,439
2006	133,853	11,247
2007	153,725	11,098
2008	152,547	11,014
2009	157,203	10,853
2010	182,773	10,666
2011	194,734	10,563
2012	206,323	10,436
2013	225,484	10,392
2014	240,798	11,098
2015	240,865	11,108
2016	248,330	11,109
2017	255,133	11,200

The consolidated numbers of employees are those from fiscal 1999 when the company started publishing them in its security reports.
The non-consolidated numbers of employees include those assigned to other companies and exclude those assigned to the company.
The numbers in fiscal 1997 and years before are cited from the appendix of *Official 100th Anniversary of Sumitomo Electric Industries, Ltd.*

Changes in capital stock

(million yen)

Period	Capital
1920.12	10
1921.12	10
1922.12	10
1923.12	10
1924.12	10
1925.12	10
1926.12	10
1927.12	10
1928.12	10
1929.12	10
1930.12	10
1931.12	15
1932.12	15
1933.12	15
1934.12	15
1935.12	15
1936.12	15
1937.12	30
1938.12	30
1939.12	50
1940.12	50
1941.12	50
1942.12	50
1943.12	53
1944.3	120
1945.3	120
1946.3	120
1947.3	120
1948.3	120
1949.3	120
1950.3	360
1951.3	360
1952.3	800
1953.3	2,000
1954.3	2,000
1955.3	2,000
1956.3	2,000
1957.3	3,000
1958.3	4,500
1959.3	4,500
1960.3	4,500
1961.3	4,500
1962.3	9,000
1963.3	13,500
1964.3	13,500
1965.3	13,500
1966.3	13,500
1967.3	13,500
1968.3	13,500
1969.3	13,500
1970.3	18,000
1971.3	18,000
1972.3	18,000
1973.3	18,000
1974.3	18,064
1975.3	18,069
1976.3	18,069
1977.3	18,069
1978.3	18,862
1979.3	20,954
1980.3	23,420
1981.3	25,010
1982.3	26,798
1983.3	29,892
1984.3	35,913
1985.3	39,140
1986.3	40,018
1987.3	44,651
1988.3	50,963
1989.3	56,542
1990.3	63,638
1991.3	65,232
1992.3	65,645
1993.3	65,646
1994.3	65,892
1995.3	67,169
1996.3	67,196
1997.3	79,709
1998.3	81,248
1999.3	81,262
2000.3	96,193
2001.3	96,230
2002.3	96,231
2003.3	96,231
2004.3	96,231
2005.3	96,231
2006.3	96,774
2007.3	96,784
2008.3	96,914
2009.3	99,737
2010.3	99,737
2011.3	99,737
2012.3	99,737
2013.3	99,737
2014.3	99,737
2015.3	99,737
2016.3	99,737
2017.3	99,737
2018.3	99,737

The numbers in fiscal 1997 and years before are cited from the appendix of *Official 100th Anniversary of Sumitomo Electric Industries, Ltd.*

Changes in net sales (non-consolidated)

(million yen)

FY	Net Sales	FY	Net Sales	FY	Net Sales
1911	0.2	1947	1,081	1983	449,378
1912	1	1948	3,032	1984	506,464
1913	1	1949	3,621	1985	532,184
1914	1	1950	8,165	1986	534,564
1915	1	1951	14,795	1987	550,115
1916	3	1952	12,049	1988	605,004
1917	6	1953	14,912	1989	700,375
1918	8	1954	11,779	1990	781,775
1919	11	1955	14,771	1991	800,470
1920	12	1956	23,535	1992	761,244
1921	12	1957	21,654	1993	707,275
1922	16	1958	20,565	1994	718,364
1923	20	1959	29,391	1995	704,683
1924	23	1960	38,603	1996	770,489
1925	21	1961	46,004	1997	777,426
1926	23	1962	44,803	1998	727,748
1927	21	1963	53,059	1999	723,696
1928	25	1964	64,756	2000	837,066
1929	24	1965	69,323	2001	825,813
1930	17	1966	89,553	2002	787,686
1931	11	1967	104,834	2003	760,877
1932	10	1968	126,533	2004	833,361
1933	16	1969	156,735	2005	912,012
1934	19	1970	167,000	2006	1,043,500
1935	28	1971	152,947	2007	1,011,577
1936	35	1972	173,854	2008	775,560
1937	58	1973	238,487	2009	731,108
1938	52	1974	231,497	2010	804,160
1939	63	1975	211,798	2011	803,807
1940	62	1976	252,506	2012	779,753
1941	75	1977	293,656	2013	832,484
1942	72	1978	310,983	2014	910,657
1943	109	1979	369,780	2015	928,976
1944	119	1980	428,874	2016	901,892
1945	98	1981	455,560	2017	1,084,165
1946	274	1982	417,641		

The numbers in fiscal 1997 and years before are cited from the appendix of *Official 100th Anniversary of Sumitomo Electric Industries, Ltd.*

Changes in ordinary income and net income (non-consolidated)

(million yen)

FY	Ordinary Income	Net Income	FY	Ordinary Income	Net Income	FY	Ordinary Income	Net Income
1920		94	1957		949	1993	28,219	18,107
1921		937	1958		848	1994	26,346	13,511
1922		1,488	1959		1,073	1995	28,656	17,540
1923		1,567	1960		1,423	1996	35,430	20,240
1924		2,164	1961		1,681	1997	33,494	20,759
1925		2,136	1962		1,518	1998	27,051	18,812
1926		2,150	1963		1,819	1999	24,886	16,412
1927		2,298	1964	2,354	2,025	2000	40,811	27,043
1928		2,398	1965	2,374	1,934	2001	17,371	15,230
1929		2,246	1966	4,016	2,401	2002	-8,837	-10,818
1930		1,495	1967	6,384	3,453	2003	10,109	9,324
1931		500	1968	6,976	4,272	2004	17,733	9,680
1932		825	1969	7,258	4,127	2005	29,307	18,674
1933		2,009	1970	5,923	3,919	2006	55,264	44,401
1934		1,922	1971	4,535	2,736	2007	46,166	37,303
1935		3,134	1972	9,209	5,149	2008	11,749	16,281
1936		3,571	1973	12,136	6,380	2009	-3,388	23,802
1937		4,501	1974	5,814	3,257	2010	26,263	11,205
1938		5,553	1975	684	2,064	2011	24,667	15,911
1939		6,513	1976	4,361	2,547	2012	14,164	10,405
1940		6,924	1977	8,081	3,965	2013	25,422	24,175
1941		6,952	1978	12,586	6,081	2014	34,288	105,911
1942		5,654	1979	12,522	6,647	2015	44,392	22,390
1943		17,141	1980	14,005	7,516	2016	49,367	42,737
1944		17,759	1981	18,004	9,083	2017	65,523	61,357
1945		-41	1982	13,518	8,581			
1946		20	1983	15,056	9,064			
1949		74	1984	20,025	10,523			
1949		38	1985	21,629	11,346			
1950		117	1986	22,128	12,024			
1951		638	1987	23,700	12,517			
1952		553	1988	25,025	13,536			
1953		672	1989	30,825	16,155			
1954		245	1990	38,434	20,125			
1955		356	1991	35,860	19,023			
1956		982	1992	30,375	18,547			

The numbers in fiscal 1997 and years before are cited from the appendix of *Official 100th Anniversary of Sumitomo Electric Industries, Ltd.*

