

# Manufacturing that Contributes to a Better Societal Environment, Creating Value to Cater to Global Needs

The NGK Group develops and supplies products that support social foundations and serve environmental conservation, leveraging its ceramics technologies accumulated over the many decades since its founding.

## Editorial Policy

### Reference Guidelines

Ministry of the Environment's Environmental Reporting Guidelines (2012)  
Global Reporting Initiative (GRI)  
Sustainability Reporting Guidelines (Ver. 4.0)

### Target Organization

Indicated along with each article and data report included in this report.

### Target Period

April 1, 2015–March 31, 2016

**Forward-looking statements** This report includes forward-looking statements, such as business forecasts, concerning the NGK Group. Such statements are based on currently available information and reasonable assumptions and projections. However, please note that these assumptions and projections may be affected by various future factors, causing actual results to differ from the presented statements.

## Details of NGK are available on the company website

NGK Group Report 2016 provides financial and non-financial information in an integrated manner. For more detailed information in each area, please visit the website of NGK INSULATORS.



### About NGK

【Japanese】

<http://www.ngk.co.jp/info/>

【English】

<http://www.ngk.co.jp/english/about/>



### Investor Relations

【Japanese】

<http://www.ngk.co.jp/IR/>

【English】

<http://www.ngk.co.jp/english/ir/>



### CSR

【Japanese】

<http://www.ngk.co.jp/csr/>

【English】

<http://www.ngk.co.jp/english/csr/>  
(To be launched in September 2016)



The following eight symbols, each representing different CSR promotion actions described in the NGK Group Guidelines for Corporate Behavior, are indicated on the pages related to the relevant topics.

Reported activities have been organized based on NGK's eight CSR promotion actions (see p. 6), which are described in the NGK Group Guidelines for Corporate Behavior. We set yearly targets for each action every fiscal year and plan activities to achieve these targets.



Provision of Products that Contribute to Better Social Environment



Disclosure of Corporate Information



Thorough Enforcement of Compliance; Risk Management



Respect of Humanity and Assurance of Comfortable Working Environment



Implementation of Fair, Free and Transparent Transactions



Preservation of Global Environment



Coordination with Local Communities and Promotion of Contribution to the Society



Communications with Stakeholders

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### KUROKO ▶

'KUROKO' is a stagehand dressed in black who assists the actors in various ways during the Japanese Kabuki performance. Character 'KUROKO' symbolizes NGK's aim to design and manufacture useful products worldwide.

KUROKO ©NGK・kero/dwarf





## ■ Top Management's Commitment ■

# Creating a Company Where Each Individual Can Fully Demonstrate Their Capabilities and Spontaneity toward Our Goal of Achieving Sustainable Growth While Addressing Social Needs and Issues

### **Fiscal 2015 net sales marked a record high; Aiming for sustainable growth from a medium- to long-term perspective**

The NGK Group achieved record high net sales and profits in fiscal 2015. We believe this to be largely attributable to the steady increase in competitiveness of our conventional businesses and smooth growth of our new businesses, in addition to positive external factors such as the booming automobile and semiconductor markets and generally weaker yen.

Our goal is to achieve sustainable growth on top of making short-term profits. To this end, since fiscal 2014 we have been undertaking the new/reformed manufacturing structures initiatives designed to enhance our competitiveness as a manufacturer over the medium to long term. The initiatives have been progressing well, steadily improving productivity at each production site through such measures as introducing a cutting-edge production line for our mainstay product, ceramics for automotive exhaust purification. In addition, since 2013 we have been implementing the "2017 Challenge 30" project aimed

at spawning new products and businesses to underpin the Group's further growth. The project's goal of boosting the proportion of sales of new products among total net sales to above 30% by fiscal 2017 is expected to be accomplished ahead of schedule.

Although we are projecting a decline in net sales and profits in fiscal 2016 due to the negative impact of the market environment, a stronger yen, and a temporary increase in costs including those for production capacity expansion, demands are expected to grow in the subsequent few years, mainly in our core businesses. It is crucial for us to be prepared to fully embrace these demands in our bid to achieve sustainable growth.

### **Developing products that address needs and social issues by leveraging our long-fostered ceramic technologies**

The NGK Group's corporate philosophy upholds, "NGK products and technologies must create new value and



# TOP MANAGEMENT'S COMMITMENT

contribute to the quality of life." It always has been and will be our solemn social responsibility to leverage the technologies we have fostered as a manufacturer to develop and deliver products needed by society. One of our strengths lies in our diverse spectrum of proprietary technologies, including ceramic technologies. Our top priority agenda under the new Five-Year Environmental Action Plan launched in fiscal 2016 being "to make environmental and social contributions through our products," we are proactively promoting the development and proliferation of products that benefit the environment.

For example, NGK's HONEYCERAM® ceramics for automobile exhaust purification is adopted in roughly one in every two vehicles sold around the world. Our mission as a manufacturer of such a widely proliferated product is to fulfill our supply responsibility by securing high quality and sufficient quantity. To this end, we are making aggressive investments in facilities and technological development to strengthen and stabilize our production systems. Furthermore, we are also reinforcing our marketing activities in order to accurately pinpoint existing needs in society. Marketing specialists are deployed in each business group to explore new development themes in coordination with the New Business Planning Division.

NGK signed the United Nations (UN) Global Compact in April 2015. Seeking to identify social issues of an even larger scale and help solve them, going forward we will investigate how our technologies can contribute to the world in consideration of the Sustainable Development Goals (SDGs) adopted by the UN in September 2015.

## Creating a company where each individual can fully demonstrate their capabilities and spontaneity

Social responsibilities that need to be fulfilled by the NGK Group are diverse, ranging from those associated with safety, the environment, and quality, to those concerning appropriate corporate governance, supply chain management, and contribution to local communities. In addition to earnestly tackling these responsibilities head on, we must also attach importance to encouraging each and every employee to fully demonstrate their spontaneity, and must value them as the driving force of our growth.

The NGK Group's roughly 20,000 employees come from diverse racial and ethnic backgrounds, and 60% of them

work outside Japan. We are aiming to build systems and mechanisms that allow our diverse teams stationed at various business units around the world to flourish and develop on the basis of mutual respect and inspiration. We have already embarked on a revision of our personnel system for the purposes of increasing opportunities for young and mid-career employees to take on higher-level challenges, enabling older employees to continue working with peace of mind, and allowing female employees to demonstrate more of their capabilities. The NGK Group is determined to focus on human resources development and the accommodation of increasing diversity toward the goal of becoming a genuinely global corporate group that can compete on the world stage.

In September 2015, NGK admitted to violating U.S. antitrust laws and other regulations in some business transactions related to ceramic substrates for catalytic converters, and accepted a plea agreement with the U.S. Department of Justice. In recognition of the seriousness of this situation, we improved our compliance structure in an effort to prevent a recurrence through enhanced compliance system and thorough training with regard to antitrust and related regulations targeting our Board of Directors and all our employees. Furthermore, we have established a Business Ethics Committee to investigate any fraudulent practices that could have a material impact on management and introduced the Hotline, a whistle-blowing system for dealing with improper behavior, thereby accomplishing our reinforcement efforts for our compliance structure by the end of fiscal 2015. However, in addition to such mechanisms, it is also crucial for each and every employee to be vigilant and alert to any irregular behavior or legal violation, and to help create a corporate culture where such misconduct can be openly pointed out. We believe that creating a workplace environment where there is good communication and people feel free to report and share any minor matters is the key to preventing any recurrence.

Ever since NGK started out as an insulator manufacturer in 1919, the company has diversified its businesses in response to the needs of the times to pursue development. We will continue to unify our group-wide efforts to keep launching new technologies and products with a strong commitment to addressing social needs and issues. We ask for your continued patronage and support.



# NGK Ceramics Technologies Create the Cutting Edge in the “Triple E” Business Domain

## Energy Power Business

### For stable supply of electric power

We offer an array of products to ensure a stable supply of electricity (surely the bedrock on which our communities and livelihoods are based) and contribute to energy conservation and sustainability.

#### Insulators and electric power equipment

Our power transmission, substation and distribution insulators and related products support the stable supply of power in over 100 countries around the world.



Insulators for power substations



Insulators for power transmission

#### NAS<sup>®</sup> battery systems for electric energy storage

NAS batteries enable megawatt-class electricity storage, which can help peak shaving and stabilization of renewable energy supply.



NAS battery systems for electric energy storage

## Ecology Ceramic Products Business

### For reduction of environmental impact

We offer a line-up of ceramic products, led by automotive exhaust gas purifiers, which serves a broad range of industries and provides smart solutions for modern requirements such as environment protection and energy conservation.

#### HONEYCERAM<sup>®</sup>: Honeycomb ceramics for automotive catalytic converters to purify exhaust gases

Secures catalytic metal on the ceramics surface to purify automotive exhaust gases.



Large-size HONEYCERAM



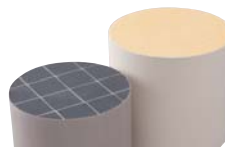
HONEYCERAM for gasoline-fueled vehicles

#### Ceramics to purify diesel vehicle exhaust gases/NOx sensors

We offer a broad range of products for purifying diesel vehicle exhaust gases.



In-vehicle NOx sensor



Diesel particulate filters

#### Industrial process products

We provide various products used for industrial processing, such as manufacturing solar cells and lithium-ion batteries, purifying industrial waste water with various processes, and safe disposal of radioactive waste.



Industrial heating systems



Subnano-ceramic membranes

## Electronics Electronics Business

### For advancement of electronics products

We offer the latest in fine ceramic technologies to help drive the technical innovation that makes electronics smaller and lighter yet more advanced.

#### Ceramics for semiconductor manufacturing equipment

Our fine ceramics help achieve semiconductor miniaturization and improved productivity.



Ceramics for semiconductor manufacturing equipment

#### Ceramics for electric and electronic machinery

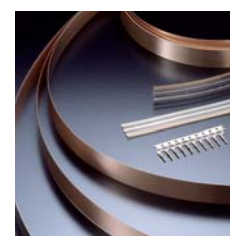
Our lineup includes bonded wafers and piezoelectric micro-actuators for digital devices, electronic components for telecommunications equipment and HICERAM<sup>®</sup> translucent alumina ceramics.



Bonded wafers

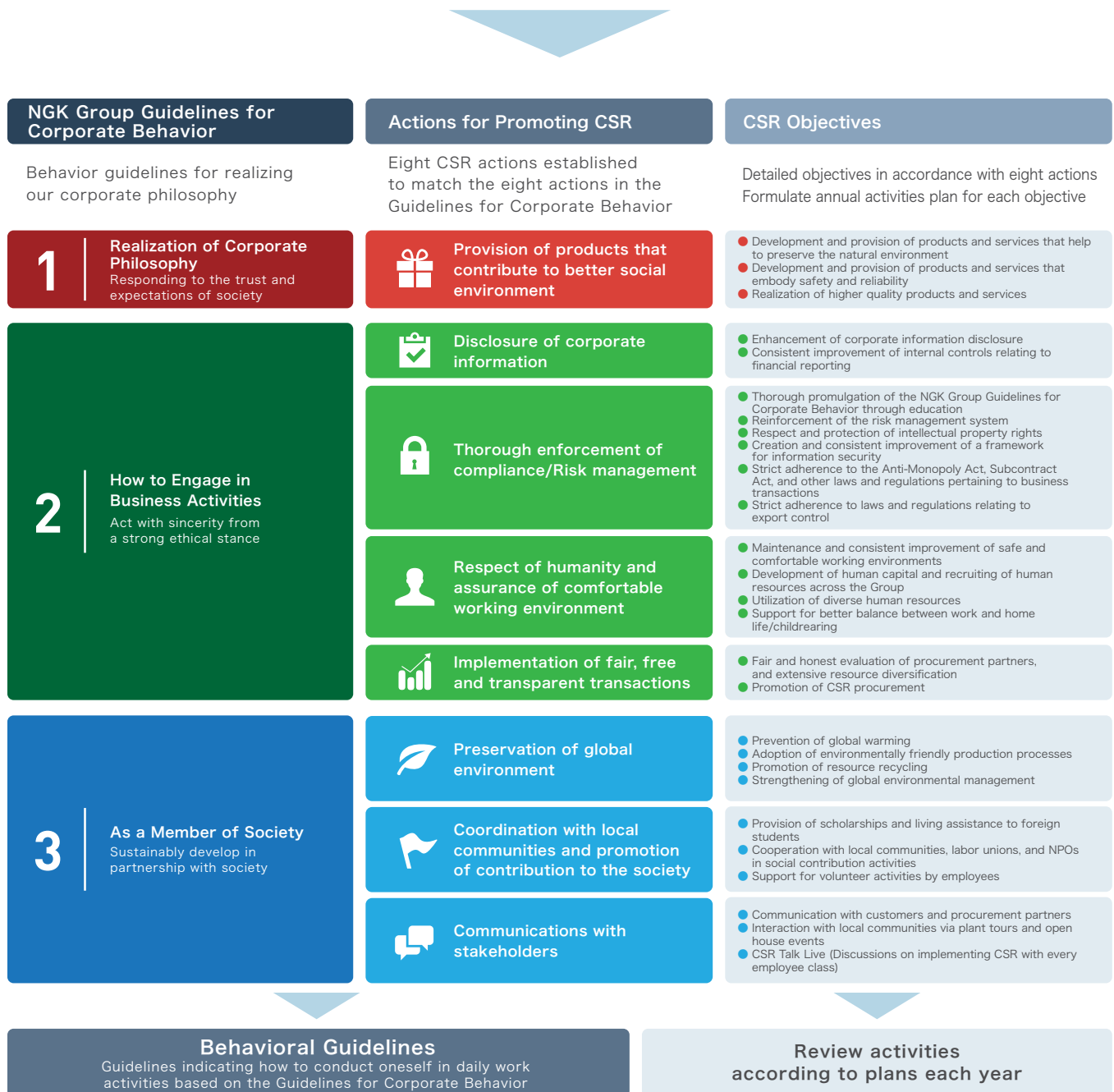
#### Beryllium Copper Alloy

We provide conductive spring material for electrical appliances and automobiles, which support improved reliability and miniaturization technologies.



Beryllium copper strip

## NGK Products and Technologies Must Create New Value and Contribute to the Quality of Life.



### Promoting Human Rights Initiatives

Having established respect for humanity in its Guidelines for Corporate Behavior, the NGK Group uses its intranet, accessible to all employees in Japan, to explain and disseminate the United Nations "Universal Declaration of Human Rights" and "Guiding Principles on Business and Human Rights." In April 2015, the NGK Group joined the UN Global

Compact\* to engage more proactively in education and awareness activities related to the protection of human rights.

\*The UN Global Compact is a global framework for realizing sustainable growth through companies and organizations acting as good members of society.

# 1919

Established to produce  
special high voltage  
insulators in Japan

Since its establishment, NGK has been striving to create value in response to



It dates back to the early 1890s when the first modern electricity infrastructure began to be developed in Japan. In those days Japan relied on imports for Special high-voltage insulators. An engineering effort was launched to attain its domestic production, wishing to help the national infrastructure building project. The research started by studying a piece of US-made insulator shards, aiming at the creation of original high-voltage insulators.

This endeavor was incorporated later in 1919 when NGK was established to independently launch a business that grew over the years by continually developing and supplying ever-advancing ultra-high pressure and ultra-high strength insulators in response to expanding electricity demand from both the

## 1950s-1960s

From the postwar period to the  
period of high economic growth

During the period of high economic growth, NGK vigorously pursued the diversification and expansion of its business. In 1958, we began manufacturing and marketing beryllium-copper products; the Chita Plant (Handa, Aichi Prefecture) and the Komaki Plant (Komaki, Aichi Prefecture) were completed in 1942 and 1962, respectively; and in 1965, our first overseas sales subsidiary was set up in the U.S.



## 1970s-1980s

From the Oil Shock to the  
Bubble Economy period

The 1973 Oil Shock threw the Japanese economy into confusion, which prompted NGK to expand its overseas business. We commenced local production of insulators in the U.S. in 1973 and Belgium in 1977. Around the same time, we began manufacturing and marketing HONEYCERAM®, a honeycomb ceramic catalyst converter substrate.



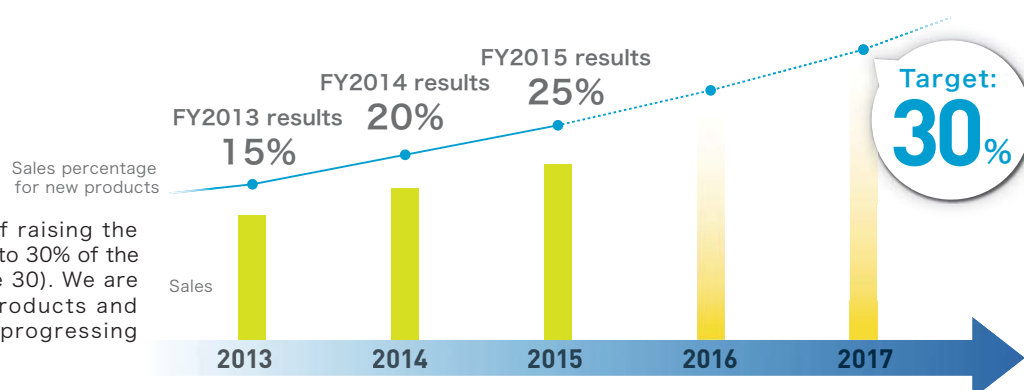
## 2017 Challenge 30

Promoting company-wide efforts to create new products and businesses that deliver higher value and higher functions.

**Double**  
sales percentage  
for new products

NGK has set a group-wide target of raising the percentage of sales for new products to 30% of the total by fiscal 2017 (2017 Challenge 30). We are currently striving to create new products and businesses, and these efforts are progressing steadily to achieve the target.

The NGK Group pursues R&D as one of key management themes. Our R&D activities focus on developing high-value added and high-function products, leveraging materials and processing technologies centering on fine ceramics.



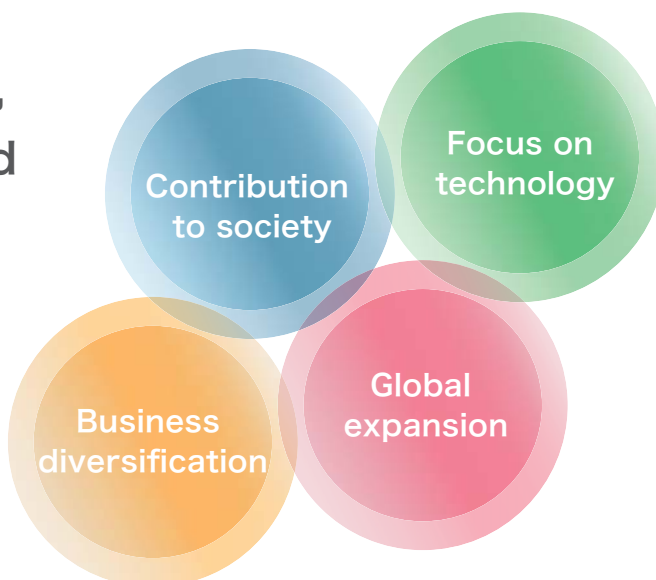


## a ceramics technology pioneer, various needs around the world

household and industrial sectors.

NGK has also pursued business diversification and global expansion vigorously. The company began in its earliest years to develop sulfuric acid corrosion-resistant apparatus for the chemical industry, commencing commercial manufacturing in 1931. And its overseas business was initiated in 1935 when exporting power transmission insulators to India.

Throughout its history, NGK has persistently endeavored to develop and supply products that support social foundations and serve environmental conservation, leveraging its accumulated ceramics technologies. This long-standing sense of commitment to social contribution has been incorporated into the company's corporate philosophy: "NGK products and technologies must create new value and contribute to the quality of life."



## 1990s-2000s

### Pursuit of sustainability and diversification

NGK promoted full scale development and production of environmental products. The production of diesel particulate filters (DPFs) commenced in 1989, and ceramics for semiconductor manufacturing equipment and NOx sensors for automobile exhausts in 1996. We began research to develop the NAS<sup>®</sup> battery for electricity storage in 1984, and launched the business in 2002 prior to commercial production starting in the following year, making NGK the world's first manufacturer in this area.



## 2010s-

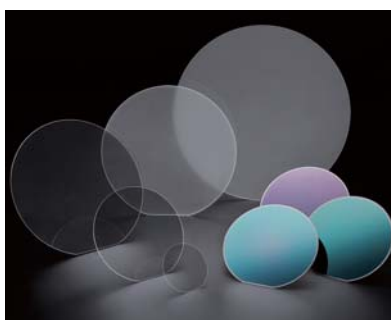
### Aiming for a better future

NGK has grown business in its key areas, particularly rapidly expanding production of ceramics for purifying automobile exhaust gases and steadily increasing orders for NAS battery systems from companies in and outside of Japan. At the same time, we strenuously engage in new developments, including gasoline particulate filters (GPFs), wafers for electronic devices, subnano-ceramic membranes, and wavelength control drying systems, in response to needs emerging from various sectors.



## Broadening the new wafer lineup

We are working to broaden the range of high-performance wafer products, fully applying a number of original processing technologies cultivated over years of engaging in ceramics projects, such as those for bonding different materials, crystal formation, and lamination of single crystal substrates.



## Establishing a company-wide ceramic battery project

To accelerate the business development of new products, including solid oxide fuel cells (SOFCs), chip type ceramic secondary batteries, and zinc secondary batteries, we established a ceramic battery project in April 2016, bringing together capabilities from Corporate Manufacturing Engineering, Corporate R&D, business divisions and Head Offices. This company-wide, cross-divisional effort engages in the development of production technologies and facilities and the strengthening of customer development activities, seeking to expedite the market introduction of new products.



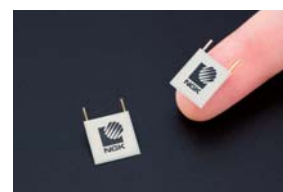
### Solid oxide fuel cell (SOFC) module

Our original full-ceramic design has been employed to achieve both high efficiency and high durability in a compact body. Intended for use in next-generation fuel cell systems.



### Zinc secondary battery

NGK's proprietary technology OH ion-conducting ceramic materials have been adopted to deliver a large-capacity long-life secondary battery. Also, the high safety property of the battery allows its wide-ranging application, particularly in home-use equipment and indoor facilities.



### Chip type ceramic secondary battery

A solid-state battery that features high energy density attained in a super-thin (0.2 mm) chip and high temperature durability (up to 120°C). Major intended applications involve wearable devices and wireless modules for IoT.

## NGK creates value through its technologies and products

NGK's insulators are used in more than **100** countries.

Electricity is closely linked with people's lives. Insulators play a key role in order to supply this essential electric energy safely and stably, by supporting power transmission lines and insulating power lines from transmission line towers and related equipment. From its establishment in 1919, NGK has developed its insulator's core technologies, working to increase product quality and endurance against many types of severe external conditions, including earthquake, storm and snow. NGK is one of the world's largest production capacities, supplying insulators to more than 100 countries.

Insulator for 1,000-kV-power transmission systems. It can support up to 86 tons with a diameter of 40 cm which has the world's greatest strength.



▲ The world's largest 11 meters hollow insulator for substation systems. Our advanced design and manufacturing technologies have been applied to achieve long-term performance which resist up to 1,000-kV-power transmission systems and massive earthquakes.

### Supporting people's lives through strong quality and technology

My task is to research on improving insulator materials and manufacturing process, chiefly for the porcelain body and glazing, aiming to further increase product quality and added value. The insulators are required to function adequately for decades to fully serve to supply safe and stable electricity although they are being used under harsh environments. Our mission is to offer the required functionality and quality without being failed, and to fulfill this challenging

task, we use our strong technologies to eliminate the smallest risk of failure that might cause disrupted power supply. Throughout the nearly century since its foundation, NGK has undergone constant development, responding to emerging needs related to the changing times by constantly offering new value. We will continue working to advance technologies to strengthen support of stable power supply, thereby improving the quality of life of many people.

## Next-Generation

NGK creates high-function ceramic components of semiconductor manufacturing equipment by leveraging its proprietary fine ceramic technologies. These components play essential roles in manufacturing nanometer-level semiconductors. Recently, we have begun to meet rising demand from the semiconductor manufacturing industry, where integrated circuit microfabrication technology is advancing to reduce size and increase speed and functions, and manufacturers find in our products the quality suitable for the technology. We are committed to continuing to develop new products and technologies to constantly offer new products that can support next-generation semiconductor manufacturing technologies.

### Foreseeing future needs to

The progress of semiconductor technologies is remarkably fast. In order to effectively respond to the needs of this fast-evolving industry, one essential key is a forward-looking strategy—accurately understanding the latest technology trends to foresee future needs, and launch development projects directed at expected trends. In the growing Internet of Things (IoT) area, for example, the latest high-demand technologies relate to microfabrication and capacity expansion of integrated circuits. This trend requires finer control of processing conditions, such as wafer temperature and plasma distribution. To satisfy these ever-advancing industry



### Yuta Tanaka

Electrical Insulator Division  
Power Business Group

Engaged in materials research to increase the product quality of insulators, partially drawing on his knowledge from his university studies in crystal materials engineering. His activities include seeking to determine the optimal material selection, compounding ratio, manufacturing conditions, and performing prototype tests while gradually scaling up the quantity to commercial production levels, with the aim of creating even higher value added products.

### Yuji Akatsuka

High Performance  
Ceramics Division  
Electronics Business Group

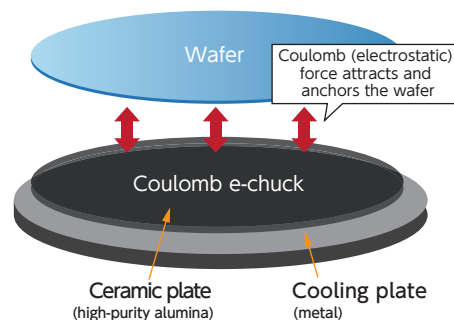
Engaged as sales engineer at a group company in the U.S. for six years. Returned to Japan last year and assigned to work on the development and design of e-chuck, targeting global markets to expand market share.

NGK's alumina Coulomb e-chuck has been developed using special casting and calcining methods. The product's fine-grained, high-purity alumina (aluminum oxide) crystals demonstrate unrivaled strong performance, increasing the efficiency of semiconductor manufacturing.



Its activities for value creation are supported by each individual worker.

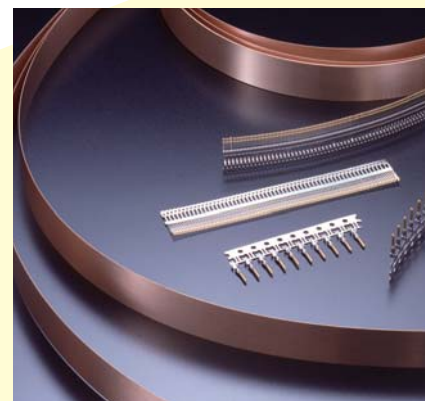
## ceramics semiconductor manufacturing components



▲Coulomb e-chuck is a type of susceptor plate (a key component in semiconductor manufacturing) designed so that the Coulomb force acting on the platform attracts and anchors a wafer, a semiconductor material, to control its temperature. A built-in heater controls the temperature of the wafer flexibly, maintaining a specified level and delivering quick changes. Capable of supporting the semiconductor microfabrication process, including the most advanced processing for smartphone production.

## Japan's first manufacturer of beryllium copper products

NGK had already started to develop and sell products contributing to environmental conservation before pollution and environmental devastation were first widely recognized as a social issue in Japan. The Company has continued pursuing this line of business, wishing to help solve environmental problems in many parts of the world. One of the key items involved in our environmental business is beryllium copper (copper beryllium) alloy. It is a copper alloy with a beryllium content below 10 percent and having a number of useful characteristics, including electrical and thermal conductivity, the major properties of copper, as well as the high-level of strength, elasticity, fatigue and heat resistance characteristic of special copper alloy. In 1958, NGK became the first Japanese company to manufacture beryllium copper products, and since then, employing a combination of materials and processing technologies, the Company has developed and offered a wide variety of products based on this material.



▲Beryllium copper is utilized as material for the strongest conductive metal springs. With high reliability, long-life, and electrical conductivity, beryllium copper springs are adopted widely for parts in various equipment, such as connectors and terminals for electronic devices and automobiles, relays and switches.

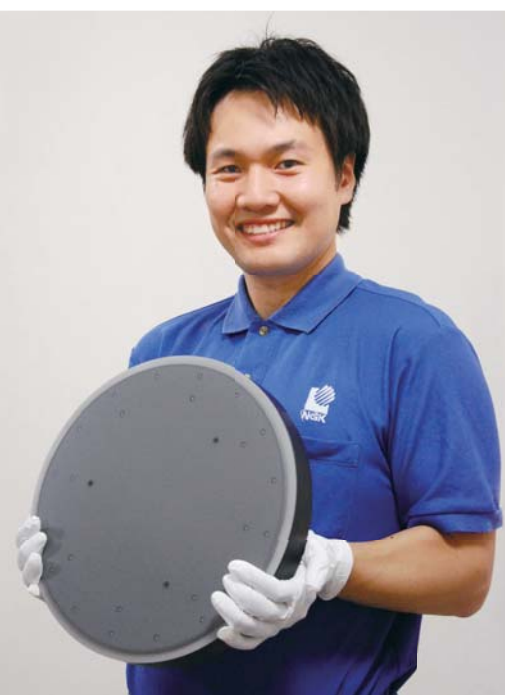
## lead technological innovations

requirements, we need to continue enhancing product performance and functions. To this end, we are organizing cross-divisional efforts, bringing together capabilities in development, technology, manufacturing, sales, quality assurance and others, to expedite a range of processes for new product projects from development to commercial production, thereby being able to offer forward-looking products, maintaining a lead over our competitors. We will continue exploring the potential of ceramics in pursuit of further technological innovations, with a focus on the material's strong corrosion-resistance and durability.

## Listening to customer needs to help environmental contribution efforts

NGK has built unparalleled, extensive sales networks in China across automobile, home electronics, industrial equipment and other markets, by visiting major trading houses and local parts manufacturers and metal stamping companies throughout the large country to forge relationships of trust. In China, facing serious environmental problems, most notably PM 2.5-related air pollution, the introduction of clean vehicles, such as electric vehicles (EVs) and plug-in hybrid vehicles (PHVs), is urgently called for as a remedy. Strong and electrical conductive beryllium copper can serve this

purpose as the ideal material for the large current capacity connectors used in EVs and PHVs. We utilize our technology capabilities to assist our customer manufacturers to facilitate product development for accelerated market introduction. We will continue developing business in the industrial market of China, which is often dubbed "the world's factory," by frequently visiting local customers to grasp their real needs, and help improvement of product quality and environmental efforts, thereby contributing to creating a cleaner environment in the country.



### Yumika Kondo

NGK INSULATORS (CHINA)  
INVESTMENT CO., LTD.  
Electronics Business Group

Engaged in overseas marketing for beryllium copper products. Based in China, NGK's most important market, to work on increasing local market share, through effectively employing the Japanese style of customer-oriented service and marketing.

# Environmental Action Plan (2016–2020) and Environmental Products New Five-Year

The NGK Group organizes environmental activities by creating five-year action plans, starting with the first in fiscal 2001. Upon completing the Third Five-Year Environmental Action Plan in fiscal 2015, the Group has established the Fourth Plan to be initiated in fiscal 2016.

## Background of the new Five-Year Environmental Action Plan

The formulation of the Fourth Five-Year Environmental Action Plan (to be initiated in fiscal 2016) was started by creating a comprehensive list of major environmental actions that socially responsible businesses are expected to take. To do this, relevant standards, such as Nikkei Environmental Management Surveys, Global Reporting Initiative (GRI) Guidelines and Dow Jones Sustainability Index (DJSI), have been used for reference.

Based on the created list, priority and focus themes have been selected considering the corporate philosophy, medium- to long-term management strategies of the NGK Group and social needs. The selected themes are organized into three groups: environmental/social contribution through products, reducing CO<sub>2</sub> emissions and discarded materials, and biodiversity

conservation and water resources risk management/response.

The first priority has been given to the theme of environmental/social contribution through products, which directly reflects the core concept of the corporate philosophy, the most essential guide to the Group's entire scope of activities. Reducing CO<sub>2</sub> emissions and discarded materials is another priority theme, as this closely relates to NGK's medium- to long-term initiative of new/reformed manufacturing structures for increasing competitiveness. Biodiversity conservation and water resources risk management/response, major issues for which socially responsible corporate action is required more urgently, have been set up as focus themes.

### Chiaki Niwa

Director and Senior Vice President  
Environmental Protection  
Committee Chair

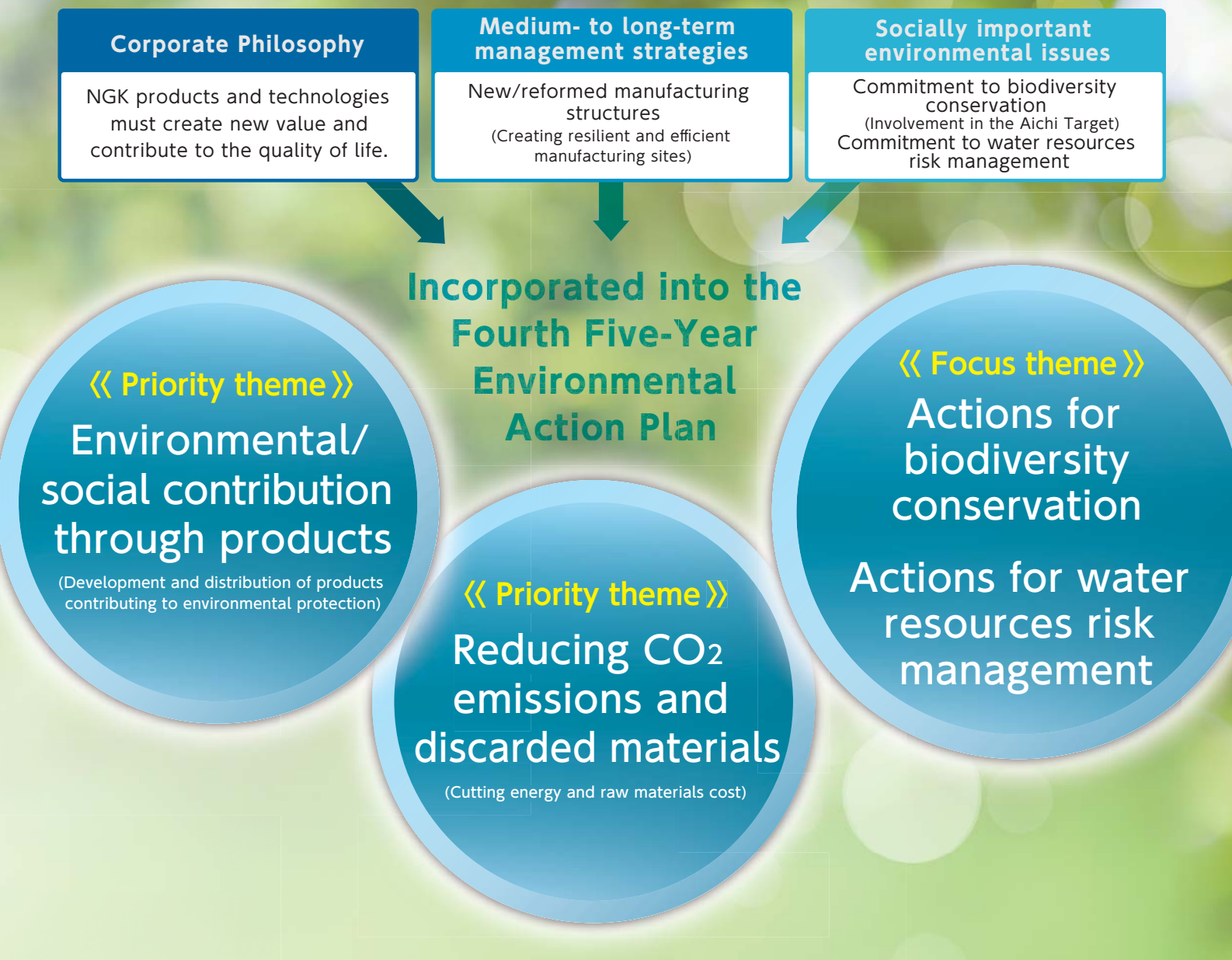


#### ►Message from NGK Environmental Protection Committee Chair

### The NGK Group working as a team to promote manufacturing that contributes to the environment

NGK attaches particular weight to promoting environmental contribution through products and environmentally aware manufacturing operations, based on the core concept of its corporate philosophy, summarized as products and technologies contributing to the quality of life. In the Fourth Environmental Action Plan starting fiscal 2016, the highest priority is given to the theme of developing and distributing products contributing to environmental protection, as this directly reflects the corporate philosophy, and we have set numerical targets for this theme, a new approach starting from the new Plan. We will instruct employees to increase their environmental understanding of new products under development, while working to expand sales for the existing lineup, in an effort to fulfill our commitment to helping build a sustainable society through business activities. Also, we have been engaged in reducing environmental impact over the years, focusing on slashing CO<sub>2</sub> emissions and discarded materials, and gradually expanding the target control scope to include global group companies. In place of a separate management method previously employed for bases in and out of Japan to set different targets, starting from the new plan, we will set common goals for domestic and overseas sites to manage activities on a consolidated basis. The entire Group will work as a team aiming to achieve shared targets set at higher-than-standard levels, thereby helping decreasing environmental impact.





### ►Expert opinion

#### Social contribution efforts for a better life are the key to sustainable business growth

Among other themes included in the new Environmental Action Plan, the highest priority has been given to the development and distribution of products contributing to environmental protection. I will take particular note of this part. NGK has chosen to promote projects involving its strong products achieved via advanced ceramics technologies, such as the NAS<sup>®</sup> battery and HONEYCERAM<sup>®</sup>, as a high-materiality strategic business, which I regard as appropriately nimble to broadly publicize its commitment to contribution to environmental conservation. In addition, I am strongly intrigued by a characteristic common to these products: essentially, many of these technologies demonstrate their potential function of environmental contribution only in combination with other technologies. For instance, the NAS battery can serve this purpose by supporting stable supply of renewable energy power, and diesel particulate filters (DPFs) by improving the environmental performance of diesel vehicles. The behind-the-scene capability of these technologies, playing a vital but low-profile role in building society, dates back to NGK's founding business that has helped social development over the years by supplying unrivaled high-quality insulators to support power supply infrastructure building. Throughout its long history, NGK has maintained this stance of supporting and improving pioneering technologies, contributing to the sound development of society and enhancement of people's life through business, thereby achieving sustainable growth. I see this aspect of the company as providing inspiring insights, and expect to see significant achievements from their efforts over the coming five years under the Action Plan.








**Noriyuki Kobayashi**

Associate Professor,  
Nagoya University  
Department of Chemical Engineering

# New Five-Year Environmental Action Plan (2016–2020)

Under the new Five-Year Environmental Action Plan, NGK is committed to two priority themes: environmental/social contribution through products and global environmental impact reduction (reducing CO<sub>2</sub> emissions and discarded materials). For each theme, effective and specific, above-standard level targets have been set to correspond with relevant business initiatives. In addition, we have drawn up plans to promote two focus themes. For biodiversity conservation, activity content and opportunities will be enhanced, and in the water resources area, risk assessment activities will be continued and initiatives for efficient water usage will be expanded within the Group.

## Fourth Five-Year Environmental Action Plan

Category		Item	KPI	Fiscal 2020 Target
Environmental/social contribution	 Environmental/social contribution through products	Develop and distribute products contributing to environmental protection	Sales growth (%)	At least 60% from fiscal 2013 (consolidated)
		Promote green procurement	Plan progress (%)	Maintain in Japan, expand overseas
	 Promotion of environmental communication	Contribute to local communities	Plan progress (%)	Continually enhance actions partnering with communities
		Raise environmental awareness		Continually enhance environmental training and information disclosure
	 Conservation of biodiversity	Promote actions based on biodiversity conservation guidelines	Plan progress (%)	Expand and enhance the content of Aichi Target actions
Environmental impact reduction	 Prevention of global warming	Reduce CO <sub>2</sub> emitted from manufacturing	Basic unit per net sales	20% reduction from fiscal 2013 (consolidated)
			Reduction from BAU* (%)	15% from fiscal 2013 (consolidated)
	 Effective use of resources	Reduce CO <sub>2</sub> emitted from supply chains	Basic unit per transport volume	Average 1% reduction per year, medium to long term (unconsolidated)
		Reduce discarded materials emitted from manufacturing	Basic unit per net sales	30% reduction from fiscal 2013 (consolidated)
			Reduction from BAU* (%)	20% from fiscal 2013 (consolidated)
		Promote resource recycling	Recycling rate	Maintain at over 99% in Japan
		Manage and respond to water resources risks	Plan progress (%)	Strengthen actions by production base for evaluating risks and streamlining water use

\*Reduction from BAU (business as usual) indicates the percentage rate of emissions reduction resulting from implemented actions against a computed value for the hypothetical absence of the actions. By not including the influence of foreign exchange movements and other factors, this indicator allows a direct grasp of the efforts by each site.

### [Base year, target year, control scope]

Base year: fiscal 2013; target year: fiscal 2020

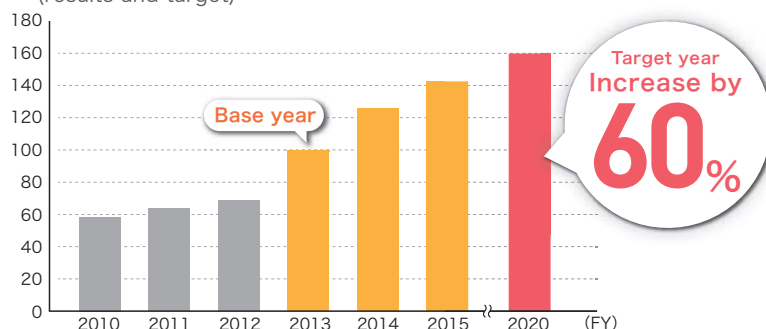
The new Five-Year Environmental Action Plan has been designed to correspond with the business initiative of new/reformed manufacturing structures. Accordingly, the base year and target year of the Plan have been set to coincide with the initiative. In principle, activities will be managed on a consolidated basis, embracing those based in and outside of Japan, in place of the previous method of managing domestic and overseas activities

separately. The consolidation method has been adopted to improve management efficiency and effectiveness in response to the recent changes in our global production output structure, particularly increased amounts from overseas manufacturing sites as well as from production chains through multiple global locations.