* Unit is thousand yen in fiscal 1944 and years before

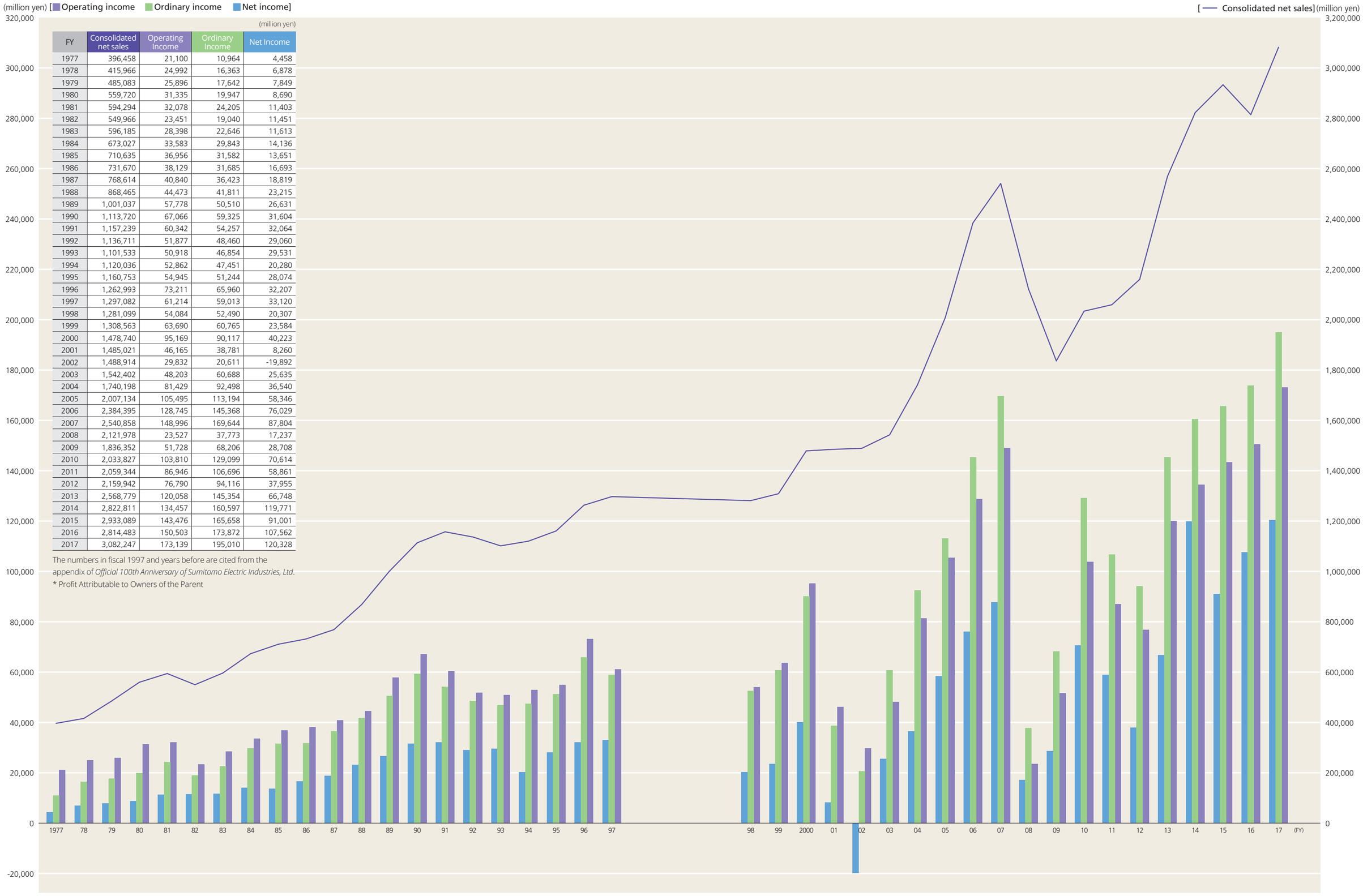
Changes in consolidated net sales, operating income, ordinary income and net income

(million yen)

FY	Consolidated net sales	Operating Income	Ordinary Income	Net Income
1977	396,458	21,100	10,964	4,458
1978	415,966	24,992	16,363	6,878
1979	485,083	25,896	17,642	7,849
1980	559,720	31,335	19,947	8,690
1981	594,294	32,078	24,205	11,403
1982	549,966	23,451	19,040	11,451
1983	596,185	28,398	22,646	11,613
1984	673,027	33,583	29,843	14,136
1985	710,635	36,956	31,582	13,651
1986	731,670	38,129	31,685	16,693
1987	768,614	40,840	36,423	18,819
1988	868,465	44,473	41,811	23,215
1989	1,001,037	57,778	50,510	26,631
1990	1,113,720	67,066	59,325	31,604
1991	1,157,239	60,342	54,257	32,064
1992	1,136,711	51,877	48,460	29,060
1993	1,101,533	50,918	46,854	29,531
1994	1,120,036	52,862	47,451	20,280
1995	1,160,753	54,945	51,244	28,074
1996	1,262,993	73,211	65,960	32,207
1997	1,297,082	61,214	59,013	33,120
1998	1,281,099	54,084	52,490	20,307
1999	1,308,563	63,690	60,765	23,584
2000	1,478,740	95,169	90,117	40,223
2001	1,485,021	46,165	38,781	8,260
2002	1,488,914	29,832	20,611	-19,892
2003	1,542,402	48,203	60,688	25,635
2004	1,740,198	81,429	92,498	36,540
2005	2,007,134	105,495	113,194	58,346
2006	2,384,395	128,745	145,368	76,029
2007	2,540,858	148,996	169,644	87,804
2008	2,121,978	23,527	37,773	17,237
2009	1,836,352	51,728	68,206	28,708
2010	2,033,827	103,810	129,099	70,614
2011	2,059,344	86,946	106,696	58,861
2012	2,159,942	76,790	94,116	37,955
2013	2,568,779	120,058	145,354	66,748
2014	2,822,811	134,457	160,597	119,771
2015	2,933,089	143,476	165,658	91,001
2016	2,814,483	150,503	173,872	107,562
2017	3,082,247	173,139	195,010	120,328

The numbers in fiscal 1997 and years before are cited from the appendix of *Official 100th Anniversary of Sumitomo Electric Industries, Ltd.*

* Profit Attributable to Owners of the Parent



Networks growing throughout the world

(As of March 2018)

Middle East Africa

12 companies

Egypt	2
Saudi Arabia	1
Tunisia	3
Morocco	4
South Africa	2

Europe

57 companies

U.K.	7
Italy	2
Ukraine	1
Netherlands	3
Spain	1
Slovakia	2
Serbia	1
Czech Republic	1
Germany	12
Turkey	4
Hungary	3
France	5
Bulgaria	1
Belgium	1
Poland	4
Moldova	1
Romania	3
Russia	5

Japan

109 companies

North & South America

48 companies

U.S.	27
Argentina	1
Canada	2
Paraguay	1
Brazil	7
Mexico	10

Asia Oceania

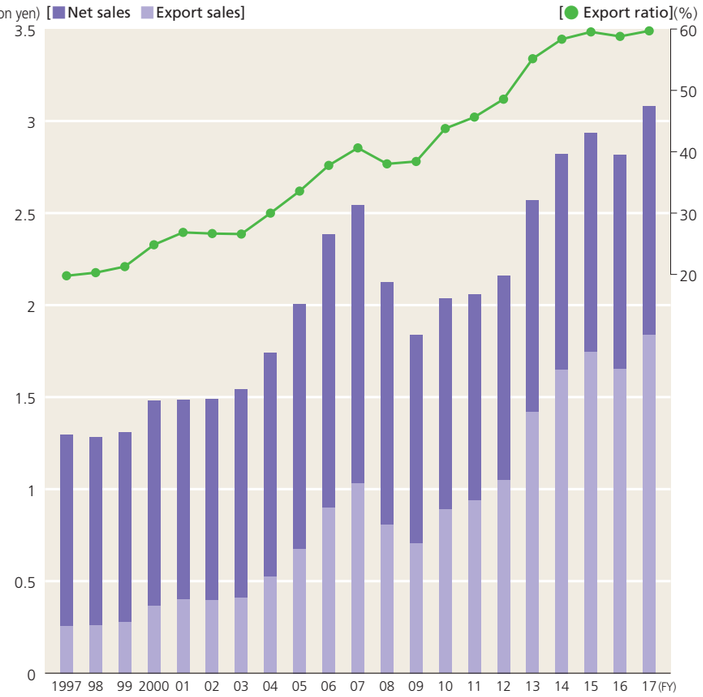
169 companies

India	7
Indonesia	12
Australia	3
Cambodia	1
Singapore	4
Thailand	23
Philippines	11
Vietnam	10
Malaysia	5
Korea	7
China	75
Hong Kong	5
Taiwan	6