## Promoting environmental contribution through products

NGK has set a target of increasing the sales of products that contribute to environmental protection, as internally defined, by at least 60% by fiscal 2020 from the base year of fiscal 2013 while maintaining the sales composition at 50% or above. This target aims at attaining business growth and expanding environmental contribution at the same time.

■ Sales from products that contribute to the environment (results and target)



## 1 Contribution to widespread use of renewable energy

### NAS<sup>®</sup> battery

#### NAS battery facilitates widespread use of renewable energy

One of the most frequent uses of the NAS battery is stabilizing renewable energy. While electricity from renewable sources, such as wind and solar power, is clean and, in principle, unlimited, its major limitation is that its output is affected by weather conditions, resulting in unstable output. The NAS battery solves this limitation by storing excess renewable energy when renewable generation exceeds demand, and supplying stored energy to the grid when renewable output is low or demand is high. With a NAS battery, intermittent renewable energy becomes stable and dispatchable, and available 24 hours a day. NAS systems enable global growth in stable renewable energy and thereby help electricity utilities worldwide reduce their environmental footprint.

NAS systems are the world's most popular grid-scale battery storage

Proven reliability for over two decades,  
with **530,000 kW**  
installed at over  
**190** locations worldwide

(as of June 2016)

#### Increasing importance of renewable energy

Fossil fuels, such as petroleum, natural gas and coal, are exhaustible resources and, when burned, emit carbon dioxide and other greenhouse gases that cause global warming. Renewable energy sources, including wind and solar power, are proven, sustainable energy sources.

■ Percentage of Japan's electricity from renewable energy production

**14.3%** FY2015 **22-24%** FY2030

Sources: Composition of power generation by source (The Federation of Electric Power Companies of Japan); Long-term energy supply and demand outlook (Agency for Natural Resources and Energy)



▲ NGK was the world's first manufacturer to commercialize the NAS battery megawatt-class electricity storage system. Featuring a large capacity, high energy density and long life. The battery can support reliable, long-term stable supply of electricity. Also, the NAS system allows a more compact housing compared with the conventional lead-acid battery

### Interview Future development for the NAS battery

#### To create a sustainable society

I am focusing on the recent marketing trend to shift from selling individual products to offering packaged systems. For NAS batteries, I am striving to build system packages, rather than providing the individual product, by adding related functions to meet the specific needs of individual customers for solving issues. I expect that demand for large-capacity energy storage systems will increase to meet needs related to stable electricity supply of renewable energy, which will be introduced broadly in coming years. I will work to sell more NAS batteries so that the products will demonstrate their intended functions to support the introduction and expansion of renewable energy use, as a way of contributing to society.

#### Daisuke Umino

Overseas Sales & Marketing  
Department, NAS Battery Division  
Power Business Group

Engaged in sales and marketing mainly in North America and Asia. Tasked with a range of responsibilities from proposing optimally customized systems to providing after-sale support services while developing new markets for NAS batteries.





## 2 Automotive exhaust gas purification

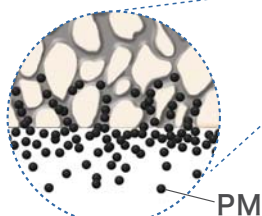
### Diesel particulate filter (DPF)

#### Remove PM from exhaust gas

DPF is a porous ceramics filter used in the exhaust system for the diesel vehicles in the world. With a fine pore structure, the filter ensures particle matters (PMs) are captured to purify exhaust gas emitted from diesel vehicles. NGK is the only company to produce two types of DPFs based both on cordierite and silicon carbide. Utilizing its ceramics technologies, NGK supports further developments of diesel vehicle.

#### Capture PM with fine pore structure

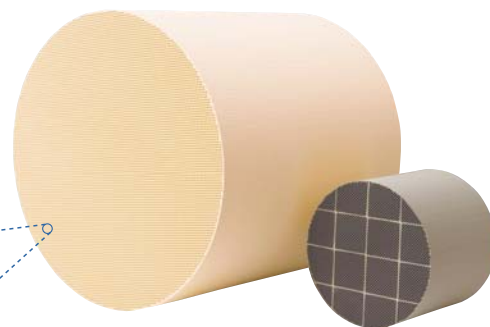
The honeycomb structure, where the inlet and outlet of the through-holes are alternately sealed, enables the thin ceramic walls to effectively capture PM while exhaust gas runs through them.



▲Cross section image of thin wall

#### Trend toward tighter automobile exhaust gas regulations

While automobile exhaust gas regulations are becoming tighter in global bases, appropriate actions are required to take place.



Eliminates up to **99%** of PM

#### Interview Future development for DPF

#### To create a cleaner air environment

When visiting cities plagued by serious air pollution in Asia and other emerging regions, I strongly feel each time that urgent measures are necessary to improve the deteriorated conditions, and NGK's DPFs can address this need in these cities. Our products can help even more widely, creating a cleaner air environment around the world. Demand for DPFs remains strong and is expected to grow in response to the likely tightening of automobile exhaust gas regulations. As a responsible, leading DPF manufacturer, we will ensure a reliable supply of products as well as the timely launch of new products to cater to customer needs effectively.

#### Ryutaro Shindo

Overseas Sales Department  
Worldwide Sales and Marketing Division  
Ceramic Products Business Group

Responsible for a range of tasks from analyzing market trends for DPFs and other products and developing sales strategies to production control planning. Leads the Group's cross-organizational sales activities, acting as a coordinator among global bases, in an effort to respond to customers' needs in a timely manner to win business.



### HONEYCERAM®

#### Indispensable function for automotive exhaust gas purifier

HONEYCERAM is a ceramic substrate for catalytic converters to purify harmful contents in exhaust gases from automobiles. The products' honeycomb structure is effective for carrying catalyst to detoxify harmful substances by chemical reaction. Since the launch of its commercial production in 1976, the product has been supplied globally over years as essential part for meeting the automobile exhaust gas regulations that become more stringent and cover wider in criteria. Production has grown to record a cumulative shipment exceeding 1.2 billion units, while expanding manufacturing bases to a current total of eight countries in North America, Asia and Africa. HONEYCERAM is an indispensable component of automobiles, an essential invention that supports enriched modern lifestyles.

#### Honeycomb structure demonstrating a effective purifying performance

NGK's HONEYCERAM production eliminates a total of 4 million tons of NOx per annum\*1, equivalent to double the annual NOx emissions in Japan\*2.

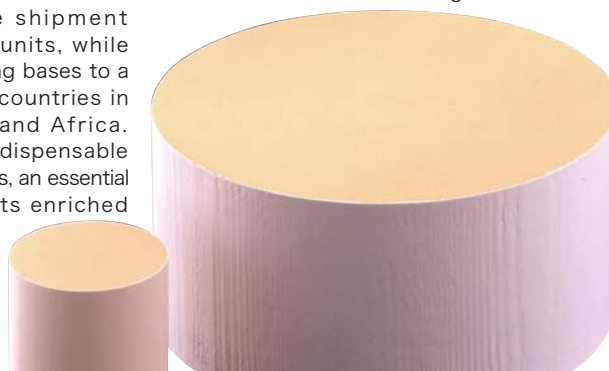
#### ■NOx elimination

**4 million tons annually**

\*1. Assumption based on installation of exhaust gas system in new cars that are not equipped with such systems

\*2. Source: OECD Environmental Statistics (2012)

▲ A HONEYCERAM for passenger cars (left) and a large-size HONEYCERAM for large diesel cars (right). HONEYCERAM carries catalyst that work to eliminate PM and NOx.





## NOx sensors

### For long-term high-accuracy measurement

NGK has developed the world's first in-vehicle sensor to measure concentrations of nitrogen oxides (NOx) in exhaust gas in real time with high precision. Specifically, the sensor is capable of measuring NOx concentrations at the parts per million (ppm) level and can thus detect even very small amounts of the gases. The sensor supports precise control of the exhaust purification device of diesel vehicles, which leads to a reduction in NOx emissions and thus helps to promote the use of clean diesel vehicles.

■ Precision of NOx concentration measurement



▲ Built-in zirconia ceramic element

1  
1,000,000 level

### Interview Future development of NOx sensors

### Contributing to the advancement of clean diesel vehicles

The NOx sensor business has achieved remarkable growth over recent years as exhaust gas regulations around the world have become more and more stringent. We are now developing and releasing a series of new-type sensors to help increase the environmental performance of clean diesel vehicles. We will continue to create environment-friendly products to meet the needs of customers and society at large and deliver them to people across the globe, thereby contributing to a better social environment.

### Dr. Daniel Sieberg

Deputy General Manager  
NOx Sensor Sales  
NGK EUROPE GMBH

In charge of sales engineering and serves as a bridge between local customers in Europe, where diesel vehicles are widely used, and NGK's development and manufacturing teams in Japan.



3

## Treatment of low-level radioactive waste

### Low-level radwaste treatment system

### To ensure safe treatment of radioactive waste

NGK has developed a wide range of systems to safely treat low-level radioactive waste generated from nuclear facilities, utilizing its proprietary incineration technology and dust collection technology by ceramic filter, and have supplied these systems to nuclear power stations and related institutes across Japan.

We undertake many of engineering projects including design, manufacturing, and site construction, and also provide a long-term maintenance service to deliver the stable and high-level radioactive decontamination. Therefore, NGK provides essential support for safe and stable operation of nuclear facilities. In addition, we focus on the development of new systems for treating various types of radwaste expected to be generated from the decommissioning and demolition of aging nuclear reactors.

#### Importance of treating radioactive waste

When treating and disposing of waste generated from radiation controlled areas, including nuclear power stations, it is critically important to prevent release and leakage of radioactivity, which requires special treatment and disposal methods, different from those for general waste.



▲ Low-level radwaste treatment systems

■ The performance level of radioactivity removal;

1  
100,000

### Contributing to Establishing by Providing Innovative

Power is vital for our life and society  
It is our mission to assure this vital lifeline.  
By constantly offering innovative technologies and services centered on ceramics technologies, the NGK Group strives to contribute to establishing clean and sustainable energy while at the same time supplying safe and prosperity community.

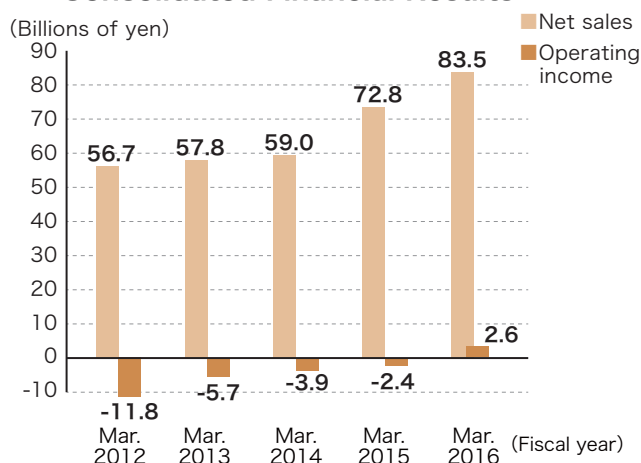


Director and Senior Vice President  
**Hideaki Saito**  
Group Executive, Power Business Group

### Business Overview for Fiscal 2015

In fiscal 2015, the Power Business Group achieved profitability for the first time in six terms. In the insulators business, since fiscal 2012 we have committed to improve our by consolidating operations, relentlessly streamlining the business structure and reducing cost. Sales increased due to replacement demand of insulators which were installed throughout Japan in and after the high growth period, in addition to the closure of NGK INSULATORS SUZHOU CO., LTD., which had been suffering from a low operating rate. In the NAS battery business, sales also grew significantly thanks to large-scale projects including the Buzen Substation of Kyushu Electric Power Co., Inc., the world's largest storage battery facility, as well as overseas projects in the United Arab Emirates (UAE), Italy and other countries.

#### Consolidated Financial Results



#### Pick up contents

### ● The World's Largest NAS<sup>®</sup> Battery Installation Commences Operation

In March 2016, the world's largest storage battery facility, a NAS battery energy storage system developed by NGK commenced operation. The NAS system was ordered by Mitsubishi Electric Corporation (Head Office: Chiyoda-ku, Tokyo) and delivered to the Buzen Substation of Kyushu Electric Power Co., Inc. (on the site of the Buzen Power Station in Buzen City, Fukuoka Prefecture). Currently, the system is utilized for demonstration project to improve the balance of power supply and demand and make effective use of a large-capacity storage battery system.

**Largest battery storage project in the world**  
(Power output: 50,000 kW, Storage capacity: 300,000 kWh)

**One third of the installation time compared with the conventional format.**

**NAS batteries are characterized by higher energy density compared with other stationary storage batteries, and are very compact and space efficient.**



# Sustainable Energy Technologies and Services

## Challenges and Future Initiatives

While power demand in developed countries is slowing, replacement needs for aging equipment exist. In addition, power demand is still growing among emerging nations and infrastructure investment is increasing. Furthermore, there have been qualitative changes in the power infrastructure on the back of technological innovation both in developed

and developing countries. Specifically, there has been a shift to renewable energy and diversification of power sources. The NGK Group has products and technologies ready to respond to these markets and is poised to expand businesses by steadily capturing demand.

### 【Insulators】

#### Swiftly Supplying High-quality Products

In the insulators business, we aim to supply high-quality products backed by our track record and experience swiftly and with enhanced services. We are pursuing product development in order to ensure a steady supply of long-term performance products that can endure harsh natural environments around the world, and that are compatible with long-distance transmission and high voltages.

### 【NAS Batteries】

#### Strengthening Proposal and Sales Capabilities in New Fields

The world's first NAS battery megawatt-class energy storage system can stabilize intermittent renewable energy and temporarily store excess energy for later use, when demand is high. In order to promote the utilization of NAS batteries across more opportunities, we are expanding our sales not only on manufacturing of the batteries but also on strengthening proposal and sales capabilities in new fields through strategic partnerships with electric power companies and systems development companies.

## Achieving Further Growth

### Aiming to Become a Brand of Choice

The insulators business is expected to remain stable in the future as we continue to supply replacement demand both in Japan and overseas and infrastructure development in emerging countries. Insulators, which have been our mainstay products since the company was established, are renowned for their track record and performance, and have strong brand power. Leveraging such strengths, we will aim to become a brand of choice by steadily capturing demand in Japan and overseas.

### Contributing to a Steady Supply of Power in the Future

Business results for the NAS battery business are expected to deteriorate temporarily in fiscal 2016, as it will fall under a period between large-scale projects. With a global trend showing a rapid shift towards renewable energy, however, power system issues as a result of the rapid shift and the excess power problem which is expected to emerge after 2020 are fields in which solutions utilizing NAS batteries will be able to exercise their full potential. Furthermore, in the future we will reinforce our solution-based proposals targeting not only user services but also ancillary services such as frequency regulation services, thus expanding business with the aim of contributing to a steady supply of power.



## ○ Responding to the Recovery of Power Infrastructures in the Wake of the Kumamoto Earthquake

In the wake of the earthquake that occurred around Kumamoto Prefecture in April 2016, the NGK Group made a concerted effort to contribute to the recovery of power generation facilities, which provide a vital lifeline, through the production and supply of relevant equipment such as insulators. In order to continue to support daily living in which electricity is supplied normally, we will work hard to make a contribution by not only responding quickly in the event of an emergency but also developing and supplying products with enhanced earthquake resistance and long-term reliability in the future.

Letter of commendation that we received from  
Kyushu Electric Power Co., Inc. for our contributions  
to the recovery after the Kumamoto Earthquake





## Developing Products and Technologies Environmental Issues, Including

The Ceramic Products Business Group is engaged in the development, manufacturing and sales of a number of products that contribute to reducing environmental impacts. In the automotive ceramics business, we address environmental pollution from exhaust gases, which is one of the most significant social issues in the automotive industry, through products such as our HONEYCERAM® and NOx sensors. In addition, our industrial process products meet various industrial needs and contribute to addressing urgent issues faced by Japan, by such technologies including low-level radioactive waste treatment systems that help to carry out safe decommissioning of aged nuclear power plants.



Director and Senior Vice President

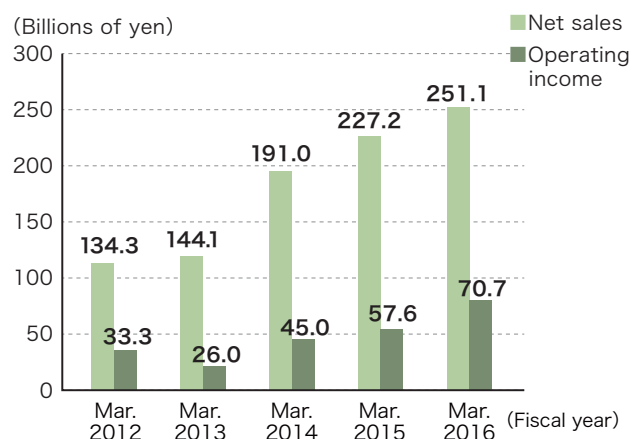
**Hiroshi Kanie**

Group Executive, Ceramic Products Business Group

### Business Overview for Fiscal 2015

The Ceramic Products Business Group posted record highs for both sales and profits overall due to the increased volume of automotive ceramics, the effect of the depreciation of the yen, and cost reductions through the introduction of new/reformed manufacturing structures. In the automotive ceramics business, sales of automobiles in the United States, Europe and China, as well as trucks in the United States remained strong. The demand for automotive ceramics also increased on the back of strong demand for our HONEYCERAM ceramic substrates for automotive catalytic converters, silicon carbide diesel particulate filters (SiC DPFs), and NOx sensors, as well as the positive effect of tax reductions for small vehicles in China. Meanwhile, profits from industrial process products improved as capital investment and spending on maintenance by major domestic customers increased in response to the recovery of market conditions in key industries including the electronics, steel and chemical industries. Moreover, our restructuring of kiln and refractory products has been delivering steady results. As a result, the Industrial Process Division on the whole achieved profitability for the first time in three terms.

### Consolidated Financial Results



### Pick up contents

### Reinforcing Global Production System

The NGK Group is actively focusing on production development at locations in the demand base. Having production sites in various countries not only helps to reduce CO<sub>2</sub> emissions from transportation but also contributes to regional communities through the creation of local jobs. We believe that it is important for the sustainability of the world and our business to contribute to the development of different regions while streamlining supply systems at each location.

NGK CERAMICS POLSKA SP. Z O.O.

DPF production capacity will be reinforced through the addition of Plant No. 2 as well as the strengthening of production capacity for Plant No. 1. (Production to commence in January 2017)

NGK CERAMICS (THAILAND) CO., LTD.

New manufacturing bases for four types of ceramic substrate for automobile exhaust purification systems are currently being developed. (Production to commence in April 2018)

Ishikawa Plant

By establishing a state-of-the-art production line for HONEYCERAM ceramic substrates, production technologies are exported to overseas manufacturing bases. Production capacity will be boosted by 70% through the addition of a new plant for elements used in NOx sensors. (Production to commence in April 2017)



# That Contribute to Solving Automobile Exhaust Gases

## Challenges and Future Initiatives

Sales and profits from the automotive ceramics business are expected to decrease in fiscal 2016 due to the appreciation of the yen coupled with increases in development costs and startup costs for new facilities at overseas plants. In anticipation of an increase in demand for our products in line with the tightening of exhaust gas regulations in emerging countries, we will take further steps to strengthen our position to take the next leap forward.

### 【Automotive-related】

#### Strengthening Supply Systems in Manufacturing Bases Worldwide

In an effort to respond to a medium to long-term increase in demand as a result of the tightening of exhaust gas regulations, the NGK Group will develop Plant No. 2 at NGK CERAMICS POLSKA SP. Z O.O. (ACP), NGK CERAMICS (THAILAND) CO., LTD. (ACT) and NGK CERAMIC DEVICE CO., LTD.'s Ishikawa Plant, and also boost ACP's NOx sensor facilities. We will strengthen our supply systems globally by introducing state-of-the-art technologies to ACP Plant No. 2 and ACT while updating aged equipment at existing manufacturing bases.

Meanwhile, net sales from industrial process business in fiscal 2016 are forecasted to remain at a similar level as in fiscal 2015 on the back of robust capital investment in sintering kilns for fusing the cell electrodes used in lithium ion batteries in China. On the profit side, we will pursue further business restructuring in an effort to strengthen the foundation with a focus on profitable businesses.

### 【Industrial Process Products】

#### Developing Businesses That Will Generate Profits Steadily

Through the improvement of our business position by returning back to the basics of engineering and manufacturing, we will emphasize on the expansion of businesses that will generate steady profits. Measures for further boost of our profitability will be taken through the reinforcement of maintenance service and purchasing power on our three product categories of membranes, energy plant (EP) and acid-proof equipment that have secured a certain level of profits among existing businesses.

## Achieving Further Growth

### Achieving Stable Supply with Increased Competitiveness

In the automotive ceramics business, we will aim to establish a system to continue to deliver a high level of profits through 2020. At the same time, in order to maintain our position as a top supplier, we will seek to enhance our cost competitiveness and achieve consistent quality globally as well as stable supply. In addition, we plan to launch new ceramic products for electric hybrid vehicles (EHVs) in line with the future reinforcement of regulations as well as new products such as new NOx sensors within a reasonable time frame.