Changes in export sales (consolidated)

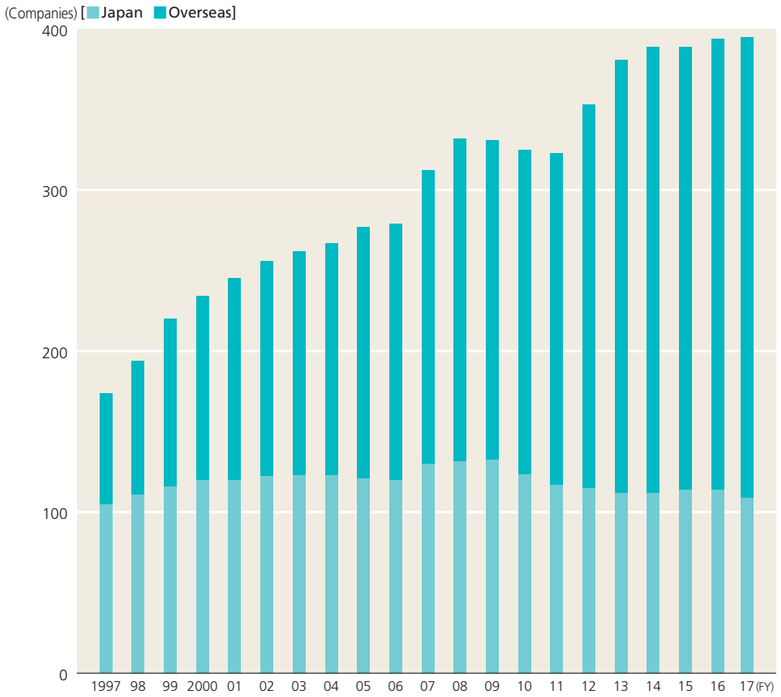
FY	Net Sales (million yen)	Export Sales (million yen)	Export ratio (%)
1997	1,297,082	256,563	19.8
1998	1,281,099	259,994	20.3
1999	1,308,563	278,327	21.3
2000	1,478,740	367,144	24.8
2001	1,485,021	398,693	26.8
2002	1,488,914	397,002	26.7
2003	1,542,402	409,916	26.6
2004	1,740,198	521,945	30.0
2005	2,007,134	673,965	33.6
2006	2,384,395	900,555	37.8
2007	2,540,858	1,032,170	40.6
2008	2,121,978	806,687	38.0
2009	1,836,352	705,357	38.4
2010	2,033,827	890,370	43.8
2011	2,059,344	939,944	45.6
2012	2,159,942	1,048,811	48.6
2013	2,568,779	1,417,009	55.2
2014	2,822,811	1,646,815	58.3
2015	2,933,089	1,746,138	59.5
2016	2,814,483	1,653,731	58.8
2017	3,082,247	1,838,823	59.7

* Export sales is included in net sales



Total subsidiaries & affiliates

FY	Japan (Companies)	Overseas (Companies)	Total (Companies)
1997	105	69	174
1998	111	83	194
1999	116	104	220
2000	120	114	234
2001	120	125	245
2002	123	133	256
2003	123	139	262
2004	123	144	267
2005	121	156	277
2006	120	159	279
2007	130	182	312
2008	132	200	332
2009	133	198	331
2010	124	201	325
2011	117	206	323
2012	115	238	353
2013	112	269	381
2014	112	277	389
2015	114	275	389
2016	114	280	394
2017	109	286	395



Subsidiaries & affiliates

● Manufacturing/Construction & Engineering ★ Sales/Other

Automotive

Japan

★ AutoNetworks Technologies, Ltd.
● Sumitomo Electric System Solutions Co., Ltd.
● Sumitomo Wiring Systems, Ltd.
● Sumitomo Riko Co., Ltd.

Overseas

● Sumitomo Electric Wiring Systems (Europe) Ltd. (U.K.)
● SEWS-Cabind S.p.A. (Italy)
● SEWS Components Europe, B.V. (Netherlands)
★ SEI ANTech-Europe GmbH (Germany)
● Sumitomo Electric Bordnetze AG (Germany)
● SEWS Hungary Wiring Harness, Ltd. (Hungary)
● SEWS South Africa Pty. Ltd. (South Africa)
● PT. Sumi Indo Wiring Systems (Indonesia)
● PT. Sumitomo Wiring Systems Batam Indonesia (Indonesia)
● Sumitomo Electric Automotive Products (Singapore) Pte. Ltd. (Singapore)
● SEWS-Asia Technical Center, Ltd. (Thailand)
● Sumitomo Electric Wiring Systems (Thailand) Ltd. (Thailand)
● International Electric Wires Phils. Corp. (Philippines)
● SUMI-HANEL Wiring Systems Co., Ltd. (Vietnam)
● Kaifeng Zhucheng Wiring Systems, Co., Ltd. (China)
● Huizhou Zhurun Wiring Systems Co., Ltd. (China)
● Huizhou Zhucheng Wiring Systems, Co., Ltd. (China)
★ SEWS-STC Co., Ltd. (China)
● Tianjin Jin-Zhu Wiring Systems Co., Ltd. (China)
● Wuhan Sumiden Wiring Systems Co., Ltd. (China)
● SEWS Taiwan Ltd. (Taiwan)
● Sumidenso do Brasil Industrias Eletricas Ltda. (Brazil)
● Sumitomo Electric Wiring Systems, Inc. (U.S.A.)

Infocommunications

Japan

● SEI Optifrontier Co., Ltd.
● Kiyohara Sumiden, Ltd.
★ STARNET Co., Ltd.
● Sumiden Opcom, Ltd.
● Sumiden Communication Engineering Co., Ltd.
★ Sumiden Material Processing Co., Ltd.
● Sumiden Semiconductor Materials Co., Ltd.
● Sumitomo Electric Device Innovations, Inc.
● Japan Communication Accessories Manufacturing Co., Ltd.
● Broad Net Mux Corporation

Overseas

● Sumiden Device Innovations Vietnam Co., Ltd. (Vietnam)
● Sumitomo Electric Photo-Electronics Components (Suzhou), Ltd. (China)
● Sumitomo Electric Optical Components (Wuxi) Co., Ltd. (China)
● Hangzhou SEI-Futong Optical Fiber Co., Ltd. (China)
● Tianjin SEI-Futong Optical Fiber Co., Ltd. (China)
● Jiaxing SEI-Futong Optical Fiber Co., Ltd. (China)
● SEI Electronics Materials Ltd. (Taiwan)
● SEI Brasil Indústria e Comércio de Soluções Ópticas Ltda. (Brazil)
★ Sumitomo Electric Device Innovations U.S.A., Inc. (U.S.A.)
● Sumitomo Electric Lightwave Corp. (U.S.A.)
● Sumitomo Electric Semiconductor Materials, Inc. (U.S.A.)

Electronics

Japan

★ Sumiden Shoji Co., Ltd.
● Sumitomo (SEI) Electronic Wire, Inc.
● Sumitomo Electric Fine Polymer, Inc.
● Sumitomo Electric Printed Circuits, Inc.
● Tomita Electric Co., Ltd.