### Promoting Development in a Wide Range of Growth Markets

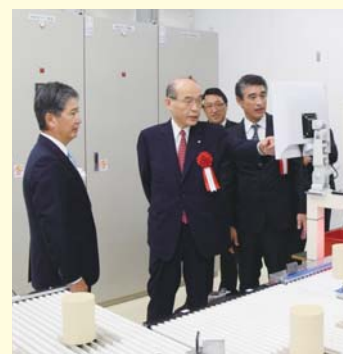
Leveraging our strengths of having a network in a wide range of industries including chemicals, fine chemicals, pharmaceuticals and semiconductors, the industrial process products business will promote its own development with a focus on the selected areas in growth markets. We will take measures to explore applications and develop markets, with an aim of expanding sales of wavelength control and drying systems as new product.

In addition, looking ahead to the decommissioning demand of nuclear power plants in the future, we will develop a product lineup of our radioactive waste treatment systems.

## ● Cutting-edge HONEYCERAM Production Line Commence Operations at the Ishikawa Plant

We established a new cutting-edge HONEYCERAM production line at the Ishikawa Plant (Nomi City, Ishikawa Prefecture), our second largest manufacturing base in Japan, and commenced full production in November 2015. With this, the annual production capacity of the Ishikawa Plant was boosted from 8 million units to 13 million units. The new production line, featuring space saving, labor saving and energy saving, has achieved high productivity with a low environmental impact. Compared with conventional equipment, productivity per unit area has approximately doubled and CO<sub>2</sub> emissions have been reduced by approximately 30% (2,700 tons per year). With the addition of the cutting-edge production line at the Ishikawa Plant, we will maintain manufacturing and employment in Japan while further enhancing its function as a mother plant that exports state-of-the-art production technologies to overseas manufacturing bases with the aim of securing competitiveness in the global market.

Production  
per unit area  
**doubled**  
CO<sub>2</sub> emissions  
decreased by  
approx.  
**30%**



▲President Taku Oshima (left) guiding Masanori Tanimoto, Governor of Ishikawa Prefecture (middle) and others in a tour of the cutting-edge production lines

## Contributing to the Development of the More Comfortable Living through Functional

Communications infrastructure equipment and power devices are indispensable in making our lives comfortable. The NGK Group provides society with components and materials that play a vital role in improving the functions and usability of these devices.

For instance, in developing countries, people can communicate using smart devices through high-speed wireless communications systems in locations without telephone lines.

Our technologies and products have been utilized for functional enhancement and miniaturization of such communication systems.



Director and Senior Vice President  
**Shuhei Ishikawa**  
Group Executive, Electronics Business Group

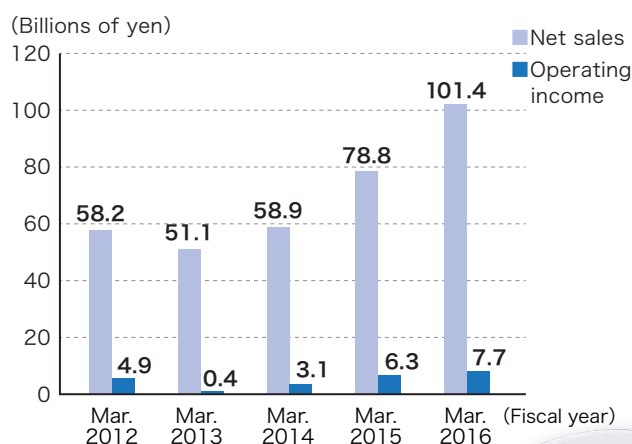
### Business Overview for Fiscal 2015

Although the first half of fiscal 2015 saw an increase in sales propelled by growth in the semiconductor market, the second half of the year brought a slowdown due to the effects of market contraction in China and other regions. However, the segment achieved increased sales and profits as performance for the year remained relatively robust overall.

Sales of ceramic components for semiconductor manufacturing equipment remained strong as we successfully incorporated the demand for highly integrated semiconductor equipment. Sales of metals decreased due to the reduced demand for beryllium copper strip in China as well as declining demand for molds.

Meanwhile, sales of electronic components increased significantly, reflecting the full year financial results of NGK Electronics Devices, Inc., which became a consolidated subsidiary in January 2015, despite a decline in business performance due to the discontinuation of products for inkjet printers.

### Consolidated Financial Results



### Pick up contents

### ● SAW Filters as a Key Factor for Communication Quality

Surface Acoustic Wave (SAW) filters, which are core electronic components used in wireless communication devices such as smartphones, are a key factor in communication quality. Bonded wafers are substrates indispensable for SAW filters.

#### Bonded Wafers Equipped with High-precision Filtering Functions

Combining different materials enables bonded wafers to deliver a performance and functionality that cannot be achieved with wafers made from a single material. While conventional SAW filters had weaknesses, one of which was that they easily contract with temperature, NGK succeeded in significantly reducing the ratio of thermal expansion through the use of bonded wafers. Bonded wafers can be used for next-generation LTE that requires high-precision filtering functions.

▼Bonded wafers for SAW filters

# Communications Infrastructure to Bring Enhancements and Miniaturization of Products

## Challenges and Future Initiatives

In fiscal 2016, while the semiconductor market is expected to remain robust, our business is likely to be negatively affected by the appreciation of the yen and price competition, in addition to the lack of vigor in demand recovery mainly in the Chinese market. One of the challenges faced by our ceramic components for semiconductor manufacturing equipment is reinforced competitiveness. Amid fierce competition among major equipment manufacturers against a backdrop of an

increase in equipment demand, we will take steps to enhance the functionality of our products and boost production capacity while achieving cost reductions. In metal products, we will focus on developing new products other than beryllium copper products as well as strengthening marketing activities. In the electronic components business, while developing commercialized new products that will boost our profits, we will incubate new products through group synergy effects.

【Ceramics for Semiconductor Manufacturing Equipment】

### Developing Susceptors with a Competitive Advantage

In the face of the high integration of semiconductors, improvements in functionality and performance are required for our products. We will push forward with development of the next generation of susceptors that can control the temperature of silicon wafers to an even level and experiment with innovative manufacturing methods that can achieve both reductions in lead times and the curtailment of costs, thus increasing our competitive advantage in the market.

【Metal Related Products】

### Strengthening Marketing Capabilities and Expanding Businesses Using Materials Other Than Beryllium Copper

In China, where demand is expanding for smartphones and other applications, we seek to develop new customers and expand sales by aggressively holding exhibitions and introducing solutions using email magazines. In addition, we aim to achieve early commercialization of products using materials other than beryllium copper, including copper-nickel-tin alloy and zirconium-copper wires which are currently under development.

【Electronic Components】

### Achieving Growth through the Development of New Products That Will Contribute to Earnings as Soon as Possible and Reinforced Collaboration

While promoting cost reductions in bonded wafers for SAW filters and piezoelectric elements for HDDs, which have been commercialized, we will take measures to establish a system for increased production in response to growing demand. Collaboration within the Group is also crucial. We will work to create new products through organic collaboration by bringing together strengths that include the material technologies of NGK INSURATORS, LTD., mass production process of NGK Electronics Devices, Inc., and broad network of SOSHIN ELECTRIC CO., LTD.

## Achieving Further Growth

### Launching New Products onto the Market in a Timely Manner

The NGK Group will pursue growth by further strengthening existing business bases and generating new products and businesses. One of the most vital points for the success of new products is the timing for launching products onto the market. Amid a rapidly changing market environment, it is essential for us to focus on speed, adequately capture customer needs at an early stage and determine customers' requirements by collaborating with them. For do this, we will constantly need to change.

### Contributing to the IoT in Collaboration with Customers

As a result of expansion in the use of the IoT,\* it is expected that demand will grow for ceramic components for semiconductor manufacturing equipment, materials other than beryllium copper, ceramic packages and bonded wafers on the back of the expansion in the communications infrastructure, increased demand for memories used in datacenters, miniaturization of electronic devices, and the emergence of wearables. The NGK Group will continue to offer products across this whole of this wide range by working closely with our customers.

\* Internet of Things (IoT)

## Sharing Our Thoughts Using a Handbook and Strengthening Business Structures

One of our strengths is the ability to develop new features and functions not developed before by combining material technologies and process technologies. By enhancing this ability, we will be able to meet global needs, develop products that incorporate technological innovation and operate our businesses in a sustainable manner. Based on the idea that it is necessary for us to share this concept across the Group, we created a business handbook in fiscal 2016. While clarifying what we should aim for as a goal and what we should be doing in order to achieve such a goal, we aim to share our corporate philosophy centered on contributing to quality of life.







## Board of Directors

① **Eiji Hamamoto**  
Chairman

② **Taku Oshima**  
President

③ **Yukihisa Takeuchi**  
Executive Vice President  
Group Executive, Corporate R&D,  
Development Committee Chair

④ **Susumu Sakabe**  
Director and Senior Vice President  
Responsible for the Finance Dept.  
and Purchasing Dept., General Manager,  
Tokyo Main Office

⑤ **Hiroshi Kanie**  
Director and Senior Vice President  
Group Executive, Ceramic Products  
Business Group, General Manager,  
Nagoya Site

⑥ **Ryohei Iwasaki**  
Director and Senior Vice President  
Responsible for Corporate Strategy Office,  
New Business Planning Office, Secretarial  
Office, Public Relations Office, and Human  
Resources Dept., Senior Officer in charge  
of Group Companies

⑦ **Hideaki Saito**  
Director and Senior Vice President  
Group Executive, Power Business Group

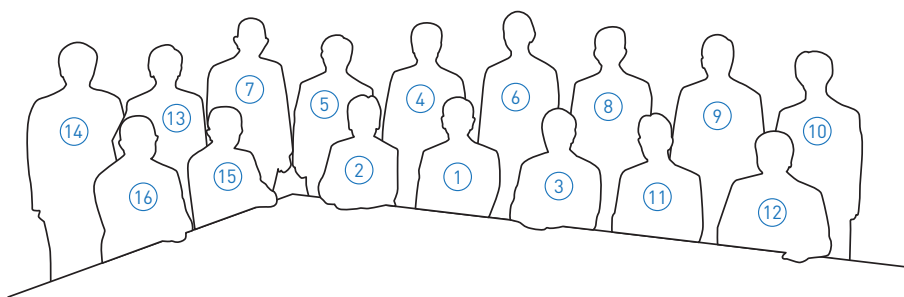
⑧ **Shuheishi Ishikawa**  
Director and Senior Vice President  
Group Executive, Electronics Business Group,  
General Manager, Chita Site

⑨ **Nobumitsu Saji**  
Director and Senior Vice President  
Responsible for Auditing Dept., CSR Office,  
Global Compliance Office, Legal Dept.,  
Intellectual Property Dept., and General Affairs  
Dept., General Manager, Global Compliance Office,  
CSR Committee Chair, Internal Controls Committee  
Chair, and General Manager, Osaka Site

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Director and Senior Vice President  
Group Executive, Corporate Manufacturing  
Engineering, Responsible for Environmental  
Management Dept. Quality Management Dept.  
and Safety and Health Management Dept.,  
Facilities Committee Chair, NGK Environmental  
Protection Committee Chair, Quality Committee  
Chair, and Safety and Health Committee Chair

⑪ **Hiroyuki Kamano**  
Outside Director

⑫ **Toshio Nakamura**  
Outside Director







## Audit & Supervisory Board

### ⑬ Takeyuki Mizuno

Audit & Supervisory  
Board Member

### ⑭ Ken Sugiyama

Audit & Supervisory  
Board Member

### ⑮ Setsuo Tanaka

Audit & Supervisory  
Board Member, Outside

### ⑯ Ichiro Terato

Audit & Supervisory  
Board Member, Outside

## Executive Officers



### Hiroshi Kurachi

Senior Vice President  
General Manager,  
Engineering Division,  
General Manager,  
Sensor Division, Ceramic  
Products Business Group



### Takaya Teshima

Senior Vice President  
General Manager,  
High Performance  
Ceramics Division,  
Electronics Business  
Group



### Atsushi Matsuda

Vice President  
General Manager,  
Worldwide Sales & Marketing  
Division, Ceramic Products  
Business Group, President,  
NGK EUROPE GMBH



### Toshiyuki Mima

Vice President  
General Manager,  
NAS Battery Division,  
Power Business Group,  
General Manager,  
Komaki Site



### Hitoshi Sakai

Vice President  
Group Vice Executive,  
SOFC Project Leader,  
Corporate R&D



### Hiroto Matsuda

Vice President  
General Manager,  
Manufacturing Division,  
Ceramic Products  
Business Group



### Hiroyuki Tsuji

Vice President  
General Manager,  
Manufacturing Engineering  
Dept., Corporate  
Manufacturing Engineering



### Tomohiro Yamada

Vice President  
Representative Director  
and Executive Vice  
President, NGK Electronics  
Devices Inc., Assistant to  
Group Executive,  
Electronics Business Group



### Tadaaki Yamada

Vice President  
General Manager,  
Human Resources Dept.



### Akira Katoh

Vice President  
General Manager,  
New Metals Division,  
Electronics Business Group



### Shigeru Kobayashi

Vice President  
General Manager,  
Electrical Insulator Division,  
Power Business Group



### Tsutomu Nanataki

Vice President  
Project Leader,  
Functional Materials  
Development Project,  
Corporate R&D



### Masanobu Inoue

Vice President  
General Manager,  
Industrial Process Division,  
Ceramic Products Business  
Group



## Environment Bringing Corporate Activities into Harmony with the Environment

### Our perspective of the issue Strategy / Policy

Recognizing that protecting the environment is a vital issue, the NGK Group has worked to develop and expand environmentally friendly products and reduce the environmental impact of business activities based on its Environmental Philosophy.

### Actions for Promoting CSR



Preservation of  
Global Environment

### Environmental Philosophy

Given its corporate philosophy, "NGK products and technologies must create new value and contribute to the quality of life," NGK will contribute to tackling environmental issues through its Triple-E business segments of ecology, electronics, and energy to create a comfortable environment for future generations.

### Preserving the Global Environment

Ecology

Electro-  
nics

Energy

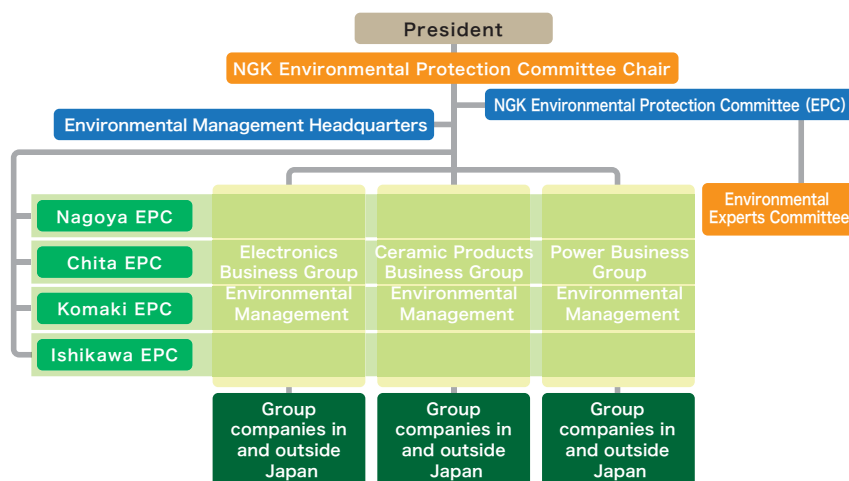
### Scope of Coverage of this Report

- NGK Headquarters/Nagoya Site/Chita Site/Komaki Site/Ishikawa Plant (Does not include Tokyo Main Office, Osaka Branch and six other sales offices.)
- Domestic Group companies: 12 manufacturing-related consolidated subsidiaries (Includes HEISEI CERAMICS CO., LTD. that was dissolved in March 2016, but excludes NGK Electronics Devices, Inc., which became a consolidated subsidiary in January 2015.)
- Overseas Group companies: 16 manufacturing-related consolidated subsidiaries

## Groupwide Involvement in Environmental Conservation Activities

### Global Environmental Management Frameworks

Under the environmental management frameworks indicated on the right, we promote environmental conservation activities through formulating medium to long-term action plans and the annual promotion plans at the NGK Environmental Protection Committee (EPC) and sharing targets among Group companies in and outside Japan. In addition to non-consolidated environmental management systems at each NGK site and plant, we promote environmental management through a consolidated management system that includes domestic and overseas Group company business groups as activity leaders. Furthermore, through liaison committee meetings between Headquarters and Group companies in and outside Japan, we exchange information from both committees to discuss environmental challenges and the action needed.



### Effective Use of Environmental Management Systems

The NGK Group encourages the acquisition of ISO 14001 or third-party certifications meeting this standard to systematically and continuously develop its environmental conservation activities. Three NGK sites (Nagoya, Chita and Komaki sites), the Ishikawa Plant, all 12 manufacturing-related domestic Group companies and all 16 manufacturing-related overseas Group companies have completed certification. We will make effective use of these environmental management systems going forward with the intention of reinforcing environmental management.

### Environmental Risk Management

In an effort to strengthen environmental management across the NGK Group, we introduce initiatives aimed at mitigating potential risks. Environmental challenges identified at each site are reported to the Business Groups and Headquarters, and essential countermeasures are taken. In addition, we will strengthen our efforts to prevent environmental pollution, including atmospheric and water pollution, by shifting the method of data management aimed at regulatory compliance from the management of actual records for the current year to trend management including historical records in the future.

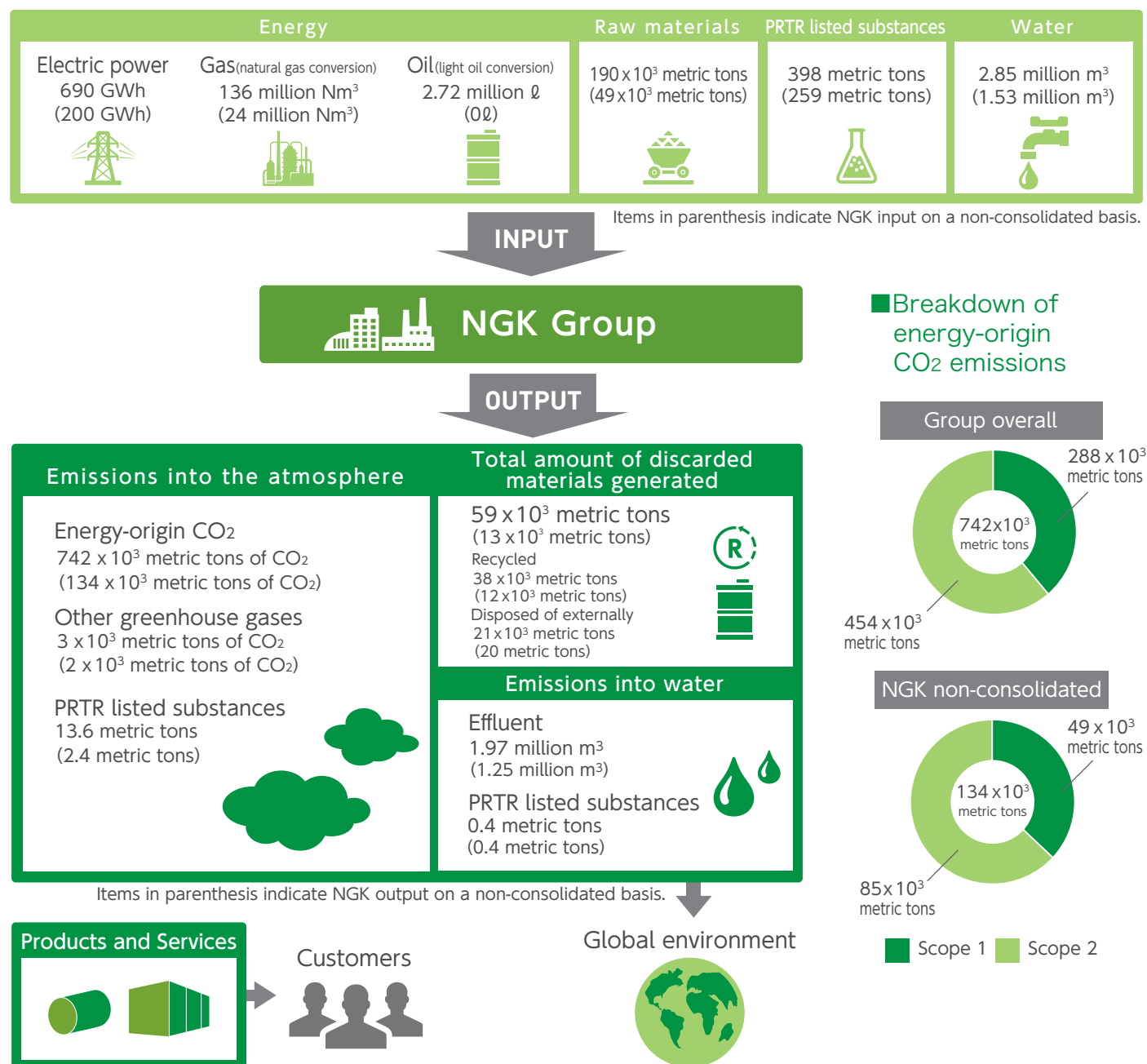
# Activities Aimed at Reducing Environmental Impact

## Overall Perspective of Environmental Impact


The diagram below shows inputs and outputs in the business activities conducted by NGK (excluding NGK Electronics Devices, Inc.). It shows inputs of raw materials and energy and outputs in the form of manufactured products and services, as well as substances that are discharged into the atmosphere and into water. In line with expanded production activities, the NGK Group's output of substances that have an impact on the

environment is on the rise. However, efforts including the introduction of the latest manufacturing and other processes have resulted in the rate of increase in emissions that impact the environment being lower than the rate of increase in products and services (net sales) provided to customers.