Overseas

● SEI Identification Solutions Ltd. (U.K.)
★ SEI Interconnect Products (Europe), Ltd. (U.K.)
● Sumitomo Electric Schrumpf-Produkte GmbH. (Germany)
★ Sumitomo Electric Asia Pacific Pte. Ltd. (Singapore)
● First Sumiden Circuits, Inc. (Philippines)
● SEI Electronic Components (Vietnam), Ltd. (Vietnam)
● Sumitomo Electric Interconnect Products (Vietnam), Ltd. (Vietnam)
● Sumitomo Electric Interconnect Products (M) Sdn. Bhd. (Malaysia)
★ Sumitomo Electric (Korea) Electronics, Ltd. (Korea)
● Sumitomo Electric (Shanghai) Electronics, Ltd. (China)
● Sumitomo Electric Fine Polymer (Suzhou) Ltd. (China)
● Sumitomo Electric Interconnect Products (Suzhou), Ltd. (China)
● Sumitomo Electric Interconnect Products (Shenzhen), Ltd. (China)
★ Sumitomo Electric Interconnect Products (Shanghai), Ltd. (China)
● Zhongshan Sumiden Hybrid Products Co., Ltd. (China)
★ Sumitomo Electric Interconnect Products (Hong Kong), Ltd. (China <Hong Kong>)
● Judd Wire Inc. (U.S.A.)
● Sumitomo Electric Interconnect Products, Inc. (U.S.A.)

Environment & Energy

Japan

● J-Power Systems Corporation
● Sumiden Transmission And Distribution System Products, Ltd.
● Sumiden Hitachi Cable Ltd.
● Sumiden Fine Conductors Co., Ltd.
● Sumitomo Electric Wintec, Inc.
● Sumitomo Electric Industrial Wire & Cable Inc.
● Sumitomo Densetsu Co., Ltd.
● Daikoku Electric Wire Co., Ltd.
● Sumitomo Electric Toyama Co., Ltd.
● Nissin Electric Co., Ltd.
● Hokkaido Electric Industries Ltd.

Overseas

● Finolex J-Power Systems Private Limited (India)
● PT. Sumi Indo Kabel Tbk. (Indonesia)
● PT. Sumitomo Electric Wintec Indonesia (Indonesia)
● J-Power Systems Saudi Co., Ltd. (Saudi Arabia)
● Sumitomo Electric Wintec (Thailand) Co., Ltd. (Thailand)
● Daikoku Electronics (Phils.), Inc. (Philippines)
● PT. Karya Sumiden Indonesia (Indonesia)
● SEI Thai Electric Conductor Co., Ltd. (Thailand)
● Sumiden Electronic Materials (M) Sdn. Bhd. (Malaysia)
● Sumitomo Electric Wintec (Malaysia) Sdn. Bhd. (Malaysia)
● KTS HIGH-TECH Rubber Co., Ltd. (China)
● Sumitomo Electric Wintec (Wuxi) Co., Ltd. (China)
● Sumi-Pac Corporation (Taiwan)
● Sumitomo Electric Wintec America, Inc. (U.S.A.)

Industrial Materials & Other

Japan

● Axismateria Ltd.
● A.L.M.T. Corp.
● Kyushu Sumiden Seimitsu Ltd.
★ Gokoh Shoji Co., Ltd.
● Sumitomo (SEI) Steel Wire Corp.
★ Sumitomo Electric Tool Net, Inc.
● Sumitomo Electric Hardmetal Corp.
● Sumitomo Electric Sintered Alloy, Ltd.
★ Takara Sangyo Co., Ltd.
● Tokai Sumiden Precision Co., Ltd.
● Tohoku Sumiden Precision Co., Ltd.
● Sumitomo Electric Tochigi Co., Ltd.
● Hoshi Industries Co., Ltd.
● Hokkaido Sumiden Steel Wire Co., Ltd.
● Hokkaido Sumiden Precision Co., Ltd.
★ Misawa Trading Co., Ltd.

Overseas

★ Sumitomo Electric Hardmetal Ltd. (U.K.)
★ Sumitomo Electric Hartmetall GmbH. (Germany)
● Sumitomo Electric Hartmetallfabrik GmbH. (Germany)
● Sumitomo Electric Sintered Components (Germany) GmbH (Germany)
● PT. Sumiden Serasi Wire Products (Indonesia)
● PT. Sumitomo Electric Hardmetal Indonesia (Indonesia)
● PT. Sumiden Sintered Components Indonesia (Indonesia)
★ SEI Carbide Australia Pty Ltd. (Australia)
★ Sumitomo Electric Hardmetal Asia Pacific Pte Ltd. (Singapore)
● Sumiden Steel Wire (Thailand), Co., Ltd. (Thailand)
● Sumitomo Electric Hardmetal Manufacturing (Thailand), Ltd. (Thailand)
● Sumitomo Electric Sintered Components (Thailand) Co., Ltd. (Thailand)
● Sumitomo Electric Sintered Components (M) Sdn. Bhd. (Malaysia)
● Sumiden Powder Metallurgy (Wuxi) Co., Ltd. (China)
● Sumiden Light Alloy (Changzhou) Co., Ltd. (China)
★ Sumitomo Electric Hardmetal Trading (Shanghai) Co., Ltd. (China)
★ Sumitomo Electric Hardmetal de Mexico, S.A. de C.V. (Mexico)
● Sumitomo Electric Sintered Components México, S.A. de C.V. (Mexico)
● Engineered Sintered Components Company (U.S.A.)
● Keystone Powdered Metal Company (U.S.A.)
● Sumiden Wire Products Corporation (U.S.A.)
● Sumitomo Electric Carbide Manufacturing, Inc. (U.S.A.)
★ Sumitomo Electric Carbide, Inc. (U.S.A.)

Other

Japan

★ SEI Business Creates, Inc.
★ SEI Professional Staffs Inc.
★ SEI Loginet Co., Ltd.
● Sunray Reinetsu Co., Ltd.
★ Sumiden Friend, Ltd.
● Sumitomo Electric Information Systems Co., Ltd.
★ Sumitomo Electric Intellectual Property & Technology Center, Ltd.
● Sumitomo Electric Technical Solutions, Inc.

Overseas

★ Sumitomo Electric Europe Ltd. (U.K.)
★ Sumitomo Electric Finance U.K. Ltd. (U.K.)
★ SEI Trading India Pvt. Ltd. (India)
★ Sumitomo Electric (Thailand) Ltd. (Thailand)
★ SEI (Philippines) Incorporated (Philippines)
★ Sumitomo Electric Asia Ltd. (China)
★ Sumiden Asia (Shenzhen) Co., Ltd. (China)
★ Innovation Core SEI, Inc. (U.S.A.)
★ Sumitomo Electric Finance U.S.A., Inc. (U.S.A.)
★ Sumitomo Electric U.S.A., Inc. (U.S.A.)