## NGK Group Material Balance (Input and Output)



### Notes:






- Environmental performance values in this report have been rounded up for convenience; therefore the sum of individual values may not match the totals.
- "Discarded materials" indicates the total amount of industrial waste and valuables.  indicates outside recycling.



# Results of Initiatives within the Third Five-Year Environmental Action Plan (2011-2015)

## Third Five-Year Environmental Action Plan Completed with Steady Achievements

The NGK Group's environmental initiatives are based on the formulation of Five-Year Environmental Action Plans. In the Third Five-Year Environmental Action Plan, which was launched in fiscal 2011, we made concerted efforts to introduce activities to reduce our environmental impact on a global scale. As a result, we successfully achieved all of the Five-Year Plan targets other than those for CO<sub>2</sub> emissions in Japan. The results for the reduction targets for CO<sub>2</sub> emissions and discarded materials overseas, in particular, significantly exceeded our targets based on the basic unit per net sales. While the results for our reduction targets for CO<sub>2</sub> emissions in Japan improved, exceeding the basic unit target, we narrowly missed the target for CO<sub>2</sub> emissions in fiscal 2015 due to a rapid increase in production volumes.

Categories	Items	Management items	Five-Year Plan Objectives	Achievements	Self-evaluation <sup>*1</sup>
 Preventing global warming	Reducing CO <sub>2</sub> from production activities	Domestic CO <sub>2</sub> emissions <sup>*2</sup>	190x10 <sup>3</sup> metric tons or less (10% reduction from fiscal 1990)	191x10 <sup>3</sup> metric tons (9.3% reduction)	△
		Domestic basic unit per net sales	20% reduction from fiscal 2010	27% reduction	○
		Overseas basic unit per net sales	5% reduction from fiscal 2010	34% reduction	○
	Reducing CO <sub>2</sub> from logistics	NGK basic unit per transport volume <sup>*3</sup>	1% reduction each year	1.7% reduction per year on average	○
 Using resources effectively	Reducing discarded materials	Domestic basic unit per net sales	10% reduction from fiscal 2010	19% reduction	○
		Overseas basic unit per net sales	5% reduction from fiscal 2010	40% reduction	○
	Promoting resource recycling	Domestic recycling rate	99% or higher recycling rate	99.3%	○
		Overseas recycling rate	Select and manage recycling rates taking into account the conditions in each country	Established separate management at each location Established recycling rate with appropriate scope	○
	Using water resources effectively	Rate of progress of plan	Create standards for efficient usage	Expand usage standards to Group companies in and outside Japan	○
 Ensuring management of chemical substances	Improving management levels for chemical substances	Rate of progress of plan	Upgrade chemical substance management systems	Completed system updates Established appropriate operations	○
 Providing eco products	Promoting environmental contribution through products	Rate of progress of plan	Formulate quantitative standards for environmental contribution from products	Conducted quantitative evaluation for key products and announced results	○
	Promoting green procurement		Complete green supplier certification	(Completed in fiscal 2012)	○
 Promoting environmental communication	Robust environmental contribution activities	Rate of progress of plan	Continue and expand activities involving regional communities	Continued activities in conjunction with regional communities including forestation and clean-ups Contributed to regional communities through the implementation of the Eco Point system	○
	Improving environmental awareness		Continue and expand environmental education, information disclosure	Continued education by environmental lecturers Enhanced disclosure through Talk Live, CSR Report, etc.	○

\*1. Self-evaluation standards for achievement level: ○Target achieved △80% or more of target achieved

\*2. CO<sub>2</sub> conversion factors (kg-CO<sub>2</sub>/unit) used in calculating CO<sub>2</sub> emissions are as follows: Units are indicated in parentheses.

Purchased electric power (kWh): 0.42, Fuel oil A (liters): 2.677, Diesel fuel (liters): 2.64, Kerosene (liters): 2.49, City gas (Nm<sup>3</sup>): 2.347 (April-August 2015), 2.29 (September 2015-March 2016), LPG (kg): 3.007, LNG (kg): 2.70, Gasoline (liters): 2.322

Sources: The Federation of Electric Power Companies of Japan (actual figures for fiscal 1990), Ministry of the Environment. Some factors have been calculated independently by NGK.

Incidentally, the fiscal 2015 energy-origin CO<sub>2</sub> emissions volume for NGK on a non-consolidated basis is 151 x 10<sup>3</sup> metric tons when using the CO<sub>2</sub> conversion factor provided by the Order for Enforcement of the Act on Promotion of Global Warming Countermeasures (revised in February 2016).

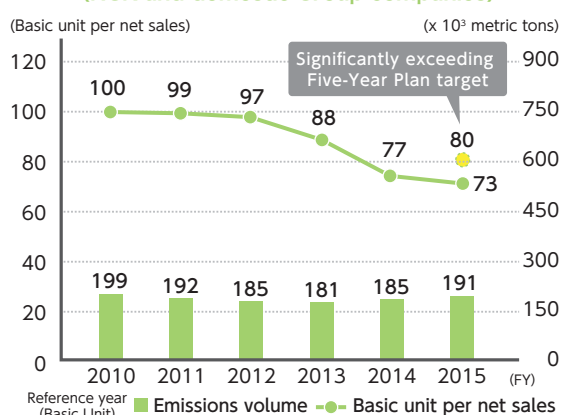
\*3. NGK basic unit per transport volume expresses in metric ton-kilometers the amount of crude oil equivalent fuel used.

## Achieving Improvement Target for Reducing Basic Unit per Net Sales CO<sub>2</sub> Emissions

NGK Group has achieved steady results by establishing medium to long-term targets for reducing CO<sub>2</sub> emissions, a major cause of global warming, as part of the Five-Year Plan, and formulating and managing annual improvement plans in line with business plans at all manufacturing bases in and outside Japan in order to achieve those targets. In fiscal 2015, we reduced CO<sub>2</sub> emissions by 3,300 metric tons, equivalent to approximately 2% of total emissions in Japan. In terms of the domestic basic unit per net sales, we achieved a 5% improvement compared to the previous fiscal year

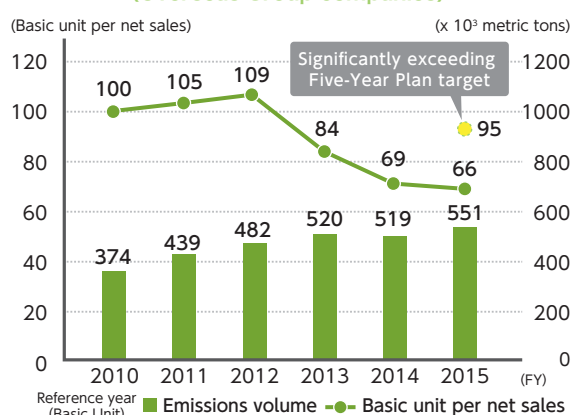
while meeting the Five-Year Plan objective. However, we fell slightly short of the target for total domestic CO<sub>2</sub> emissions due to the effect of an increase in production. Overseas, we reduced CO<sub>2</sub> emissions by 13,400 metric tons, equivalent to slightly more than 2% of the total overseas emissions. Overseas basic unit per net sales also improved more than 4% from the previous fiscal year, an improvement in the reduction that significantly exceeds the Five-Year Plan objective.

**CO<sub>2</sub> Emissions/Basic Unit Per Net Sales\***  
(NGK and domestic Group companies)



\*Basic unit per net sales calculated with the value in fiscal 2010 as 100.

**CO<sub>2</sub> Emissions/Basic Unit Per Net Sales\***  
(Overseas Group companies)



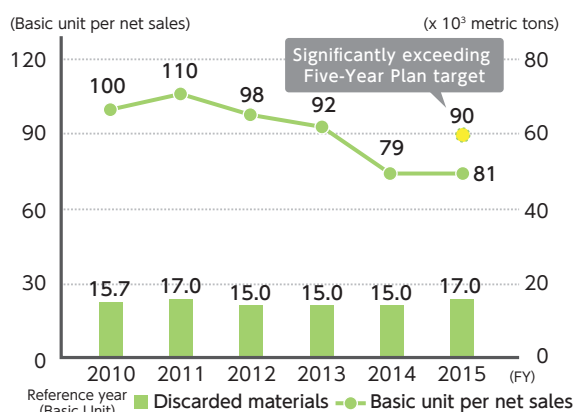
## Achieving a Reduction in Discarded Materials

The NGK Group has successfully managed to limit its generation of discarded materials by formulating and managing annual improvement plans to achieve the Five-Year Plan targets for the reduction of discarded materials in the same way that it did for reducing CO<sub>2</sub> emissions.

In fiscal 2015, we reduced discarded materials by 900 metric tons, equivalent to approximately 5% of domestic CO<sub>2</sub> emissions. Although the domestic basic unit per net sales deteriorated compared with the previous year due to the

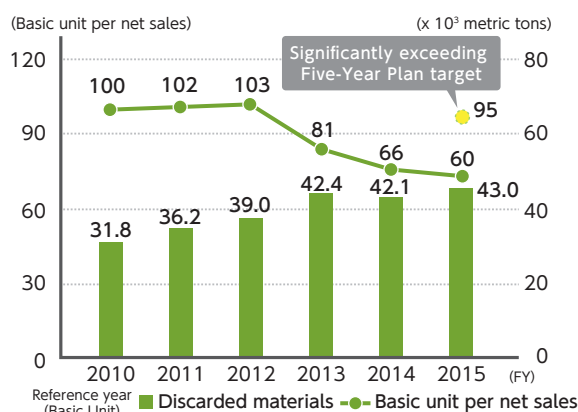
effect of increased sample production that did not contribute to sales, the results significantly exceeded the objective of the Five-Year Plan. Overseas, we reduced discarded materials by 3,900 metric tons, equivalent to approximately 9% of overseas CO<sub>2</sub> emissions. The domestic basic unit per net sales also improved slightly above 9% compared from the previous year, significantly exceeding the objective of the Five-Year Plan.

**Amount of Discarded Materials Generated/Basic Unit Per Net Sales\***  
(NGK and domestic Group companies)



\* Basic unit per net sales calculated with the value in fiscal 2010 as 100.

**Amount of Discarded Materials Generated/Basic Unit Per Net Sales\***  
(Overseas Group companies)



## Reducing CO<sub>2</sub> Emissions from Logistics

As regards reducing CO<sub>2</sub> emissions from logistics, with a target under the Five-Year Plan of reducing basic unit per transport volume by 1% each year, NGK promoted initiatives including enhancing loading efficiency as well as a modal shift to marine transport. Thanks to these initiatives, the basic unit per transport volume improved throughout the period, achieving a 1% reduction level every year. As a result, the reduction rate for the third Five-Year Plan period reached 1.7% per year on average, achieving the objective.

## Promoting Recycling Initiatives

Through systematic sorting, separating and the quest for new recycling methods, the NGK Group has focused on introducing recycling initiatives. As a result, we have maintained a domestic recycling rate of 99% or higher for NGK and domestic Group companies since fiscal 2013. At NGK, in particular, landfill disposal for fiscal 2015 was merely one metric ton, achieving a recycling rate of nearly 100%. At overseas Group companies, where situations differ by country and region, we took into account the circumstances in each country when setting appropriate targets. The overseas recycling rate has remained approximately 90% based on calculations that exclude three companies, who generate non-recyclable discarded materials, out of 16 overseas manufacturing Group companies.

## Promoting Biodiversity Initiatives

The NGK Group recognizes the conservation of biodiversity as an important issue for the company. Specifically, we have engaged in activities pursuant to "Aichi Target" international goals for biodiversity agreed upon at the 10th Meeting of the Conference of the Parties to the Convention on Biological Diversity (COP 10). In fiscal 2015, in addition to former initiatives, we started to participate in activities by the Nagoya Biodiversity Center (Environmental Affairs Bureau, City of Nagoya) by registering two employees of NGK as Nagoya citizen researchers into living creatures. We will continue to expand our initiatives aimed at preserving biodiversity in the future.

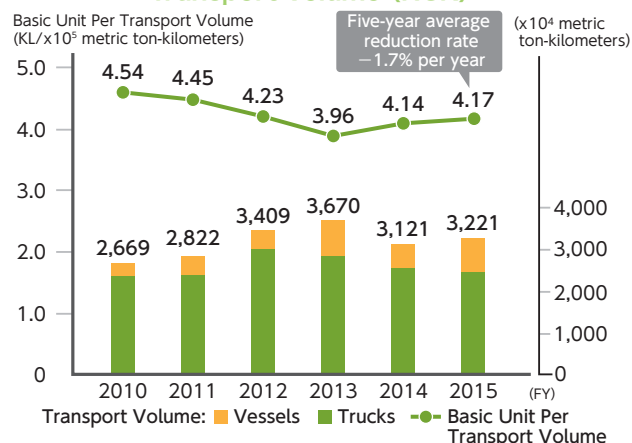


◀ Maintenance of Asian skunk cabbage colonies (NGK Okhotsk)

## Internal and External Environmental Education

NGK provides employee training for environmental management, specialized environmental training targeting personnel in charge of environmental management, and special environmental education aimed at increasing environmental awareness among general employees. As for external initiatives, NGK also provides lectures at elementary schools and children's centers as environmental education for children who will form the next generation and who will lead us into the future.

### Transport Volume / Basic Unit Per Transport Volume (NGK)



## Optimization of Water Usage

At the NGK Group, we make efforts to ascertain water risks based on the water stress level and water usage using "Aqueduct\*" at all business sites in Japan and overseas, while conducting risk assessment using guidelines (checklist on water usage). We will continue this risk assessment and introduce measures to optimize water usage at bases with greater water risks.

\* Global water risk analysis tool made publicly available by the World Resources Institute (WRI).

Aichi Target		NGK Activities
Target 1	Spread awareness	Employee environmental education, next-generation education (Voluntary environmental lectures at schools)
Target 4	Sustainable production and consumption	CO <sub>2</sub> reduction, effective use of resources, expand sales of products that contribute to the environment
Target 5	Prevent loss of all natural habitats	Voluntary employee participation in forestation and other environmental conservation activities
Target 8	Control pollution from chemical substances, etc.	Chemical substance management, management of exhaust and waste water, expanding sales of products that prevent air pollution
Target 11	Conserve protected areas	Voluntary employee participation in forestation and other environmental conservation activities
Target 14	Ecosystem services	Voluntary employee participation in forestation and other environmental conservation activities



▶ Presentation of water purification experiments at elementary schools



## Supporting the Acquisition of Environment-Related Qualifications

NGK makes an effort to systematically support the acquisition of legal qualifications targeting managers engaged in environmental management required in the operations at each business site. In addition, we support the acquisition of Eco Test certification with the intention of increasing environmental awareness among our employees.

Eco Test Certification

**471** passed,  
equivalent to  
approximately  
**13%** of all employees

## NGK Eco Point System

Employees earn points for environmental behavior conducted at work and in the home, a portion of which is converted into cash and donated to funds operated by regional municipalities (environmental funds), contributing to regional communities. This system was introduced at the Chita Site in fiscal 2012 as a trial and then expanded throughout the entire company in fiscal 2013.

## Environmental Initiatives at Group Companies

 Belgium  
NGK CERAMICS EUROPE S.A

### Reducing Plant Power Usage through the Introduction of Solar Power Systems

Solar power systems introduced in August 2013 in response to stringent environmental regulations in Europe have contributed to reducing CO<sub>2</sub> emissions significantly through the effective use of renewable energy.

Lionel Fourneau ▶

Section manager in charge of equipment maintenance who was involved in introducing the solar power systems




Reduced CO<sub>2</sub> emissions  
equivalent to approximately

**18** metric tons  
per year

(For an annual output of 60 MWh)



255 solar panels installed on the roof of the plant

 South Africa  
NGK CERAMICS SOUTH AFRICA (PTY) LTD.

### Focused on Recycling with the Aim of Achieving

**100%** Recycle Rate  
for All Waste

We are now focusing on recycling waste that used to be disposed of in landfill. We also conduct regular environmental training for all employees in order to facilitate waste treatment and sorting.



Recycled bricks



Louise Green ▲

In charge of quality assurance and the environmental management system

 Australia  
NGK STANGER PTY. LTD.

### Contributing to the Environment through Reuse and Recycling of Products

We have worked on reusing and recycling power distribution equipment that we have been supplying since fiscal 2010. We reuse those collected switches that can be repaired and recycle those that cannot be repaired by separating into individual components.

Clem Sapkaroski  
In charge of inspection  
process for  
gas switches ▶



 Indonesia  
P.T. NGK CERAMICS INDONESIA

### Monitoring Energy Waste through Energy Audits

We have implemented NGK's measures to reduce CO<sub>2</sub> emissions in our overseas Group companies. We make an effort to reduce power usage through energy audits by visualizing energy usage for equipment such as compressors and boilers.

Yuswan Natalius  
In charge of  
maintenance of  
general-purpose  
equipment ▶



Checking whether equipment is operating at optimal rate

 Mexico  
NGK CERAMICS MEXICO, S. DE R.L. DE C.V.

### Contributing to the Environment by Conserving Water Resources

Water is a precious resource in Mexico, which suffers from a serious water shortage and water pollution. At NGK CERAMICS MEXICO, we are working to preserve water resources by recycling manufacturing process wastewater through filtration using specialized reverse osmosis (RO) membranes in addition to using purified well water as factory water.



Factory wastewater before filtration (left) and after purification



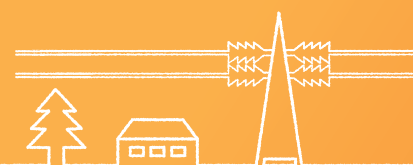
Checking operation records for purification equipment



Edmundo Salas (left) ▲  
Joel Castillo (right)



# Striving to Become a Corporate Citizen to Contribute to a Better Social Environment



## Our perspective of the issue Strategy / Policy

The NGK Group considers the provision of products and services that contribute to a better social environment to be one of its most important missions. In order to accomplish this mission, we engage in a wide variety of activities, including: creating quality from the customer's perspective, developing safe and pleasant workplaces, nurturing human resources, building a fair and honest supply chain, and contributing to a society as a corporate citizen trusted by local communities.

As a global business corporation, we set the policies of the entire Group as well as plans and objectives that take account of specific issues, cultures, and customs of each country and region.

### Quality Policy

NGK is dedicated to quality and committed to providing valuable products and services that are trusted by our customers and respected by society

### Quality Objectives 2016

Clarify changes and evaluate impacts on design and production

### Actions for Promoting CSR

- Provision of Products that Contribute to Better Social Environment
- Respect of Humanity and Assurance of Comfortable Working Environment
- Implementation of Fair, Free and Transparent Transactions
- Coordination with Local Communities and Promotion of Contribution to the Society
- Communications with Stakeholders

## Realization of Higher Quality Products and Services NGK Group Quality Activity Rules

The NGK Group promotes restructuring of its quality activities to respond more precisely to increasing and diversifying quality demands from customers in different target markets. In particular, quality activity rules have been formulated to eliminate quality risks in the market; we are promoting the establishment and improved efficacy of the rules.

### Strengthening Product Design Review

The increasing and diversifying quality demands from customers call for the integration of knowledge among various members, not only from the Design division but also from the Manufacturing and Production Engineering divisions, throughout the development process. For this reason, the Group considers the Design Review (DR) to be the most critical activity. DRs are conducted when development milestones are reached or when production processes change. Critical DRs are conducted by reviewers from throughout the company to support the elimination of risks.

#### DR (Design Review) Guidelines

Key concepts and perspectives

- Systematically search for influential factors, check for risks with no omissions.
- Discuss the bases for risk assessments, get opinions.
- Exchange knowledge that makes for better design with everyone.



Designers

Product design and process design consideration (DR preparation)



DR participants

Discussion and deliberation at DR

Ultimate Goal

To eliminate quality risks by improving DR

### Four Rules for Quality Activities

#### Quality confirmation rule

Establishes milestones, from development to start of production, and confirm conformance with six quality levels when production processes change.

#### DR function strengthening rule

Registers DR plans with quality risks of medium or high level as important DR subjects with participation of DR reviewers. The Quality Management Department head holds company-wide DR for cases with particularly high risk level.

#### Quality monitoring rule

Monitor and share information company-wide with respect to quality status changes or problems concerning products or markets. Manufacturing defects and customer complaints are shared company-wide every month through reports to the Quality Management Department, and the appropriateness of countermeasures is discussed.

#### Handling major customer complaints rule

In the event of a major customer complaint, including a potential complaint, the situation is promptly reported to the Quality Committee Chair to formulate company-wide countermeasures.

### Developing and Enhancing Quality Activities at Overseas Production Bases

From their inception, overseas production bases have created quality systems appropriate to their situations and acquired ISO 9001 or TS 16949 certification. Monthly reports from each base regarding customer complaints and the status of manufacturing quality are discussed at quality activity meetings, enabling the entire NGK Group to evaluate the quality status in a timely manner. Moreover, quality activity rules and an annual quality objectives are developed in an attempt to develop and enhance quality activities.

### Developing QuiC Activities to Improve Quality with Full Employee Participation

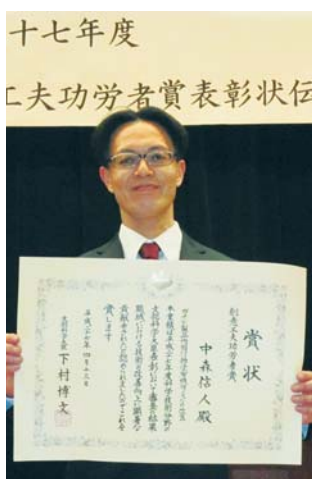
The NGK Group develops QuiC (Quality up innovation Challenge) quality improvement activities in which all employees participate. These activities consist of quality improvement activities by small groups and suggestions that strive to enhance the quality of products and work; the best practices are shared by the entire NGK Group. In fiscal 2015, 14 best practices, including two cases from overseas plants, were introduced at the Company-wide QuiC Activities Contest.



▲The level of improvement activities at overseas production bases continues to increase each year. In 2015, a representative of the Polish production base won the Grand Prize at the Activities Contest.

### Receiving the Prize for Creativity from the Ministry of Education, Culture, Sports, Science and Technology

The Prize for Creativity given by the Ministry of Education, Culture, Sports, Science and Technology is given to individuals and groups who have contributed to technological improvement at work through excellent creativity. In fiscal 2015, Nobuto Nakamori (Manufacturing Section Electrical Insulator Division, Power Business Group) won the award, in recognition of his work in improving glazing equipment for insulators, leading to a reduction in man-hours and waste, as well as enhanced safety.



### Contributing to the Business Development of Our Customers

We contribute to the business development of many customers through the stable supply of high-quality products based on Rules for Quality Activities.

#### Receiving Excellent Partner Award from Tokyo Electron

NGK received the 2015 Excellent Partner Award from Tokyo Electron Limited, a leading manufacturer of semiconductors in Japan. The award was given in recognition of a number of high-quality ceramics, developed by NGK, to manufacture semiconductors that have contributed to the business development of Tokyo Electron.



▲At the award ceremony, Mr. Toshiki Kawai: Representative Director, President and CEO of Tokyo Electron (right); Mr. Tetsuro Higashi: Corporate Director and Corporate Advisor of Tokyo Electron (left); and Shuhei Ishikawa: Director and Senior Vice President, NGK Group Executive of Electronics Business.

#### Visiting a Super-High Voltage Substation

#### Listening to Customers towards Manufacturing beyond Expectations

"We want to actually see how our customers use the products we designed, manufactured, and sold; and we want to listen to the voices of customers directly." Staff members of the Power Business Group, who put customers first and are working on changing the business culture, visited a super-high voltage substation, the "Kita-Toyota Substation" with the cooperation of Chubu Electric Power Co., Inc.



NGK has been our great partner since its foundation

**Mr. Shinji Aoyama**

Chubu Electric Power Co., Inc.

We prevent problems with equipment through inspections on a daily basis. We also do everything we can to ensure that high-quality electricity can be transmitted constantly and reliably. Most of the insulators we use at Kita Toyota Substation are made by NGK. We have a deep trust in insulators made by NGK with excellent technical strength. They support our stable power supplies.



# Striving to Create a Safe and Pleasant Work Environment

Aiming for zero industrial accidents, NGK has introduced an Occupational Safety and Health Management System (OSHMS) based on company-wide safety and health policies. Since its introduction, we have made efforts to thoroughly

embed and operate this system and strengthen risk assessment. Also, we are proactively engaged in improving the health of our employees.

## Enhancing Safety and Health Activities

After an accident at the Chita Site in July 2012, NGK formulated a three-year action plan and strengthened safety measures. In fiscal 2015, even after the plan had been completed, we continued the exhaustive risk assessments which

we began in fiscal 2012, formulating measures sequentially against the risks picked up from operations based on the degree of importance and risk.

### Interview

Safety and Health Management Department will disseminate the corporate policy and ensure that the situation of each company is understood and shared.

**Junichi Ishikawa**  
Safety and Health Management Department

The Safety and Health Management Department was newly established in fiscal 2016. Before then, the Safety and Health Group in the Human Resources Department had promoted safety and health activities mainly for domestic sites. As for Group companies, the activities had been mainly led by each company and the relevant departments. From now on, the Safety and Health Management Department will disseminate important policies of the Headquarters; it will also assess and share the activities of each company. Through this structure, we strive to improve the safety and health management system of the entire Group.



▲Mr. Ishikawa (left) inspecting a plant with President Taku Oshima

## Organizing “Safety PEM” to Review Safety Measures and to Prevent Potential Risks

In September 2015, NGK brought together staff in charge of automotive business from nine production bases in Japan and overseas to hold Safety PEMs (Process Expert Meeting) at the Headquarters. During the meeting, we reviewed the safety measures of all Group companies while reconfirming changes in the manufacturing environment and systems at each production base.



## Employee Volunteers Won the Team Championship at a First Aid Skill Competition

Employee volunteers of NGK Insulators Tangshan, our Group company in China, has formed a first aid team. In May 2015, the team participated in a safe production first aid skill competition in Tangshan City, China, and won the team championship. We will continue to hold fire drills and first-aid training regularly for all employees to further raise safety awareness among employees.



## Promoting Activities to Support Physical and Mental Health

### ■Activities for Health Promotion

NGK is actively engaged in promoting the physical and mental health of its employees. We deploy ongoing activities to provide mental health care, focusing on the Four Types of Care recommended by the Ministry of Health, Labour and Welfare. In fiscal 2015, industrial physicians and our Human Resources Department communicated closely to exchange information on employees with mental health issues. We also conducted a survey on sleep disorders. Starting in September 2016, we will also conduct stress checks.

#### Four Types of Care

Self-care

Line care

Care by industrial health staff within business sites

Care by resources outside business sites

### ■Position-Based Mental Care Education

We also conduct ongoing position-based mental care education. In fiscal 2015, we provided educational courses to new hires, regular employees and managers totaling 558 people. NGK also gives consideration to employees on sick leave, enabling them to devote their full attention to recovery with peace of mind. As for employees assigned overseas, we provide physical and mental care while taking account of climate, culture and environment that are different from Japan.

## Developing the Most Precious Management Resource: People

At NGK, people are our most precious management resource. With respect for employee motivation and ambition, we engage in developing human resources who will lead the next generation. In recent years, NGK has concentrated efforts on the enhancement of cross-cultural communication skills and language training in line with globalization of the business environment, as well as the education of talented employees for management positions. In addition to position-based mandatory training, we have also introduced approximately 120 programs throughout the year to provide systematic education.

Approximately  
**120**  
programs are  
introduced per year

## Promoting Human Resource Development through the Establishment of Systems in Four Areas



## Developing Global Human Resources in the Early Career Stage

### ■English Instruction for New Employees

With the aim of developing global human resources in the early career stage, we provide English language instruction targeting all newly hired staff in general positions during the first year of employment. In fiscal 2015, we added programs to enhance communication skills and global mindset, both essential for global human resources. The secretariat provides individual counseling to trainees, promoting their autonomous efforts based on their goals while providing appropriate advice according to their situations.

Time spent learning English  
per general employment  
new hire (fiscal 2015 results)

**128** hours  
per year



▲ A new employee making a presentation in English on the achievements of the 9-month training

## Further Strengthening Worksite Capabilities in Manufacturing

### ■In-house Instructor Development Training

As many employees with rich experience reach the retirement age, the proportion of those with less experience is increasing at manufacturing sites. In response, the NGK Group conducts In-house Instructor Development Training for staff to develop skills as leaders in manufacturing, with an aim to strengthen worksite capabilities.



### Interview

#### Developing leaders who can take the initiative **Tadayoshi Sasaki**

NGK ADREC CO., LTD.



I play a role as an in-house instructor. In order to keep up with the accelerating speed of business, we need to promptly develop worksite leaders who can take the initiative so that we can enhance manufacturing capabilities and succeed in global competition. When training my juniors, I try to have them experience joy, accomplishment, and exhilaration by solving problems with colleagues so that they can pursue higher goals while finding satisfaction in the process.

## Actively Promoting the Active Participation of Women

### Creating an Employee-Friendly Environment for Women

NGK has a flexible system that promotes employees' work-life balance. In addition to flexible working arrangements, such as the shortened working hour system, we also provide extensive financial support, including subsidies for childcare expenses and allowances to support caregiving. Since the major revision in 2010, we have continuously enhanced our system to promote a work-life balance while incorporating employees' needs. As part of these efforts, we launched a new program in 2013 that enables employees to take leave when accompanying their spouse to an overseas assignment.



#### Interview

I was able to spend time with family without worry thanks to the leave program.

**Noriko Izumi**

Sales and Marketing Division  
Power Business Group



When my husband was transferred to the Netherlands, I decided to take leave to accompany him, taking account of my family situation with two young children. I was able to spend a lot of time with my family there. The time in Europe, where many countries are close to each other, also provided wonderful opportunities for my children to experience different cultures. When I go back to work, I would like to use the energy I saved during my leave time and make even greater contributions.

### Certified as a Company Promoting Women's Activities by the City of Nagoya

NGK was certified as a Company Promoting Women's Activities by the city of Nagoya in January 2012, in recognition of its efforts to improve employment conditions to promote the active participation of women, including the revised system for transferring to general

employment jobs. We were recertified in fiscal 2014, in recognition of ongoing active efforts to promote the active participation of women as well as further improvement of the existing systems.



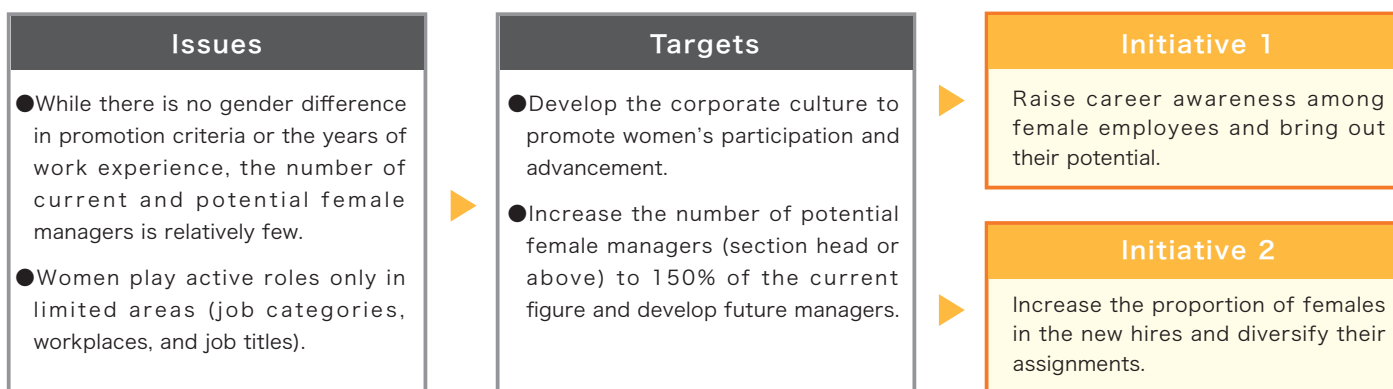
▲ Certification logo of a Company Promoting Women's Activities by the City of Nagoya

### Submitting an Action Plan to Promote Women's Participation and Advancement in the Workplace to the Ministry of Health, Labour and Welfare

In January 2016, NGK submitted an action plan based on the Act of Promotion of Women's Participation and Advancement in Workplace to Aichi Labor Bureau; the Ministry of Health, Labour and Welfare.

We submitted the plan with seven other companies within Aichi Prefecture before other companies.

#### ■ Our Action Plan (April 1, 2016 to December 31, 2018)





# Ensuring Fair and Honest Partnerships with Suppliers

## Promotion of CSR Procurement

The NGK Group has established the Basic Purchasing Policy in an attempt to conduct fair and equitable business transactions and to prosper together with all our procurement partners. We prioritize business transactions with appropriate partners based on the CSR Procurement Guidelines. We pay particular attention to impacts on regional communities stemming from the use of raw materials with the potential to cause social issues, such as human rights violations and poverty, and has taken steps to avoid using such materials when there is risk of adverse impact.



## Communication with Procurement Partners

The NGK Group places great value on communications with procurement partners. In order to maintain stable procurement from the best suppliers, we have made various efforts, including: earnings presentations for major suppliers, operation of Supplier Helpline, and one-on-one meetings in Japan and overseas.



▲ In June 2015, we invited 229 people from 131 suppliers to an earnings presentation.

## Improvement of Buyers' Skills at Overseas Group Companies

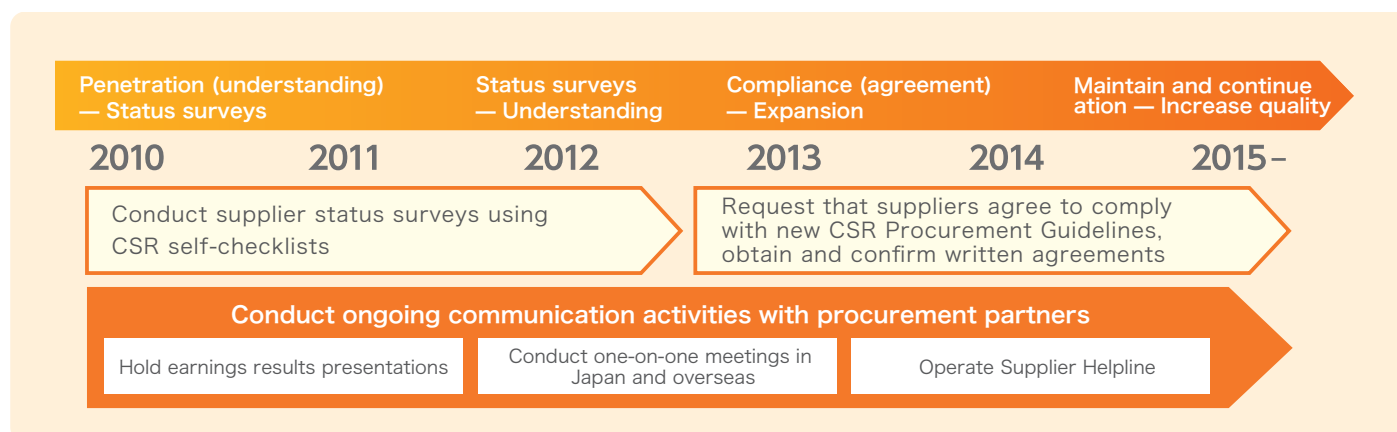
The Purchasing Department of NGK invited procurement staff from P.T.NGK CERAMICS INDONESIA in November 2015 and from NGK CERAMICS POLSKA SP.Z O.O. in February 2016 for buyers' training programs. The goals of these programs were to enhance procurement capabilities among overseas Group companies and to improve the skills of staff members. The trainees acquired the knowledge for efficient procurement, including roles of Procurement division, procurement know-how, and management of suppliers.



## Developing CSR Procurement in Conjunction with Societal Trends

The NGK Group has engaged in the expansion of CSR Procurement; we inculcated an understanding of CSR Procurement among our suppliers and conducted status surveys by fiscal 2013, and have been taking proactive steps to further advance the CSR Procurement Guidelines compliance since fiscal 2014. Meanwhile, we have also expanded CSR

Procurement activities to new suppliers. Going forward, we will strive for further quality improvement through the maintenance and continuation of CSR Procurement activities with suppliers while continuing to consider societal trends. We will also promote appropriate activities in each country and region where we operate overseas Group companies.



# As a Company Contributing to a Society and Trusted by Communities across the Globe

The NGK Group engages in social contribution activities in response to needs in each community across the globe where it develops its business. We collect information on such activities from correspondents of NGK Group companies in Japan and

## Developing Human Resources to contribute to the Development of an International Community

NGK established and operates the NGK Foundation for International Students with the aim of contributing to human resource development that contributes the development of an international community. The Foundation mainly provides housing and (benefit-type) scholarships to international students visiting Japan. In fiscal 2015, we provided housing for 32 students from 4 countries and scholarships to 20 students from 12 countries. NGK also conducts a variety of events to promote grassroots international relations among supported students, regional communities and employees. We have organized language classes taught by international students every year since 2000 and cross-cultural exchange meetings since 2006.



▲Event welcoming international students attended by employees



▲NGK International House, housing for international students

## Becoming a Company Supported by Communities

NGK actively interacts with regional communities. In fiscal 2015, three of our sites conducted six plant tours for a total of 152 elementary school students and local residents to deepen their interest in and understanding of NGK and manufacturing.



overseas; in fiscal 2015, we received 70 activity reports. The Group also engages in dynamic interactions with residents of the region through opportunities such as plant tours and regional events to promote direct dialogue.

## Assisting with a Work Experience Program for Middle School Students of Rikuzentakata City

In January 2016, we assisted with a work experience program for middle school students of Rikuzentakata City, Iwate Prefecture, sponsored by Nagoya City Board of Education. We welcomed two students and had them try taking products in and out of a kiln. Based on the Kizuna (Friendship) Agreement, which was concluded in 2012 between the Board of Education in Nagoya City and the one in Rikuzentakata City, middle school students in each city visit each other every year.



I was exhausted from the work I was unfamiliar with, such as inspecting many products and handling fragile products carefully yet quickly. But I accomplished all of my missions.

## Assisting with Disaster Relief in the Wake of Kumamoto Earthquakes

Massive earthquakes hit the Kumamoto area in April 2016. To assist the affected area, the NGK Group worked as one, producing and supplying insulators and relevant equipment, in order to restore power facilities that served as essential utilities. The Group also contributed 10 million yen to assist relief activities for disaster victims and towards reconstruction in the affected areas. The Group also organized the Matching Gift, calling for donations from its employees and matching the same amount to donate. Moreover, we also delivered food and mineral water stocked at the Headquarters and other sites to the affected areas through Second Harvest Japan.



▲Second Harvest Japan staff and people of Aso City, Kumamoto Prefecture



## Group Volunteer Participation in Marathon Festival Nagoya-Aichi

In March 2016, Marathon Festival Nagoya-Aichi was held in Nagoya City. Approximately 100 employee volunteers of the NGK Group and associated companies participated in the event to support this major local event. They supported operations by providing runners with water and maintaining the course.



Number of employee volunteers  
Approximately  
**100**  
people

### Interview

Cheering on runners with colleagues!

**Yoko Dan**

NGK CERAMIC DEVICE CO., LTD.



I gave out water to runners with loud cheers, trying to give them not just water but also energy! After 6 hours of work since the early morning with my colleagues, I was exhausted but felt satisfied and inspired. I am really glad I participated in the event.

## Introducing Experiments to the Next Generation

As a manufacturing company, NGK actively provides information on science to children so that they can find joy in this subject and become interested in science and technology to lead the next generation. We have NGK Science Site on our website, where a different scientific experiment supervised by specialists is introduced each month with detailed instructions. Employee volunteers also demonstrate these experiments introduced on the website.



▲Employee volunteers demonstrating experiments

## Supporting Children in Africa through TABLE FOR TWO

Since September 2010, NGK has participated in the TABLE FOR TWO (TFT) program. When a meal is ordered from the employee cafeteria's healthy menu, a donation equivalent to one school lunch (20 yen) is provided to children in Africa. This program is provided at all of the NGK cafeterias (8 sites in 4 areas). In fiscal 2015, the equivalent of approximately 41,500 meals were donated. The Group companies also participate in the TFT program through vending machines.

Cumulatively,  
Approximately

**210**

thousands meals  
have been  
donated

(equivalent to  
950 school lunches  
every day  
for one year)



NGK Science Site introduces experiments that can be tried at home easily.

This website ranked second and sixth on "You still have time! Summer projects for school" of "Ranking of Everything" in Nikkei Plus 1 (Saturday supplement of Nikkei Newspaper) dated August 22, 2015.

## Joining Blood Donation Campaigns in Malaysia

NGK ELECTRONICS DEVICES (M) SDN.BHD. and NGK GLOBETRONICS TECHNOLOGY SDN.BHD., both based in Malaysia, organized blood donation campaigns in April and August 2015. A total of 136 employees donated their blood.







## Governance

# Striving to Become a Company Trusted by All Stakeholders



### Our perspective of the issue

### Strategy / Policy

NGK strives to become a company trusted by all stakeholders. To ensure appropriate operations and transparent management, NGK has set its sights on establishing and maintaining an organization capable of swiftly responding to changes in the business environment, and a fair and open management system emphasizing the interests of shareholders. These components make up NGK's basic approach to corporate governance. To put this approach into practice, NGK has chosen a corporate governance structure anchored by Audit & Supervisory Board. NGK corporate governance also includes the Executive Committee and several other committees to assist President in management decision-making, enhancing governance efficacy.