Affiliates

Japan

● OCC Corporation
● Kitanihon Electric Cable Co., Ltd.
● Sumitomo Rubber Industries, Ltd.
● Dyden Corporation
★ Techno Associe Co., Ltd.
★ Bay Communications Inc.
● MIRAIT Holdings Corporation

Overseas

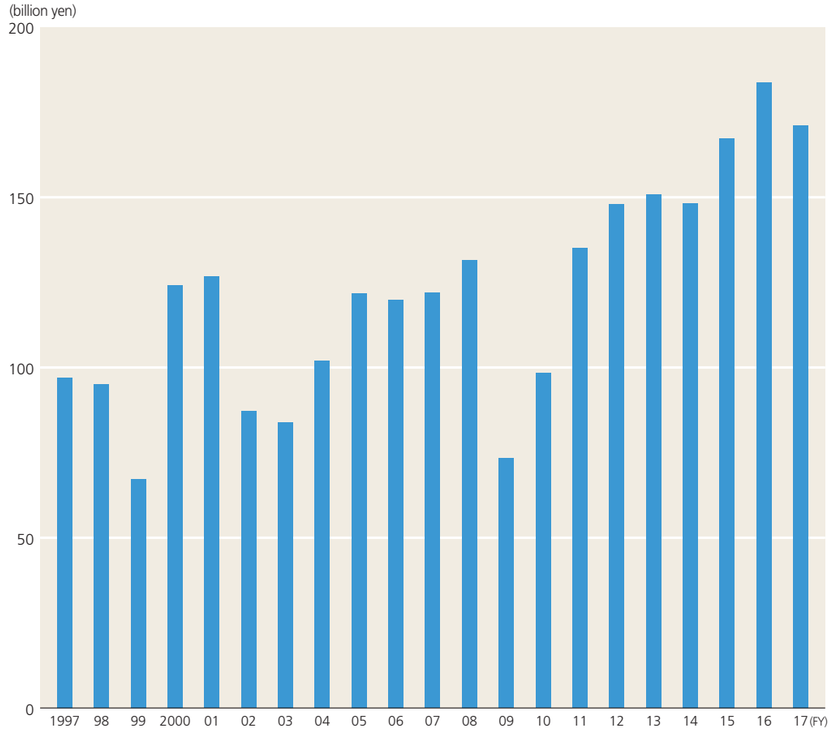
● Opticable S.A. (Belgium)
● Korloy Inc. (Korea)
● Kyungshin Corporation (Korea)
● KSM/SAMHAN (Korea Sintered Metal Co., Ltd.) (Korea)
● Chengdu SEI Optical Fiber Co., Ltd. (China)
● SPW (Sumiden Powder Metallurgy (Wuxi) Co., Ltd.) (China)
● SEI-Nanjing Putian Optical Network Co., Ltd. (China)
● Jiaxing SEI-Futong Optical Fiber Co., Ltd. (China)

Changes in capital expenditure

(billion yen)

FY	Consolidated
1997	97.0
1998	95.0
1999	67.3
2000	124.2
2001	126.7
2002	87.2
2003	84.0
2004	102.1
2005	121.8
2006	119.9
2007	121.9
2008	131.6
2009	73.3
2010	98.4
2011	135.0
2012	147.9
2013	150.8
2014	148.2
2015	167.3
2016	183.7
2017	171.1

Cited from the *FACT BOOK*



Changes in R&D expenditure

(billion yen)

FY	Consolidated
1997	45.8
1998	43.4
1999	42.0
2000	44.8
2001	48.5
2002	48.6
2003	55.2
2004	56.5
2005	64.4
2006	68.4
2007	72.3
2008	73.0
2009	72.3
2010	79.0
2011	86.6
2012	94.3
2013	99.5
2014	105.6
2015	110.8
2016	115.2
2017	117.7

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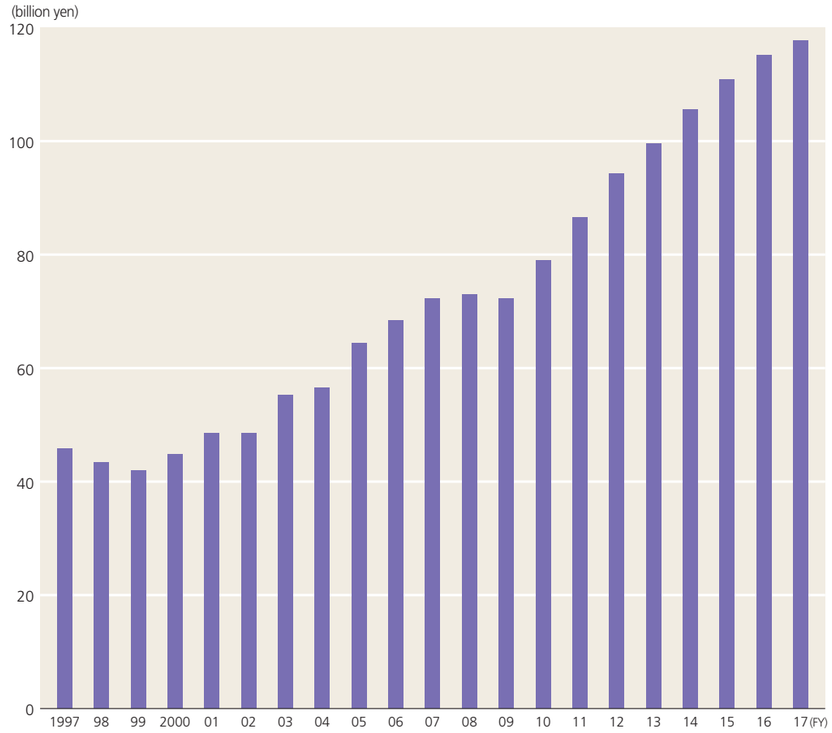