### Actions for Promoting CSR



Disclosure of Corporate Information

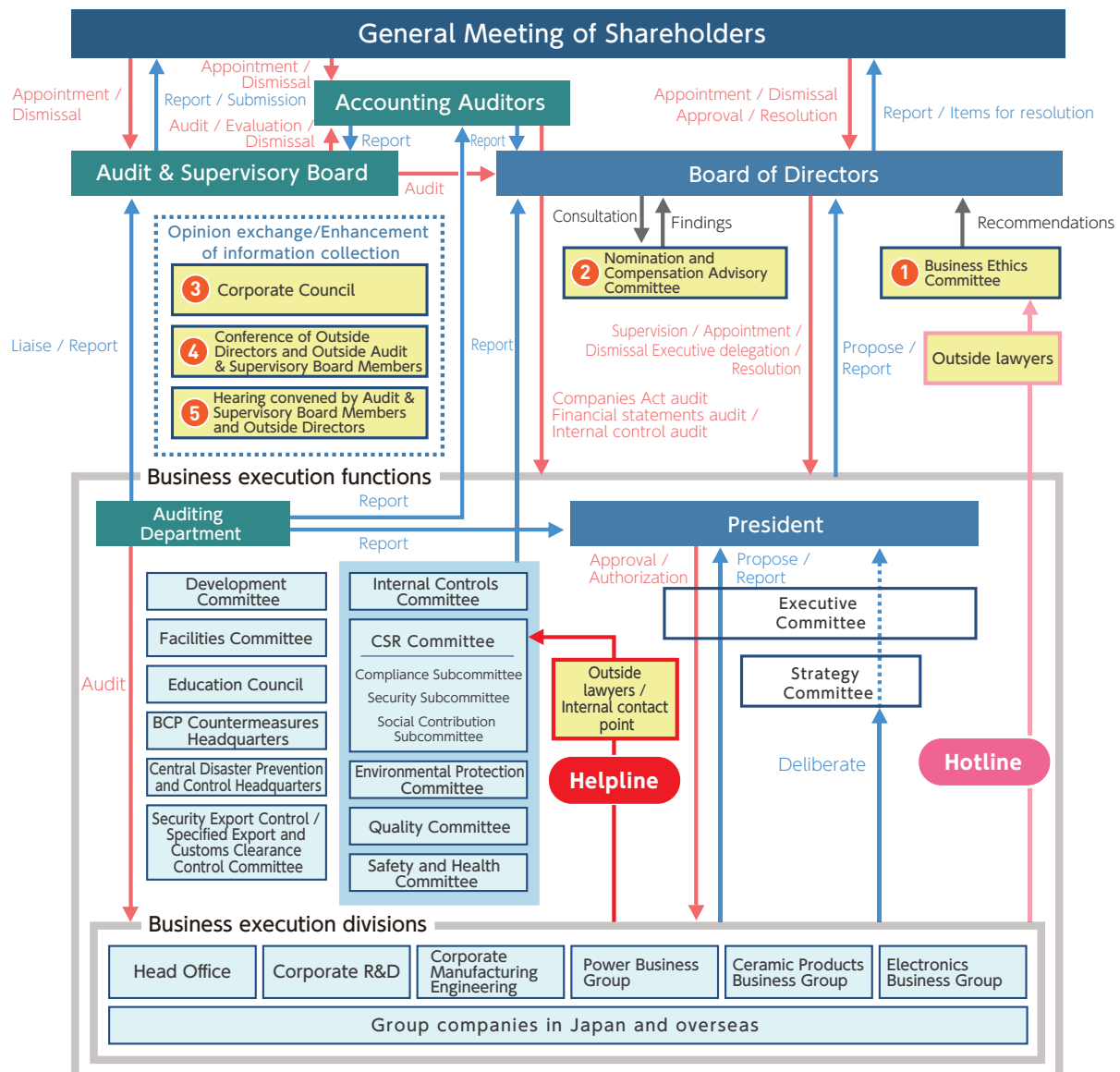


Thorough Enforcement of Compliance; Risk Management



Communications with Stakeholders

## 《《 Corporate Governance Scheme 》》



## Enhancing the Corporate Governance Scheme

NGK is conducting measures to expand and strengthen its corporate governance to increase corporate value with the intent of becoming a company trusted by all its stakeholders.

## Establishing New Committees to Enhance Transparency

We make continuous efforts to enhance our system to ensure transparency, such as bolstering the supervision and monitoring functions on management and making recommendations on the overall management. In 2015, we established the following five committees to further enhance and improve transparency.



## Organizing a Meeting to Inform the New Governance Scheme

In January 2016, NGK Legal Department organized a meeting on laws, regulations, and compliance to thoroughly inform employees about the new governance scheme. As part of the response to the Corporate Governance Code, which started operations in June 2015, the new governance scheme was established in December. At the meeting, explanation on this new scheme and basic policies was provided to approximately 400 employees, mostly managers.



### ► Comment by Business Ethics Committee Chair

## Promoting active education and supervision

We reformed our corporate governance scheme in December 2015 and are currently focusing on its operations. Regarding compliance, we will actively engage in education, awareness raising, checking, and supervision in order to encourage each employee in Japan and overseas to pay full attention to it. Each employee should understand and voluntarily practice compliance while taking account of different laws, regulations, and cultures in each region across the globe. This will serve as one of the effective ways for our company to become significant for all stakeholders.



**Hiroyuki Kamano**

Outside Director  
Business Ethics  
Committee Chair

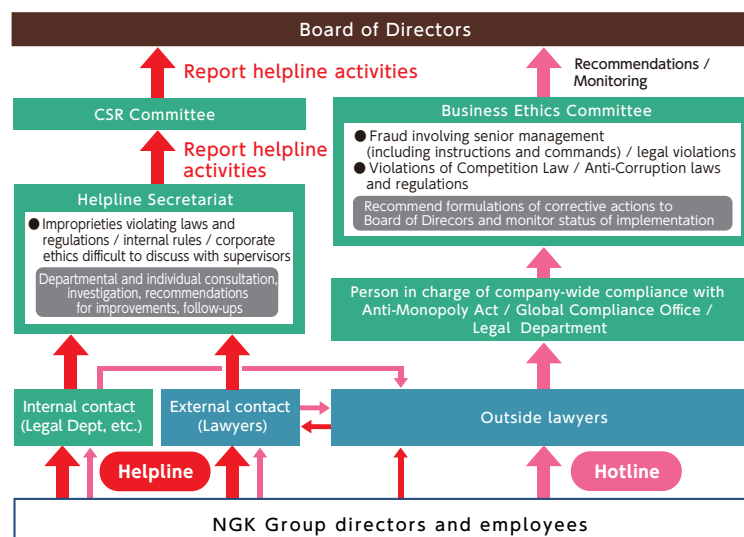
Helpline

Hotline

## Enhancing the Whistle-Blowing System — Establishing Helpline and Hotline —

We have established Helpline to receive inquiries and reports from employees aimed at curtailing and preventing activities contrary to the spirit of the NGK Group Guidelines for Corporate Behavior and to facilitate a speedy resolution when issues occur.

We also established Hotline in December 2015 as an internal control system for responding to fraud and legal infractions committed by senior management, as well as violation of Competition Law and Anti-Corruption laws and regulations. The Hotline is first received by outside lawyers, with issues handled by the Business Ethics Committee, composed mainly of external directors, who report directly to the Board of Directors.



## Thorough Compliance

Viewing compliance as the foundation of CSR, the NGK Group positions it as the most important initiative to enhance trustworthiness. Based on this perspective, the Group strives to create specific systems to inculcate this view among employees, prevent corruption, and comply with laws and regulations.

### Measures to Strengthen Our Compliance System Related to Competition Laws

Year conducted	Regulation Development	Creation of Internal Systems	Training
FY1997	●Formulated guidebook and briefing document for the Anti-Monopoly Act	●Required each business group to submit a Compliance Status Report on the Anti-Monopoly Act	●Lectures on the Anti-Monopoly Act by outside instructors (attorneys) (subsequently held annually)
FY2011	●Formulated Competition Laws Compliance Rules		
FY2012	●Created and distributed the Competition Laws Compliance Handbook ●Created and distributed an Appendix to the Competition Laws Compliance Handbook	●Established an independent committee	●In-house training led by Legal Department staff ●Lectures by local attorneys held at overseas Group companies
FY2013			●Conducted briefing on the Competition Laws Compliance Handbook ●Invited U.S. attorneys to lecture on Competition Laws
FY2014	●Revised Competition Laws Compliance Rules ●Launched operation of a database for advanced notifications and participation reports pertaining to meetings ●Launched operation of an e-mail monitoring system ●Revised Competition Laws Compliance Rules at sales subsidiaries in the United States	●Introduced company-wide centralized supervision and reporting structures led by the Board of Directors (independent of the president) ●Appointed company-wide Competition Laws supervisory managers ●Enhanced the helpline	●Conducted study meetings for newly appointed directors on Competition Laws and the Companies Act by Japanese and U.S. attorneys (subsequently held annually) ●Conducted study meetings on Competition Laws at overseas Group companies (corresponding to laws and regulations in each country)
FY2015	●Enforced revised Competition Laws Compliance Rules ⇒ Submission of written oaths ⇒ Confirmation of compliance status by third parties ●Revised Competition Laws Compliance Rules at Group companies in Japan and overseas except the United States	●Competition Laws Compliance Program was resolved by the Board of Directors ●Established the Global Compliance Office	●Conducted study meetings on Competition Laws for new employees ●Distributed DVD on Competition Laws to Group companies in Japan

### Promoting Compliance Education for Corporate Officers and Employees

CSR Office, Global Compliance Office and Legal Department play a leading role in compliance education and its awareness raising for corporate officers and employees.

#### Training on Competition Laws Conducted in Fiscal 2015

	No. of times conducted	Content
Competition Laws training for corporate officers	1	Competition Laws and bribery prevention
Lectures by outside instructors	1 <sup>*1</sup>	Competition Laws and bribery prevention
Training for overseas Group companies	18 <sup>*2</sup>	Competition Laws: details, execution status and important practical points for observing these laws
Competition Laws training conducted by internal lecturers	14	Basic knowledge of Competition Laws and important practical points for observing these laws

\*1. Seven additional lectures were conducted using DVDs in each area.

\*2. Twenty-six companies took the training.



▲We revised the Competition Laws Compliance Handbook in February 2016 and distributed it to all NGK corporate officers and employees. The Handbook is reader-friendly, explaining what they are expected to do.

### Establishing the Global Compliance Office

In June 2015, we established the Global Compliance Office with an aim to build a group-wide foundation for an effective compliance scheme at a global level. We also commissioned PwC Advisory LLC as a third party advisor to review the

operational effectiveness of the competition law compliance program as well as the consistency of the company's compliance reporting structure of the NGK Group, which includes Japanese and overseas Group companies.



# Furthering Risk Management

The NGK Group assumes six categories of company-wide risks, such as compliance, information, employment and labor. The Strategy Committee and Executive Committee conduct comprehensive examinations and analyses to avoid and prevent such risks. We dedicate ourselves to manage the risks associated with our business activities, including periodic follow-ups by the CSR Committee regarding company-wide risk management efforts.

## Business Continuity Planning (BCP) Initiatives

The NGK Group is developing Company-Group-wide Business Continuity Planning (BCP) through the establishment of the BCP Headquarters, an organization for leading business continuity and quick recovery in the event of a large-scale natural disaster, led by the President. Countermeasure initiatives include the establishment of multiple manufacturing bases and procurement sources, the damage mitigation measures related to building and equipment and employee safety assurance.



### Our initiatives in Fiscal 2015

- We stockpiled supplies, such as food and blankets, at facilities that can also be used by the general public.
- A drill was conducted to deal with a situation assuming five to six hours after a large-scale earthquake. In addition, we conducted another drill assuming three days after the earthquake and exercised procedures up to decision-making on a restoration policy. We carefully examined pieces of information that will be necessary to make a decision on the restoration policy, and identified any problems in our existing plan.

### Initiatives Going Forward

Enhancing drill scenarios,  
expanding the scope and targets of drill

### Interview Voice of Staff

We will make  
BCP more effective

**Minako Nojima**

Corporate Strategy Office



We augment BCP efficacy through more practical drill and more advanced scenarios, expanding scope of training to include more employees in an effort to improve initial response and continue business activities. Practical drills provide more findings than what we can assume from the desk, and these have helped us to improve our plan. We become more able to make fine-tuned improvements every year. We will keep reviewing the measures through more practical drill to improve the effectiveness of BCP.

## CSR Talk Live

### Dialogue with Employees Aimed at CSR Practices

To deepen each and every employee's understanding of CSR initiatives, the NGK Group conducts "CSR Talk Live," a dialogue event facilitating direct discussions between senior management and employees held at all domestic sites since fiscal 2009. In fiscal 2015, this event was held at 10 venues, with a total of 388 employees participating. At each venue, senior management emphasized the importance of NGK Group CSR initiatives to those in attendance. Afterwards, a Q&A session with employees was conducted on topics including environmental conservation, workplace safety, CSR initiatives, and usage of the Helpline. Comments provided on a post-event survey included: "This event has given me pride as a member of the NGK Group," and "I would like this event to be expanded overseas." These comments enabled us to ascertain the depth of employee's understanding of CSR activities. We will continue these activities in an attempt to further disseminate CSR.



### Overview of the CSR Talk Live Events in Fiscal 2015

Venue	Date	Number of Participants
Nagoya Site	December 8	50
	December 11	49
	December 16	50
Chita Site	December 2	48
Komaki Site	October 20	49
Ishikawa Plant	November 25	23
NGK Filtech	October 28	26
Ikebukuro Horo Kogyo	December 1	37
NGK FineMolds	November 5	30
Group companies on the Nagoya premise	December 10	26

Total number  
of participants  
at 10 venues:

**388**

# Corporate Outline

## Company Name

NGK INSULATORS, LTD.

## Address

2-56 Suda-cho, Mizuho,  
Nagoya 467-8530, Japan  
Telephone + (81) 52-872-7181

## Employees

NGK  
Full-time: 3,700 (As of March 31, 2016)  
Contract & Temporary: 474 (Avg. in FY2015)  
Consolidated  
Full-time: 16,657 (As of March 31, 2016)  
Contract & Temporary: 3,543 (Avg. in FY2015)

## Establishment

May 5, 1919

## Paid-In Capital

69.8 billion yen  
(As of March 31, 2016)

## Net Sales

435.8 billion yen  
(Consolidated, for the year  
ended March 31, 2016)

## Business Development by Region

(As of March 31, 2016)

NGK INSULATORS, LTD. 59 consolidated subsidiaries 2 equity-method affiliates	Japan 22 consolidated subsidiaries
	North America 14 consolidated subsidiaries
	Europe 6 consolidated subsidiaries
	Asia and Others 17 consolidated subsidiaries

## Organization

### Power Business Group

- Business Planning Dept.
- Sales and Marketing Div.
- Insulator Div.
- Electrical Equipment Dept.
- NAS Battery Div.
- Quality Assurance Dept.

### Ceramic Products Business Group

- Business Planning Dept.
- Worldwide Sales and Marketing Div.
- Engineering Div.
- Manufacturing Div.
- Sensor Div.
- Industrial Process Div.
- Quality Assurance Dept.

### Electronics Business Group

- Business Planning Dept.
- High Performance Ceramics Div.
- New Metals Div.
- Electronic Components Div.
- Quality Assurance Dept.

### Head Office

- Auditing Dept.
- Environmental Management Dept.
- Quality Management Dept.
- Safety and Health Management Dept.
- Corporate Strategy Office
- New Business Planning Office
- Secretarial Office
- Public Relations Office
- Human Resources Dept.
- CSR Office
- Global Compliance Office
- Finance & Accounting Dept.
- Legal Dept.
- Intellectual Property Dept.
- General Affairs Dept.
- Purchasing Dept.

### Corporate R&D

- Wafer Project
- NCM Project
- Functional Materials Development Project
- SOFC Project
- ZNB Project
- Materials Research Laboratory
- Future Technology Management Center

### Corporate Manufacturing Engineering

- Administration Dept.
- Manufacturing Engineering Dept.
- Information Technology Dept.
- Construction & Maintenance Dept.

# Summary of Consolidated Financial Results for Five Fiscal Years

	Mar. 2012	Mar. 2013	Mar. 2014	Mar. 2015	Mar. 2016	Mar. 2016
<b>Operating results (fiscal year)</b>					Millions of yen	1,000 USD
Net Sales	248,948	252,789	308,671	378,665	435,798	3,856,619
Cost of sales	172,456	178,052	208,052	254,387	289,266	2,559,876
Selling, general and administrative expenses	49,987	54,041	56,367	62,701	65,634	580,832
Operating income	26,505	20,696	44,252	61,577	80,898	715,911
Profit (loss) attributable to owners of parent	(35,351)	11,422	27,045	41,505	53,316	471,823
Capital expenditures	28,839	31,216	28,435	30,366	45,437	402,097
Depreciation and amortization	18,924	20,089	19,894	25,532	27,366	242,177
Research and development expenses	11,428	11,316	12,060	13,943	17,410	154,071
<b>Cash flows</b>						
Cash flows from operating activities	13,851	3,680	32,648	73,002	59,445	526,061
Cash flows from investing activities	(45,438)	(582)	(21,185)	(39,497)	(47,773)	(422,769)
Cash flows from financing activities	56,608	12,448	2,027	(26,000)	(373)	(3,300)
Cash and cash equivalents	85,149	102,845	119,782	128,617	136,065	1,204,115
<b>Financial position (end of fiscal year)</b>						
Total assets	523,323	563,030	614,220	702,234	711,897	6,299,973
Interest-bearing debt	131,436	155,816	167,296	156,203	163,973	1,451,092
Net assets	264,382	303,073	344,453	404,001	417,973	3,698,876
<b>Per share information</b>					yen	USD
Profit (loss) per share	(108.27)	34.98	82.82	127.11	163.28	1.445
Cash dividends per share	20	20	22	28	38	0.336
<b>Financial indicators (%)</b>						
Operating margin	10.6%	8.2%	14.3%	16.3%	18.6%	18.6%
Return on equity (ROE)	-12.6%	4.2%	8.6%	11.4%	13.3%	13.3%
Equity ratio	48.5%	52.0%	54.3%	55.8%	57.1%	57.1%

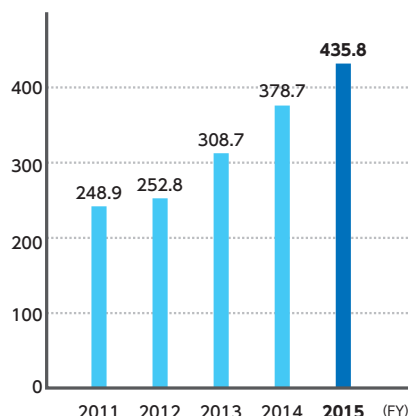


# Financial Highlights

The following data includes financial results of consolidated subsidiaries (22 domestic, 37 overseas companies as of March 31, 2016).

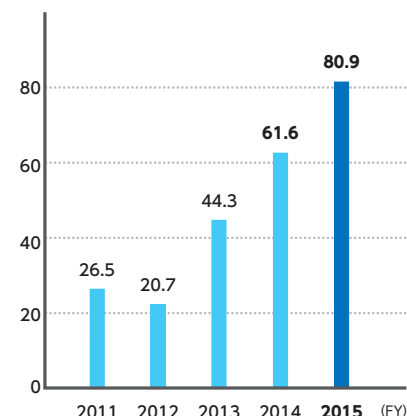
## Net Sales

(Billions of yen)



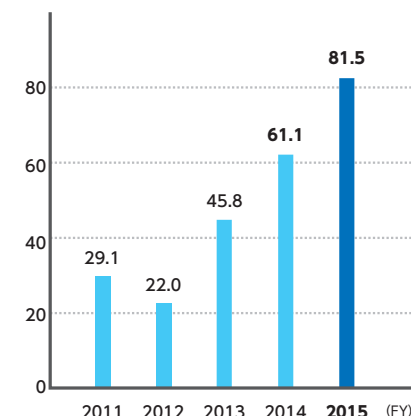
## Operating Income

(Billions of yen)



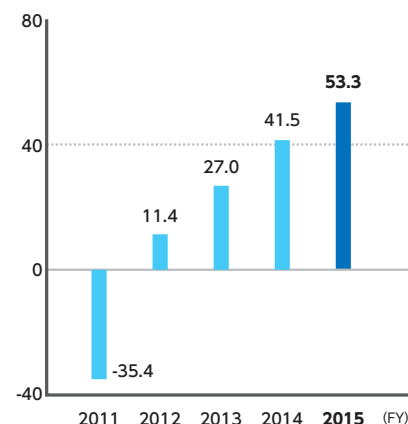
## Ordinary Income

(Billions of yen)



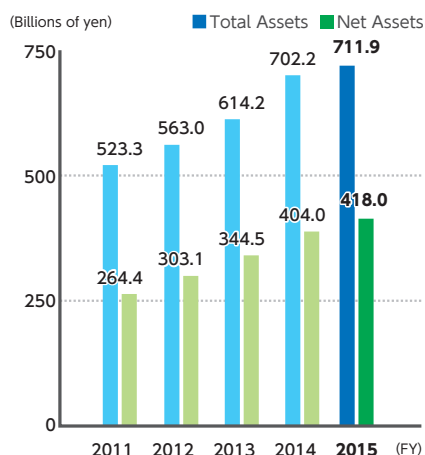
## Net Income (Loss)

(Billions of yen)



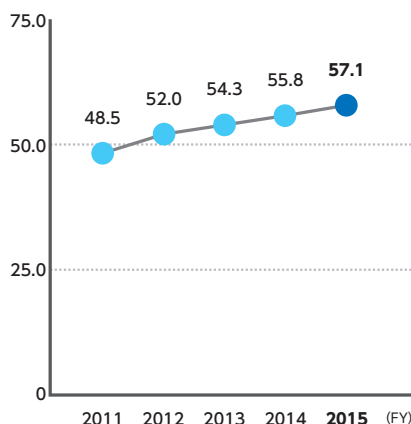
## Total Assets/Net Assets

(Billions of yen)