Chronological table

Year	Month	
1997	Apr	Commencement of construction of Kiyohara Sumiden, Ltd.'s new optical fiber plant
	Jun	Formulation of the Sumitomo Electric Group Corporate Principles and Sumitomo Electric Employee Code of Conduct
		Formulation of the 100th Anniversary Declaration
	Aug	Establishment of Sumitomo Electric Intellectual Property & Technology Center, Ltd.
	Sep	Development of 7 Tesla high-temperature superconductor Magnet
	Oct	Development and release of MegaBit Gear local system using on-board telephone lines
	Nov	Receipt of Japan Investor Relations Association Best IR Award
1998	Jan	Establishment of PT. Karya Sumiden Indonesia (KSI), the first overseas copper wire rod production base
		Establishment in China of optical fiber manufacturing and sales joint venture, Chengdu SEI Optical Fiber Co., Ltd.
	Feb	Acquisition of ISO 14001 certification by Kumatori Works
	Mar	Start of operations for Fine-Pitch FPC Mass Production Line
	Apr	Start of electric cable eco-project activities
		Development of large-diameter 6-inch high-quality GaAs single crystal for wireless communication systems
	Jul	Release of optical link module for 2.5 Gbps long-distance transmission
	Aug	Launch of environmentally friendly Eco Wire series of electronic equipment and automotive wires
	Sep	Delivery of Tokyo Metropolitan Police Department disaster prevention and traffic control system
	Oct	Establishment of Sumitomo Electric Information Systems Co., Ltd.
	Nov	Acquisition of ISO 14001 certification by Kanto Works
		Completion of Anan-Kihoku DC trunk line using 500 kV OF submarine cable for the Kansai Electric Power Co., Inc. and Electric Power Development Co., Ltd. (J-Power)
1999	Jan	Establishment of Broad Net Mux Corporation as a jointly-owned company in CATV business through integration of Toshiba Corporation and CATV businesses
	Feb	Acquisition of ISO 14001 certification by Yokohama Works
	Apr	Announcement of new high-temperature superconductor SQUID product SEIQUID
	Jun	Appointment of Chairman Noritaka Kurauchi and President Norio Okayama
		MegaBit Gear Lite equipment for ADSL general subscriber telephone network wins Best of Show Special Award in Communications Infrastructure Division from NetWorld+Interop 99 Tokyo
	Jul	Brake business spun off to form Sumitomo (SEI) Brake Systems, Inc.
		Fine Polymer products business spun off to establish Sumitomo Electric Fine Polymer, Inc.
		Increase of Sumitomo Electric shares in British wiring harness joint venture company to 100% thus forming SEWS-E
	Aug	Start of delivery of ADSL equipment for first domestic subscriber telephone network
	Oct	Completion of Anan-Kihoku DC overhead power transmission cable for the Kansai Electric Power Co., Inc. and Electric Power Development Co., Ltd. (J-Power)
		Start of joint research of high-temperature superconducting cable system with TEPCO
2000	Mar	Establishment of Sumitomo Electric Printed Circuits, Inc.
		Acquisition of ISO 14001 certification by Osaka Works
	Apr	Receipt of order for redox flow battery from Tottori SANYO Co., Ltd. (first commercial operation in the world)
		Commencement of QUICK campaign (Quality Innovation Complete Kihon)
		World's first development and commercialization of Gallium Nitride (GaN) substrate
	Jun	Completion of PCB chemical processing for the first time in Japan; received Encouragement Award in the Osaka Environmental Awards
	Jul	Magnetic wire manufacturing division spun off to establish Sumitomo Electric Magnet Wire, Inc.
	Aug	Establishment of Axismateria, Ltd.
		Establishment of electrical wire manufacturing and sales company in China, Sumitomo Electric Interconnect Products (Shanghai) Ltd. (SESH)
	Sep	Logistics division spun off to establish S.E.I. LogiTex Co., Ltd.
		Acquisition of ISO 14001 certification by Itami Works
	Oct	Establishment of A.L.M.T. Corp.
		Establishment of Wintec Wire, Inc.
	Nov	Start of operation of TEPCO's Shin-Keiyo-Toyosu Line
2001	Jan	Establishment of SEI Electronics Materials Ltd. in Taiwan
	Apr	Absorption-type merger of Nippon Senzai, Co. Ltd. into Sumitomo Electric Toyama Co., Ltd.
		Completion of public transportation priority system and bus location system for Osaka Prefectural Police Department and Nankai Bus Co., Ltd.
	May	Establishment of Sumiden Semiconductor Materials Co., Ltd. in Kobe
		Acquisition of wiring harness business from Italy's Cabind Automotive S.p.A. to begin operations under a new structure
	Jun	Start of long-term trials to develop the world's first three-core high-temperature superconducting cable
	Jul	Integration of high-voltage power cable businesses with Hitachi Cable, Ltd. to establish J-Power Systems Corporation
		Establishment of ADVICS CO., LTD. (brakes business) through collaboration between brake business with, Aisin Seiki Co., Ltd., Denso Corporation and Toyota Motor Corporation
		Establishment of Sumitomo Electric Interconnet Products Optical Fiber and Cable (Shenzhen), Ltd.
	Sep	Launch of Southeast Asia's largest copper wire rod plant in Indonesia
	Oct	Commencement of operations by J-Power Systems Corporation
		Establishment of a committee for urgent structural reform
		Establishment of Sumitomo Electric Interconnect Products (Suzhou), Ltd.
	Nov	Establishment of Sumitomo Electric Semiconductor Materials, Inc. (SESMI) in the U.S.
2002	Jan	Commencement of shipping of multi-layer FPCs for mobile phones
	Apr	Commencement of QR-1 campaign
		Establishment of Asdex Corporation by forge dye machining business together with Aichi Steel Corporation
		Personnel affairs, salary and other business divisions spun off to establish SEI Personet
		Successful development of large diameter 4 inch Indium Phosphide (InP) crystal for optical transmission
	Jun	Successful completion of long-term trials of high-temperature superconducting cable
	Jul	Merger of electric wire and cable business for construction and electric sales with Hitachi Cable Co., Ltd. and Tatsuta Electric Wire and Cable Co., Ltd. to establish Sumiden Hitachi Cable Ltd.
		Acquisition of wiring harness business from Calsonic Kansei Corporation
	Aug	ADSL business spun off to establish Sumitomo Electric Networks, Inc.
	Oct	Special steel wire business spun off Sumitomo (SEI) Steel Wire Corp.
		Establishment of Sumitomo Electric Wintec, Inc. through merger of three magnetic coil [magnet wire] companies
2003	Jan	Commencement of operations by Sumiden Hitachi Cable Ltd.
	Feb	Receipt of the exclusionary recommendation due to antimonopoly violation bidding for traffic signals and other works for the Tokyo Metropolitan Police Department
	Mar	Establishment of Compliance Committee
	Apr	Powder alloys and diamond business spun off to establish Sumitomo Electric Hardmetal Corp.
		Transfer and integration of manufacturing and development divisions of sintered products to establish Sumitomo Electric Sintered Alloy, Ltd.
		Start of Action ECO-21 campaign as a Group-wide environmental conservation activity
		Establishment of Structural Reform Promotion Committee
		Introduction of Cafeteria Plan (voluntary welfare plan selection system)
		Restructure of electrical wire businesses to establish Sumitomo (SEI) Electronic Wire, Inc. and Sumitomo Electric Flat Components, Inc.
		Start of world's first mass-production of Gallium Nitride (GaN) substrate for blue-violet laser
		Establishment of Sumitomo Electric Technical Solutions, Inc.
	Jun	Introduction of executive officer system
	Jul	Establishment of Green Procurement Guidelines
		Introduction of business unit system
	Aug	Launch of Crisis Management Committee
		Introduction of new wage and compensation scheme
	Oct	Transfer of the functional parts business and merger into A.L.M.T.
		Establishment of Information Security Policy
2004	Jan	Launch of Fellow and Senior Specialist certification system
	Apr	Start of operations by Toshiba Sumiden Medical Information Systems Corporation
		Establishment of Eudyna Devices Inc.
	Jun	Appointment of Chairman Norio Okayama and President Masayoshi Matsumoto
	Jul	Launch of CSR Committee
		Reorganization of A.L.M.T. Corp. into a wholly-owned subsidiary
	Oct	Transfer of sales to Japanese electric power companies to J-Power Systems Corporation
		Merger of Hannan Electric Wire & Cable Co., Ltd. with Sumitomo Electric Industrial Wire & Cable Inc.
	Nov	First announcement of Sumitomo Electric Group's management plan (VISION 2007)

Year	Month	
	Nov	Acquisition of a 50% share of Kyungshin Industrial Co., Ltd., a leading wiring harness manufacturer in Korea, (Sumitomo Electric: 30%, Sumitomo Wiring Systems, Ltd. 20%)
	Dec	Start of online sales of LuneQ-40 multi-beam antenna
2005	Jan	Selection of bismuth-based superconducting wire for the grand prix Masuda Prize during Nikkan Kogyo Shimbun's Ten Best New Products Awards
	Mar	Formulation of "Ingenious Dynamics" as the Group's tag line
	Apr	Reorganization of the education and training system into "SEI University"
		Introduction of the "Meister" and "Expert" system
		Establishment of SEI Hybrid Products, Inc. following spin-off of hybrid products division
	Sep	Formulation of the Sumitomo Electric Group Charter of Corporate Behavior
	Oct	Opening of SEI University's Minami-Hakone Seminar House
		Introduction of re-employment systems after retirement (Masters Program)
	Dec	Development of HEV pipe-shielded wiring harness for Honda Motor Co., Ltd.
2006	Jan	Receipt of Nikkan Kogyo Shimbun's Ten Best New Products Awards for 2005 by LuneQ-40 multi-beam antenna
	Mar	Acquisition of Germany automotive wiring harness manufacturer, Volkswagen Bordnetze GmbH with Sumitomo Wiring Systems, Ltd.
	Jun	Opening of the Tool Engineering Center (TEC) on the premises of Itami Works
	Jul	Start of power transmission using Sumitomo Electric's high-temperature superconducting cable for Albany project in the U.S.
	Oct	Establishment of Sumitomo Electric Technical Solutions, Inc.
2007	Feb	Global Manager Development Program held in Japan (GMJ)
	Mar	Announcement of construction of "WinD Lab" research building
	May	Announcement of VISION 2012 mid-term management plan
		Formulation of the Sumitomo Electric Group Basic Policies on Social Contributions
	Jul	Establishment of Suzuki-Sumiden Stainless Steel Wire Co., Ltd.
	Aug	Reorganization of Sumitomo Wiring Systems, Ltd. into a wholly-owned subsidiary
	Sep	Abolishment of Experienced Expert system
	Oct	Transfer of automotive brakes business to Aisin Seiki Co., Ltd.
	Dec	Reorganization of Nissin Electric Co., Ltd. into a consolidated subsidiary
		Reorganization of Toyokuni Electric Cable Co., Ltd. into a wholly-owned subsidiary
2008	Jan	Establishment of Finolex J-Power Systems Pvt. Ltd., a high-voltage power cable joint venture
	Mar	Opening of childcare center at Yokohama Works (Hama-kids)
	Apr	Launch of Eco-Life Activities "Household Eco-Account Book"
		Launch of J-SOX Project
		Launch of SWITCH campaign
		Establishment of SEI Loginet Co., Ltd. through integration of S.E.I. LogiTex Co., Ltd., with Sumidenso Loginet Co., Ltd.
		Opening of childcare center at Osaka Works (Izumi-kids)
	May	First delivery of recycled OC wire
	Jun	Exhibition of a superconductor electric vehicle at the Integrated Exhibition of the Environment commemorating the G8 Hokkaido Toyako Summit
		Adoption of wastewater treatment filtration modules by sewage treatment facility in Dangjin City, Korea
	Jul	Start of operation by Sumiden Friend, Ltd. (Special subsidiary)
		Establishment of Dubai Office
		1st Sumitomo Electric Group Global Award Ceremony
		Introduction of the Factory Expert System
		Establishment of SE Wiring Systems Egypt S.A.E. with Sumitomo Wiring Systems, Ltd.
	Sep	Development of aluminum wiring harnesses for automotive low-voltage systems using stranded thin aluminum wires
		Establishment of SE Bordnetze Tunisia S.A.R.L. with Sumitomo Wiring Systems, Ltd.
	Oct	Opening of the Technical Training Center
		Commencement of joint shuttle transportation with Furukawa Electric Co., Ltd.
	Nov	Establishment of Optical fiber and cable manufacturing joint venture with Futong Group (Zhejiang), China
	Dec	Commencement of joint shuttle transportation with Panasonic Corporation
		Establishment of Structural Reinforcement Promotion Committee
		Investment in Opticable S.A., Belgium, a subsidiary of French Nexans S.A.

Year	Month	
2009	Jan	Start of MKP program (developing engineers to drive manufacturing innovation), GKP program (developing personnel to promote on-site improvements) and KKP training (reinforcement of manufacturing fundamentals)
	Mar	Opening of childcare center at Itami Works (SEI Itami-kids)
		Contract with Electric Power Development Co., Ltd. (J-POWER) for submarine cable project (45 km connecting Hokkaido and Honshu) using DC XLPE cable
	Apr	Establishment of SEI Group CSR Foundation
	May	Start use of WinD Lab R&D building
	Jul	Success in oscillating the world's first true green semiconductor laser
	Aug	Launch of Sumitomo Electric Device Innovations, Inc. after reorganizing optical and electric device business
	Sep	Delivery of superconductive cable core to Chubu University for use in the world's first practical demonstration of long-distance superconducting cable
		Establishment of joint venture with Tokai Rubber Industries, Ltd. and Chinese firm, KTK Group Co., Ltd., for the manufacture and sale of air springs and anti-vibration rubber for railway cars
2010	Jan	Establishment of NEXT center
	Feb	Official recognition given to SEI Group CSR Foundation as a public interest incorporated foundation
	Apr	Completion of WinD Lab auditorium building and opening ceremony
		Reorganization of Song Gang Electric Wire Factory into a wholly-owned subsidiary and incorporation to Sumitomo Electric Interconnect Products (Shenzhen)
		Establishment of a Joint venture with Niagara Refining LLC in Buffalo, U.S. to refine raw materials for tungsten from ore
	Jun	Formulation of regulations for compliance with the Antimonopoly Act
		Establishment of SEI-Nanjing Putian Optical Network Co., Ltd. jointly in Nanjing, China with Nanjing Putian Telecommunications Co., Ltd. to manufacture optical networking equipment for FTTx
	Jul	1st Stakeholder Dialogue
		Merger of Toyokuni Electric Cable Co., Ltd., and Sumiden High Precision Co., Ltd., after adding part of Sumitomo Electric's business to establish SEI Optifrontier Co., Ltd.
	Aug	Delivery of a superconducting magnetic system to Nihon Denji Sokki Co., Ltd. for its BH curve tracer
		Formulation of the Sumitomo Electric Group CSR Procurement Guidelines
	Sep	Commencement of operations of Hangzhou SEI-Futong Optical Fiber Co., Ltd. (manufacturer of base material)
2011	Feb	Change from Global Manager Development Program in Japan (GMJ) to the Global Leadership Development Program (GLP)
	Mar	New world record set for transmission capacity of 109 Tbps using multi-core optical fiber
	Apr	Establishment of Sumitomo Electric Hardmetal Manufacturing (Changzhou) Co., Ltd. for mass production of cemented carbide drills and diamond crystal inserts in Changzhou, Jiangsu Province, China
		Commencement of operations for wet-chemical treatment plant for tungsten recycling
	May	Start of Smile Relay blog
	Jun	Start of on-site micro smart grid demonstration system
	Aug	Establishment of a joint venture, Kaifeng Zhucheng Wiring Systems, Co., Ltd. with Sumitomo Wiring Systems Ltd.
	Sep	First delivery of POREFLON Membrane Module to a food company in Japan
		Formulation of "Global Human Resource Management Policy"
	Oct	Start of sales of quick charger connector for EV (SEVD-01)
2012	Jan	Receipt of the Thomson Reuters 2011 Top 100 Global Innovator Award
	Mar	Acquisition of the vertical-cavity surface emitting laser (VCSEL) light source business from EMCORE Corporation
	Apr	Integration of Sumitomo Electric Flat Components, Inc. into Sumitomo (SEI) Electronic Wire, Inc.
		Development, manufacture and sales of Thunderbolt cable
		Establishment of PT. Sumiden Sintered Components Indonesia in Bekasi, West Java, Indonesia
		Establishment of SEI Thai Electric Conductor Co., Ltd.
	May	Commencement of full operation of its new plant producing cemented carbide indexable inserts at Hokkaido Sumiden Precision Co., Ltd.
	Jun	Development of the world's best high-level and high-efficiency true green semiconductor laser
		Establishment of SEI Brasil Indústria e Comércio de Soluções Ópticas Ltda. in Brazil
	Jul	Commencement of demonstration operation of the megawatt-class large-scale power generation/storage system (Yokohama Works)
		Donation made to Sumitomo Sogo Ground and athletic track upgraded to an all-weather track