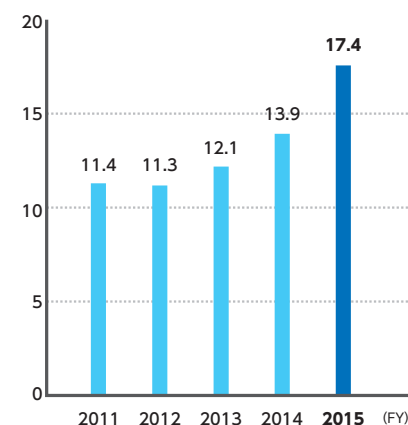
## Equity Ratio

(%)



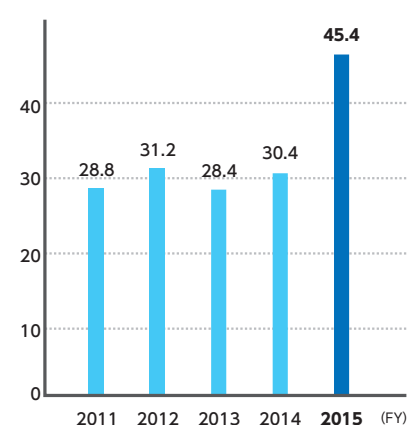
## Research and Development Expenses

(Billions of yen)



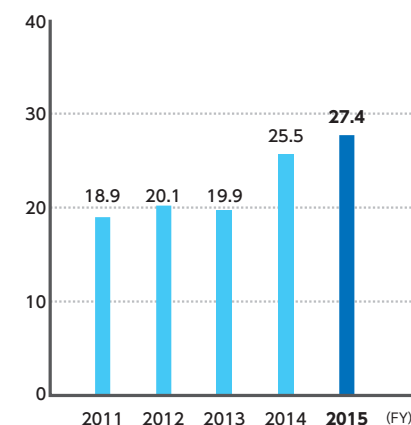
## Capital Expenditures

(Billions of yen)

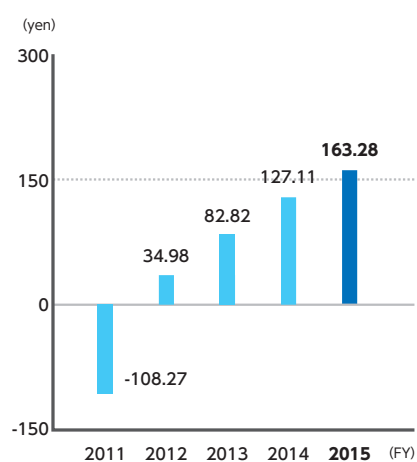


## Depreciation and Amortization

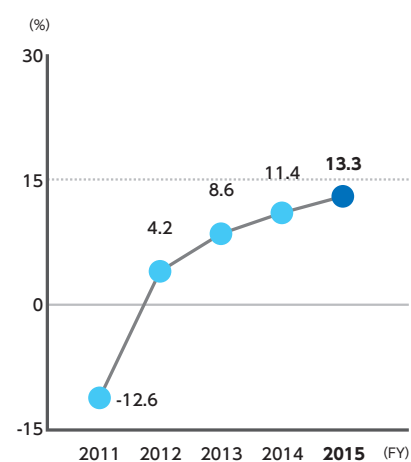
(Billions of yen)



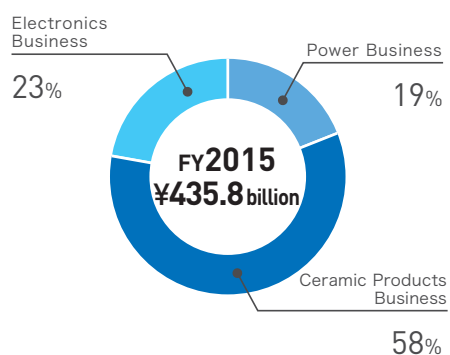
### Net Income (Loss) per Share



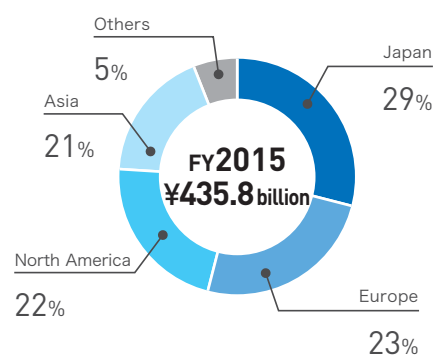
### Return on Equity



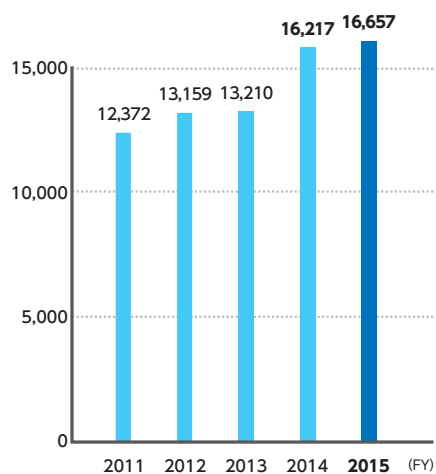
### Sales by Business Segment



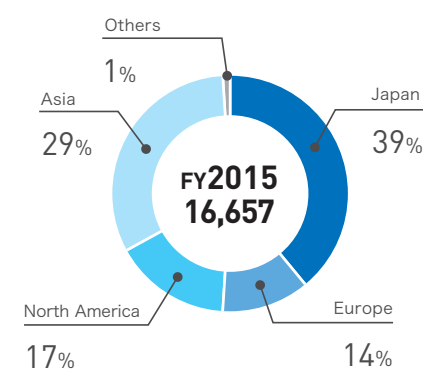
### Sales by Region



### Number of Employees



### Workforce by Region



# Global Network (List of Group Companies)

## Japan

### ENERGY SUPPORT CORPORATION

Manufacture and sale of power distribution equipment etc.

### AKECHI INSULATORS, LTD.

Manufacture of insulators for power distribution and other ceramic products

### IKEBUKURO HORO KOGYO CO., LTD.

Design and manufacture of glass-lined apparatus

### NGK CHEM-TECH, LTD.

Sale and maintenance services for corrosion-resistant equipment and glass linings

### NGK FILTECH, LTD.

Design and manufacture of pharmaceutical water purification systems and membrane filtration systems

### NGK ADREC CO., LTD.

Manufacture of refractories

### NGK KILNTECH CORPORATION

Design, manufacture, and sale of heating devices

### SOSHIN ELECTRIC CO., LTD.

Manufacture and sale of electronic components for communication devices

### NGK ELECTRONICS DEVICES, INC.

Manufacture and sale of ceramic packages, functional circuit boards, and electronic functional components

### NGK CERAMIC DEVICE CO., LTD.

Manufacture of electronic functional components

### NGK OKHOTSK, LTD.

Manufacture of jigs for ceramics production

### NGK METEX CORPORATION

Processing of beryllium copper wrought products

### NGK FINE MOLDS, LTD.

Manufacture and sale of metal molds

### NGK SPORTS PLANNING CO., LTD.

Management of tennis clubs and golf ranges

### NGK LIFE CO., LTD.

Insurance agency service and golf course management

### NGK YU-SERVICE CO., LTD.

Welfare and business services

### NGK LOGISTICS, LTD.

Transportation and storage of products, raw materials, and equipment

### NGK BUILDING SERVICE, LTD.

Building administration and maintenance



NGK TECHNOCERA  
SUZHOU CO., LTD.



NGK CERAMICS  
SUZHOU CO., LTD.



NGK INSULATORS  
TANGSHAN CO., LTD.

## China

## Europe



NGK BERYLCO FRANCE



NGK CERAMICS EUROPE S.A.



NGK CERAMICS POLSKA  
SP. Z O.O.



## Asia



SIAM NGK TECHNOCERA  
CO., LTD.



P.T. NGK CERAMICS  
INDONESIA

## Africa



NGK CERAMICS  
SOUTH AFRICA (PTY) LTD.



## North America

### LOCKE INSULATORS, INC.

Manufacture of insulators for substations

### NGK-LOCKE INC.

Sale of insulators and other products related to energy supply

### NGK-LOCKE POLYMER INSULATORS, INC.

Manufacture of polymer insulators

### NGK CERAMICS USA, INC.

Manufacture of automotive ceramics

### NGK AUTOMOTIVE CERAMICS USA, INC.

Sale of automotive ceramics

### FM INDUSTRIES, INC.

Processing and coating of metal modules for semiconductor manufacturing equipment; manufacture of modules

### NGK ELECTRONICS USA, INC.

Sale of ceramics for semiconductor manufacturing equipment

### NGK METALS CORPORATION

Manufacture and sale of beryllium copper products

### NGK INSULATORS OF CANADA, LTD.

Sale of insulators and other products related to energy supply and automotive ceramics

### NGK CERAMICS MEXICO, S. DE R.L. DE C.V.

Manufacture of automotive ceramics

## Europe

### NGK BERYLCO U.K. LTD.

Processing and sale of beryllium copper products

### NGK CERAMICS EUROPE S.A.

Manufacture of automotive ceramics

### NGK EUROPE GMBH

Sale of automotive ceramics etc.

### NGK DEUTSCHE BERYLCO GMBH

Sale of beryllium copper products

### NGK BERYLCO FRANCE

Manufacture and sale of beryllium copper products

### NGK ITALY S.R.L.

Support to NAS\* Battery projects

### NGK CERAMICS POLSKA SP. Z O.O.

Manufacture of automotive ceramics

### NGK CERAMICS SOUTH AFRICA (PTY) LTD.

Manufacture and sale of automotive ceramics

## Asia, Others

### NGK INSULATORS TANGSHAN CO., LTD.

Manufacture and sale of insulators for power transmission

### NGK INSULATORS (CHINA) INVESTMENT CO., LTD.

Sale of insulators and other products related to energy supply and beryllium copper products

### NGK CERAMICS SUZHOU CO., LTD.

Manufacture and sale of automotive ceramics

### NGK TECHNOCERA SUZHOU CO., LTD.

Design, manufacture, and sale of heating devices; sale of refractories

### NGK AUTOMOTIVE CERAMICS KOREA CO., LTD.

Sale of ceramics for automobiles and semiconductor manufacturing equipment

### P.T. NGK CERAMICS INDONESIA

Manufacture and sale of automotive ceramics

### NGK CERAMICS (THAILAND) CO., LTD.

Manufacture and sale of automotive ceramics

### SIAM NGK TECHNOCERA CO., LTD.

Manufacture and sale of refractories

### NGK TECHNOLOGIES INDIA PVT. LTD.

Sale of automotive ceramics and beryllium copper products

### NGK STANGER PTY. LTD.

Manufacture and sale of power distribution equipment; sale of insulators for power distribution/transmission





(TRANSLATION)

## Independent Practitioner's Assurance Report

July 12, 2016

Mr. Taku Oshima,  
President,  
NGK Insulators, Ltd.

Hiroshi Inanaga  
Chief Executive Officer

Deloitte Tohatsu Evaluation and Certification Organization Co., Ltd.  
3-3-1, Marunouchi, Chiyoda-ku, Tokyo

We have undertaken a limited assurance engagement of the energy-origin CO<sub>2</sub> emissions on a non-consolidated basis on page 26 and page 27, and the transport volume and basic unit per transport volume on a non-consolidated basis on page 29 (the "CO<sub>2</sub> information") for the year ended March 31, 2016 included in the "NGK Report 2016" (the "Report") of NGK Insulators, Ltd. (the "Company").

### The Company's Responsibility

The Company is responsible for the preparation of the CO<sub>2</sub> information in accordance with the calculation and reporting standard adopted by the Company (the Report page 27). CO<sub>2</sub> quantification is subject to inherent uncertainty for reasons such as incomplete scientific knowledge used to determine emissions factors and numerical data.

### Our Independence and Quality Control

We have complied with the independence and other ethical requirements of the Code of Ethics for Professional Accountants issued by the International Ethics Standards Board for Accountants, which is founded on fundamental principles of integrity, objectivity, professional competence and due care, confidentiality and professional behavior. We apply International Standard on Quality Control 1, *Quality Control for Firms that Perform Audits and Reviews of Financial Statements, and Other Assurance and Related Services Engagements*, and accordingly maintain a comprehensive system of quality control including documented policies and procedures regarding compliance with ethical requirements, professional standards and applicable legal and regulatory requirements.

### Our Responsibility

Our responsibility is to express a limited assurance conclusion on the CO<sub>2</sub> information based on the procedures we have performed and the evidence we have obtained. We conducted our limited assurance engagement in accordance with the International Standard on Assurance Engagements ("ISAE") 3000, *Assurance Engagements Other than Audits or Reviews of Historical Financial Information*, issued by the International Auditing and Assurance Standards Board ("IAASB"), ISAE 3410, *Assurance Engagements on Greenhouse Gas Statements*, issued by the IAASB and the *Practical Guideline for the Assurance of Sustainability Information*, issued by the Japanese Association of Assurance Organizations for Sustainability Information.

The procedures we performed were based on our professional judgment and included inquiries, observation of processes performed, inspection of documents, analytical procedures, evaluating the appropriateness of quantification methods and reporting policies, and agreeing or reconciling with underlying records. These procedures also included the following:

- Evaluating whether the Company's methods for estimates are appropriate and had been consistently applied. However, our procedures did not include testing the data on which the estimates are based or reperforming the estimates.
- Undertaking site visits to assess the completeness of the data, data collection methods, source data and relevant assumptions applicable to the sites.

The procedures performed in a limited assurance engagement vary in nature and timing from, and are less in extent than for, a reasonable assurance engagement. Consequently, the level of assurance obtained in a limited assurance engagement is substantially lower than the assurance that would have been obtained had we performed a reasonable assurance engagement.

### Limited Assurance Conclusion

Based on the procedures we have performed and the evidence we have obtained, nothing has come to our attention that causes us to believe that the Company's CO<sub>2</sub> information is not prepared, in all material respects, in accordance with the calculation and reporting standard adopted by the Company.

The above represents a translation, for convenience only, of the original Independent Practitioner's Assurance report issued in the Japanese language.

Member of  
Deloitte Touche Tohmatsu Limited

## Third Party Opinion



**Mr. Koichi Ikeda**

Visiting Professor  
Ritsumeikan University  
Management School

The NGK Report 2016 takes on a big challenge to cover everything about the NGK Group in a way that is easy for readers to understand. This is the first step toward an integrated report, combining financial and non-financial (e.g. CSR) information.

An integrated report strongly reflects management philosophy and the actual business performance in what information to be chosen from a wide variety of facts and how to be reported. The NGK Report 2016 clearly shows that the Group is fully aware of its social significance and strengths, makes them the foundations of its management, pursues its business based on these foundations, and foresees its sustainable growth.

Under the corporate philosophy “NGK products and technologies must create new value and contribute to the quality of life,” the NGK Group has placed the highest priority on “environmental and social contribution through products” by leveraging its unique and various technologies such as ceramics, one of its great strengths, in its new Five-Year Environmental Action Plan which started in fiscal 2016. Based on this plan, the Group will actively promote efforts to develop and spread environmentally-friendly products. These are emphasized in the Management’s Commitment at the beginning of the report.

In the following special feature section, New Five-Year Environmental Action Plan (2016–2020) and Environmental Products, specific details are described. The notable point is that the Group has, for the first time, set numerical targets on “development and distribution of products contributing to environmental protection” that are directly linked to its corporate philosophy. Another notable point is that the Group has set the shared goals in Japan and overseas on the main theme regarding reduction of environmental impact (reducing CO<sub>2</sub> emissions and waste) then clearly indicated consolidated management. The report demonstrates the Group’s high aspirations to practice the environmental contribution through products and environment-friendly manufacturing at a global level; it also shows the Group’s serious commitment to these goals to people within and outside the company. This enhances our trust and expectations for the Group’s environmental and social contribution as well as for the specific results the Group brings that integrate such contribution into business growth.

Moreover, the Group also stresses that the driving force for growth is each and every employee. Based on this idea, the report introduces various practical activities in ESG Report 2: Society, reflecting the top commitment to build a company where each employee can fully demonstrate his/her potential and initiative. In order to accomplish its corporate mission to provide products and services that contribute to the quality of life, the Group engages in a variety of activities, including human resource development, a safe work environment, and an employee-friendly environment for women. The report introduces these activities using a lively style with photos, simple charts, and real voices of people in the field; that is one of the wonderful features we can see throughout the NGK Report 2016.

We can say that the NGK Report 2016 has set the direction and central axis toward an integrated report demanded by society. I hope the Group continues to refine the structure of the report to gain further support and understanding from society, as well as to review the contents so that all the information is provided equally and effectively.

## Response from NGK



**Nobumitsu Saji**

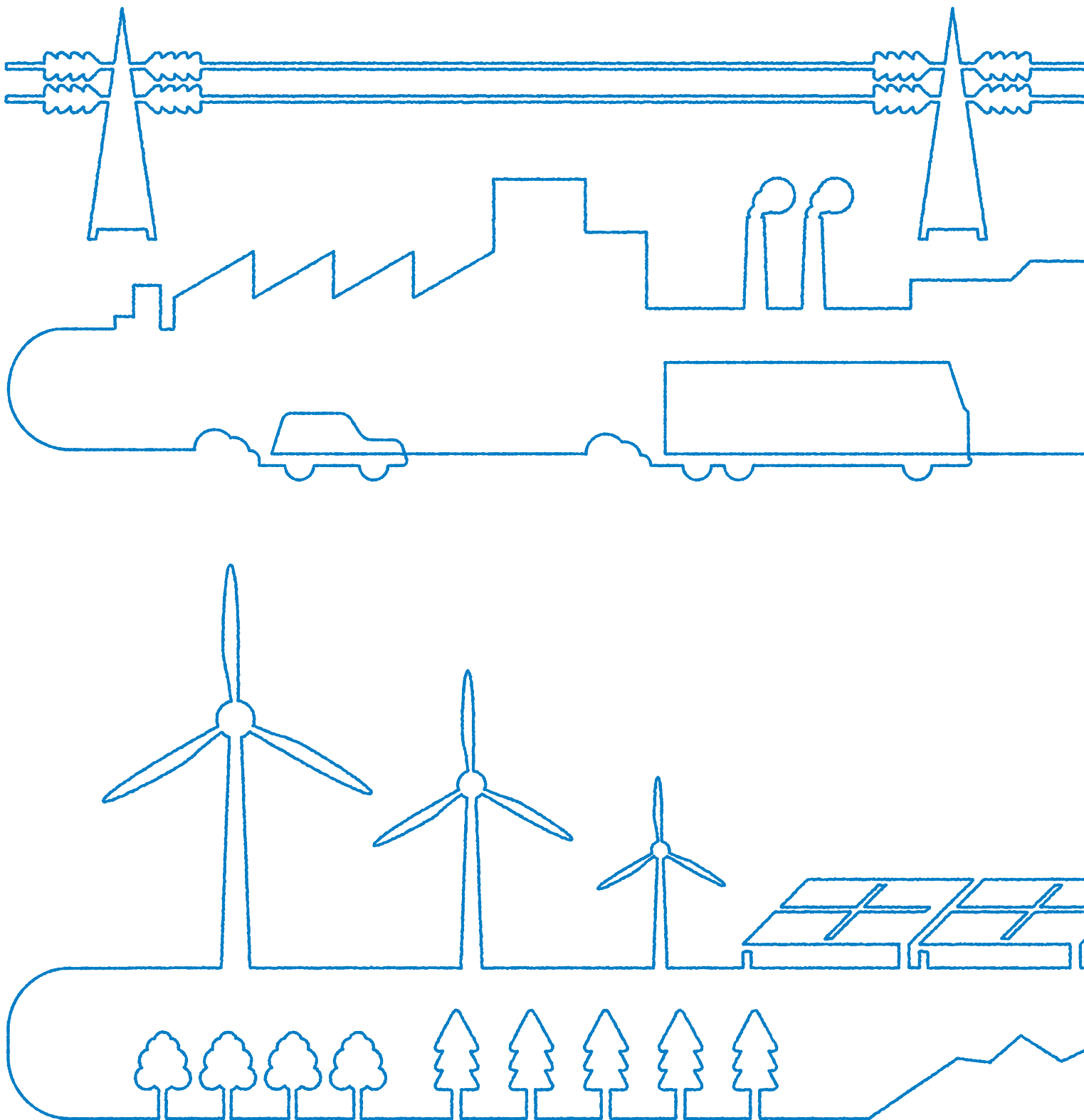
Director and Senior Vice President  
CSR Committee Chair

Thank you very much for sharing your valuable opinions.

Starting this year, we have combined financial and non-financial information as ‘NGK Report’ in its printed version. All NGK Group staff and employees will focus on realizing our corporate philosophy by reflecting on ourselves and constantly pursuing the essence of “contributing to the global environment and society through work activities,” while listening with sincerity to the voices of our stakeholders in an attempt to rise to a higher level. I would appreciate it if you would read the report along with the information on our website and then give us your candid feedback.

While we anticipate further expansion of business overseas, the global society is increasingly demanding international corporations to comply with laws and regulations. The Group will work as one to live up to the expectations and trust from global society by continuing to recognize compliance as the linchpin of CSR activities, while also following international standards for decision-making and acting with sincerity.





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Published in August 2016

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**Ink:** To replace petroleum-based inks, vegetable-based inks with the volatile organic compounds (VOCs) content reduced to below 1% have been employed.

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