Year	Month	
	Oct	Japan's first demonstration testing to connect a superconducting cable to an actual power grid
		Establishment of SEI Electronic Components (Vietnam), Ltd. as mass-production base for FPC
	Nov	Commencement of operations by Sumiden Steel Wire (Thailand) Co., Ltd.
2013	Jan	Commercialization of the industry's smallest photovoltaic power conditioner
		Commencement of long-term demonstration testing of power distribution using high-temperature superconducting cable
		Receipt of the world's first certification for Thunderbolt optical cable and started mass-production
		Movement of Tokyo headquarters to Akasaka Center Building
	Feb	Start of delivery of 1500 V DC cable for photovoltaic power generation equipment
	Mar	Sponsorship of Lake Biwa Mainichi Marathon
		Adoption of high-temperature superconducting DC system verification research project by Ministry of Economy, Trade and Industry
	Apr	Beginning of verification testing of photovoltaic power generation in Morocco
	May	Announcement of VISION 2017 mid-term management plan
		New world record set for the lowest optical fiber transmission loss of 0.149 dB/km
		Start of mass production of FPC with conductive paste connection
		Receipt of world's first GE-PON products certification meeting DPoE 1.0 specifications from CableLabs
	Jul	Adoption of large-scale storage battery system using redox flow battery in a fiscal 2012 emergency demonstration project for large-scale power storage system
		Signing of a comprehensive cooperation agreement with Wakayama Medical University
	Oct	Formulation of regulations for anti-bribery compliance
		Start of sales of high heat-resistant FPC
		Establishment of Sumitomo Electric (Shanghai) Electronics, Ltd., as an electronic product sales management company
	Dec	Establishment of Sumiden Light Alloy (Changzhou) Co., Ltd. as an electronic enclosures manufacturing and sales company in Changzhou City, Jiangsu Province, China
2014	Jan	First appearance of Athletics club at the All-Japan Men's Corporate Team Ekiden Championships ("New Year Ekiden" relay)
		Receipt of an order for 15 km of a 230 kV submarine CV cable project under San Francisco Bay
		Receipt of an order for the production of 115 km of 500 kV DC MI submarine cable to link Montenegro and Italy
	Feb	Successful completion of the long-term demonstration testing of high-temperature superconducting cable
		Publication of *ALL SEI* for all Group employees in Japanese, English, Chinese, German and Thai
	Mar	Receipt of the Okochi Memorial Technology Prize at the 60th Okochi Prize for nano-polycrystalline diamond synthesis technology and applied product development
	Apr	Reorganization of J-Power Systems Corporation into a wholly-owned subsidiary
		Introduction of "Global Grade System"
	Jul	Start of sales of light-weighted and compact refrigerated superconducting magnet system
		Adoption of traffic information and map distribution service, "Traffic Vision" and "AgentNavi" by Yahoo! CarNavi
	Aug	Establishment of Sumitomo Electric Sintered Components Mexico, S.A. de C.V.
	Sep	Registration of OF cable by Japan's National Museum of Nature and Science as "Essential Historical Materials for Science and Technologies" (popularly called "Future Engineering Heritage")
		Sale of all of Sumitomo Electric's shares in Sumitomo 3M Limited
	Oct	Receipt of the Minister of Economy, Trade and Industry Prize from the Reduce, Reuse, Recycle Promotion Association
	Nov	Acquisition of additional shares in Sumiden Hitachi Cable Ltd.
	Dec	Commercialization of a real-time mega-solar monitoring device using power line communication (PLC)
2015	Jan	Introduction of visual identity (VI)
	Apr	Establishment of Monozukuri Technology Improvement Committee
		Start of mass production of high-strength materials for aluminum wiring harness
	May	Announcement of interim revision of the company's VISION 2017
		Certification of VAD Method as an IEEE Milestone
	Jun	Receipt of an order for high-voltage DC power transmission cable to link Britain and Belgium
		Opening of a branch office of Sumitomo Electric (Thailand) Ltd. in Yangon, Myanmar

Year	Month	
	Jul	Receipt of an order for 250 kV DC XLPE cable construction between Hokkaido and Honshu from Hokkaido Electric Power Co., Inc.
	Aug	Participation by Yuta Konishi and Tomoya Tamura in the IAAF World Championships
		Start of test projects for demand response using Sumitomo Energy Management System Architecture" (sEMSA) at the three Sumitomo Electric plants
	Sep	Successful transmission to a data center using a DC superconducting cable in the high-temperature superconducting DC system verification research project
	Dec	Start of demonstration testing using redox flow battery with storage capacity of 60 MWh at Minami-hayakita Substation of Hokkaido Electric Power Co., Inc.
		Receipt of an order for a traffic control system for Phnom Penh, Cambodia
		Start of mass production of under-floor pipe-shielded wiring harnesses for the fourth-generation Prius
2016	Jun	Consolidation of Chubu District Office and Nagoya Branch Office
		Signing of a sales cooperation agreement with Wa Minn Group of Companies in order to expand medium- to low-voltage power cables in Myanmar
	Jul	Participation in the Ministry of Economy, Trade and Industry's Virtual Power Plant (VPP) Construction Verification Project
		Introduction of full-scale teleworking system
	Aug	Participation by Tomoya Tamura of the athlete club in Rio 2016 Olympic Games
		Certification as the highest-grade "Eruboshi" company under the Act on Promotion of Women's Participation and Advancement in the Workplace
	Sep	Acquisition of Keystone Powdered Metal Co., a major U.S. sintered parts manufacturer
	Oct	Launch of SEI-CSIRT Office
		Establishment of chassis dynamo experiment equipment with a radio wave darkroom at Suzuka Plant of Sumitomo Wiring Systems, Ltd.
		STEC in Thailand conducts the integrated manufacture of aluminum wiring harness from the casting and rolling process
	Nov	Entry by J-Power Systems Saudi Co., Ltd. (JPS Saudi) into a long-term contract for delivery of submarine power cable with the Saudi Arabian Oil Company (Saudi Aramco), the world's largest oil company
		Completion of concentrator photovoltaics (CPV) plant and demonstration testing underway at the research facilities of the Moroccan Agency for Solar Energy (MASEN)
2017	Jan	Delivery of PC steel wire for Lach Huyen Bridge constructed in Vietnam
	Mar	Start of demonstration operations of the U.S. largest-scale redox flow battery storage system at San Diego Gas & Electric Company
		Signing of a cooperation agreement with Siemens for high-voltage DC transmission
		Receipt of an order for joint construction with Siemens of India's transmission system including 320 kV DC cable for Power Grid Corporation of India Ltd.
		New world record set for the lowest optical transmission loss of 0.1419 dB/km
	Apr	120th anniversary
		Completion of new building of Toyota Branch
	May	Completion of new plant of Tohoku Sumiden Precision Co., Ltd.
		Start of mass production of 6-inch diameter low defect GaAs monocrystal for VCSEL
	Jun	Appointments of Masayoshi Matsumoto as Chairman & CEO, and Osamu Inoue as President & COO
	Jul	Start of operations at Sumiden Wire Products Corporation's new Texas plant
	Sep	Success in experiment and breaking of the world record of transmission capacity through a single optical fiber and achieved 10.16 petabits/second
	Nov	Development of magnesium alloy for die casting with the University of Toyama

Editor's note

Sumitomo Electric's History covers the period following the *Official 100th Anniversary of Sumitomo Electric Industries, Ltd.* published in 1997. After founding the Company History Editorial Office within the Human Resources Division in July 2016, we decided to contract the Information Innovation Business Division C&I Center of Dai Nippon Printing Co., Ltd., which specializes in the production of histories, and established our editorial organization.

We set the following three basic editorial policies.

1. To summarize the first 100 years since our foundation, and to focus on events of the past 20 years.
2. To divide the past 20 years into sections of around five years, each introduced with the background of the times and its significance to management in order to dynamically communicate the motivation behind management decisions, followed by a business section describing developments in each business area.
3. To use a visual layout for ease of reading.

After we began the task of editing, the transformation of the business due to the dramatic changes in the business environment over the past 20 years became apparent. It has proven extremely difficult to decide to what extent to elaborate on the development of each business within the limits imposed for publication. In the face of such difficult decisions, we would like to thank APIX Co. for reading through vast amounts of materials covering a wide scope of the business, and summarizing the changes in management and the business from an objective perspective.

Finally, we would like to express our thanks to everyone at the Sumitomo Historical Archives and Sumitomo Electric Group who provided valuable advice and materials to assist with the compilation.

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Company History Editorial Office,
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Sumitomo Electric 120 Year Journey

To Become a "Glorious Excellent Company"

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